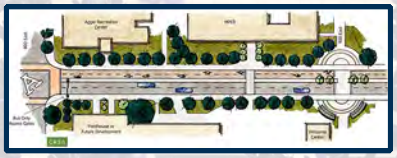
UTAH STATE UNIVERSITY

TRANSPORTATION STUDY



UtahStateUniversity

March 30, 2016

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Abbreviations

ADA	Americans with Disabilities Act of 1990
APBP	Association for Pedestrian and Bicycle Professionals
BRT	Bus Rapid Transit
CAPCOA	California Air Pollution Control Officer's Association
CMPO	Cache Metropolitan Planning Organization
CVTD	Cache Valley Transit District
FTA	Federal Transit Administration
GHG	Greenhouse Gas
HAWK	High-Intensity Activated Crosswalk
LOS	Level of Service
MPH	Miles per Hour
NTD	National Transit Database
P&TS	Parking & Transportation Services
RRFB	Rectangular Rapid Flashing Beacon
SRTP	Short Range Transit Plan
STIC	Small Transit Intensive Cities
TDM	Transportation Demand Management
UDOT	Utah Department of Transportation
USU	Utah State University
VMT	Vehicle Miles Traveled

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Executive Summary

Utah State University (USU) is one of Utah's premier education institutions. Located in picturesque Logan, Utah, the campus is increasing in population, while constrained by several geographical features and ever-increasing transportation demands. This Master Plan is a comprehensive analysis and inventory of the current transportation conditions and provides a vision for the future transportation system. This transportation plan identifies goals, projects, and programs intended to balance the needs of the campus, while promoting a safer, more sustainable transportation system. The USU Transportation Master Plan has been closely coordinated with the USU Master Plan, various district plans, the USU Recreational and Open Space Plan, the Logan Bicycle and Pedestrian Plan and the Logan City 400 North Corridor study. The culmination of these master plans represent countless hours devoted to a substantial body of work that has been contributed to by a large group of experts, many internal constituent groups within USU, and stakeholders from the surrounding community.

According to the USU Master Plan, USU's student population is projected to grow from 14,000 FTE to 26,000 FTE over the next 20 to 30 years. Corresponding expansion in academic programs would require an estimated addition of 2.5 million square feet of academic and support facilities, as well as an increase of 3,000 new beds to maintain current on-campus student housing ratios.

With its finite land area, replacing older single story facilities with multistory buildings will continue to be a priority for physical growth of campus where possible. However, as these options diminish, and in order to retain more desirable open green space, the process of infill will eventually result in limited and more expensive interior parking options along with increased perimeter surface parking. If USU progresses towards its growth targets without addressing current and future transportation issues, mounting congestion will result in less-than-desirable campus environment outcomes. These include a negative impact upon the student life experience and in turn, a potential decline in student retention and degree completion resulting in decreases in tuition and auxiliary revenue.

The Transportation Master Plan is segmented into three implementation periods, each looking further out into the future. Phases II and III, which range from 6 to 25 years out, are fluid and subject to adjustment over time, and are included in the master plan as guiding standards for growth.

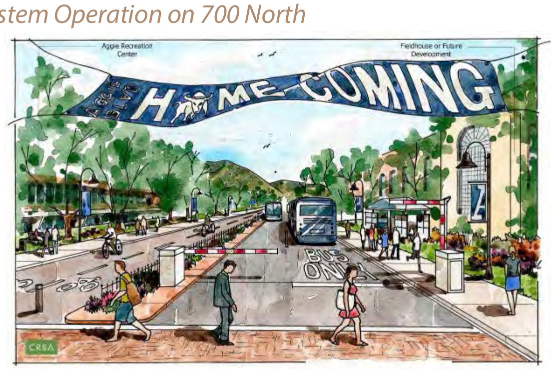
Key Improvements

The key improvements focus on the more dynamic and complex changes being recommended in the first five years of this plan. Additional details on how and why these improvements were recommended can be found in the subsequent chapters.

Highway 89 Traffic Control

With existing traffic volumes on Highway 89 and the projected increase in traffic, congestion from local traffic and tourism traffic in and out of Logan Canyon, the 1200 East - Hwy 89 intersection currently meets warrants for adding a traffic signal. With high vehicle speeds, limited sight-distances, and large traffic volumes adding to the perilous conditions, the intersection of Hwy 89 and Champ Drive also warrants additional traffic control. A proposed raised median on Hwy 89 would serve to allow access to Champ Drive from an eastbound left-hand turn lane, while also preventing eastbound left hand turn access from Champ Drive onto Hwy 89. Access from Champ drive to Hwy 89 would be by right-hand turn only. In addition, a legal U-turn at the intersection of 400 North and 600 East would allow service vehicles and other campus traffic to return to the east of campus if needed.

Improved Pedestrian, Bicycle and Transit System Operation on 700 North



Looking East on Aggie Blvd. - Street Level (from 800 East)

To significantly reduce vehicular congestion from private vehicles driving and queuing up on 700 North, increase transit reliability and travel times, and to reduce pedestrian and bicycle conflicts with vehicles, the plan recommends restricting private vehicular access to 700 North. Phase I would **not restrict access, but would include pedestrian and bike improvements. Restricted access will be evaluated for implementation between the intersections of 800 and 1200 East in Phase II, or approximately 6** to 10 years. Access would continue to be allowed for the Aggie Shuttle and Cache Valley Transit District (CVTD) busses, while at the same time providing a physical separation between pedestrians, busses and bicycles. Service and delivery vehicles would also be able to access 700 North when needed.

Looking West on Aggie Blvd. – Street Level

The USU Transportation Master Planning steering committee visited Stanford University and University of California, Davis to observe first-hand how restricted drives function in an active campus setting. As a result, the steering committee was able to visualize how these traffic management tools would work for 700 North. Campus surveys taken in person showed support (74 percent in favor) for the proposed 700 North changes.

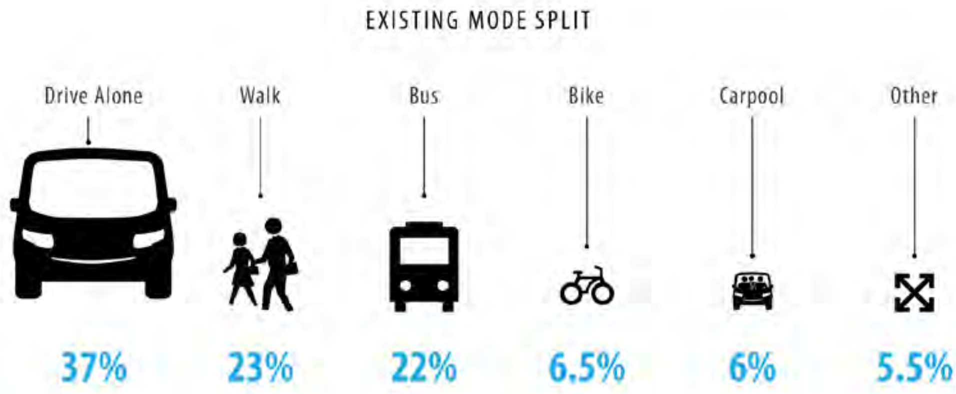
700 North modifications would not only serve to reduce the risks of accidents between all transportation modes as well as to lessen congestion and delays, but also provide an extremely attractive streetscape that better defines inner campus and its connection to other pedestrian pathways.

1200 East throughway modifications

Traffic congestion at 1200 East and 850 North (campus outlet just south of the Logan Cemetery at 1200 East) are significant during several key times of the day and evening. The drive serves as access and exit for Spectrum athletic events, Clinical Services, the Early Childhood Center, and two large residential halls. Immediately to the east of this outlet is a drive that serves as access for Facilities department work vehicles as well as employee parking for Facilities and the Nutrition and Food Sciences building. To ease this congestion and improve safety, the plan recommends a roundabout be installed at this location.

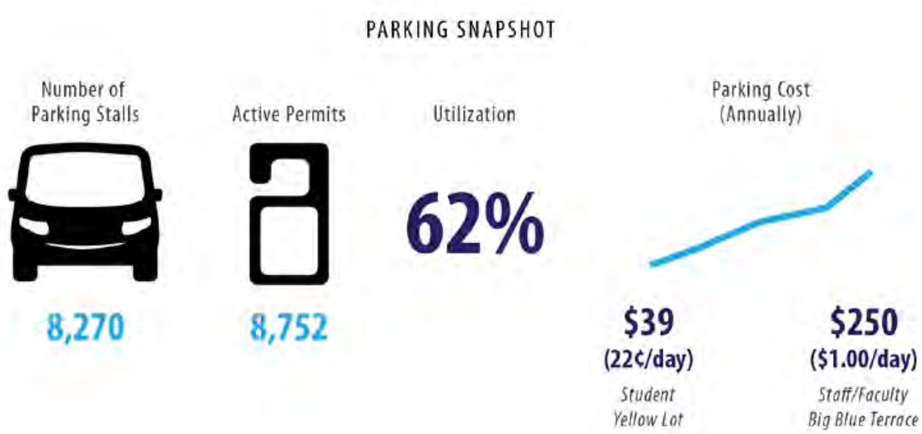
Current System

Utah State University has approximately 17,000 students and 2,800 faculty and staff. These campus users travel to campus predominately by private vehicle, walking, and transit.



On-campus circulation generally operates at acceptable levels today, with most intersections operating under low levels of delay. There are a few exceptions: the intersections of 1200 East / 1400 North, 1200 East / US-89, and Champ Drive / US-89. These intersections have high levels of congestion for at least one peak hour.

Parking is provided throughout central campus and in off-central campus lots, such as by the stadium. Parking user fees pay for all parking administration, enforcement, and management. Although there are roughly the same number of stalls to active permits, parking utilization for the entire campus is only 62 percent, indicating a surplus of over 3,000 stalls on campus.



The USU campus is served by two fare-free transit providers: the university-run Aggie Shuttle, which provides on-campus circulation, and the CVTD, which provides regional transit services. CVTD and the Aggie Shuttle each offer very successful services: they serve a combined three million passengers annually and approximately 90 percent of survey respondents rate each service as "good" or "excellent."

Bicycling is a popular mode to and on campus. Bicyclists are accommodated through several on-campus pathways. There are nearly 2,900 bicycle stalls, and demand is concentrated near the Taggart Student Center, the Library, and the Engineering Building. Bike racks are also available on transit vehicles. A major contributor to the success of bicycling on campus is Aggie Blue Bikes, which lends out bicycles throughout the year, in addition to offering education classes and maintenance. Aggie Blue Bikes is a free service to the campus community.

In addition to accommodations for transit and bicycling, USU has created management strategies to reduce the vehicular trips to campus. These management strategies include reserved stalls for carpools, rideshare matching, car share, advertising campaigns, and awareness techniques such as the Open Streets Festival and National Bike Challenge.

Overarching Goals

1 Develop a transportation network and auxiliary facilities that foster and support an engaged and vibrant residential student life experience and campus community and accommodate the projected growth of population and goods movements on campus.

2 Create a safe, convenient, and well-connected network that facilitates all modes and promotes environmentally-friendly travel alternatives such as biking, walking, and public transit.

3 Generate and keep record of measurable outcomes to enable the evaluation of progress and to inform future planning decisions on campus.

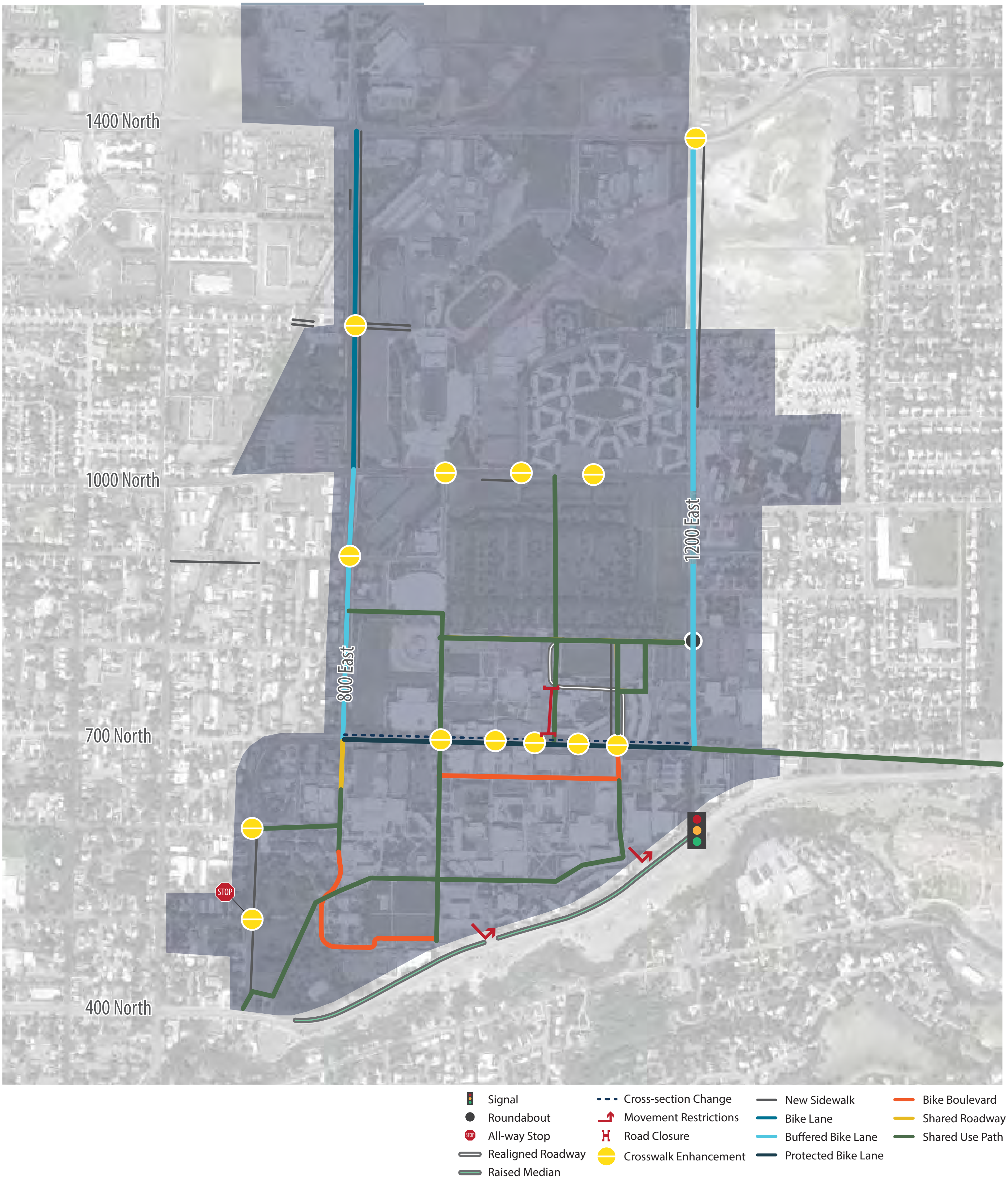
4 Reduce greenhouse gas emissions from the transportation sector to help achieve carbon neutrality by 2050, as outlined by the *USU Climate Action Plan*.

The plan strives to create a transportation network that encompasses:

- Safety First
- Multi-Modal Infrastructure
- Access for All
- Informed Choices
- Clean Environment and Healthy Community
- Smart Investments

Improvement Priorities

Projects recommended by this plan focus on optimizing the current system, increasing safety for system users, and reducing vehicular trips to campus. This plan was categorized into three priorities: Phase 1 (5 years), Phase 2 (10 years), and Phase 3 (25 years), as shown in **Figures ES-1 to ES-3**. **Table ES-1** summarizes the top priority projects within each phase.



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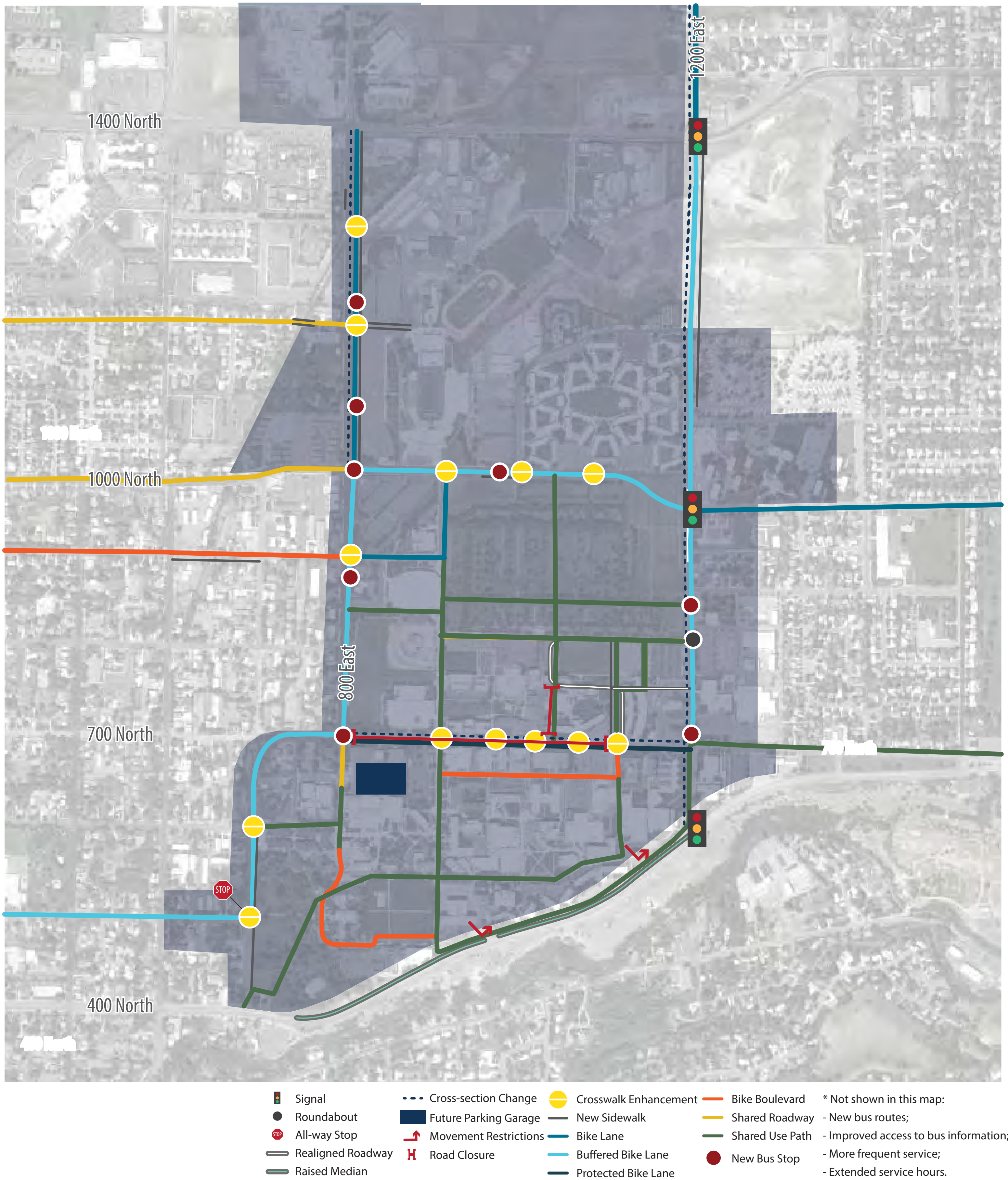
Phase 1 (0-5 Years) Improvements

figure ES1



Phase 2 (5-10 Years) Improvements

figure ES2

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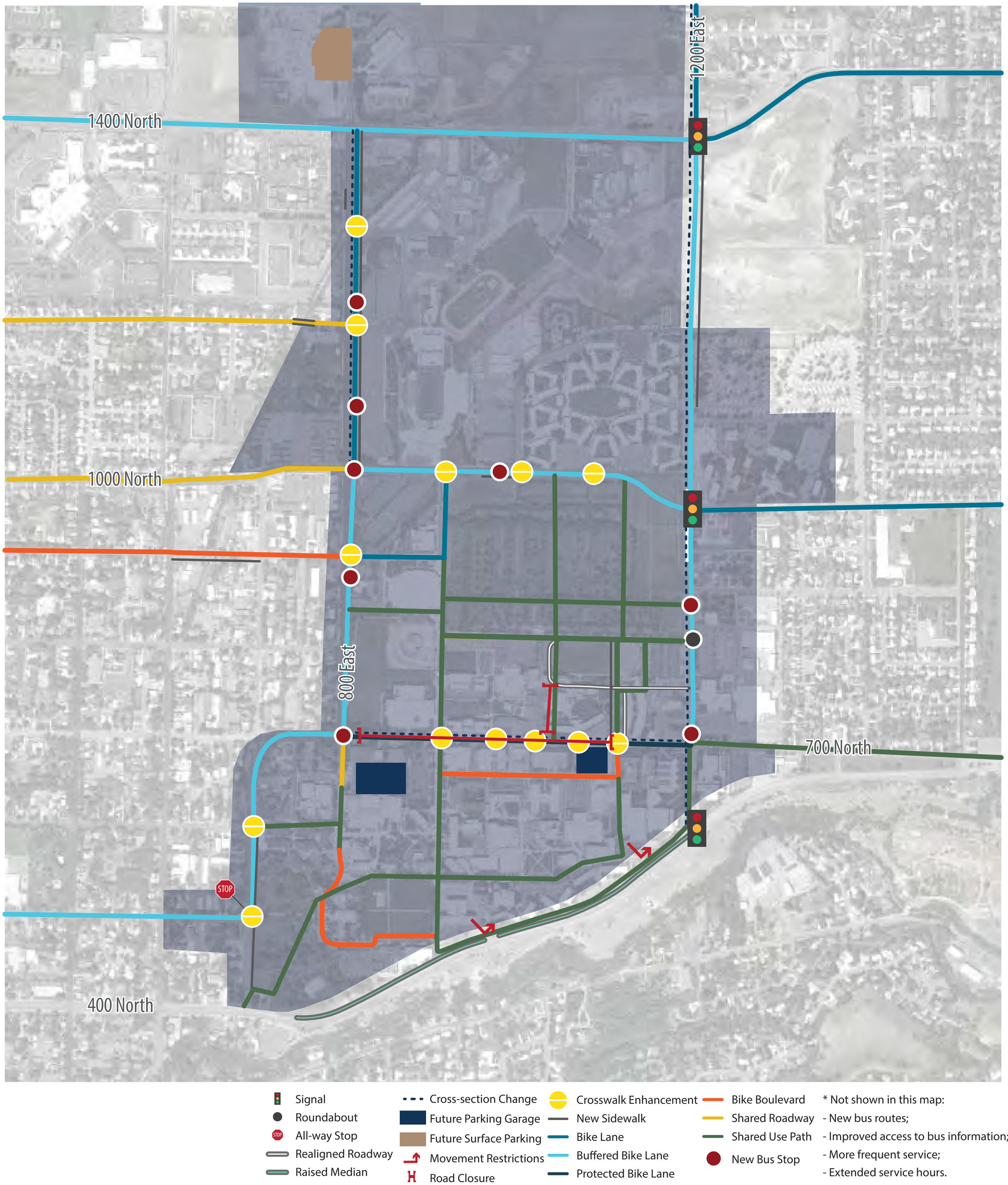

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Phase 3 (10-25 Years) Improvements

figure ES3

Table ES-1 | Top Priority Projects

Priority	Project	Description	Cost Range	Grant or Alternative Funding Possible	Ease of Implementation
Phase 1					
1	Campus Core North Roadway Modifications	Realignment of roadways within the Campus Core North area to address Edith Bowen pick-up/drop-off operations and reopening Bullen Hall. With these realignments, accommodate a shared use path for bicycles and pedestrians on roadways internal to the Campus Core North.	$850k-$1M	No	Moderate
2	1200 East Roundabout	Construction of a roundabout at the intersection of 1200 East and 850 North.	$400k-$550k	Yes	Moderate
3	700 North Modification	Construction of a protected bicycle facility between 800 East and 1200 East; and enhanced crosswalks between 800 East and 1200 East.	$900k-$1.1M	Yes	Moderate
4	1200 East / US-89 Signalization	Signalization of the intersection of 1200 East and US-89.	$200k-$350k	Yes	Moderate
5	800 East Modification	Modifying 800 East to accommodate bicycle lanes in each direction by narrowing lane widths; construction of a sidewalk on the eastern side of 800 East between 1000 North and 1400 North; and addition of a signalized crosswalk at approximately 1200 North.	$300k-$450k	Yes	Difficult
6	700 North Shared Use Path	Construction of a shared use path along 700 North between 1200 East and 1500 East, eventually leading to the Bonneville Shoreline Trail.	$15k-$25k	Yes	Moderate

Table ES-1 | Top Priority Projects

Priority	Project	Description	Cost Range	Grant or Alternative Funding Possible	Ease of Implementation
7	1200 East Buffered Bike Lanes	Construction of buffered bike lanes on 1200 East between 700 North and 1400 North.	$25k-$40k	Yes	Moderate
9	Establish Transportation Demand Management (TDM) Coordinator Staff Position	Fund and support a TDM coordinator, who will responsible for implementing short- and long-term TDM strategies.	$N/A (yearly salary cost)	Yes	Easy
9	Create Centralized TDM Webpage	Establish a "one stop shop" webpage for TDM strategies for campus travelers, linking to relevant TDM resources.	$N/A (relatively low cost for initial setup and continual maintenance)	No	Easy
10	Provide TDM Materials to New Students, Staff, and Faculty	Provide informational packets to new students and faculty as early and as often as possible, which detail commuting options and programs and the financial, environmental, and health benefits from choosing not to drive to campus.	$N/A (relatively low cost for initial setup and continual maintenance and printing)	No	Easy

Table ES-1 | Top Priority Projects

Priority	Project	Description	Cost Range	Grant or Alternative Funding Possible	Ease of Implementation
Phase 2					
1	Big Blue Terrace Replacement	Construction of an underground parking structure beneath the new student center to replace the Big Blue Terrace.	$8M-$15M (substantial amount of unknowns, but cost will be high)	Yes	Moderate
2	700 North Modification	Vehicular restrictions between 800 East and Bullen Hall	$15k-$25k	Yes	Easy
3	Additional Bus Stops	Bus service improvements through additional bus stops and shelters.	$150k-$300k	Yes	Easy
4	1000 North Modification	Realigning 1000 North to complete a four-way intersection at 1200 East; signalization of the intersection; and construction of bicycle lanes and sidewalks along 1000 North.	$350k-$450k	Yes	Difficult
5	800 East Bus Service	Consolidate the Stadium Express and 8th East Express/Innovation Aggie Shuttle routes into a single service.	$14k-$55k/year Savings	Yes	Moderate
6	Bicycle Pilot Project	Conduct a pilot project to determine the feasibility of separating bicycle and pedestrian traffic in the Campus Core.	$10k-$30k	Yes	Easy
Phase 3					
1	Increase Student Housing and On-Campus Amenities	Construction of additional housing and on-site amenities to reduce vehicle trips to campus.	$N/A	Yes	Difficult

Table ES-1 | Top Priority Projects

Priority	Project	Description	Cost Range	Grant or Alternative Funding Possible	Ease of Implementation
2	Completion of Bicycle Facilities to Campus	Work with Logan to complete proposed bicycle facilities to campus, as shown in the Bicycle and Pedestrian Master Plan.	See Logan Bicycle & Pedestrian Master Plan	Yes	Moderate
3	Performance Hall Parking Garage	Replacement of surface lot with additional parking garage on the southwest corner of 700 North and Bullen Hall.	$6M-$8M	Yes	Moderate

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Introduction

Utah State University (USU) is Utah's land-grant, public research university. Nestled at the base of Logan Canyon, USU is an attractive campus to both students and faculty, and as such, the campus population is projected to increase well into the future. This Transportation Master Plan provides USU with a comprehensive strategy for campus transportation that accommodates campus growth. To do so, this plan provides for increased pedestrian safety, ensures on-campus transit service meets the needs of its users, manages campus parking supply, and identifies Transportation Demand Management (TDM) program elements to minimize vehicle use and provide campus populations with the full range of travel mode options.

The following goals and objectives serve as an outline to shape this plan and the future transportation system.

Overarching Goals

1 Develop a transportation network and auxiliary facilities that foster and support an engaged and vibrant residential student life experience and campus community and accommodate the projected growth of population and goods movements on campus.

2 Create a safe, convenient, and well-connected network that facilitates all modes and promotes environmentally-friendly travel alternatives such as biking, walking, and public transit.

3 Generate and keep record of measurable outcomes to enable the evaluation of progress and to inform future planning decisions on campus.

4 Reduce greenhouse gas emissions from the transportation sector to help achieve carbon neutrality by 2050, as outlined by the *USU Climate Action Plan* and the *USU Sustainability Plan*.

Performance Objective 1: Reduce commuters' carbon footprint and improve air quality by promoting alternative travel modes and lowering vehicle miles traveled (VMT) in and around campus from the current 39 percent (Source: 2012 GHG Inventory baseline) to:

- 30 percent by 2020,
- 25 percent by 2025, and
- 20 percent by 2030.

Performance Objective 2: Reduce the percentage of driving alone trips by encouraging carpooling and promoting alternative modes of travel to shift short car trips from the current 37 percent (source: 2014 Transportation Survey) to:

- 31 percent by 2020,
- 24 percent by 2025, and
- 18 percent by 2030.

Performance Objective 3: Increase the percentage of walk and bike trips by installing pedestrian and bike facilities such as pedestrian and bicyclist crossings, bike lanes, and bike parking from 30 percent (source: 2014 Transportation Survey):

- 35 percent by 2020,
- 40 percent by 2025, and
- 45 percent by 2030, as well as

Providing incentives and designating programs to reduce the percentage of students who currently do not have access to a bicycle from 35 percent (source: College Survey Results) to.
:

- 29 percent by 2020,
- 23 percent by 2025, and
- 15 percent by 2030.

Performance Objective 4: Increase transit ridership by improving shuttle service and stop locations from 22 percent (source: 2014 Transportation Survey) to:

- 23 percent by 2020,
- 24 percent by 2025, and
- 25 percent by 2030.

Objectives

Safety First

Implement measures recommended by the *USU Bike Plan* and adopt a Complete Street policy to create a walkable and bikeable campus by minimizing conflicts between pedestrians, cyclists, and motorists and providing safe access for all users.

Maintain the state of good repair of road, bicycle, and pedestrian infrastructure to improve safety and level of service for all campus users.

Lower the speed limit to 20 miles per hour on campus streets as recommended in the Bicycle Friendly University Feedback Report and coordinate with the USU Police Department to enforce the lower speed limit, and design and operate a transportation network in a way that facilitates safe and efficient movements of both people and goods.

Improve safety at major intersections and pedestrian crossings on campus to mitigate potential conflicts between pedestrians, bicyclists, and automobiles.

Multi-Modal Infrastructure

Consider a layered network approach that establishes high priority routes for cyclists and pedestrians.

Create a review process to enable quantitative evaluation for the accessibility of new campus facilities to bicyclists, pedestrian, and transit riders.

Designate pedestrian loading/unloading areas to reduce congestion in parking areas and major roadways.

Work with campus maintenance staff to ensure snow removal and storage activities do not impede travel for non-motorized users of all types.

Identify detour routes for cyclists when construction impacts established cyclist routes on campus.

Improve the connectivity between the campus and the city by providing more convenient and effective linkages to campus to accommodate students and faculty, as well as visitors.

Improve bicyclist and pedestrian access to campus in hilly areas through implementation of various means including shared-use ADA-accessible pathways, year-round stair access at the Aggie Parking Terrace, and other strategies.

Extend Aggie Shuttle service to serve students and employees in a broader area and develop a flexible schedule and temporary routes to provide access for the USU community especially under inclement weather conditions.

Access for All

Provide and improve access to campus facilities for people with limited mobility or disabilities through ADA compliant infrastructure and special transportation services.

Promote transit and paratransit options on campus and invite people with limited mobility or disabilities to participate in campus transportation decision making.

Informed Choices

Continue the real-time shuttle tracker service and provide easy access to information on parking availability through social media and other means.

Implement a consistent way-finding system to help students and visitors navigate while enhancing the identity of the campus as a whole.

Ensure TDM strategies are given priority before considering street improvements or improving parking capacity to accommodate the projected population growth on campus.

Establish dedicated TDM staff to inform and coordinate activities such as ride sharing, Guaranteed Ride Home, bike share, and other transportation choices, and establish a "one-stop shop" online where TDM strategies are outlined for the public.

Clean Environment and Healthy Community

Maintain the state of good repair of the Aggie Shuttle fleet, and increase fuel efficiency of the fleet by 20 percent.

Improve air quality by reducing single-occupant-vehicle travel, including promoting more transit use, encouraging cycling and walking, reducing the need for short trips, and encouraging carpooling.

Consider options to increase housing availability and provide incentives to encourage faculty, staff, and students to live on and near campus.

Launch educational programs to build awareness of the environmental benefits of active transportation and provide wellness-related incentives for the USU community to improve their health through active transportation.

Smart Investments

Explore innovative funding sources, such as parking revenue, and strategies to invest in transportation improvements and prioritize projects that benefit all modes and users.

Align the City of Logan's transportation, especially alternative transportation-related, capital improvements to secure funding while exploring new funding options to improve transit and Cache Valley Transit District (CVTD) service.

Continue to invest in and expand the Aggie Blue Bikes service to meet the increasing demand for easy access to bicycles among students, faculty, and staff and secure funds from the state for bike structures.

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Existing Conditions

Campus Overview

The Utah State University Campus in Logan is only one part of a larger educational network, including statewide campuses in Blanding, Brigham City, Kaysville, Moab, Price, Tooele, the Uintah Basin, and a handful of other locations. The USU Main Campus in Logan is by far the largest; student populations from the 2013-2014 and 2014-2015 academic years are provided in **Table 1**. These enrollment numbers were several thousand higher than initial forecasts; updated projections that reflect these higher enrollment trends are not currently available.

Table 1 | Current Student Population

	2013-2014	2014-2015
Undergraduate Students	14,683	15,709
Graduate Students	1,728	1,824
Total Student Population[1]	16,411	16,903

Source: Utah State University Ad-Hoc Population By Year
1. Some students may be enrolled in undergraduate and graduate degrees concurrently

The Logan campus consists of 400 acres sitting on a scenic bench at the base of Logan Canyon. Approximately 20 percent of students live in campus housing. In addition, the university is the main employer in the region with approximately 2,500 employees, and a major economic driver for the region.

Planning Documents

Several guiding documents provide direction for transportation decisions on the USU campus in Logan. These include the *Utah Department of Transportation (UDOT) Long Range Plan*, Cache Metropolitan Planning Organization (CMPO) *Long Range Transportation Plan*; the Cache Valley

Transit District *Short Range Transit Plan*; the *Logan Transportation Master Plan*; the *Logan Bicycle and Pedestrian Master Plan;* and documents internal to USU including the *Campus Master Plan*, the *Recreation & Open Space Master Plan*, the *Climate Action Plan*, the *Bicycle Master Plan*, and supporting documentation for the Bicycle Friendly Universities application. This information is summarized briefly below.

Utah Department of Transportation Long Range Plan | 2011

The Utah Department of Transportation compiles long range plans every four years to identify projects for implementation by UDOT throughout the state, and is frequently limited to improvements on UDOT-owned facilities. UDOT is organized by Regions, and Region 1 includes Cache County along with several other counties in the northern part of the state. The *Region 1 Long Range Plan* does not currently identify projects in the area around USU.

> A new long range plan is currently under development for 2015, and may likely introduce new projects that may influence USU circulation.

CMPO Long Range Transportation Plan | 2011

This document was produced in cooperation with the Utah Department of Transportation, Cache Valley Transit District, Cache County, and other stakeholders in the Cache Valley area. Major needs identified in this plan include:

- Future capacity improvements on the Main Street corridor, including transit investments
- Congestion relief in downtown Logan and near USU
- Commuter transit service between Logan and Ogden
- Circulator shuttles for communities in the Cache Valley
- A CVTD maintenance facility
- Future expansion of express routes to bus rapid transit (BRT)
- Sidewalk connectivity improvements
- Snow removal enforcement for sidewalk routes
- Improved pedestrian crossings on major roadways
- Bicycle storage facilities near transit routes
- Bicycle racks, including covered facilities
- Selected shoulder widening throughout Cache Valley to accommodate bicycle lanes

Specific improvements in the Cache MPO plan that affect the USU campus include:

- 1200 East, from Highway 89 to 300 North in Hyde Park: expand to accommodate two travel lanes and a median, funded in Phase Two with an inflated project cost of $39M
- Cache North transit route, on 1200 East through campus and connecting downtown Logan with USU, North Logan, Hyde Park, and communities to the north

- Proposed bicycle routes or trails on 800 East, 1200 East, and 1400 North near campus

As with the *UDOT Long Range Plan*, the Cache MPO will also introduce a new long range transportation plan in 2015 that may show projects on or near the USU campus.

Cache Valley Transit District Short Range Transit Plan | 2012

As outlined in the Short Range Plan, Cache Valley Transit District (CVTD) operates sixteen routes in the Cache Valley area in addition to complementary paratransit services. A comparison provided in the plan established that transit ridership increased over the 2006 – 2011 period, despite a small dip in ridership correlating with the peak of the recession. Three routes provide service to the USU campus, and these represent some of the highest-ridership routes in CVTD's service area. Public outreach conducted through the plan identified several issues and needs associated with transit access in Logan, including:

- The span of service during the day needs to be longer;
- More frequent service is needed; and
- More direct service and competitive travel times are desirable.

The *Short Range Transit Plan* established recommendations for implementation with a near time span – two to five years following the adoption of the plan. These recommendations include the following that affect USU:

- Restructuring Routes 4 and 9 to provide better service to USU, including less time lost in delays at pedestrian crossings on 700 North and therefore fewer missed connections at the transit hub;
- Increasing frequency for the restructured Route 4 to 15-minute headways; and
- Increasing frequency on the CVS Express regional route between Logan and Hyrum, from 60-minute to 30-minute headways, and extend it to USU to provide a direct one-seat ride to campus from the southern part of the Cache Valley.

Logan City Transportation Master Plan | 2008

The Logan City *Transportation Master Plan* analyzed future roadway needs throughout the City and identified several routes and intersections near the USU campus that would be at or approaching failing conditions by 2030:

- 1200 East/1400 North, currently an all-way stop control intersection, projected to be level of service (LOS) F; signalization is recommended;
- 1200 East/1000 North, projected to have a poor LOS in the future; signalization is recommended;

- Add missing sidewalk segments on 1000 North between 800 East and 1200 East; on 1200 East between 1000 North and 1400 North; and on US-89 along the south boundary of campus;
- Proposed bikeways on US-89, 700 East, 800 East, 1200 East, 600 North, 700 North, 1000 North, and 1400 North; and
- Trails on 1400 North, 1200 East (northern edge of campus and north), and on a diagonal route crossing the northwest corner of campus north of the hospital.

Logan City Bicycle and Pedestrian Master Plan | 2015

The Logan City Bicycle and Pedestrian Master Plan examined potential programs and facilities that would help improve the walking and bicycling conditions in the city, including sidewalk improvements and completing network gaps; crossing improvements, overall intersection improvements, and signals; bike network facilities; and shared use path and side path projects. Proposed projects near the USU campus include:

- Trail along the canal alignment in the northern part of campus, on 700 North east of campus, and parallel to US-89 on the south edge of campus;
- Standard bike lanes on 800 East between 1000 North and 1400 North, on 900 North from 800 East to the Logan Cemetery, on 1000 North from 1200 East to 1600 East, and on 1500 North from 1200 East to 1600 East
- Buffered bike lanes on 800 East from 700 North to 1000 North, on 1400 North west of 1200 East, on 1000 North from 800 East to 1200 East, and on 1200 East from 700 North to 1400 North
- Spot improvements at various locations, including several on campus:
    - Access improvements into the Logan Cemetery near the Spectrum building and also near the Tower soccer field
    - Crossing improvements at several entrances to campus including 400 North/600 East, 500 North/700 East, 700 North/800 East, and 700 North/1200 East
    - Grade separated crossings on 800 East at roughly 1150 North (option for at-grade crossing), and on 1400 North east of 800 East
    - Signalized crossing on 800 East at the canal (roughly 1300 North)

      These and other campus-specific recommendations are generally captured in the Phase 1, 2, and 3 maps for bicycle and pedestrian improvements in this document. However, one proposed improvement in the Logan plan was inconsistent with the transportation vision established by Utah State University: the grade separated crossing on 800 East at approximately 1150 North. This proposed crossing is roughly 375' south of the 1200 North intersection, where this Transportation Master Plan is recommending a HAWK beacon. Given that both HAWK beacons and grade separated crossings are relatively costly improvements, funding may not be available to implement both. USU planners should continue coordination with Logan City to reach consensus on crossing treatments in this section of 800 East; meanwhile, the grade separated crossing at 1150 North is not shown on maps for this plan. The Logan City Bicycle and Pedestrian Master Plan was in the adoption process at the time this document was written.

USU Campus Master Plan | 2011

The *Campus Master Plan* identified several transportation-related improvements that would mitigate vehicle/pedestrian conflicts. These included:

- Limiting the amount of vehicle parking that can be accessed only via 700 North;
- Traffic calming measures such as road diets and raised pedestrian crossings;
- Installing a landscaped median on 800 East from 700 North to 1400 North;
- Incremental development of parking garages, primarily to replace the commuter lots west of the Stadium and also between the Spectrum and the stadium off 800 East; and
- Creating a gateway and visitor signage near the 500 North entrance to campus.

USU Bicycle Master Plan | 2012

The Facilities Planning Department prepared a bicycle master plan in 2012 to provide clarity in how cyclists should interact with other modes on campus, identify preferred routes throughout campus for cyclists and establish several goals for implementation in subsequent years. The plan identifies several major pathways across the internal campus area where cyclists can ride alongside pedestrians but should exercise caution and yield right-of-way to pedestrians. The plan also identifies a Dismount Zone near the Student Center. Both types of facilities are identified by pavement icons, directing cyclists to dismount or "yield your wheels" as appropriate. 700 North was identified as the highest priority route for on-street facilities in the plan, with 800 East, 1000 North, and 1200 East also shown as high priority routes.

Previously Conducted Surveys

CMPO (along with other regional and statewide partners) gathered information as part of the Utah Household Travel Survey in 2012 on how students feel about walking and bicycling in their communities. This included responses to specific questions in addition to individualized geocoded responses where people perceived barriers to walking and bicycling.

The College Travel Survey, as part of the Utah Household Travel Survey, asked a wide range of questions on demographics, travel choices, and perceptions. Responses for Utah State University students are summarized below (note: these responses include students from across the USU system, 87 percent of which represented the Logan campus).

- USU students make 44 percent of their trips to campus via private vehicle, 14 percent via transit, and 41 percent via active transportation.
- USU students make 85 percent of their trips to off-campus jobs via private vehicle, 8 percent via active transportation, 2 percent via transit, and 5 percent using other means.
- 16 percent of USU students use transit four or more times per week; 14 percent use transit one to three days per week; 32 percent use transit a few times per month or less; and 38 percent never use transit.
- 9 percent of USU students ride a bicycle four or more times per week; 10 percent ride a bicycle one to three days per week; 40 percent ride a bicycle a few times per month or less; and 41 percent never ride bicycles.

In 2014, the USU Parking & Transportation Services Department undertook another survey of faculty, staff, students, and administration to gather more information on travel habits. Several observations worth noting were revealed in this survey:

- Roughly 2/3rds (67 percent) of respondents live within 3 miles of campus, which represents an opportunity for converting more trips to walking and bicycling (nearly 40 percent lived within one mile of campus).
- 65 percent of respondents leave campus between one-three times each day, generally to eat or to run errands. Offering more variety of services or eating establishments on campus may reduce mid-day trips to and from campus.
- Many pedestrians (76 percent) continue to walk to campus even when the weather is poor (and rely on Aggie Shuttles somewhat more than personal vehicles as an alternate method of transportation).
- Inclement weather is more of a deterrent for cyclists: only 32 percent of respondents who biked to campus said they would still do so if the weather was bad, and these individuals tended to rely more on personal vehicles as an alternate method. This issue may be worth additional follow-up through surveys and other efforts to determine what services USU could offer to keep cycling attractive and viable as a means of transportation in the winter months.
- Respondents indicated a desire for more bicycle parking near the Taggart Student Center and the library, and didn't support paying a fee of $10/month for secure bicycle parking. However, there may be a lower payment threshold that may be more acceptable for users, and could potentially be explored.
- Carpooling is not particularly popular, primarily for reasons of convenience and varied commute times.
- Only 23 percent of respondents supported paying an additional fee to expand Aggie Shuttle service to and around the USU campus.
- Over half (51 percent) of respondents have no parking permits whatsoever, which indicates that free parking is readily available. This is convenient for staff, faculty, and students, yet does not incentivize the use of transit, walking, or bicycling to reduce congestion or air pollution and to help meet sustainability goals.

Several locations where respondents perceived problems with walking and bicycling specifically were pinpointed by survey respondents on or near USU. These include:

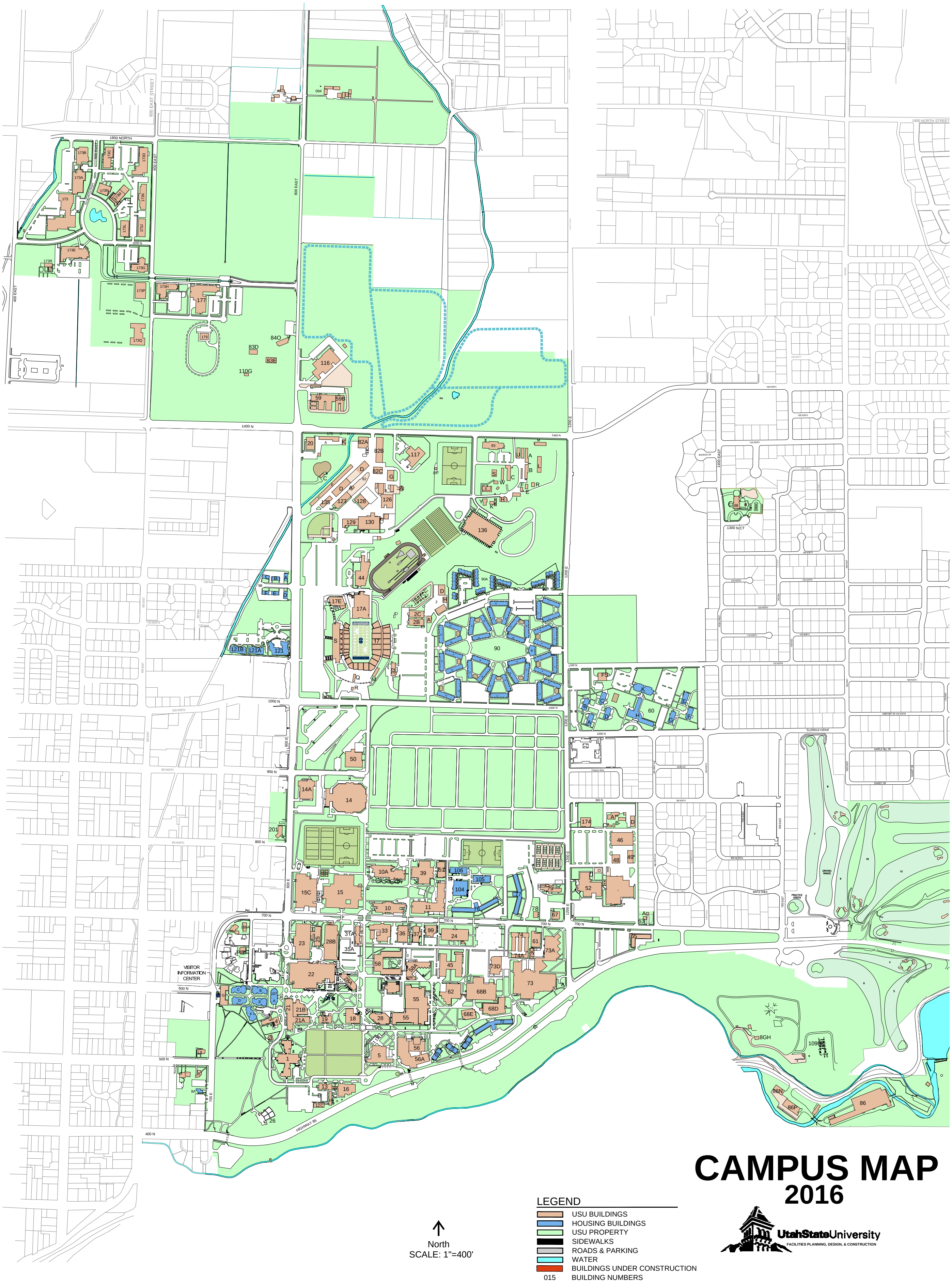
- The intersection of Aggie Bullevard with a parking lot access just west of Hillcrest Avenue, where a respondent felt that lighting was inadequate for a location with this degree of vehicle and pedestrian traffic;
- The intersection of 1200 East and 900 North near the cemetery, where a respondent indicated that the shoulders are often covered in debris, no bike lanes are available, and students ride against traffic;
- The intersection of 800 East and 1000 North near the stadium, where a respondent said the sidewalks were inadequate to and from the stadium, and that bus stops are not connected to the sidewalks; and
- The intersection of 800 East and 1400 North, where a respondent expressed a desire for bicyclists to be able to trigger the signal.

Circulation

USU is a multi-modal campus providing students with many transportation options. This section gives a brief description of existing conditions, with a more detailed assessment of the system presented in the following chapter. Figure 1 provides an overview of the campus.

Traffic

Vehicle traffic in and around campus is accommodated by only a handful of roads. 800 East and 1200 East provide north/south travel adjacent to campus. Cross-campus travel is accommodated on 1400 North, 1000 North, and 700 North. US-89/400 North forms the southern boundary of campus and is a main corridor linking Logan, the USU campus, and Logan Canyon. Many of these roads do not provide direct, continuous access through campus to neighboring areas. For instance, the main corridor through campus, 700 North, only connects 700 East to 1500 East, and 800 East connects to 700 North but does not extend south to US-89. 1000 North provides good connection eastward through the University, but has an off-set intersection at 1200 East, providing disjointed connectivity to the east of campus. Table 2 provides more information about the roadways around campus.



UtahStateUniversity

Campus Overview

figure 1

Table 2 | Campus Roadways

Roadway	Speed Limit	# of Lanes	Average Daily Traffic
1400 North	25 mph	3	8,100
1000 North	25 mph	2	4,700
700 North	25 mph	2	5,800
US-89	40 mph	5	12,900
800 East	25 mph	5 between 1000 North and 1400 North; 2 elsewhere	7,300
1200 East	35 mph	2	8,600

Source: Fehr & Peers; Utah Department of Transportation

Students, faculty, and staff purchase permits through the P&TS to use the lots; parking supply and active permit allocation is outlined in the table below. Parking regulations are generally enforced between 7:00am and 5:00pm. Parking at student housing locations is enforced 24 hours a day and seven days a week. Figure 2 shows the campus parking locations.

Table 3 | Current Parking Permits

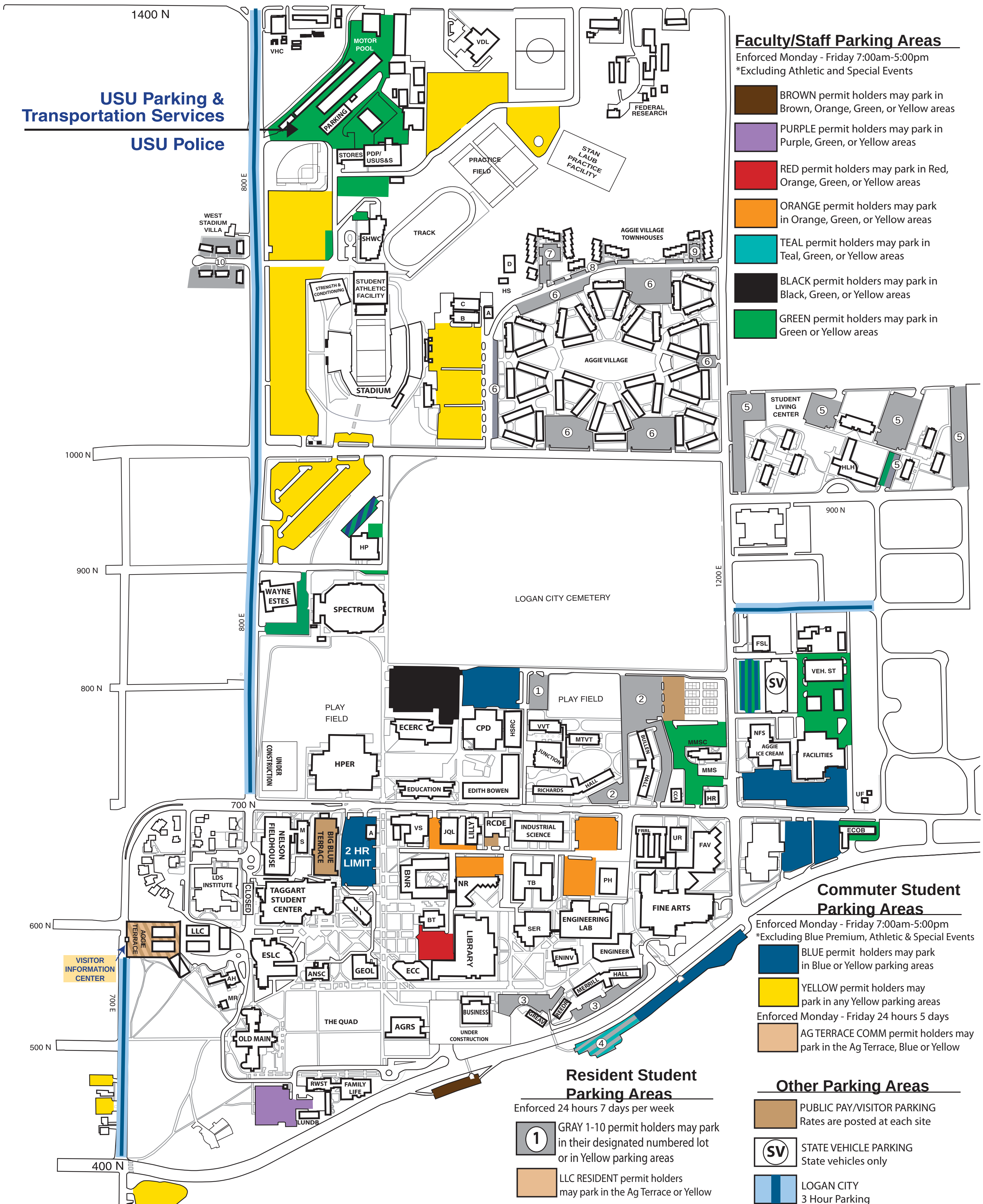
Lot Types	Number of Stalls	Active Permits[1]
Faculty/Staff – Central Campus	1,613	2,017
Student – Central Campus	2,119	3,276
Central Campus Sub-Total	*3,732*	*5,293*
Business Related/Other – Off Central Campus	953	-
Student – Off Central Campus	3,585	3,459
Off Central Campus Sub-Total	*4,538*	*3,459*
Grand Total	**8,270**	**8,752**

Source: Utah State University Parking and Transportation Department

1. Active permits as of April 1, 2014.

Of the 8,270 parking stalls on campus, 917 are structured parking stalls and 7,353 are surface parking stalls. Student parking supply comprises 69 percent of the total campus parking (including student housing parking). The breakdown of user group by campus location is shown in Table 4 and the subsequent Charts 1a-1c.

USU sells a number of different types of permits for use of the on-campus and residential parking supply. Table 5 shows the permit types and associated fees per year for students and faculty/staff. Parking permits by semester are also available.



Campus Parking Locations

figure 2

UtahStateUniversity

Table 4 | Current Parking Supply

User Group	Number of Stalls	Percent
Central Campus		
Students	1,182	32%
Student Housing	937	25%
Faculty/Staff	1,613	43%
Central Campus Sub-Total	*3,732*	*100%*
Off Central Campus		
Students	2,372	52%
Student Housing	1,213	27%
Business Related/Other	953	21%
Off Central Campus Sub-Total	*4,538*	*100%*
Campus Total		
Students	3,554	43%
Student Housing	2,150	26%
Faculty/Staff	1,613	20%
Business Related/Other	953	12%
Grand Total	8,270	100%

Source: Utah State University Parking and Transportation Department

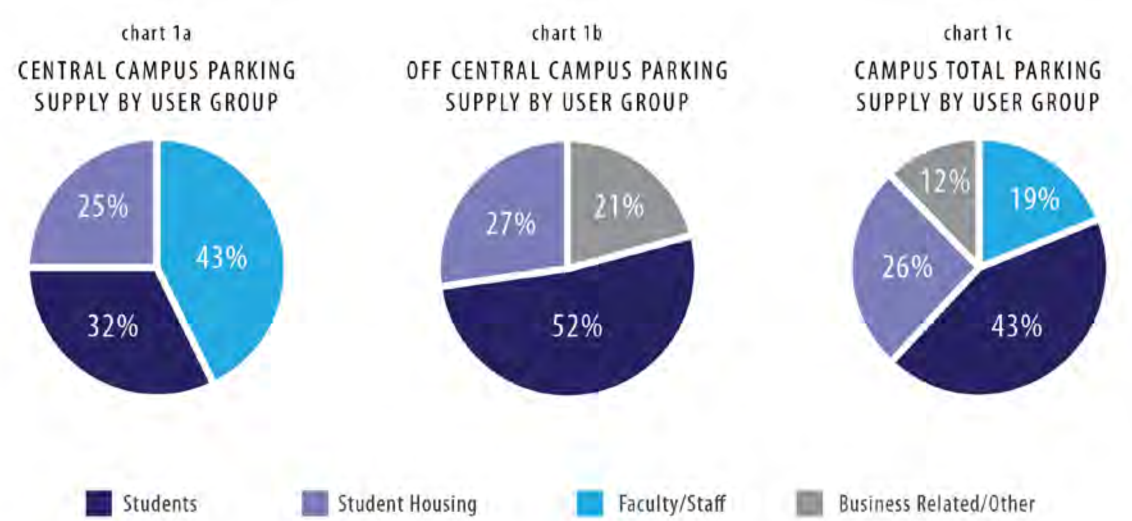


Table 5 | Current Annual Parking Permit Rates

Parking Lot/Type	Current Price	New Price[1]
Student Lots		
Blue	$102	$110
Blue Semester	$60	$65
Yellow	$35	$39
Aggie Terrace Commuter	$207	$215
Aggie Terrace Semester	$115	$121
Off Campus Resident	$103	$105
Student Housing Lots		
Aggie Terrace Resident	$185	$193
Gray 1 Valley View Tower	$95	$101
Gray 2 Mountain View Tower	$90	$96
Gray 3 Merrill	$95	$101
Gray 4 Highway	$80	$86
Gray 5-10 Lots	$48	$52
Faculty/Staff Lots		
Aggie Terrace	$241	$250
Big Blue Terrace	$241	$250
Purple	$164	$173
Red	$185	$194
Orange	$134	$143
Brown	$164	$173
Teal	$134	$143
Black	$134	$143
Green	$114	$123
Yellow	$43	$47

Source: Utah State University Parking and Transportation Department

1. Effective Summer 2015

There is no free parking on campus. Visitor parking is accommodated in the Big Blue Parking Terrace, the Aggie Parking Terrace, or at a parking meter. Day passes are available to students, faculty, staff, and visitors. The cost is $5 per day or $20 per week. The lot the permit is valid for is determined by the P&TS staff based on need and availability. Rates at the Big Blue and Aggie Terraces are $1.50 an hour with a maximum of $7.50 day. The parking meters (locations and times vary) around campus are $0.05 = 4 minutes, $0.10 = 8 minutes, $0.25 = 20 minutes. Details on the campus parking demand and utilization can be found in the *Assessment of Data and Demand Projections* chapter.

Transit

The USU campus is served by two transit providers: the university-run Aggie Shuttle, which provides on-campus circulation, and CVTD, which provides regional transit services. CVTD and the Aggie Shuttle each offer very successful services: they serve a combined three million passengers annually and approximately 90 percent of respondents in the USU Survey rate each service as "good" or "excellent."

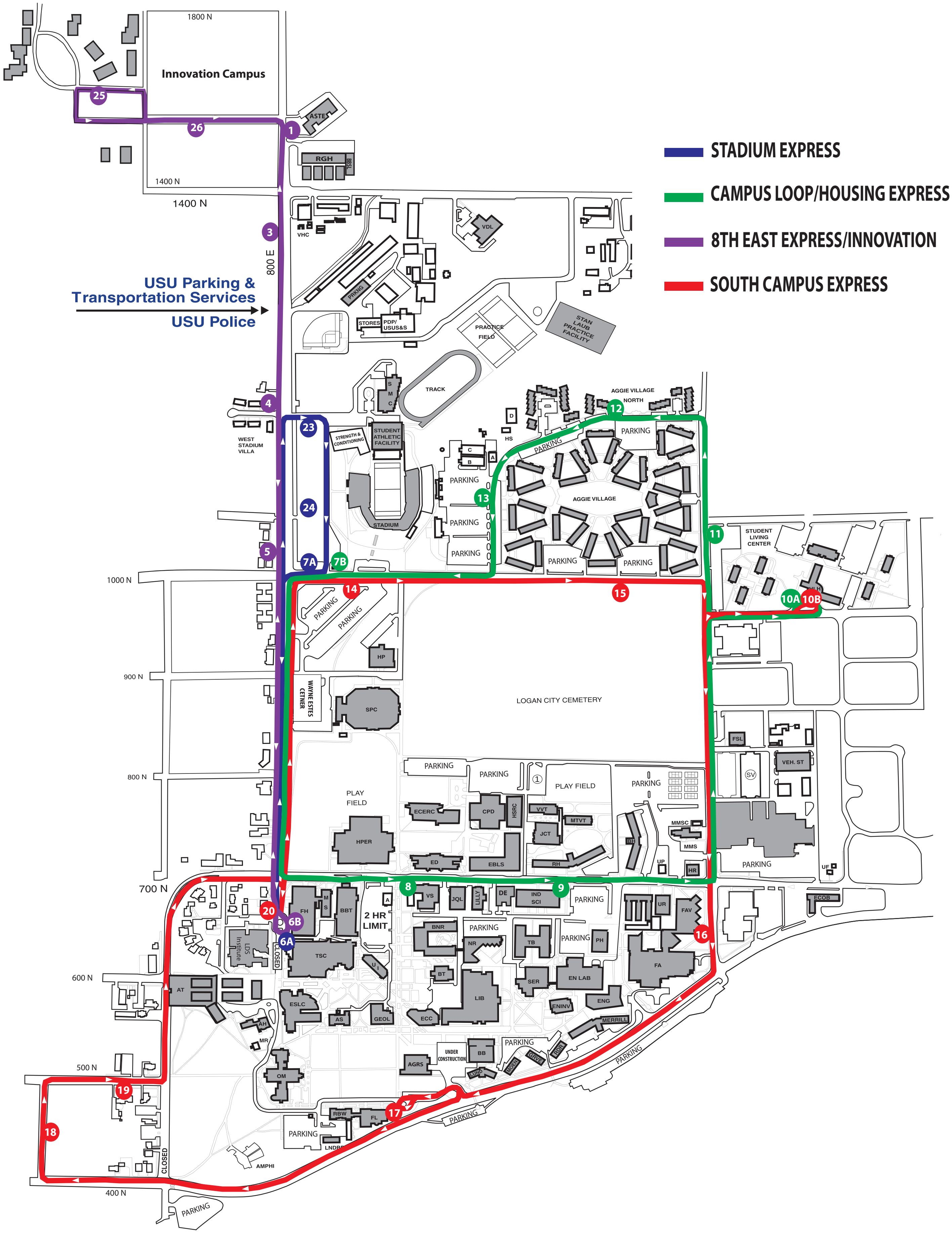
Aggie Shuttle

The Aggie Shuttle provides free transit services to the USU campus when the university is in session (153 academic days per year). It is funded by a student transportation fee but open to the public. Four lines presently operate at varying frequencies between 7 AM and 6/6:30pm: the Stadium Express, Campus Loop/Housing Express, 8th Street East Express/Innovation, and South Campus Express. In addition, the Evening Express offers service between 5:30 PM and 9:30 PM. Figures 3 and 4 show Aggie Shuttle's daytime and evening operations, while Table 6 shows daily hours of operation and frequency by time of day.

Table 6 | USU Shuttle Operations

Route	Total Daily Hours of Operation	Frequency by Time of Day					
		7 AM – 8 AM	8 AM – 10 AM	10 AM – 12:30 PM	12:30 PM – 3:30 PM	3:30 PM – 6 PM	5:50 PM – 9:30 PM
Stadium Express	19	8	4	4	4	8[1]	-
8th East Express	21.5	7.5	5	7.5	7.5	15	-
Campus Loop	21.5	7.5	5	7.5	7.5	15	-
South Campus Express	15.5	18	9	9	18	18	-
Evening Express	4	-	-	-	-	-	10

1. Operates until 6:30 PM



Aggie Shuttle Daytime Operations

figure 3

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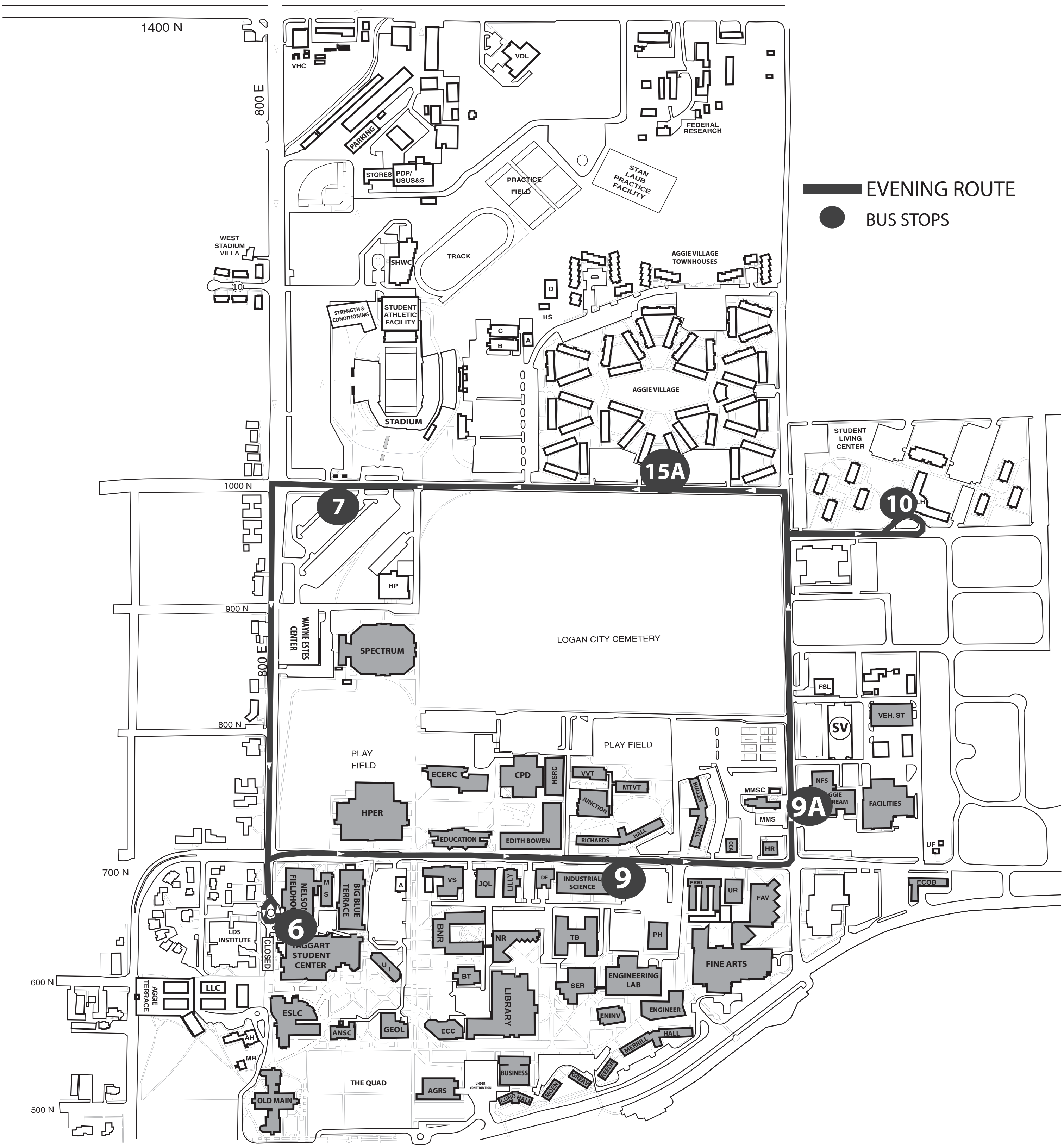

Aggie Shuttle Evening Operations

figure 4

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The Aggie Shuttle system serves over 1.1 million passengers per year, an increase of 4.4 percent between the 2012-2013 and 2013-2014 academic years. Over 7,000 passengers ride the Aggie Shuttle per day when USU is in session. Ridership is most heavily concentrated around the 800 East, 700 North, and 1200 East corridors.

The total budget for the Aggie Shuttle during the 2013-2014 academic year was $870,162. Of this total, $393,943 went toward shuttle operations, $395,535 went toward debt service for equipment costs, and $80,684 went toward charter operations. For the 2014-2015 academic year, it is anticipated that Aggie Shuttle operations will cost approximately $414,000.

Transit ridership for on-campus routes is available for the 2012-2013 and 2013-2014 school years and is summarized in the table below.

Table 7 | Transit Ridership

Route	July 2012 – July 2013	July 2013 – June 2014	Percent Change
800 East	251,930	269,789	7.1%
Campus Loop	275,910	247,174	-10.4%[1]
Charter	37,628	38,420	2.1%
Evening	20,237	19,532	-3.5%
South Campus	112,762	164,618	46.0%[1]
Stadium Express	375,678	382,292	1.8%
Water Lab	6,585	6,770	2.8%
Total	1,080,730	1,128,595	4.4%

Source: Utah State University Transportation and Parking Department

1. The South Campus route added a stop at the Lundstrum building in the 2013-2014 school year, which contributed to the decline in ridership on the Campus Loop route.

As shown in the table, ridership increased somewhat between the 2012-2013 and 2013-2014 school years, although enrollment decreased slightly in this time period. The highest-activity stops on the campus system include the Taggart Student Center, where over 300,000 riders boarded the shuttles during the 2013-2014 school year. Boardings are also high at the South Stadium stop (over 85,000 in 2013-2014), as well as the Oakridge stop on the 800 East route (also over 85,000 in 2013-2014). Aggie Shuttle operators also track boardings with bicycles, which totaled 2,837 bicycles in 2012-2013 and 4,559 bicycles in 2013-2014. The stops with the highest number of boardings with bicycles included the Innovation stop on the 800 East route (nearly half of bicycles were loaded at this location), as well as the Stadium locations. Predictably, riders also frequently board with buses on 600 East on the South Campus route; this is a low-elevation point on campus, and cyclists can gain elevation using the shuttle instead of by their own power.

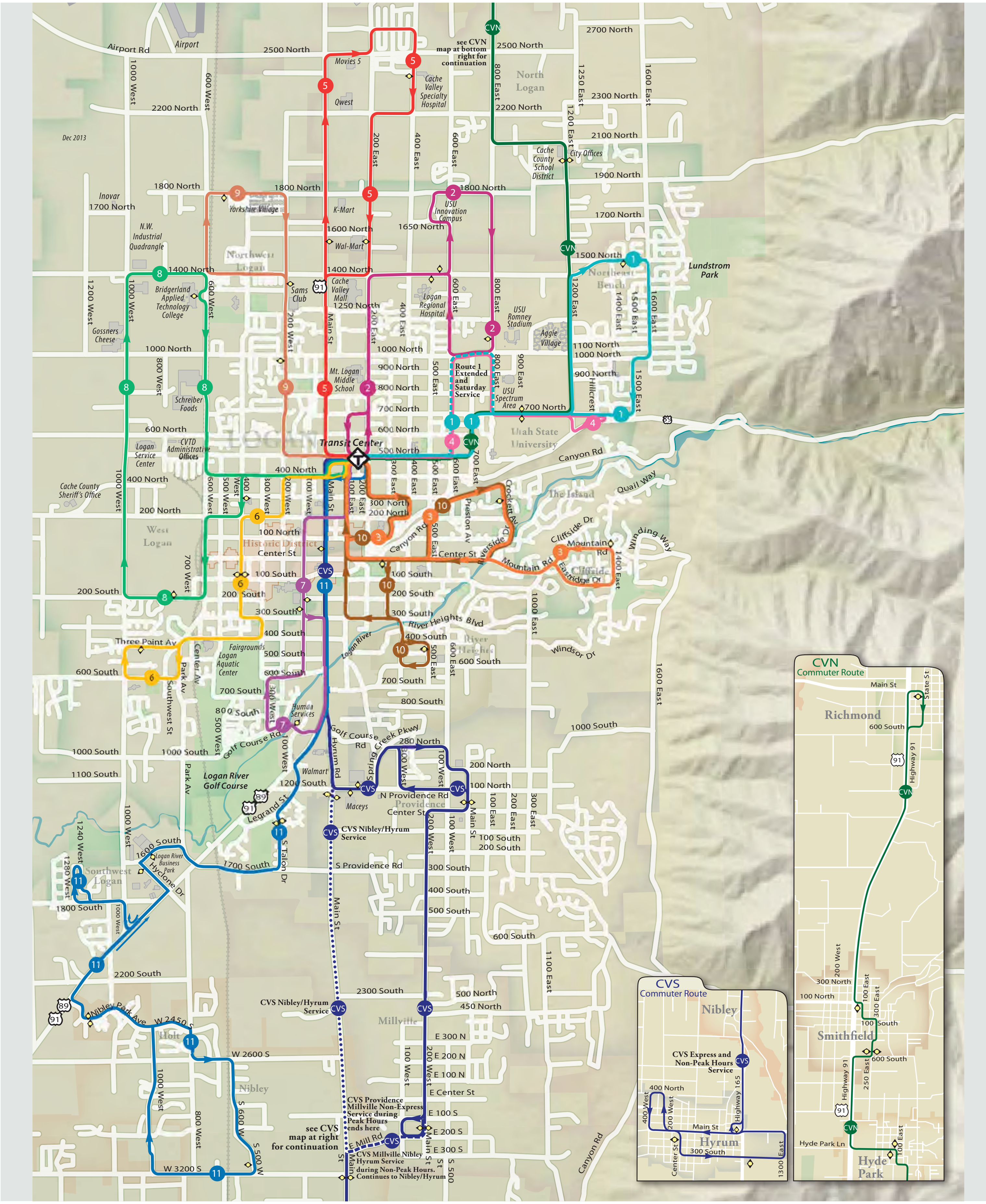
CVTD

CVTD provides free transit services to the Cache Valley region. Service is provided Monday-Friday, typically from 6:10 AM to 8:40 PM, and on Saturdays from 10:10 AM to 6:40 PM (specific service hours depend on the route). No service is provided on Sundays. Services are funded by a combination of local sales tax and federal dollars.

The CVTD network is designed as a hub-and-spoke system in which all lines converge on a single transit center in the City of Logan. The Transit Center facilitates transfers via a service "pulse," in which all lines converge every 30, 60, or 90 minutes. USU is served by four CVTD routes: Routes 1/1EXT, 2, 4, and CVN. A description of each route is provided below, followed by a system wide overview.

- Route 1/1EXT connects the Transit Center and northeast Logan via 700 East through the USU campus. It offers 15 minute headways from 8 AM to 10:30 AM and 3 PM to 6 PM when USU is in session, and 30 minute headways at all other times.
- Route 2 connects the Transit Center and USU Innovation campus. It offers 30 minute headways.
- Route 4 connects the Transit Center and USU campus via 600 East and 700 North. It offers 30 minute headways.
- Route CVN connects the transit center and northern Cache Valley via the USU campus. It offers 45 minute headways during weekdays and 90 minute headways during weekends.

Figure 5 displays a map of CVTD operations, while Table 8 shows daily hours of operation and frequency by time of day.



CVTD Operations

figure 5

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Table 8 | CVTD Operations

Route	Frequency	Span (Weekday)	Span (Saturday)
1/1 EXT	15 mins[1]	8 AM - 10:30 AM[1]; 3 PM - 6 PM[1]	--
	30 mins	All other times from 6:11 AM - 8:41 PM	10:11 AM - 6:41 PM
2	30 mins	6:13 AM - 8:43 PM	10:13 AM - 6:43 PM
3	60 mins	6:05 AM - 8:30 AM ; 3 PM - 8:30 PM	10:05 AM - 6:27 PM
4	30 mins	7 AM - 8:22 PM	--
5	30 mins	6:09 AM - 8:39 PM	10:09 AM - 6:39 PM
6	30 mins	6:12 AM - 8:42 PM	10:12 AM - 6:42 PM
7	30 mins	6:09 AM - 8:39 PM	10:09 AM - 6:39 PM
8	30 mins	6:08 AM - 6:08 PM	--
9	30 mins	6:10 AM - 8:40 PM	10:10 AM - 6:40 PM
10	60 mins	6:40 AM - 8:47 PM	10:30 AM - 6:40 PM
11	60 mins	5:30 AM - 5:46 PM	10:30 AM - 5:46 PM
CVN	45 mins	5:45 AM - 6:47 PM	--
	90 mins	--	10:15 AM - 6:45 PM
CVS	75 mins	6:30 AM - 6:10 PM	10:15 AM - 6:33 PM
CVS Express	60 mins	4:50 AM - 8:35 AM; 2 PM - 6:35 PM	--
FC Connection	4 trips daily	Morning/evening peak	--

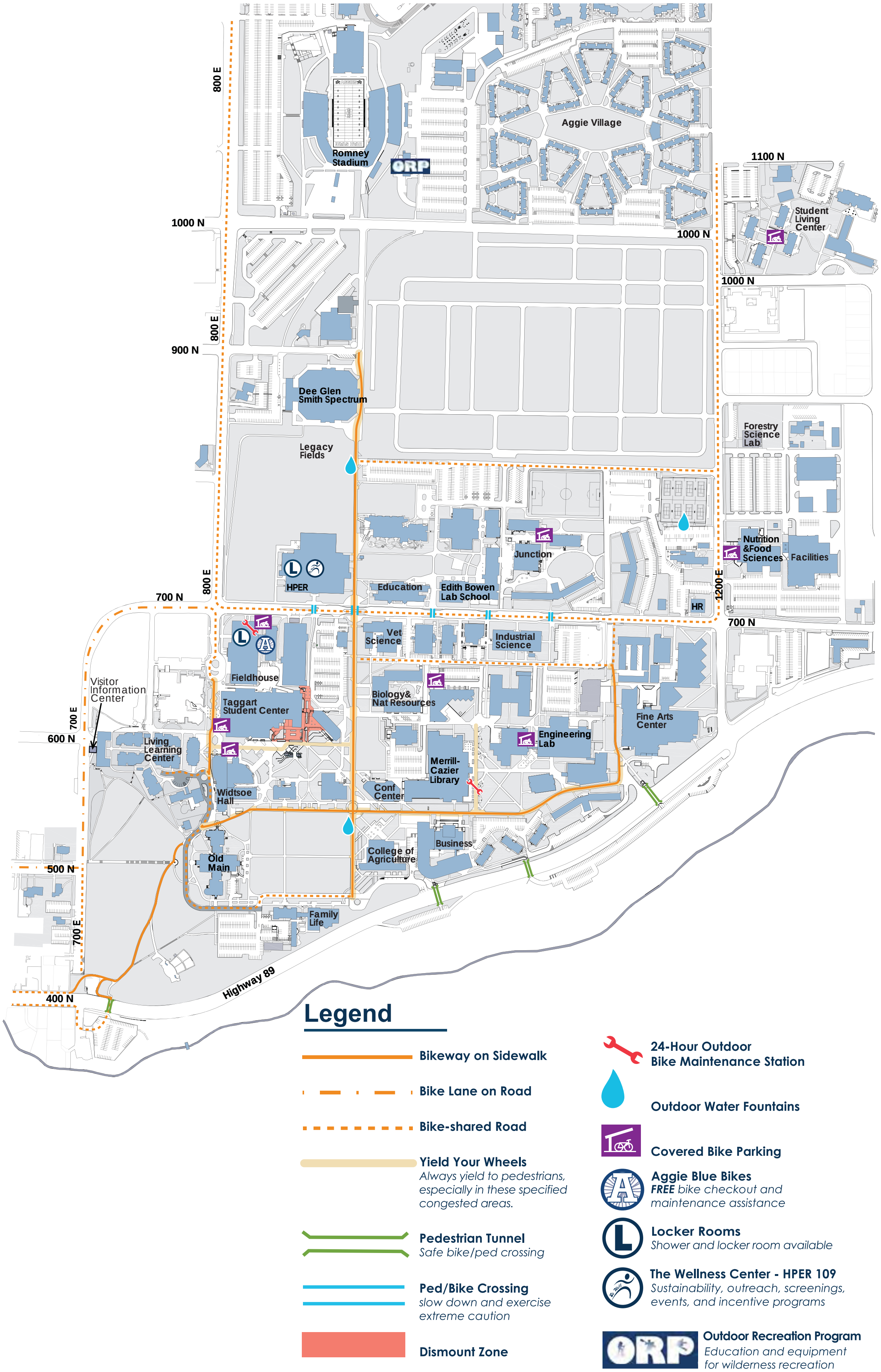
1. On weekdays while USU is in session

Bicyclists and Pedestrians

Bicycling is a popular method of transportation on the USU campus, and has been supported through campus initiatives to add cycling-specific routes on campus, wide placement of bike racks, and establishment of the Aggie Blue Bikes bike share program.

Bicycle lanes and routes

Existing on-campus bicycle specific routes are shown in **Figure 6**, which also indicates where bicycle facilities approach campus on Logan City roads.



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Existing On-Campus Bicycle Facilities

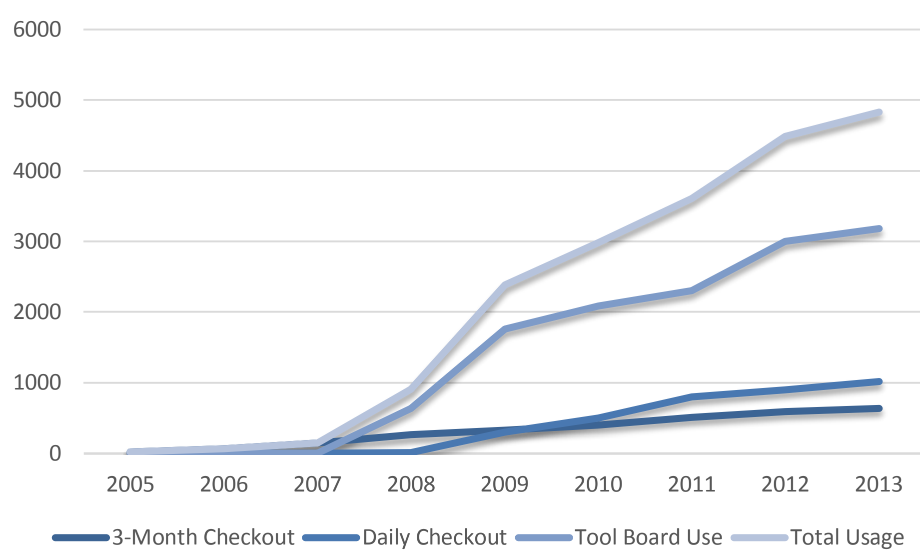
figure 6

Bicycle Racks and Stationary Facilities

The University has enough bicycle racks across campus to accommodate nearly 2,900 bicycles. A range of rack styles is represented, including post, ribbon, sled, and loop racks. Some racks are more highly utilized than others; data gathered during November 2014 indicated that demand for racks was concentrated near the Taggart Student Center, the Library, and the Engineering Building, and that more racks might be valuable in these locations. The campus also has four freestanding bicycle structures, which provide a degree of coverage from the elements and are a space-efficient method of storing bicycles. Bike racks are also available on campus shuttles and on vehicles operated by CVTD. In addition, funding from the student "green fees" instituted in 2011 has been used to create two bicycle maintenance stations on campus, in addition to purchasing a cargo bike for use in transporting materials across campus. Indoor bicycle storage is also offered at student housing locations, although students are not currently allowed to take their bicycles into their dorm rooms.

Aggie Blue Bikes

Aggie Blue Bikes offers cycling education, repair services in addition to do-it-yourself repair facilities, bike check-outs (both short- and long-term), bike valet parking, and stolen bike recovery assistance. Long-term bike check-outs from Aggie Blue Bikes are free to students and faculty for a three-month period. Daily bike check-outs and do-it-yourself tool board use are among the most popular services offered by Aggie Blue Bikes, and have been increasing in usage since the program began in 2005. Aggie Blue Bikes also periodically offers free lights and fenders for cyclists at events such as winter cycling clinics. The chart below marks the usage of selected Aggie Blue Bikes programs over time.



Collisions and Safety Data

The USU Campus Police Department provided individual incident reports for all traffic-related events from July 2013 through August 2014. The 63 incidents that were reported to Campus Police in this time frame are generally categorized as follows:

- 31 incidents were minor fender-benders occurring in on-campus parking lots, as drivers were attempting to enter or exit parking stalls and accidentally collided with vehicles circulating through the parking lots or with adjacent vehicles as they attempted to park.
- 12 incidents involved a moving vehicle hitting some other object (for example, parking lot gate arms, fence posts, and walls) and included several instances of unmanned vehicles sliding into other unmanned vehicles (due to icy road conditions or vehicles not in gear).
- 700 North was the site of four incidents where both vehicles were in operation at the time of collision: two rear-endings (one at 810 East and another at 940 East), and two U-turn collisions (at 980 East and at 1130 East).
- 5 incidents occurred due to failure to yield on behalf of one of the drivers; two of these involved an Aggie Shuttle bus, indicating that drivers may need more education on how to interact with shuttle buses on the road.
- 4 incidents occurred between moving vehicles due to improper lookout on behalf of one of the drivers. One of these occurred at 970 East 760 North between a vehicle attempting to turn onto the south side cemetery road, whose drivers' view of oncoming traffic was blocked by parked cars along the road; similarly, the oncoming vehicle could not see the turning vehicle due to the presence of the parked cars.

Existing Transportation Demand Management Strategies

Transportation Demand Management (TDM) seeks to reduce vehicle trips made to campus through encouragement, incentives, and/or penalties. In addition to the Aggie Shuttle Service, Aggie Blue Bikes, and infrastructure for bicycles and pedestrians, USU has the following TDM strategies in place. However, these strategies may be improved by having a single information portal for TDM.

Carpool Parking

USU offers reserved parking spaces for carpools. The purchasing member of the carpool permit is responsible for all violations and citations, but the permit may be transferable among official carpooling groups. Carpool members may share the cost of a single parking permit.

Rideshare

USU has an on-line rideshare matching program that allows individuals to connect with other members of the USU community to share rides or set up carpool networks. Recently, USU studied how to improve this service and selected ZimRide as their new service provider.

Car Share

Enterprise runs a car share program on the USU campus. Membership costs $25 to enroll with $5-$7 per hour rental fees. There were two car share locations on campus during the 2014-2015 school year: at the Stadium parking lot and just east of Mountain View Tower.

Advertising

USU is actively engaged in an advertising campaign to educate campus users on transportation options, called "Walk it, Bike it, Share it, Bus it!"

Encouragement and Awareness Techniques

In addition to the year-round programs USU runs, awareness events take place throughout the year.

The Open Streets Festival takes place each fall and closes 700 North to only allow non-motorized transportation, in order to showcase how interactive a street can be when it's accessible to active transportation. There are also informational booths, games, performances, and music. It is combined with the Alternative Transportation Week, when students, faculty, and staff are encouraged to use alternatives to driving a single-occupancy vehicle (SOV) to campus.

USU participates in the National Bike Challenge which rewards individuals for daily riding and mileage-based riding. Recognition occurs through individual monthly prizes, monthly team recognition for improvement, and yearly grand prizes. In addition, Aggie Blue Bikes hosts outreach activities at Bike To Work Week, where commuters can have breakfast snacks and claim small giveaway items. USU also holds Bike to Breakfast each May and October in collaboration with Dining Services and local food providers.

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Assessment of Data and Demand Projections

Campus Population

The growth in campus population is a key component to understanding the future demand on the transportation network. Table 9 shows the projected campus population between now and 2019, as projected by USU. In the next five years, campus population is expected to increase by 26 percent.

An additional source that can be used to determine campus growth is the Cache Metropolitan Planning Organization (CMPO), the regional planning authority for Cache Valley. CMPO maintains a travel demand model which is used to determine future roadway volumes and transit ridership in the region. This model shows a projected 2040 campus population of 27,000 students. In discussions with the Steering Committee, this 27,000 student build out number is appropriate.

Table 9 | USU Enrollment Comparison

	Headcount		Projected					
	2012	2013	2014	2015	2016	2017	2018	2019
Undergraduate								
1st Time Higher Ed	3,076	2,943	3,267	3,490	3,637	3,718	3,801	3,880
Transfer	1,129	1,156	1,176	1,200	1,224	1,248	1,273	1,298
Continuing	10,273	9,673	9,666	10,555	11,293	11,903	12,468	12,982
Returning	718	884	973	861	824	915	977	1,018
HS Concurrent/Other	2	2	2	2	2	2	2	2
Non-Matriculated	41	25	25	25	25	25	25	25
Total Undergraduate	**15,239**	**14,683**	**15,079**	**16,133**	**17,005**	**17,811**	**18,546**	**19,206**
Graduate								
New	534	536	576	605	635	667	700	735
Transfer	0	0	0	0	0	0	0	0
Continuing	1,168	1,129	1,183	1,186	1,209	1,243	1,286	1,336
Returning	9	0	4	4	4	4	4	4
Matriculated Subtotal	*1,711*	*1,665*	*1,763*	*1,794*	*1,848*	*1,914*	*1,990*	*2,075*
Non-matriculated	59	63	61	65	65	65	65	65
Total Graduate	**1,770**	**1,728**	**1,824**	**1,859**	**1,913**	**1,979**	**2,055**	**2,104**
Total USU - Logan	**17,009**	**16,411**	**16,903**	**17,993**	**18,917**	**19,790**	**20,601**	**21,373**

Source: Utah State University

Traffic

Data Collection

Traffic data was collected on campus during the week of September 7, 2014. Intersection counts, collecting vehicle, bicycle, and pedestrian data, were conducted at the following intersections:

- 600 East / US-89 / 400 North
- 700 East / 500 North
- 700 East / 600 North
- 800 East / Aggie Bullevard / 700 North
- 800 East / 1000 North
- 800 East / 1400 North
- 1200 East / Aggie Bullevard / 700 North

- 1200 East / 850 North
- 1200 East / 1000 North
- 1200 East / 1400 North
- 1200 East / US-89
- Champ Drive / US-89

Vehicular volumes at each intersection are shown in **Figure 7**. Bicycle and pedestrian counts are shown in **Figure 8.**

Traffic Level of Service

Level of service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. **Table 10** provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections. The Highway Capacity Manual 2010 (HCM 2010) methodology was used in this study to remain consistent with "state-of-the-practice" professional standards. This methodology has different quantitative evaluations for signalized and unsignalized intersections. For unsignalized intersections, LOS is reported based on worst movement.

Existing AM and PM peak hour LOS was computed for each intersection around campus. The results of this analysis are reported in **Table 11** (see **Appendix A** for the detailed LOS reports)

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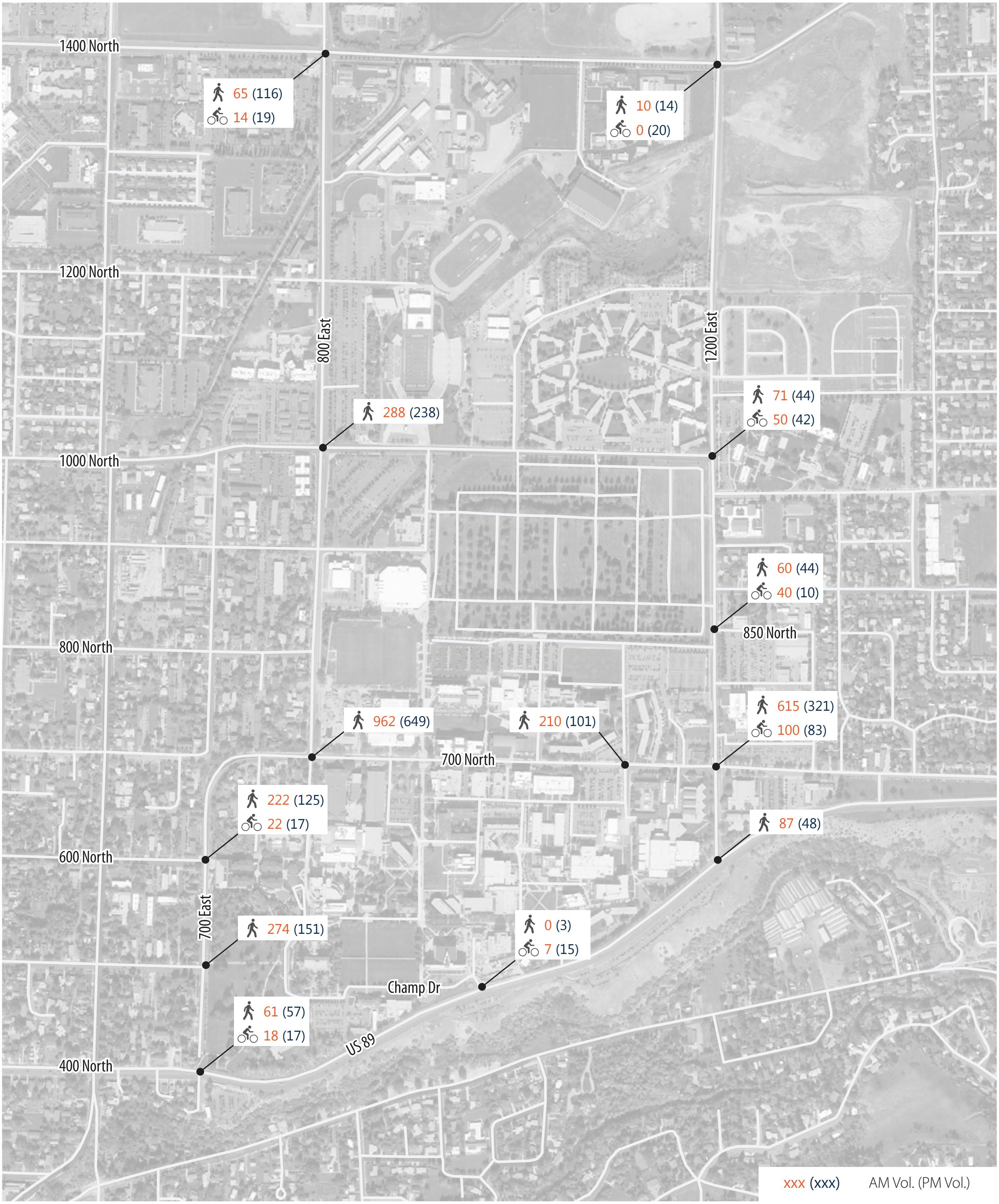
Existing AM and PM Traffic Volumes

figure 7



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Bicycle and Pedestrian Volumes

figure 8

Table 10 | Intersection Level of Service Criteria

Level of Service	Description	Average Delay (sec/veh)	
		Unsignalized Intersection[1]	Signalized Intersection[2]
A	Free Flow / Insignificant Delay Extremely favorable progression. Individual users are virtually unaffected by others in the traffic stream.	< 10.0	< 10.0
B	Stable Operations / Minimum Delays Good progression. The presence of other users in the traffic stream becomes noticeable.	> 10.0 to 15.0	> 10.0 to 20.0
C	Stable Operations / Acceptable Delays Fair progression. The operation of individual users is affected by interactions with others in the traffic stream.	> 15.0 to 25.0	> 20.0 to 35.0
D	Approaching Unstable Flows / Tolerable Delays Marginal progression. Operating conditions are noticeably more constrained.	> 25.0 to 35.0	> 35.0 to 55.0
E	Unstable Operations / Significant Delays Can Occur Poor progression. Operating conditions are at or near capacity.	> 35.0 to 50.0	> 55.0 to 80.0
F	Forced, Unpredictable Flows / Excessive Delays Unacceptable progression with forced or breakdown of operating conditions.	> 50.0	> 80.0

Source: Fehr & Peers descriptions, based on *2010 Highway Capacity Manual*.
1. Overall intersection LOS and average delay (seconds/vehicle for all approaches.
2. Worst approach LOS and delay (seconds/vehicles) only.

Based on Table 11, there are operational deficiencies at 1200 East / 1400 North, 1200 East / US-89, and Champ Drive / US-89. At 1200 East / 1400 North, operational deficiencies exist only in the PM peak hour and are a result of heavy northbound volumes at an all-way stop intersection. This deficiency could be eased by removing the northbound and southbound stop controls or installing a signal; as shown in the section below, this intersection warrants a signal in the PM peak hour.

Table 11 | Existing 2014 AM and PM Peak Hour Level of Service

Intersection				Worst Movement[1]			Overall Intersection[2]	
ID	Location	Period	Control[3]	Movement	Delay	LOS	Avg. Delay	LOS
1	600 East / 400 North	AM	Signal	-	-	-	16.4	B
		PM		-	-	-	13.8	B
2	700 East / 600 North	AM	EB/WB Stop	EB	32.9	D	<5.0	A
		PM		EB	14.5	B	< 5.0	A
3	700 East / 500 North	AM	SB Stop	SB	10.8	B	<5.0	A
		PM		SB	11.4	B	< 5.0	A
4	800 East / 1400 North	AM	Signal	-	-	-	13.1	B
		PM		-	-	-	15.5	B
5	800 East / 1000 North	AM	Signal	-	-	-	11.9	B
		PM		-	-	-	11.5	B
6	800 East / 800 North	AM	EB Stop	EB	10.3	B	<5.0	A
		PM		EB	10.1	B	< 5.0	A
7	800 East / 700 North	AM	Signal	-	-	-	16.8	B
		PM		-	-	-	14.9	B
8	1200 East / 1400 North	AM	AWSC	NB	19.1	C	15.8	C
		PM		**NB**	**36.9**	**E**	22.0	C
9	1200 East / 1000 North	AM	EB Stop	EB	23.8	C	6.0	A
		PM		EB	22.0	C	5.9	A
10	1200 East / 850 North	AM	EB Stop	EB	25.4	D	<5.0	A
		PM		EB	19.3	C	5.2	A
11	1200 East / 700 North	AM	Signal	-	-	-	15.7	B
		PM		-	-	-	12.7	B
12	1200 East / US-89	AM	SB Stop	**SB**	**> 50.0**	**F**	**>50.0**	**F**
		PM		**NB**	**> 50.0**	**F**	**> 50.0**	**F**
13	Champ Drive / US-89	AM	SB Stop	**SBL**	**> 50.0**	**F**	< 5.0	A
		PM		SBL	23.8	C	< 5.0	A

Source: Fehr & Peers

1. This represents the worst movement LOS and delay (seconds/vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds/vehicle).
3. AWSC = All-way Stop Control; NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; L = Left Turn

The intersection of 1200 East / US-89 fails in both peak hours due to very heavy southbound volumes. These are primarily southbound rights, which are failing to find sufficient gaps in cross-traffic. In addition, the traffic from the parking lot on the south side of US-89 experiences heavy delay as well. This intersection also meets signal warrants in both peak hours and its unsafe conditions were a much-cited issue during community outreach.

Southbound left-turning vehicles also experience heavy delay at the intersection of Champ Drive / US-89 in the AM peak hour and, to a lesser degree, in the PM peak hour. Again, this is primarily due to high traffic volumes on US-89. Although there is a two-stage left-turn, aggressive left-turning behavior is dangerous and is reflected in the identification of this location during community outreach. To improve this intersection, it is recommended that southbound left-turns be restricted.

Signal Warrants

Traffic signals help control the flow of traffic, but in order for a traffic signal to be installed either sufficient volumes or safety concerns must be met. Signal warrants are used to determine if there are sufficient volumes at an intersection for a traffic signal to be installed. There are currently five traffic signals around campus. Key intersections around campus were examined to determine if there were sufficient volumes to need a traffic signal. Table 12 indicates which of the study intersections met signal warrants (see **Appendix B** for more detailed information). It should be noted that right-turn volumes were included in the warrant analysis because many of the intersections in question have shared lanes which adds to the delay at the intersection. It is recommended that UDOT be notified to conduct a full warrant analysis during the typical peak periods of the school year (September) to determine what warrants are officially met.

Table 12 | Existing Signal Warrants

Intersection	AM Peak Signal Warrant	PM Peak Signal Warrant
1200 East / 1400 North	Unmet	Met
1200 East / 1000 North	Met	Unmet
1200 East / 850 North	Unmet	Unmet
1200 East / US-89	Met	Met
Champ Drive / US-89	Met	Met

Source: Fehr & Peers

Future Traffic Level of Service

Future traffic conditions were forecasted using growth rates calculated from the CMPO travel model. This model indicates annual growth rates between 1.1 percent and 2.3 percent for streets around campus. Intersection volumes were grown to 2040 to determine future traffic operations. The results of the future operations analysis are reported in Table 13 and Figure 9.

Table 13 | Future 2040 AM and PM Peak Hour Level of Service

Intersection				Worst Movement[1]			Overall Intersection[2]	
ID	Location	Period	Control[3]	Movement	Delay	LOS	Avg. Delay	LOS
1	600 East / 400 North	AM	Signal	-	-	-	**> 80.0**	**F**
		PM		-	-	-	**55.1**	**E**
2	700 East / 600 North	AM	EB/WB Stop	**EB**	**48.9**	**E**	7.3	A
		PM		**EB**	**65.4**	**F**	11.6	B
3	700 East / 500 North	AM	SB Stop	SB	11.4	B	<5.0	A
		PM		SB	15.7	C	< 5.0	A
4	800 East / 1400 North	AM	Signal	-	-	-	19.7	B
		PM		-	-	-	20.6	C
5	800 East / 1000 North	AM	Signal	-	-	-	14.3	B
		PM		-	-	-	16.7	B
6	800 East / 800 North	AM	EB Stop	EB	11.1	B	<5.0	A
		PM		EB	10.9	B	< 5.0	A
7	800 East / 700 North	AM	Signal	-	-	-	22.7	C
		PM		-	-	-	22.9	C
8	1200 East / 1400 North	AM	AWSC	**NB**	**> 50.0**	**F**	**> 50.0**	**F**
		PM		**NB**	**> 50.0**	**F**	**40.2**	**E**
9	1200 East / 1000 North	AM	EB Stop	**EB**	**> 50.0**	**F**	**> 50.0**	**F**
		PM		**EB**	**> 50.0**	**F**	**> 50.0**	**F**
10	1200 East / 850 North	AM	EB Stop	**EB**	**> 50.0**	**F**	8.6	A
		PM		**EB**	**> 50.0**	**F**	13.2	B
11	1200 East / 700 North	AM	Signal	-	-	-	18.3	B
		PM		-	-	-	21.6	C
12	1200 East / US-89	AM	SB Stop	**SB**	**> 50.0**	**F**	**38.1**	**E**
		PM		**SB**	**> 50.0**	**F**		
13	Champ Drive / US-89	AM	SB Stop	**SBL**	**> 50.0**	**F**	**>50.0**	**F**
		PM		**SBL**	**> 50.0**	**F**	18.7	C

Source: Fehr & Peers
1. This represents the worst movement LOS and delay (seconds/vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds/vehicle).
3. AWSC = All-way Stop Control; NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; L = Left Turn

UtahStateUniversity

2040 AM and PM Traffic Volumes

figure 9

Intersection Improvements

With the increase in development around the University and in campus population, many intersections develop operational deficiencies by 2040 unless mitigations are made. In addition to the intersections that currently fail, the on-campus intersections of 1200 East / 1000 North and 1200 East / 850 North are projected to fail in the future. Both of these intersections experience heavy delay for eastbound movements experiencing insufficient gaps in cross traffic. A roundabout at the location of 1200 East / 850 North and signalization of the intersection of 1200 East / 1000 North will improve LOS and delay.

700 North Sensitivity Analysis

Campus planners expressed interest in modifying 700 North to prioritize bicycle and transit movements, and limit access by private vehicles. Major concerns about these modifications centered on parking access and redistribution of traffic. Care was taken to ensure all parking would still be accessible with the roadway modifications and traffic analysis was conducted to determine the impacts of the roadway modification.

The CMPO travel model was run with and without the closure for the existing and the future conditions to determine if there were resulting changes to circulation patterns. The model projected only minor increases to traffic volumes between local roads. Growth rates in the area were consistent between the baseline future model and the modified future model, indicating that modifications to 700 North would have no impact to traffic operations.

The intersections of 800 East / 700 North and1200 East / 700 North were individually analyzed to determine their sensitivity to an increase in traffic volumes with the redistribution of traffic due to the modifications of 700 North. At the intersection of 800 East / 700 North, volumes at each individual movement can increase by 35 percent in the AM peak hour and double in the PM peak hour without degrading the intersection into failing conditions. At the intersection of 1200 East / 700 North, volumes for each individual movement can increase by 50 percent in the AM peak hour and by 90 percent in the PM peak hour without degrading the intersection to failing conditions. The results of this sensitivity analysis suggest that there is sufficient capacity at both of these intersections to accommodate traffic distribution changes as a result of 700 North modifications.

1200 East Corridor Signalization

The 1200 East corridor has four significant unsignalized intersections and one signalized intersection between US-89 and 1400 North. Under existing conditions, two of the unsignalized intersections have a failing LOS and, with no mitigations, two additional intersections will fail in the future. Due to the close spacing of US-89, 700 North, and 850 North, the corridor was analyzed in further detail to ensure compatibility between additional signalization and the proposed roundabout at 850 North. The results of this analysis indicated that signalizing US-89, 1000 North, and 1400 North and constructing a roundabout at 850 North will improve operations along this corridor and will not result in conflicts due to the minimal spacing between signals or the roundabout.

Parking

Parking Utilization

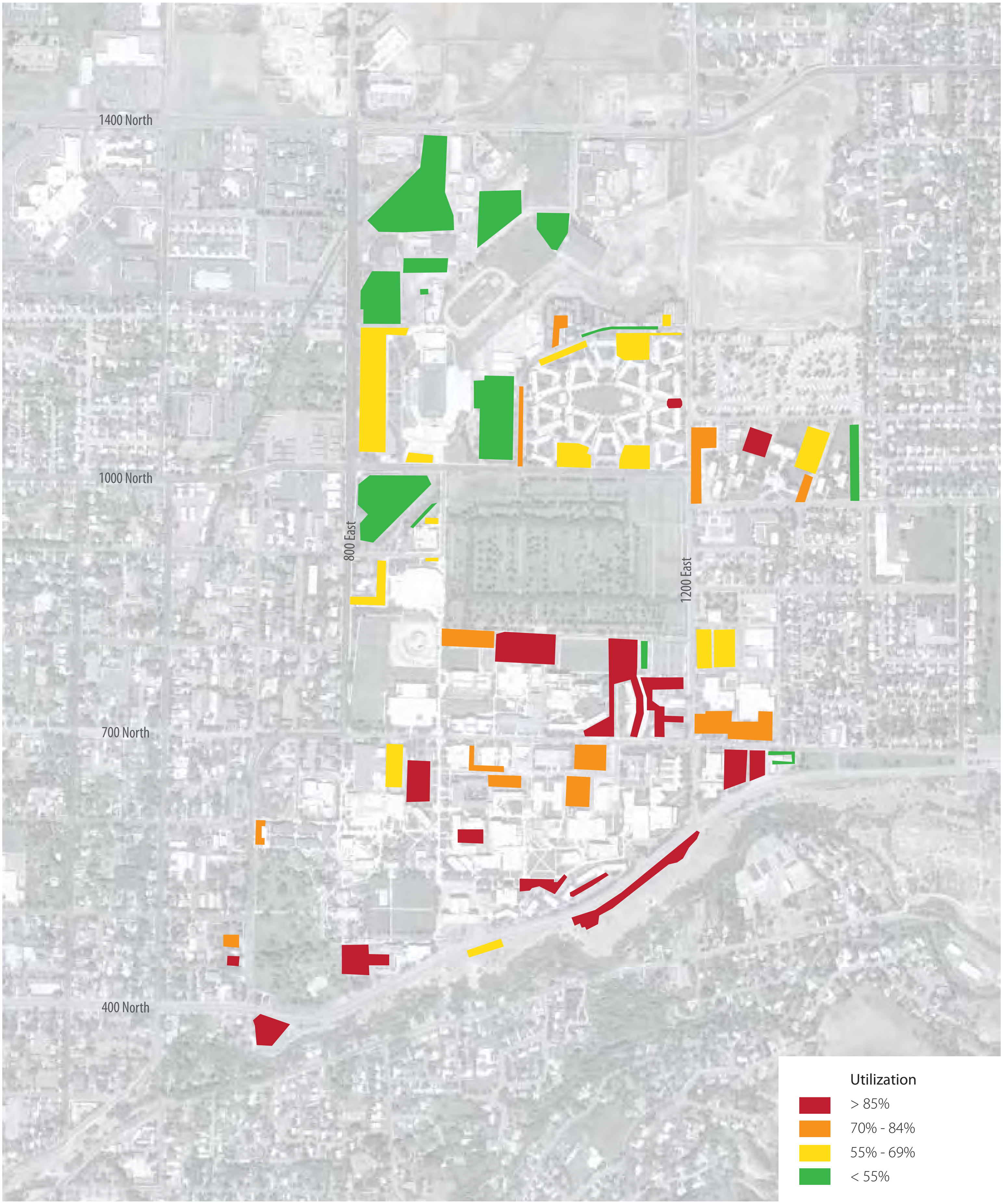
P&TS staff regularly count the number of vacant parking stalls on Central Campus. The information in this section was either provided by P&TS, gathered through field observations or on-line mapping sources or a combination thereof for either the Spring or Fall Semester of 2014. Demand for parking is highest in the close-in lots in Central Campus, where the ratio of active permits to parking stall supply is 125 percent for faculty and staff lots, and 155 percent for student lots. The ratios of active permits to stalls in the on-campus lots indicates that faculty, staff, and students tend to have adequate access to available parking, and that competition for parking spaces is generally low for Off Central Campus lots. This makes driving to campus more convenient for campus users, and does not necessarily encourage them to use alternate modes of transportation such as transit, walking, and bicycling.

Table 14 shows the breakdown of parking supply and average parking utilization based on Fall 2014 utilization data (vehicles present / spaces available). The map in Figure 10 shows the percent utilization by parking lot location.

Table 14 | Current Parking Utilization

Parking Location	Parking Supply	Utilization
Central Campus	3,732	76%
Off Central Campus	4,538	52%
Total	**8,270**	**62%**

Based on the data, USU has a surplus of 895 spaces for Central Campus and 2,178 spaces for Off Central Campus for a total overall surplus of over 3,000 stalls on campus. Although the overall parking supply exceeds the current demand during the period surveyed, much of USU's parking supply on Central Campus would be considered completely utilized in parking planning terms – as shown in Figure 10. Typically, a healthy parking system considers utilization rates of 85-90 percent to indicate fully utilized parking supply. A parking area would be considered full despite the 10-15 percent remaining capacity, because the time spent circulating the parking lot to find an empty space would be excessive.



UtahStateUniversity

Existing Campus Parking Utilization

figure 10

The existing USU parking ratio is approximately 2.7 persons/space, or a campus population to parking supply ratio of 0.37, based on the population (student, faculty, and staff) of 19,713. The current ratio breakdown by campus population type is shown in **Table 15.**

Table 15 | Current Parking Ratios

	Population[1]	Population/Parking Ratio[2]
Students	16,903	0.34
Faculty/Staff	2,810	0.57
Total	**19,713**	**0.37**

1. Utah State University Student Services
2. The ratios do not consider on-street parking or parking stalls associated with Conferencing, Metered Stalls, Service Stalls, State Vehicle lot, and Off Central Campus Green lots (PDP, North Stadium, Public Safety, Motor Pool), and other business related stalls (total of 953 stalls).

For comparison, other campuses in the west have the following parking space to campus population ratios:

- Arizona State University = 0.30
- Colorado State University = 0.34 (has a future goal of 0.28-0.32)
- University of Oregon = 0.19
- University of Washington = 0.30
- University of California, Davis = 0.33

Over time, it is a goal of this plan to reduce the campus-wide parking ratios to 0.30 spaces per campus population. **Table 16** shows the number of parking stalls for each horizon-year, based on the projected number of students, faculty and staff on campus to maintain a rate of 0.30 parking spaces per person. This table does not account for parking spaces that may be lost due to new building construction, but is intended to represent the total number of stalls needed in the future at the assumed rate.

Table 16 | Future Horizon Parking Ratios

Year	Population[1]	Parking Ratio	Number of Stalls Needed
Existing	19,713	0.37	7,317
2025	25,064	0.30	7,519
2040	**29,706**	**0.30**	**8,912**

In the near future, there will be parking losses from the construction of a roundabout at 1200 East and 850 North (15 stalls), the reconstruction of the Big Blue Terrace (318 stalls), and the redevelopment of the Campus Core North area (197). However, the Big Blue Terrace is projected to be rebuilt with at the least the same number of stalls that exists today. Table 17 illustrates projected parking losses, shortfalls to meet the future parking ratios, and proposed mitigations.

Table 17 | Parking Needs and Mitigations

Year	Ratio	Needed Stalls	Provided Stalls	Difference Before Mitigations	Mitigations	Difference After Mitigations
Existing	0.37	7,317	7,317	0	-	0
2025 (with parking losses accounted)	0.30	7,519	7,105	-414	State Vehicle lot (198) Performance Hall Structure (519)	+303
2040	**0.30**	**8,912**	**7,822**	**-1,090**	800 East surface lot (693)	**-397**

To meet future parking ratios, it is recommended that the State vehicles be moved to an off-site location and that this lot become available to the USU campus population. In addition, it is recommended to construct a structure to replace the existing surface lot on the southwest corner of Bullen Hall and 700 North. To meet the 0.30 parking ratio in 2040, an additional 693-stall parking lot on 800 East, north of 1400 North, is recommended. This parking lot would be connected to the Campus Core through Aggie Shuttle service.

Even after these three projects are constructed, there will be an approximate 397 stall shortfall in 2040 to meet a parking ratio of 0.30. The remainder of this parking demand can be met with TDM solutions that reduce the demand for on-campus parking.

Transit

A key objective of the Transportation Master Plan is to develop a transit plan which supports sustainable growth and circulation on campus and the surrounding Cache Valley community. The *Campus Master Plan* projects significant increases in enrollment, faculty, staff, and development. USU already has a successful shuttle system around campus, with connections to CVTD. Jointly, these services must be designed to ensure that current travel needs are met and also to support future expansion and growth. A comprehensive assessment of transit services in and around the USU campus was undertaken to support goals of managing traffic around campus, providing transportation options, and reducing air pollution. The ultimate goal is to further develop a system that is easy to use, reliable, and accessible for customers.

Improving access to campus and optimizing circulation between the various origins and destinations in and around campus requires a comprehensive analysis of existing transit operations and the development of transit alternatives. It is important to provide appropriate amenities to encourage transit use, as well as to make the experience of using transit easier, safer, more comfortable, and more enjoyable.

Transit Service Goals & Outcomes

Before identifying performance metrics to evaluate transit service on and around the USU campus, it is necessary to define the transit service goals for both the USU Shuttle and CVTD bus service as it relates to the *Campus Master Plan*. Broadly speaking, transit networks can be oriented toward two main goals:

1. Maximizing ridership, to concentrate resources on the most productive corridors in order to reduce automobile trips, parking demands, and air pollution
2. Maximizing coverage, to serve all areas of a community and meet the needs of transit-dependent populations

These goals are not mutually exclusive: providing frequent, direct, and efficient transit service can both support ridership growth and improve mobility for transit-dependent populations; providing service across a wide area creates a larger catchment area to attract ridership. Both ridership and coverage are valuable elements of a transit network that require a balancing act to serve everyone's needs.

The *Campus Master Plan* prioritizes multimodal access to reduce automobile trips and air pollution while accommodating growth. Transit plays an integral role in this vision: it offers students, faculty, staff, and visitors the freedom to commute and circulate around campus without needing a car. The university's ability to support transit service and grow in a manner which supports transit ridership will offer a number of benefits, including but not limited to a reduction of parking demand, cost of living, and environmental impacts. Accordingly, the evaluation methodology of this analysis is weighted toward maximizing ridership via frequent, efficient, and dependable service that offers a convenient alternative to driving.

Evaluation Methodology

The following evaluation methodology is intended to identify the opportunities, constraints, and needs for both the USU Shuttle and CVTD bus services. This methodology is broken into two categories: service characteristics and performance. These metrics will be examined on both a network and route-by-route basis.

Service Characteristics

Frequency & Span

Frequency measures how often a bus runs: a high frequency bus runs every 15 minutes or greater, while a low frequency bus may run every 30, 45, or 60 minutes. Frequency is a key indicator for mobility because it determines the degree of freedom and spontaneity for a transit rider: riders are generally comfortable casually showing up for a service that runs every 15 minutes or more throughout the day, but services that run less often usually requires consultation of a schedule. Frequency is especially important for routes that facilitate short trips: if a passenger can walk to their destination in less time than it takes to wait for the next bus, the utility of the route diminishes.

Span measures when a service runs. Span is closely related to frequency in fostering mobility by granting riders the freedom to travel when needed – mornings, afternoons, evenings and/or weekends.

Speed/Linearity

Speed indicates how fast a service runs from point A to point B. Because a direct, linear service is almost always faster than a circuitous or indirect route, speed is closely related to linearity. Speed must always be examined in the context of frequency, since the importance of speed is eroded if a passenger has to wait a long time for the bus to arrive.

Reliability

Reliability reveals how trustworthy a service is. A reliable service is predictable and dependable, while an unreliable service can be subject to delays, run off schedule, and miss transfer opportunities.

Connectivity/Coverage

Connectivity and coverage measure how many people, jobs, and destinations are served by a particular transit service. Connectivity and coverage often come into balance with frequency and speed: more bus lines that zig-zag across neighborhoods maximize connectivity and coverage, but can come at the expense of frequent, fast service. As a rule of thumb, a ¼-mile coverage area (about a five-minute walk) is generally appropriate to measure the walkshed of a bus stop. This coverage area may vary based on terrain, weather, design, safety, and other obstacles, as well as the frequency and speed of a particular transit line (people are often willing to walk farther for frequent, fast service).

Simplicity & Legibility

The simplicity and legibility of a transit network indicates how easy it is to understand and navigate. A simple, legible network is user-friendly and encourages ridership, whereas a complicated, illegible network serves as a barrier to riding.

Civility

Civility encompasses the amenities, attractiveness, and safety associated with a transit service, particularly as it relates to stops and vehicles. It is important for bus stops to serve as a safe, pleasant, and distinctive place. Important features include shelters (to protect from rain, snow, and wind), benches, a trash receptacle, user-friendly wayfinding signage and maps, appropriate lighting, and safe pedestrian access (via sidewalks and crosswalks).

The civility of bus vehicles similarly plays an important role. Low-floor buses are preferable to allow for easy access and egress for people of all ages and abilities; high-floor buses are more challenging for mobility-impaired passengers or passengers carrying heavy bags (slower dwell times also affect frequency, speed, and reliability). Similarly, bike access is another important factor: bike racks on buses promote inclusive multimodal travel.

Service Performance

Passenger Trips

Passenger trips (ridership) show how many passengers are using a bus route. Passenger trips are typically measured in boardings (people getting on the bus), but the distribution of alightings (people getting off the bus) is also important for an assessment of travel patterns.

Passengers per Revenue Hour

The number of passengers per revenue hour reveals the relative productivity of a bus route – how many passengers ride the route relative to how much service is provided. As a general rule, routes below 20 passengers per revenue hour are low-performing, while routes above 50 passengers per revenue hour are high performing.

Cost per Passenger

Cost per passenger measures the cost of operations (labor, fuel, and maintenance) for every passenger served. This cost excludes the fixed cost of debt service for equipment.

Small Transit Intensive Cities (STIC) Program Performance

The Small Transit Intensive Cities (STIC) program is administered by the Federal Transit Administration (FTA) to provide operational funding assistance for high-performing transit agencies in urbanized areas with a population less than 200,000. STIC funds support bus operations and preventative maintenance. CVTD receives funding through this program; therefore, it is important to review the performance of CVTD (and the Aggie Shuttle) in the context of the STIC program. The STIC program allocates funding through six categories that measure performance. For each category in which an agency meets or exceeds the industry average (for urbanized areas with populations between 200,000 and 999,999), it receives $192,016. The performance categories include:

- Passenger miles traveled per vehicle revenue mile
- Passenger miles traveled per vehicle revenue hour
- Vehicle revenue miles per capita
- Vehicle revenue hours per capita

- Passenger miles traveled per capita
- Passengers per capita

Aggie Shuttle Performance Evaluation

This section evaluates the performance of the Aggie Shuttle system. It is divided into two parts: a route-by-route analysis, and a system wide analysis.

8th East Express/Innovation

Frequency/Span

The 8th East Express/Innovation route operates frequent service throughout most of the day. On average, it offers five minute headways (three buses) during the morning peak and 7.5 minute headways (two buses) until 3:30 PM. From 3:30 PM to 6 PM, its headways decrease to 15 minutes (one bus).

Table 18 | 8th East Express / Innovation Operations

Time of Day	7 AM – 8 AM	8 AM – 10 AM	10 AM - 3:30 PM	3:30 PM – 6 PM
Frequency	7.5 minutes	5 minutes	7.5 minutes	15 minutes

The 8th East/Innovation route does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

Speed/Linearity

The 8th East Express/Innovation route provides a fast, direct connection between the Innovation Campus and the Student Center (about seven to eight minutes travel time). However, it offers indirect service for in between destinations along 800 East due to the route's lack of northbound stops (which were omitted because of the lack of crosswalks and east side sidewalk). Passengers traveling to student housing along 800 East from the student center must either overshoot their destination and double-back on foot, or continue riding the bus through the Innovation Center until it returns to a southbound stop. Both scenarios result in circuitous trips for anyone traveling to intermediate destinations along the 800 East corridor. Similarly, no direct connection is provided between the 800 East/Stadium Lot area and the Innovation Campus.

Reliability

The 8th East Express/Innovation route generally experiences reliable operations with minimal delay.

Connectivity/Coverage

The 8th East Express/Innovation route provides incomplete connectivity and coverage along the corridor due to its lack of northbound stops. As discussed above, the lack of northbound stops diminishes the ability of transit to serve the 800 East corridor between 700 North and 1400 North; bidirectional stop pairs are needed. The intersection of 800 East and 900 North also represents an opportunity area for transit service given its high concentration of student housing.

Service Performance

The 8th East Express/Innovation route performs strongly. The route carries an average of 1,864 riders per day. The highest ridership stops are the Taggart Student Center (706/day), Oakridge (560/day), Innovation (194/day), and Old Farm (178/day). The 8th East Express/Innovation route serves 89 passengers per revenue hour and costs $0.38 per passenger, indicating a highly efficient service.

Campus Loop/Housing Express

Frequency/Span

The Campus Loop/Housing Express route operates frequent service throughout most of the day. On average, it offers five minute headways (three buses) during the morning peak and 7.5 minute headways (two buses) until 3:30 PM. From 3:30 PM to 6 PM, its headways decrease to 15 minutes (one bus).

Table 19 | Campus Loop / Housing Express Operations

Time of Day	7 AM – 8 AM	8 AM – 10 AM	10 AM - 3:30 PM	3:30 PM – 6 PM
Frequency	7.5 minutes	5 minutes	7.5 minutes	15 minutes

The Campus Loop/Housing Express route does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

Speed/Linearity

As a one-way loop, the Campus Loop/Housing Express route serves some trips better than others. For passengers traveling from Aggie Village to main campus, the route offers a convenient and fast connection. For other passengers, like those traveling from the Student Living Center to the east side of main campus, riding the bus is the same speed as walking (and can be slower, when factoring in headways).

Reliability

The Campus Loop/Housing Express experiences several sources of delay that impact its reliability. Most notably, the 700 North segment through campus is routinely congested as a result of heavy pedestrian volumes crossing the street and the ensuing automobile queues. Other sources of delay include the route's four unprotected left turns and operations through the Aggie Village parking lot.

Connectivity/Coverage

The Campus Loop/Housing Express serves as the primary means of circulating among the main campus and on-campus student housing, and offers good connectivity to these areas. However, in some locations, the route's wide stop spacing creates a missed opportunity for transit connectivity. In particular, the lack of stops at the intersections of 700 North/800 East, 700 North/1200 East, and 800 East/900 North creates gaps in coverage. Additionally, as a one-way loop, the route lacks the ability to provide an east-west connection across campus along 700 North despite a strong (and growing) market for cross-campus trips.

Service Performance

The Campus Loop/Housing Express performs strongly. The route carries an average of 1,801 passengers per day. The highest ridership stops include Veterinary Science (430/day), South Stadium (372/day), Lundstrum (269/day), and Industrial Science (241/day). The route serves 86 passengers per revenue hour at a cost of $0.40 per passenger, indicating a highly efficient service.

Stadium Express

Frequency/Span

The Stadium Express operates very frequent service through most of the day. On average, it offers 4.5 minute headways (two buses) between 8 AM and 3:30 PM, and 9 minute headways (one bus) from 7-8 AM and 3:30 PM-6:30 PM. The Stadium Express route does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

Table 20 | Stadium Express Operations

Time of Day	7 AM – 8 AM	8 AM – 3:30 PM	3:30 PM – 6 PM
Frequency	9 minutes	4.5 minutes	9 minutes

Speed/Linearity

The Stadium Express offers a fast, direct connection between the stadium parking lot and the Taggart Student Center without any route diversions.

Reliability

The Stadium Express generally offers reliable service but is commonly subject to delay during peak hours. Delays on the route result from three sources: heavy passenger volumes boarding and alighting, congestion when exiting the stadium lot, and the left turn from 1000 North to 800 East. While run times can be as low as eight minutes roundtrip during off-peak hours, 10-11 minutes is not uncommon during peak hours.

Connectivity/Coverage

The Stadium Express is primarily oriented around serving the stadium parking lot. The lack of crosswalks on 800 East hinder the ability for passengers to safely cross the street and use the route for other purposes. As a consequence, the Stadium Express offers limited connectivity to the existing and planned student housing areas on the 800 East corridor.

Service Performance

The Stadium Express experiences the largest passenger volumes of any Aggie Shuttle route. On average, it serves 2,634 passengers per day, split evenly between the stadium lot stops and the Taggart Student Center. The route serves 139 passengers per revenue hour at a cost of $0.24 per passenger – a very efficient service.

South Campus Express

Frequency/Span

The South Campus Express is the least frequent Aggie Shuttle route. On average, it offers 9 minute headways (two buses) between 8 AM and 12:30 PM, and 18 minute headways (one bus) from 7-8 AM and 12:30 PM-6 PM. The South Campus Express does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

Table 21 | South Campus Express Operations

Time of Day	7 AM – 8 AM	8 AM – 12:30 PM	12:30 PM – 6 PM
Frequency	18 minutes	9 minutes	18 minutes

Speed/Linearity

The South Campus Express operates as a large one-way loop, generally resulting in slow travel times for many trips. For trips between Aggie Village and South Campus, the service is faster than other Aggie Shuttle routes; however, for trips from South Campus, it is usually faster to walk to another Aggie Shuttle route that offers more frequent and direct service.

Reliability

The South Campus Express generally provides reliable service. The primary location for delay is the unsignalized right turn from Champ Drive onto US-89.

Connectivity/Coverage

The South Campus Express is oriented toward maximizing connectivity and coverage for the Aggie Shuttle network. It offers valuable service to areas of campus that are otherwise not served by transit, including South Campus and the downhill areas west of campus.

Service Performance

The South Campus Express performs strongly. On average, it serves 1,024 passengers per day, distributed relatively evenly throughout the route with the exception of Lundstrum, which serves 316 passengers per day. The route serves 73 passengers per revenue hour at a cost of $0.50 per passenger, indicating a very efficient service.

Evening Express

Frequency/Span

The Evening Express runs Monday-Friday from 5:30 PM to 9:30 PM. On average, it offers 10 minute headways (one bus). The hours of operation are more limited compared to the hours of the library, which is typically open until midnight Monday-Thursday. The Evening Express does not provide service on weekends, summer instructional days, or non-instructional days.

Table 22 | Evening Express Operations

Time of Day	5:30 PM - 9:30 PM
Frequency	10 minutes

Speed/Linearity

The Evening Express operates as a small one-way loop, which offers fast trips around campus with limited diversions.

Reliability

The Evening Express generally experiences reliable operations given limited traffic congestion in the evenings.

Connectivity/Coverage

The Evening Express offers good coverage of the main campus and student housing areas. Its primary role is to facilitate trips between the library, labs, and instructional buildings to student housing and the stadium parking lot.

Service Performance

As a service oriented toward access as opposed to productivity, the Evening Express performs reasonably well, but not as strongly as other Aggie Shuttle routes. On average, it serves 132 passengers per day, three-quarters of whom board at main campus stops including the Taggart Student Center, Veterinary Sciences, and Industrial Sciences stops. The route serves 44 passengers per revenue mile, with a cost of $1.01 per ride.

System-wide Evaluation

Simplicity & Legibility

The relative complexity of the Aggie Shuttle's operations hinders its ability to attract new riders from students, faculty, staff, and visitors who may not take full advantage of its services. From a network-level perspective, the Aggie Shuttle has a relatively complex route structure. The network's split services, layered one-way routes, and varying frequencies throughout the day can create a barrier to attracting new users. From a stop-level perspective, a lack of signage and wayfinding similarly makes using the Aggie Shuttle challenging for riders who are not already well-versed in the system. While some stops feature distinctive shelters and are easy to find, others are marked by limited signage, often attached to the back of another street sign. System maps and schedules are not always available at stops. While these factors may not play significantly impact existing riders, they hinder the attractiveness of the system for new riders.

Civility

The Aggie Shuttle's bus stop facilities provide inconsistent accommodations. As noted above, some stops contain nice shelters and wayfinding signage, creating a convenient and user-friendly rider

Aggie Shuttle stops at times lack visibility, such as this Evening Express stop at experience; others, however, provide minimal signage and no amenities. Accordingly, stop improvements were the third-most requested improvement in the USU Survey. To attract and sustain ridership, shelters, benches, and lighting are necessary features at all stops.

The Aggie Shuttle bus fleet is generally in good condition and meets the needs of riders. Over time, the phasing of low-floor buses is preferable to the existing high-floor bus operations to improve the ease of access and egress for people of all ages and abilities. The Aggie Shuttle provides excellent bicycle capacity.

STIC Program Performance

The Aggie Shuttle does not receive STIC funding and is ineligible to directly receive STIC funds without collaboration with CVTD.

Summary & Conclusions

The Aggie Shuttle is a high-performing transit service that plays an integral role in the USU transportation network. It offers very frequent and mostly reliable service that covers the majority of campus destinations.

Table 23 | Aggie Shuttle 2013-2014 Performance Analysis

Route	Passengers per Day	Passengers per Revenue Hour	Cost per Passenger
800 East	1,864	88.8	$0.38
Campus Loop	1,801	85.8	$0.40
Stadium Express	2,634	138.6	$0.24
South Campus Express	1,024	73.1	$0.50
Evening Express	132	44.0	$1.01
Total	7,455	126.4	$0.36

In evaluating the Aggie Shuttle, areas for improvement include:

- Eliminating the redundancy of service along 800 East through improvements in pedestrian infrastructure
- Improving the reliability of operations on 700 North by reducing conflicts with other modes
- Expanding the span of service
- Improving bus stop facilities and access to bus information
- Phasing out the use of one-way loops for core campus circulation during the day

CVTD

This section evaluates the performance of the CVTD Shuttle system. It examines system-wide performance and anticipated changes resulting from the 2012 *Short Range Transit Plan* (SRTP).

System-wide Evaluation

Frequency & Span

CVTD operates relatively infrequent service to access USU, posing a major obstacle to growing transit ridership to campus. Most CVTD service operates every 30 minutes, requiring passengers to consult a schedule and plan ahead. In a city where most trips are less than 20 minutes by driving, a 30-minute wait acts as a significant deterrent for riding transit – especially in bad weather. Route 1 operates at 15 minute headways during peak hours, a frequency that offers greater flexibility where more passengers are able to casually show up without planning ahead. Consequently, Route 1 is the most heavily used line in the CVTD system. More frequent service was the second-most requested improvement for CVTD in the USU Survey.

The span of CVTD service is generally sufficient for basic commuting and mobility needs of the Cache Valley region, but a longer span is needed to serve the needs of the growing USU population. While CVTD ends service at 8:40 PM on weeknights, some evening activities, classes, and labs last well beyond that, and the Merrill-Cazier Library stays open until midnight. Accordingly, students, faculty, or staff living off-campus who stay late have few choices other than driving. CVTD's weekend span of service also limits mobility for students living on-campus: the lack of Saturday evening and Sunday service limits the ability of students to live without a car and still run errands or go to a restaurant. As a result, many students who ride CVTD also still must own cars. Extended service hours were the third-most requested improvement in the USU Survey.

Speed/Linearity

The hub-and-spoke design of the CVTD network results in longer trips times that can be indirect or circuitous. Although CVTD offers excellent access and coverage throughout the Cache Valley, a majority of trips to campus rely on a transfer at the Transit Center to access campus, which can add a delay of 5-10 minutes per trip. Transferring plays an integral role in a successful transit network; however, the lack of direct service creates a barrier for some transit connections with significant existing and latent demand – most notably the northwest Logan-USU and Downtown-USU connections.

Reliability

CVTD offers very reliable operations. Only two percent of all scheduled trips result in missed transfers. However, despite this reliable performance, a higher than expected number of survey respondents desired improvements to reliability (the fifth-most requested improvement, out of ten). This disproportionate response may result from the delays circulating through campus via 700 North, as previously discussed. Additionally, it may be an issue of perception of reliability, which is influenced by two factors: frequency and real-time arrival information. A single negative experience, such as a missed transfer or an uncertain arrival, can create the perception of unreliable service and serve as a deterrent to ridership. Enhanced frequency and real-time arrival information help improve the perception of reliability by mitigating the negative impacts of a bad experience like a missed transfer or uncertain arrival.

Connectivity/Coverage

The CVTD network provides strong coverage throughout the Cache Valley region: most households are within less than ¼ mile of a bus line, and most destinations are accessible by bus.

Simplicity & Legibility

Due to the large number of routes (15) and complexity of individual alignments, the CVTD system can be challenging to understand for people who are not frequent riders. Varying frequencies and spans between routes are not effectively communicated via existing maps, and the system does not participate in third-party mapping tools such as Google Maps.

Civility

Like the Aggie Shuttle, CVTD provides inconsistent bus stop facilities: some CVTD stops are clearly marked with benches, shelters, and signage, while others have minimal street presence despite experiencing high ridership. According to the USU Survey, stop improvements were the fourth-most requested improvement. Given the infrequent service on most CVTD routes, the addition of shelters, benches, lighting, and signage are needed at bus stops to create a more accommodating place to wait for the bus.

Additionally, improving passenger access to information will help improve the CVTD rider experience. CVTD presently lacks bus tracking capabilities and consequently does not offer a mobile application for real time arrival information – an omission that makes riding the bus less convenient and adds uncertainty for when the bus will arrive.

Service Performance

USU students, faculty, staff, and visitors represent an integral part of CVTD's ridership. CVTD's two busiest routes travel through the USU Campus: Route 1 serves approximately 1,360 passengers per day, while Route 4 serves 988 passengers per day. The majority of these passengers are traveling between the Transit Center and the residential areas west of campus, and Veterinary Sciences or Industrial Sciences stops. Two additional routes, Route 2 and CVN, travel through campus.

A summary of CVTD service performance is provided in **Table 24. Figure 11** illustrates ridership for outbound trips on Routes 1 and 4 (from the 2012 SRTP).

Table 24 | CVTD Performance Analysis (2011 Data)

Route	Passengers per Day	Passengers per Revenue Hour
Route 1	1,360	68.0
Route 2	766	50.9
Route 4	988	68.4
CVN	555	28.6

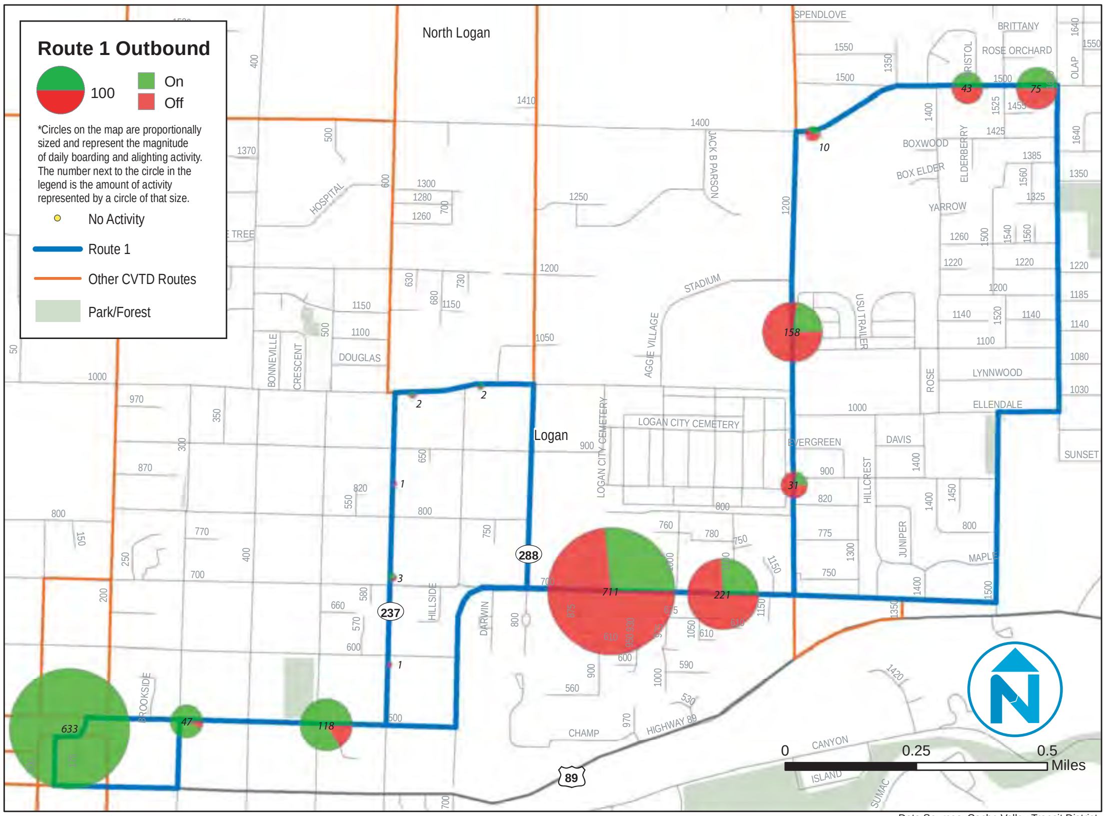
STIC Performance

For the FY-2014 STIC apportionment, CVTD received $576,049 for exceeding three of the six performance criteria. CVTD significantly exceeded the STIC thresholds for each performance criteria: passenger miles per vehicle revenue mile (+31 percent over performance threshold), passenger miles per vehicle revenue hour (+17 percent), and passenger trips per capita (+51 percent). CVTD did not exceed three criteria: vehicle revenue miles per capita (-17 percent), passenger miles per capita (-12 percent), and passenger miles per capita (-11 percent). In essence, CVTD experiences very high ridership, but operates less service over a shorter distance compared to the performance thresholds.

Table 25 | 2014 Small Transit Intensive Cities Performance Data and Apportionment Projections for Consolidated CVTD-USU Reporting

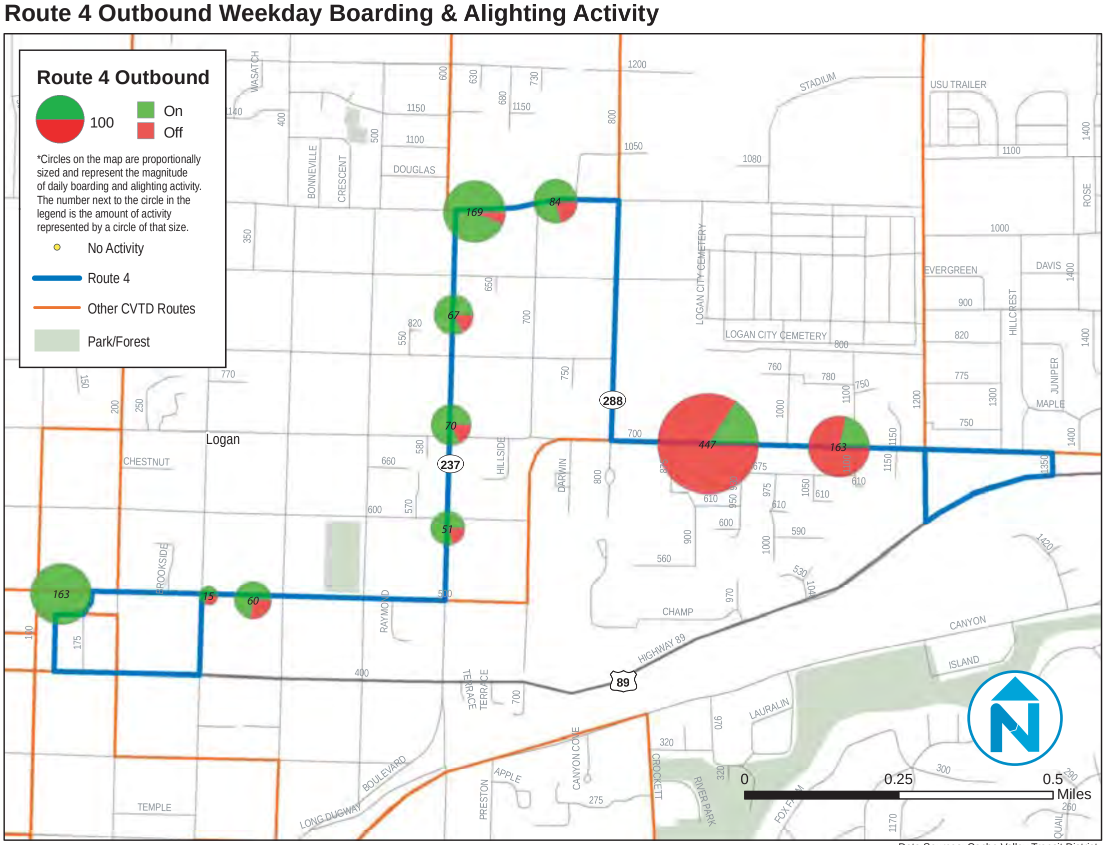
Category	Passenger Miles per Vehicle Revenue Mile	Passenger Miles per Vehicle Revenue Hour	Vehicle Revenue Miles per Capita	Vehicle Revenue Hours per Capita	Passenger Miles per Capita	Passenger Trips per Capita	Number of Criteria Met or Exceeded	STIC Funding Allocation
STIC Thresholds (2014)	6.33	104.59	10.62	0.68	82.42	13.22		
CVTD (2014)	8.30	122.55	8.84	0.60	73.33	20.00	3	$576,049

Route 1 Outbound Weekday Boarding & Alighting Activity



Data Sources: Cache Valley Transit District, Utah SGID, U.S. Census TIGER/Line, ESRI

Route 4 Outbound Weekday Boarding & Alighting Activity



Data Sources: Cache Valley Transit District, Utah SGID, U.S. Census TIGER/Line, ESRI

UtahStateUniversity

Outbound Ridership for Outbound Trips

figure 11

Summary & Short Range Transit Plan

CVTD operates a highly efficient system that plays a key role in facilitating access to USU and offering mobility choices for students, faculty, staff, and visitors. It offers a strong base of regional transit services to build upon as the campus expands. For USU, the primary challenge to growing CVTD ridership to/from campus is the limited frequency and span of service – 15 minute weekday frequencies and more evening and weekend service is needed to improve its convenience. Additionally, faster, more direct service, real-time arrival information, and stop improvements are needed. Upon achieving these service levels, CVTD will provide a more viable alternative for students, faculty, and staff. However, all of these improvements are presently limited by financial constraints.

CVTD has already begun planning for service improvements and expansions through its 2012 SRTP. The SRTP offers a number of recommendations that will change service to USU, likely to be implemented by 2017. Most notably, the SRTP recommends the termination of service along Routes 2 and 9 and reallocating these resources to an extension of Routes 4 and 5. This reconfiguration would offer significant benefits to USU by creating a direct connection between the dense neighborhoods of northwestern Logan and the USU Innovation Center, Logan Regional Hospital, Aggie Village, and the main campus. To be cost-neutral, it is anticipated that headways will remain at 30 minutes for both Routes 4 and 5.

CVTD outlines two scenarios for expanding transit service, as additional funding becomes available:

- With $300,000 in additional funding, CVTD proposes operating Route 4 every 15 minutes during peak hours on weekdays when USU is in session. It also proposes operating Route 7 every 15 minutes during peak hours to meet capacity needs on a heavily-used route, and increasing service on the CVN to 30 minute peak frequencies.
- With $1,000,000 in additional funding, CVTD proposes operating Routes 4 and 7 every 15 minutes all day when USU is in session, expanding service hours for two additional hours per day, and increasing frequencies on Routes 12, CVS, and CVN.

These service expansions will focus on CVTD's most productive routes, including those that serve the USU campus. Increased frequency and span over service will both increase ridership and enhance competitiveness for STIC funding – which, in turn, can lead to more service and ridership. It is in the best interest of USU for CVTD to fully implement its SRTP and to continue growing service beyond these recommendations, so that transit may serve as an attractive choice for a multitude of trips and users.

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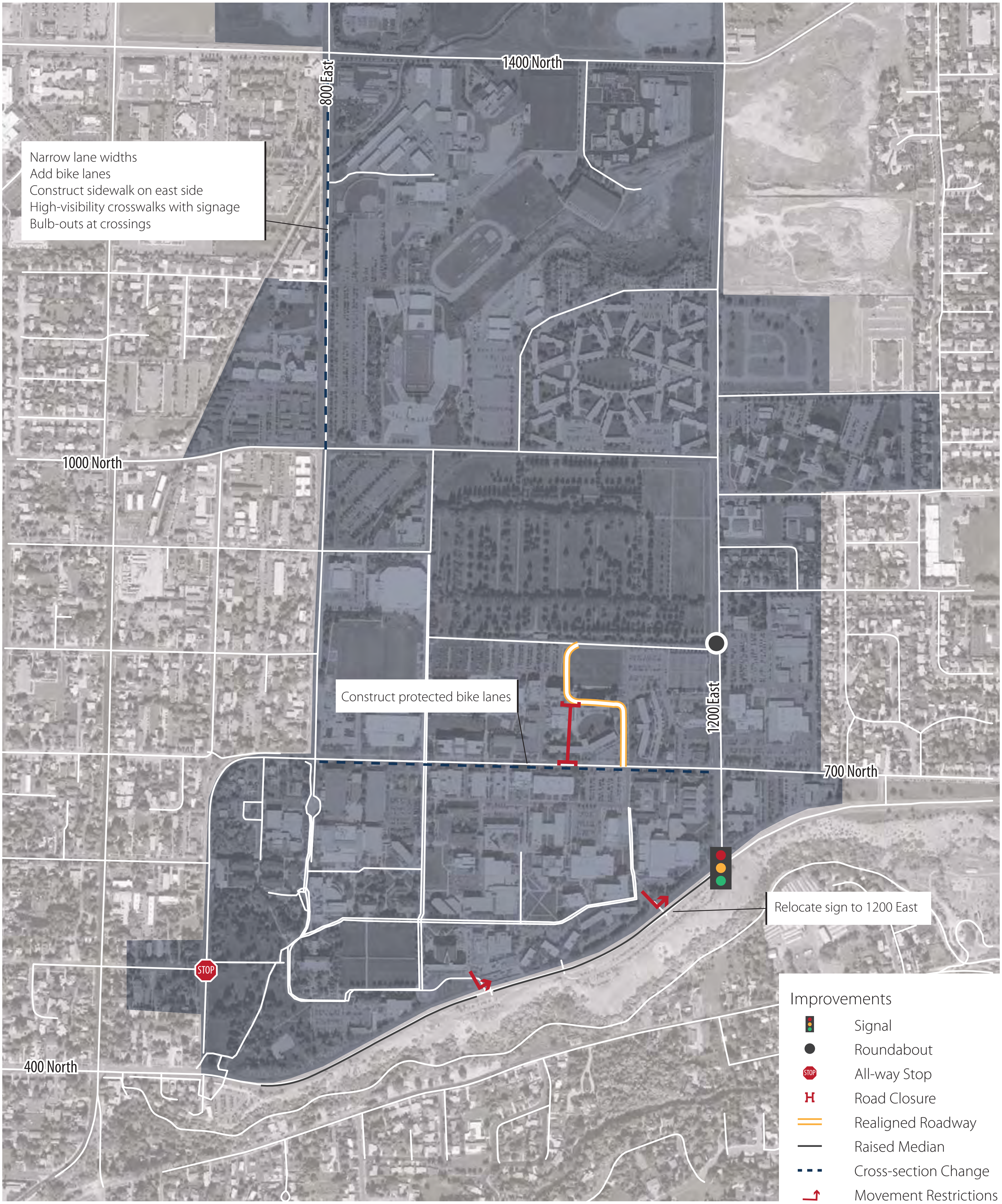
Transportation Improvement Plan by Phase

Phase 1 (0-5 years)

Vehicular Circulation Improvements

The Phase 1 vehicular circulation improvements are aimed at improving immediate safety needs on the campus. US-89 (400 North) and 700 North (Aggie Bullevard) are at the core of these improvements. Improvements are shown in Figure 12.

Along the southern edge of campus, a signal is proposed at the intersection of 1200 East and US-89. This intersection has been a concern of the campus community and is the location of a number of rear-end collisions. Under existing traffic conditions, this intersection operates at failing levels of service for delay and warrants a traffic signal based on traffic volumes. A traffic signal at this location would also benefit pedestrians crossing 1200 East by providing dedicated crossing phases.



UtahStateUniversity

Phase 1 Vehicular Circulation Improvements

figure 12

US-89 is a five-lane roadway with relatively high traffic speeds and heavy truck volumes. In addition to this signal, turning movement restrictions at Champ Drive and at 550 North are proposed to improve safety.

Restrictions would allow left- and right-turns from US-89 but would only allow right-turns onto US-89.In conjunction with this improvement, a raised median on US-89 from just east of 700 East to 1200 East would prevent unsafe U-turns. It is also proposed to move the wayfinding sign at 550 North on US-89 to the intersection of 1200 East to reduce driver confusion. Westbound to eastbound U-turns should be allowed at the 600 East and US-89 (400 North) intersection.

To improve access and delay at the intersection of 1200 East and 850 North a roundabout is recommended. Currently, this intersection operates as an eastbound stop. The relatively high traffic volumes and few gaps in traffic on 1200 East cause high levels of delay for drivers exiting 850 North. A roundabout improves traffic flow by creating opportunities for drivers to safely turn left.

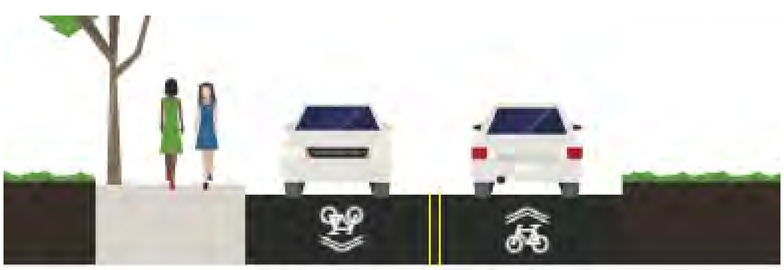
Outside the central core of campus, there are two additional proposed improvements. The first improvement is creating an all-way stop at the intersection of 700 East and 500 North. This intersection is currently a three-way intersection with a north- and southbound stop. The eastbound left- and right-turning movements do not stop and this free flow movement causes safety issues for pedestrians crossing across the southbound approach. The benefit of the additional stop-controlled movement is increased pedestrian visibility and slower traffic speeds, both of which improve pedestrian safety.

800 East between 1000 North and 1400 North is currently a five-lane roadway with on-street parking. 800 East is a multi-modal corridor that serves as a major connection to central campus. Currently, there are no bicycle lanes along 800 East and there is only sidewalk on one side of the roadway. 800 East also sees significant jaywalking traffic between the Aggie Shuttle stops on the east side of the roadway and the residential land uses on the west. To improve safety of pedestrians, bicyclists, and transit users, a reconfiguration of right of way for 800 East is proposed. These improvements include narrowing travel lanes and the center turn lane to 11', adding bicycle lanes in each direction, constructing a sidewalk on the east side of the roadway, and crosswalk improvements. The crosswalk improvements include constructing a high-intensity activated crosswalk (HAWK) beacon about 800' north of the intersection of 800 East and 1000 North, signage, and bulbouts.

Looking South at 800 East & 1200 North

Conceptual cross-sections post-implementation of recommended improvements are shown below for 850 North, 1200 East, Bullen Hall, and Champ Drive.

850 North Cross-Section



1200 East Cross-Section

Service Drive south of Aggie Bullevard and Champ Drive Cross-Section

Parking Improvements

The Taggart Student Center is proposed to be reconstructed on the current site of the Field House and the Big Blue Terrace near the end of Phase 1 or beginning of Phase 2. When this occurs, replacement parking will be needed to maintain USU's parking ratio goal. It is recommended that the new student center provide underground parking under the student center with access from 800 East and not 700 North. Providing access on 800 East improves operations at the intersection of 800 East and 700 North and reduces impact to transit from vehicles entering and exiting the garage. The new garage should maintain existing Big Blue Terrace parking capacity.

Transit Improvements

A key objective of the Transportation Master Plan is the development of a transit plan which supports sustainable growth and circulation on campus and the surrounding Cache Valley community. The *Campus Master Plan* anticipates significant growth and associated increases in student, faculty, and staff populations. The Aggie Shuttle and CVTD will play a critical role in supporting future expansion and growth.

The performance evaluation has demonstrated that USU and CVTD operate highly successful transit services that serve a significant amount of riders. To build upon this success and accommodate campus growth, it is necessary to expand funding and achieve operational efficiencies to implement more frequent, efficient, user-friendly service. Once additional resources are available, the USU Shuttle and CVTD bus systems can expand service to meet future needs.

Three recommendations that span each phase of this plan are:

1. Coordinate with CVTD to seek additional funding, specifically by way of the Small Transit Intensive Cities Program by the Federal Transit Administration
2. Invest in operational efficiencies and rider experience, through capital improvements that improve pedestrian access, reduce conflicts between buses and other modes, and create more interconnected and user-friendly systems
3. Consolidate and enhance service, to grow ridership in key opportunity areas on campus and region-wide

Closer coordination between CVTD and USU offers opportunities to expand transit funding to improve existing service. This section evaluates how CVTD and the Aggie Shuttle can collaborate to grow funding for transit in the region. The STIC program offers an opportunity to expand transit funding for CVTD and USU. CVTD and USU staff have expressed a desire for closer coordination in order to potentially improve their competitiveness for STIC funding. In 2014, CVTD received $576,049 by qualifying for three of the six performance categories. These funds support bus operations and preventative maintenance.

According to correspondence with the FTA Region 8 office, formula apportionment for the STIC program is based upon all services that meet the statutory definition of public transportation (being open to the public and ADA-compliant). All services that are reported to the National Transit Database (NTD) are eligible, regardless of who operates the service. Because the USU Shuttle meets these requirements, they are eligible for STIC funding; however, their services are currently not included in CVTD's reporting to the NTD.

The joint reporting of USU and CVTD operations data to the NTD would likely increase their apportionment through the STIC program. Based on 2014 estimates, CVTD-USU would exceed five performance categories by reporting together, as opposed to three by CVTD reporting without USU:

- Three categories continued to exceed performance thresholds: passenger miles per vehicle revenue mile, and passenger miles per vehicle revenue mile would decrease in value, but continue to securely exceed the thresholds; passenger trips per capita would significantly increase in value
- One categories would exceed performance thresholds that currently do not: vehicle revenue hours per capita
- Vehicle revenue miles per capita would remain below the performance threshold, but increase to a value close to meeting the threshold if service is expanded.

The changes to specific metrics are shown in **Table 26** below; criteria which exceed the thresholds are shown in green; criteria which do not exceed the thresholds are shown in red.

Table 26 | 2014 Small Transit Intensive Cities Performance Data and Apportionment Projections for Consolidated CVTD-USU Reporting

Category	Passen-ger Miles per Veh. Revenue Mile	Passeng-er Miles per Vehicle Revenue Hour	Vehicle Revenue Miles per Capita	Vehicle Revenue Hours per Capita	Passen-ger Miles per Capita	Passen-ger Trips per Capita	Number of Criteria Met or Exceeded	STIC Funding Allocat-ion
STIC Threshold (2014)	6.33	104.59	10.62	0.68	82.42	13.22		
CVTD (2014)	8.30	122.55	8.84	0.60	73.33	20.00	3	$576,049
CVTD (with USU)[1]	8.02	113.61	10.20	0.72	81.82	31.12	5	$960,080
Total Projected Increase in STIC Funding								$384,031

1. Excluding charter services and Water Lab service. Passenger miles for Aggie Shuttle estimated by Fehr & Peers through analysis of ridership patterns.

Additionally, it is worth noting that joint reporting could create a positive feedback loop: an increase in STIC funding would allow for more service, which will increase vehicle revenue miles, vehicle revenue hours, passenger miles, and passenger trips – leading to stronger STIC performance and potentially more funding. More information about joint reporting can be found in Appendix C.

While $384,000 in additional STIC funding will provide opportunities for service expansions, it is unlikely that this sum will prove sufficient for service expansions to reach levels that meet existing and future demand. For this reason, the pursuit of additional funding will be necessary.

Additional Funding Sources

As the USU campus and Cache Valley region grows, additional funding will be necessary to support enhanced service by CVTD as well as the Aggie Shuttle. Potential funding sources for the Aggie Shuttle and CVTD include:

- Transit fee for faculty and staff
- Parking surcharge (for all users)
- Increase in student fees
- Regional sales tax measure

- Transit fares
- Federal grants

A brief discussion of each measure is below.

Transit Fee for Faculty and Staff

A transit fee for faculty and staff is worthy of consideration to offer greater equity in funding the Aggie Shuttle. Presently, faculty and staff do not financially contribute to the service, yet they receive benefits from the shuttle service.

Parking Surcharge

A surcharge on parking serves as both a means of increasing funding for transit and as a TDM measure to help manage parking supply. Revenues from a parking surcharge could be reinvested in Aggie Shuttle and/or CVTD services to support shuttle services that connect to satellite parking lots and improve access to campus by CVTD.

Increase in Student Fees

An increase in student fees could result in up to $270,000 annually. However, it is recommended that other funding measures are pursued before increasing student fees, given that students already shoulder the full cost burden of the Aggie Shuttle service despite its benefits to the entire university population. Any increase should also clearly articulate the additional services provided so that students may have an active role in prioritizing what services they want to expand (i.e. daytime, weeknights, and/or weekends).

Regional Sales Tax Measure

A regional sales tax increase has been under discussion by CVTD to increase transit funding region-wide. A 0.25 percent increase in sales tax would generate $2.8 million per year (a 50 percent increase in revenue). The proposed sales tax increase would help fund real time vehicle tracking, increased frequency of services, more direct connections to USU, and cleaner, more fuel-efficient buses. In the future, should CVTD pursue a ballot measure to increase sales tax, it is recommended that USU support this measure to enhance transit services to campus and reduce transportation impacts of campus expansion, including traffic congestion, parking demand, and air pollution.

Transit Fares

As previously stated in this report, both Aggie Shuttle and CVTD provide their services without charging fares. The implementation of fares is not recommended at this time for either CVTD or the Aggie Shuttle. As noted in the CVTD SRTP, the implementation of fares is likely to cost a significant amount to implement, reduce ridership (jeopardizing STIC funding), and increase travel times. Similar negative impacts are anticipated if the Aggie Shuttle introduced fares.

Federal Grants

A number of federal grant opportunities exist to invest in capital improvements and lifeline transportation services. The availability and scope of these grants is constantly changing. USU should play an active role in supporting CVTD's pursuit of these grants, as needed.

Service Improvements

A redesign of 800 East presents an opportunity to improve transit service and accessibility while reducing operating costs. The 800 East corridor is the Aggie Shuttle's busiest, comprising half of the system's ridership (about 4,500 per day when USU is in session). All four routes travel along at least a portion of 800 East, connecting to housing, parking, and the Innovation Campus. The west side of 800 East is a dense and growing area for student housing as well. However, despite its heavy transit use, the existing design of 800 East is designed to facilitate fast automobile travel at the expense of pedestrian, bicycle, and transit accessibility: the street is 90 feet wide, lacks a sidewalk along the east side adjacent to the stadium, and has no crosswalks for a ½-mile stretch between 1000 North and 1400 North. Due to the lack of pedestrian facilities on 800 East, Aggie Shuttle service is split into two lines to reduce the need to cross the street: the Stadium Express and 8th East Express/Innovation. The intent of this split configuration is to allow direct shuttle access for passengers traveling to/from the stadium parking lot without crossing 800 East. The 8th East Express/Innovation route has no northbound stops; passengers traveling to the west side of 800 East are expected to continue riding to the innovation campus and back to the southbound stops at 1200 North and 1000 North – a diversion of approximately 10 minutes. This route configuration has several unintended consequences:

- A redundancy of bus service, which increases operating costs by $14,000-$52,000 per year
- Passengers still jaywalk across 800 East where there is no crosswalk between 1000 North and 1400 North, creating potential conflicts with fast-moving vehicles
- Passengers who access the east side of 800 East without jaywalking are penalized with a diversion of 10 minutes per trip
- Less frequent service to the Innovation Campus and student housing
- Bus capacity constraints at the Taggart Student Union turnaround
- More complex and less user-friendly bus service

To improve transit conditions on 800 East, it is recommended that the Stadium Express and 8th East Express/Innovation routes are combined into a single service to reduce costs, provide more frequent service, and better serve existing demand. Three consolidation alternatives are possible:

1. Consolidation while maintaining the same frequencies (4-5 minutes peak, eight minutes off-peak) would reduce operating costs by 25 percent ($52,000/year). In this scenario, three buses would operate at during peak hours, as opposed to five as currently operate. This scenario would expand service capacity to the Stadium Lot, but decrease capacity on

the corridor as a whole, which may be an issue if peak demand is high for travel to the Innovation Campus.

2. Consolidation while increasing frequency and capacity during the morning peak, offering under four minute headways from 8 AM to 10 AM. Four buses would operate during the morning peak in this scenario (the busiest time of day). Service would mirror Scenario 1 otherwise. This scenario would reduce operating costs by 20 percent ($41,800/year).
3. Consolidation while increasing frequency and capacity during the school day, offering under four minute headways from 8 AM to 3:30 PM. Four buses would operate for most of the day under this scenario. This scenario would offer for a savings of seven percent ($14,000/year).

Table 27 | 800 East Service Alternatives

Route	Total Daily Hours of Operation	Frequency	Operations Cost
Stadium Express	19	8-10 minutes (7 AM -8 AM, 3:30 PM - 6:30 PM) 4-5 minutes (8 AM -3:30 PM)	$96,600
8th East Express/ Innovation	21.5	13-15 minutes (3:30 PM - 6 PM) 7-8 minutes (7 AM -8 AM, 10 AM - 3:30 PM) 4-5 minutes (8 AM -10 AM)	$109,300
Total Hours of Operation	**40.5**	**Estimated Annual Operations Cost**	**$205,900**
8th East/Innovation, Scenario 1	30.5	7-8 minutes (7 AM -8 AM, 3:30 PM - 6:30 PM) 4-5 minutes (8 AM -3:30 PM)	$154,000
		Scenario 1: Estimated Annual Savings	**$51,900 (-25%)**
8th East/Innovation, Scenario 2	32.5	7-8 minutes (7 AM -8 AM , 3:30 PM - 6:30 PM) 4-5 minutes (10 AM -3:30 PM) 3-4 minutes (8 AM -10 AM)	$164,100/year
		Scenario 2: Estimated Annual Savings	**$41,800 (-20%)**
8th East/Innovation, Scenario 3	38	7-8 minutes (7 AM -8 AM , 3:30 PM - 6:30 PM) 3-4 minutes (8 AM -3:30 PM)	$191,900
		Scenario 3: Estimated Annual Savings	**$14,000 (-7%)**

An additional northbound and southbound stop could be added between 1000 North and 1200 North to maximize access to the stadium lot, if desired. A new stop is also recommended at 900 North to serve additional housing and provide a downhill-uphill connection. While there will be capital costs for these improvements, the annual operating costs savings, enhanced pedestrian accessibility, and improved transit service will result in lower expenses and fewer conflicts over the long term. These savings could be reinvested into additional service on the 800 East corridor, or elsewhere on the USU campus.

To enhance transit connections between the Cache Valley and USU campus, it is recommended that CVTD implement the recommendations of the SRTP as funding becomes available. The expansion of transit services throughout Logan and beyond directly benefits USU because all students, faculty, and staff experience increased mobility and choice. As frequency and span of service is increased, the convenience of riding CVTD is enhanced; ridership will increase as a result.

While all recommendations in the SRTP provide benefits to USU, in particular, key campus access priorities include:

- Increased frequency to 15 minutes (all day) on Routes 4 and 7, and to 30 minutes (peak) for Route CVN
- Rerouting Route 4 (and corresponding changes to Routes 2, 5, and 9) to provide a direct connection between northwest Logan and the USU campus
- Expanding the span of evening service from 8:30pm to 10:30pm on weekdays and 6:30pm to 8:30pm on Saturdays

In its SRTP, CVTD splits these improvements into two packages: a $300,000 increase in operating costs, and a $1,000,000 increase in operating costs. The $300,000 package includes 15 minute peak service for Routes 4 and 7, while the $1,000,000 package includes 15 minute all day service as well as a number of other improvements. Rerouting Route 4 is a cost-neutral improvement expected to occur between now and 2017. It is likely that an increase in STIC funding could cover the $300,000 package; additional funding is needed from other sources to further expand service. Additionally, each package requires a capital investment to purchase new buses.

The SRTP estimates that the $300,000 package would increase ridership by 814 passengers per day (168,240 per year, an 8 percent increase), while the $1 million package would increase ridership by 1,894 passengers per day (474,679 per year, a 24 percent increase).

Extended Service Hours (Nights & Weekends)

Over the short term, the USU Survey identified extending service hours – both nights and weekends – as its highest priority recommendation. Presently, service ends at 9pm on weeknights, despite the fact that some USU facilities such as the Merrill-Cazier Library are open until 12am. Weekend service, particularly on Sundays, also represents a critical need to support students who live without access to a car, providing access to groceries, shopping, dining, and other typical weekend trips.

An expansion of weeknight service is highly recommended to improve mobility during late night hours. The Evening Express hours of operation should be extended to 12am (Monday-Thursday) to match the hours of operation for the library and other facilities. This expansion of service would cost approximately $12,000 per year, and represents a high priority for USU in the short term.

The Evening Express service should also be expanded to weekends during the day as a new Weekend/Evening Express. Much like the evening service, the weekend service would provide on-campus circulation for students to access the library and other facilities. This service could operate on Saturdays, Sundays, and holidays (Labor Day, Fall Holiday, Martin Luther King Day, and President's Day) while school is in session, both during the day and evenings to mirror hours of operation for other campus facilities. The feasibility of these services is largely dependent upon campus residential growth, so these services are recommended at a later stage of implementation. Weekend daytime service would cost $16,800 per year for 28 weekends per year when school is in session. Holiday service would cost an additional $1,300 per year.

The Aggie Shuttle should also consider launching weekend off-campus service to supplement services provided by CVTD. Saturday evening and Sunday service represents a lower regional priority for CVTD relative to improving weekday service, but it is a higher priority for USU students because it enhances mobility and quality of life and reduces the need to own a car. Initially, a Sunday route could provide basic coverage of Downtown Logan, the USU campus, and shopping destinations in Logan via hourly service. If this program proves successful, it could be expanded to serve additional areas with high concentrations of USU students. Saturday evening service between USU and Downtown Logan is also warranted to improve access to dining and entertainment options for USU students without needing a car. CVTD service currently stops around 6:40 PM on Saturdays. USU could potentially partner with CVTD to implement these services.

Sunday service that runs hourly from 10 AM to 6pm, 28 Sundays per year (during regular instructional days) would cost approximately $7,500 per year, and represents a high priority. A service operating every 30 minutes would double costs to $15,000 per year. Saturday evening service from 6:30 PM to 10 PM, 28 Saturdays a year would cost $3,200/year.

More Frequent Service

Aggie Shuttle service expansion should be targeted along two corridors: the 800 East corridor, connecting the Taggart Student Center and Innovation Campus, and the 700 North/1200 East corridor, connecting the Taggart Student Center and student housing areas. These corridors contain the highest concentrations of existing ridership and significant planned growth.

Frequent, bidirectional service on the 700 North/1200 East corridor would facilitate cross-campus trips on 700 North and provide a direct connection to growing student housing areas on 1000 North. This service would likely be implemented through realigning the Campus Loop route. This alignment would reduce travel times for students by providing a point-to-point service. It would also offer direct bidirectional connections across campus, linking with the 800 East route. This route would likely terminate at the Taggart Student Center. This change in service itself would result in no changes to frequency or annual cost; however, it is recommended that frequencies are increased between 3:30 PM and 6pm from every 15 minutes to every 7.5, which would cost approximately $12,700 per year. It is worth noting that the implementation of this service would benefit from a partial redesign of 700 North ; otherwise, this service may be subject to delays.

It is assumed that the South Campus Express route will be maintained at service levels similar to existing operations. The South Campus Express provides coverage to relatively lower-activity areas of the USU campus not served by the two lines described above, including 1000 North, Champ Drive, and downhill areas west of campus.

As growth occurs on 800 East and 1200 East, the needs for late night service will also change. Over time, a bidirectional U-shaped service along 800 East, 700 North, and 1200 East should replace the existing Evening Express loop to serve growth north of 1000 North.

Stop Additions and Enhancements

The construction of a transit center has been under consideration by USU to concentrate transit services at a single hub on campus. A transit center offers the ability to centralize transit services on campus to create a combined facility for both CVTD and the Aggie Shuttle, which are not always well connected. However, the construction of a new transit center is not recommended at this time due to a lack of centrally-located sites, geometric constraints of multiple divergent through-routes, and the potentially high cost. Instead, stop improvements at the intersection of 700 North/800 East are recommended to better facilitate transfers between CVTD and the Aggie Shuttle.

Presently, there are two stops on the USU campus with particularly high ridership: the Taggart Student Union turnaround (2,100 boardings per day) and Veterinary Science Building (1,300 boardings per day). However, these stops are separated by a relatively long distance of over 800 feet, which discourages transferring between the two systems. To better integrate and connect CVTD and Aggie Shuttle services, this transfer distance should be reduced.

One alternative to improve connections between CVTD and the Aggie Shuttle is to expand the small transit center at the Taggart Student Center turnaround. However, this alternative is not ideal: the turnaround has capacity constraints and is unable to hold more buses. Additionally, a route diversion into the turnaround (or any other potential site) would result in delays for CVTD routes that run along 700 North, resulting in longer travel times for all passengers traveling through the corridor. This alternative is not recommended for these reasons.

To improve connections between CVTD and the Aggie Shuttle, targeted improvements to the 700 North/800 East intersection and Taggart Student Center turnaround are recommended. These include:

- Adding CVTD (and Campus Loop) stops on the far-side of the intersection, reducing transfer distances to 250-400 feet (a decrease of 50-75 percent)
- Installing high-visibility crosswalks and other pedestrian improvements
- Expanding stop areas at Taggart Student Center turnaround
- Wayfinding signage, maps, and real-time arrival information at both stops

The consolidation of the 8th East/Innovation and Stadium Express routes should also help alleviate bus storage capacity issues at the Taggart Student Union turnaround. However, as transit service grows at this location, additional design modifications may be warranted to provide priority to buses, such as restrictions for automobile access. Overall, it is anticipated that these improvements will cost significantly less than the construction of a new transit center or major expansion of existing facilities.

These intersection improvements will have a relatively lower cost in lieu of the construction of a new transit center, and will preserve land to be available for other University uses. Over the long run, similar improvements are recommended at the intersection of 1400 North and 800 East, which will become another key transfer point.

Enhancing bus stops represents a key opportunity for improving the experience of bus riders. While some CVTD and Aggie Shuttle stops already include basic components like wind-protected shelters, benches, wayfinding signage, trash cans, and convenient pedestrian access, many others do not. Improvements to shelters and lighting was one of the top four recommendations of the USU Survey for both CVTD and the Aggie Shuttle. Both CVTD and the Aggie Shuttle should strive to make these components standard at both on-campus and off-campus stops in order to make riding the bus a pleasant experience regardless of weather or time of day. At key high-volume stops, real-time arrival information displays are also recommended.

The addition of new stops at key gaps is also recommended to improve transit connectivity and accessibility. In some locations around campus, stop spacing is rather wide relative to the high concentration of activity. The Aggie Shuttle and CVTD should add stops at select locations, including:

- 700 North/800 East, for both CVTD and Aggie Shuttle service
- 700 North/1200 East, for both CVTD and Aggie Shuttle service
- 800 East/900 North, for Aggie Shuttle service (all routes)
- 800 East/1000 North and 1200 East northbound (8th East/Innovation)
- 700 North at the Veterinary Sciences Building, for the Evening Express

Information Accessibility

Both CVTD and USU should strive to improve information accessibility for riders. Presently, the Aggie Shuttle offers real-time bus tracking via a mobile phone app, website, and text message service, while CVTD publishes schedules on bus service. Enhancing information access for both CVTD and the Aggie Shuttle offers an opportunity to improve the experience of existing riders and attract new riders. The following improvements are recommended:

- The Aggie Shuttle should publish frequencies for each route by time of day to better inform riders. Frequencies vary by time of day on most routes, so it is difficult for riders to plan ahead without knowing when a bus operates at five minute versus 15 minute headways.

- CVTD and the Aggie Shuttle should include maps and schedule information at all stops, as previously discussed.
- CVTD should implement real-time bus tracking to provide live schedule updates to riders and alert them to potential delays. According to the USU Survey, real-time bus tracking was the most desired improvement for CVTD. If possible, CVTD should collaborate with USU to create a single integrated bus tracking platform with similar mobile app, website, and text message capabilities.
- CVTD should update its website to feature a more user-friendly map interface and improve mobile capabilities.
- Both CVTD and USU should collaborate with third-party trip planning services like Google Transit to improve the accessibility of trip planning information. These services allow riders to easily plan their trips and help make transit more accessible to people who are not regular riders. These services are free of charge; it is only necessary to submit operations data.

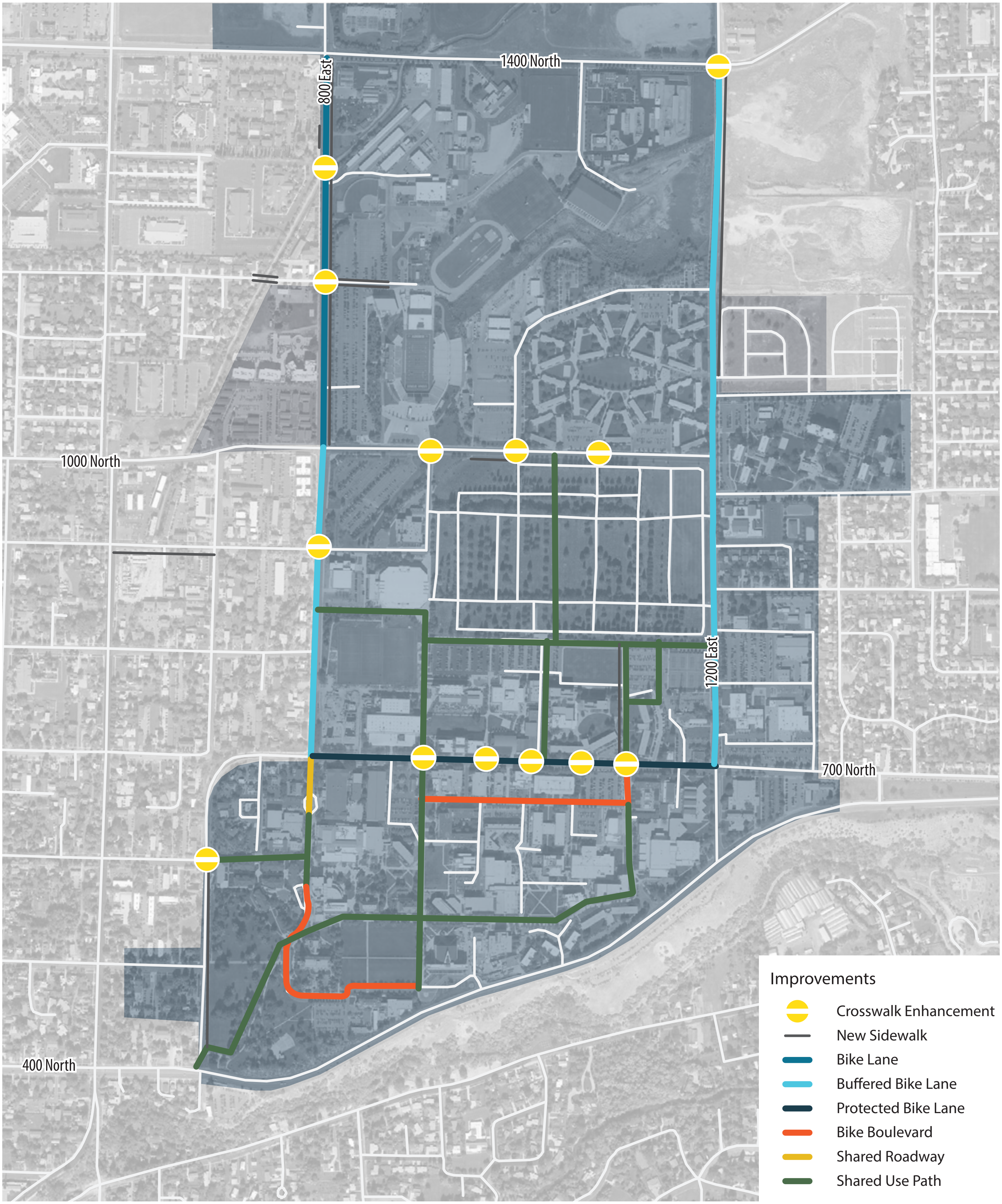
Bicycle and Pedestrian Improvements

Bicycle and pedestrian improvements introduced in Phase 1 of this plan focus on establishing a high-quality network of facilities throughout campus and connecting to adjacent areas. This includes formalizing several well-used pathways across campus and defining spaces for specific users. Bicycle and pedestrian improvements are shown in **Figure 13**.

For cyclists in the heart of campus, Phase 1 of the plan establishes Champ Drive and the service drive that parallels Aggie Bullevard to the south as bicycle boulevards. Bicycle boulevards are often placed on relatively low-volume roads that are popular routes used by cyclists, but which lack adequate pavement width to build a full bike lane. Bicycle boulevards can include stencil markings on the pavement, as well as traffic calming features like raised crosswalks or bulbouts to slow vehicles. A shared lane designation should be added to 800 East in front of the Taggart Center and the Field House.

Shared use pathways are already present throughout campus, and the recommendation of this plan is to continue allowing both cyclists and pedestrians to use them. However, feedback from campus users indicated that there were conflicts between bicyclists and pedestrians on campus, especially during class changing times. It is recommended that a pilot project be established to study the possibility of reallocating space on shared use pathways to create designated bicycle and pedestrian areas. This separation could occur through temporary measures such as painted lanes or removable planters or bollards.

The east-west shared use pathway between Old Main and the Engineering Building is recommended as the location of the pilot project.



*Improvements on city roads should default to approved Logan Bicycle and Pedestrian Master Plan

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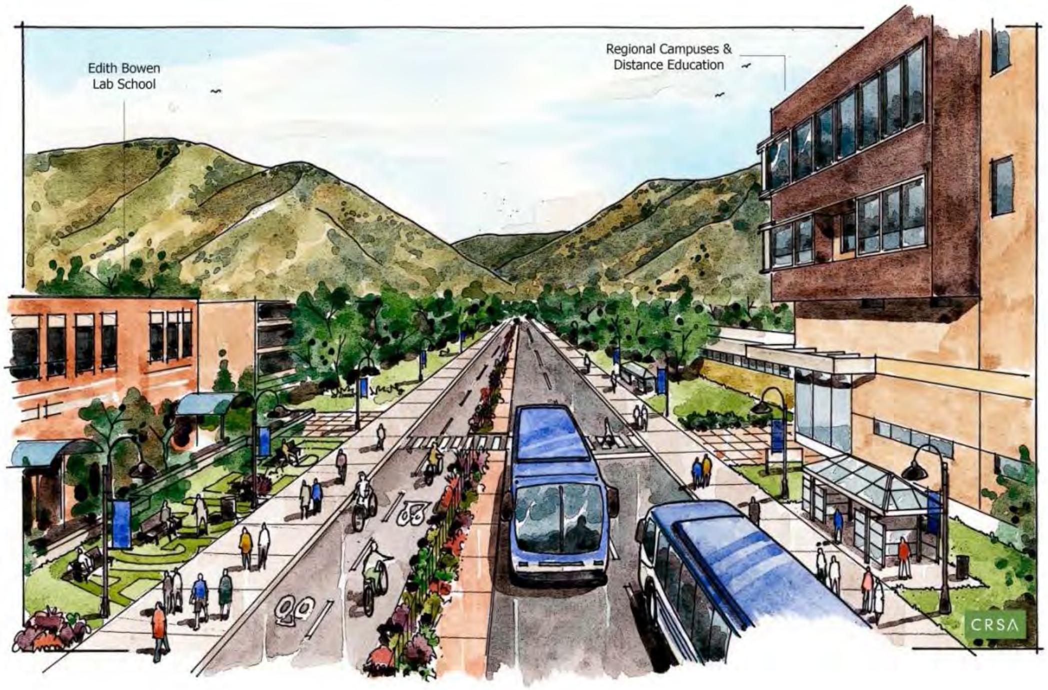
Phase 1 Bicycle and Pedestrian Improvements

figure 13



Looking East on Aggie Blvd. - Aerial View

A protected bike lane is proposed on the north side of 700 North between 800 East and 1200 East. The protected bike lane could be a two-way facility located on the north side of the roadway, separated from bus and vehicle traffic by a landscaped median. The median should be wide enough to hold people unloading from the bus, to prevent them from blocking the protected bike lane. The protected bike lane needs to have enough breaks in the median for cyclists to exit the lane and enter campus using the crosswalk locations, but enough continuity in the median to discourage pedestrians from crossing at non-crosswalk locations. The existing crosswalks should be enhanced to include high visibility paint, detectable warning signs, or other features.

A buffered bike lane is recommended on 1200 East, extending from 700 North to 1400 North and beyond. This is a popular route for cyclists accessing USU from neighborhoods to the east and north of campus. The pavement on 1200 East is roughly 40' wide and accommodates one traffic lane in each direction. This should be adequate pavement width to include a buffered bike lane (typically 5' bike lane plus a 2-3' buffer) and still accommodate vehicle travel within the existing footprint. Design for this buffered bike lane should take into account transit stops along 1200 East, to minimize conflicts between buses and cyclists.

An additional enhanced crosswalk is recommended at the intersection of 600 North and 700 East, at the bottom of a steep curve near the west edge of campus. A Rectangular Rapid Flashing Beacon (RRFB) and high visibility crosswalk striping, paired with advance warning signs on 700 East, would make this a safer crossing for pedestrians faced with high-speed traffic. Pedestrians would also benefit from a new shared-use pathway connecting that crossing, which accesses the residential neighborhoods west of campus, to the heart of campus. A shared-use switchback path is proposed to make this connection. This pathway will need to be maintained year-round to provide a safe connection throughout the winter. Additional sidewalk on the east side of 700 East between 600 North and 400 North should be constructed for improved accessibility and safety. In addition, an ADA-accessible ramp is required on the eastern side of the intersection of 500 North / 700 East to connect the crosswalk with existing sidewalks. Currently, only stairs exist, making this an unsafe area for any physically-challenged individuals.

In the portion of campus between 700 North and 1000 North, several recommended features would improve accessibility. Creating a shared use road on the service drive that parallels Aggie Bullevard to the south would improve accessibility for bicyclists and provide awareness that bicyclists may be present in an area that is traditionally thought of as parking access. Establishing a 10'-12' shared-use path along the north side of 850 North would create a comfortable east-west facility for cyclists and pedestrians. This could connect to other proposed shared-use paths north-south through the cemetery and past Edith Bowen Laboratory School. These would connect residents of student housing to the main campus, providing alternatives to on-street routes. Curb cuts would be needed on the 850 North route, to allow cyclists easy access in and out of the north-south cemetery routes and into the areas south of 850 North. A new pathway on the roadway between Bullen Hall and Richards Hall achieves a similar purpose, as do shared use paths near the Spectrum and HPER buildings. New access gates into the cemetery and pedestrian ramps where appropriate may be needed to supplement these concepts and facilitate movement in the area.

Enhanced pedestrian crossings on 1000 North near the cemetery would serve student housing residents who walk to campus, as would a new sidewalk link on 1000 North near the canal. A pedestrian crossing on 1000 North is recommended, near 900 East. This location aligns with the main north/south campus pedestrian mall further south, and provides a crossing opportunity for pedestrians going between the main campus and the stadium or student housing on 1000 North. An incremental approach is recommended at this location. For example, there are not currently pedestrian volume counts available at this location; future data collection efforts should gather counts of pedestrians crossing at this location to help "make the case" for future crossing investments. Crossing treatments at 900 East should include a high-visibility marked crosswalk with signage, along with installation of a median refuge island. Adequate space exists in the roadway to restripe the existing pavement to include buffered bike lanes (as identified in the Logan City Bicycle and Pedestrian Master Plan), 11' travel lanes, and an 8' landscaped median. The median provides pedestrians with a space to wait, outside the travel lanes, if they are only able to cross one lane of traffic at a time. Future additions to this crossing could include overhead beacons, RRFB's, or eventually a HAWK beacon if the pedestrian volumes are high enough. USU and Logan City staff should observe and monitor conditions at this crossing location once initial crossing treatments are installed to determine whether further improvements are needed.

Outside the main areas of campus, other projects would improve safety and accessibility between adjacent neighborhoods and the campus. Buffered and traditional bike lanes are proposed on 800 East, consistent with the 2015 Logan City *Bicycle and Pedestrian Master Plan*. On 800 East between 1000 North and 1400 North, new sidewalks would provide a safe route for pedestrians accessing campus from areas to the north. This section of 800 East also lacks adequate crossing opportunities. This plan proposes a HAWK beacon at 1200 North, near the stadium, to accommodate pedestrians and cyclists wishing to cross 800 East. A staggered pedestrian refuge island could be included in this crossing feature as well. These refuge islands (as shown in the rendering) provide a protected space in the median after pedestrians cross the first half of street, and direct their line of sight towards oncoming traffic prior to crossing the second half of the street.

A new canal crossing is also proposed just west of 800 East, to allow people on 800 East to easily access the neighborhoods to the west. New sidewalks into the stadium area at approximately 1200 North would allow pedestrians and cyclists to stay out of vehicle paths while attempting to cross through the parking lots at the stadium. Flashing overhead beacons and high-visibility crosswalks on 800 East at 900 North and 1300 North also provide opportunities for people trying to cross the street safely. In addition, pedestrian conditions on 1200 East could be improved by installing a sidewalk on the east side of the street between 1100 North and 1400 North, and building crosswalks at the intersection of 1400 North and 1200 East.

Also near campus, USU and Logan City are working together to implement a shared-use path along 700 North between 1200 East and 1500 East, eventually connecting eastward to the Bonneville Shoreline Trail. This pathway was a high priority to students surveyed for the USU Recreation and Open Space Plan, and is recommended in the Logan City Bicycle and Pedestrian Master Plan. Campus planners anticipate funding and constructing this trail connection before 2020.

Several short-term policy actions could also help improve biking and walking conditions on campus. These include:

- Establishing a program to build and manage long-term bicycle parking at the student housing units;

- Adopt guidelines from the Association for Pedestrian and Bicycle Professionals (APBP) for bicycle rack selection and placement, and develop a program for replacing racks that do not meet the guidelines;
- Establish bicycle rack placement procedures that prioritize racks in the front of buildings, in highly visible (and theft-deterrent) locations, rather than behind buildings where visibility is low;
- Working with campus and Logan City police to enforce laws relating to cyclist infractions and cyclist/motorist interactions, and to educate both drivers and cyclists on laws and procedures;
- Establish secured and covered bicycle parking at satellite parking lots, so students can store bicycles at these locations and then ride into campus after parking remotely; and
- Conduct a sidewalk and curb ramp inventory to ensure safe access to campus by individuals with limited mobility.

Phase 2 (5-10 Years)

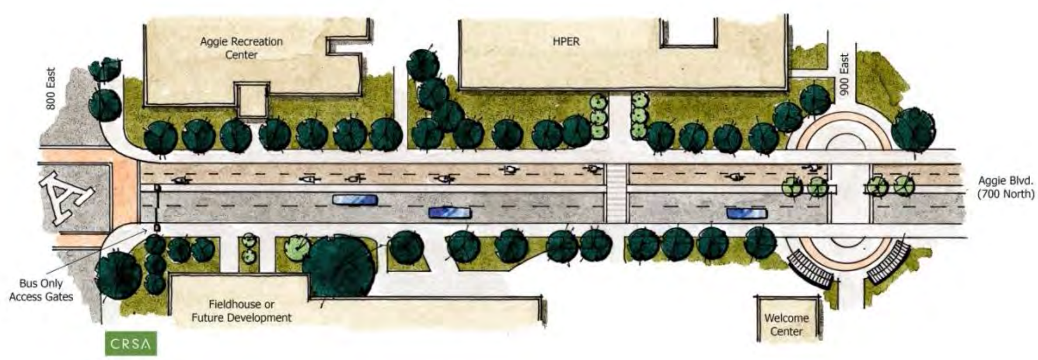
Vehicular Circulation Improvements

One of the most significant land uses changes to campus will be the re-siting and construction of a new student center where the existing Field House is. The new student center will require demolition of the Field House, Taggart Student Center, Big Blue Terrace, and the surface parking lot to the east of the Big Blue Terrace. This will alter circulation patterns in the core of campus as the existing parking on this site will be reconstructed in below-grade parking with vehicular access on 800 East instead of 700 North.

When the new Student Center is completed, there will no longer be parking access from 800 East to 900 East and it is proposed in Phase 2 to have a reallocation of 700 North to create a bicycle- and transit-way. The current configuration of 700 North is particularly challenging for bus operations: it is the busiest stretch in the CVTD system, yet it is also the most unreliable and biggest source of delay for CVTD and the Aggie Shuttle. Approximately 4,200 bus passengers ride through campus on 700 North per day (3,000 CVTD passengers and 1,200 Aggie Shuttle passengers). These passengers are subject to delays from three sources: high volumes of pedestrians crossing the street at crosswalks, pedestrians who “jaywalk,” and vehicle queues. Pedestrian volumes crossing 700 North are sizable throughout the day, particularly between classes; this activity is unavoidable on a pedestrian-oriented campus like USU. However, delays at crosswalks are compounded by resulting vehicle queues that back up along the street. Rather than pulling up to a crosswalk and waiting a few seconds for a break in pedestrians, buses must wait behind other vehicles that are each waiting for a break. These queues also encourage more jaywalking when cars are traveling slowly or are stopped. Therefore, a delay of a few seconds becomes a delay of minutes at a time. In Phase 2, vehicular traffic (with the exception of transit and facilities vehicles) would be restricted from using 700 North between 800 East and Bullen Hall.

This reconstruction could only occur once the *Campus Core North Master Plan* recommendations of realigning internal roadways and reconfiguring the Edith Bowen access are completed. In addition to restricting vehicle traffic, the 700 North project includes construction of protected bicycle lanes and enhanced crosswalks (included in Phase 1). The closure of 700 North could be phased to allow vehicular access to parking at the Big Blue Terrace until it is replaced with the new Student Center. In this scenario the bus only section would be from 900 East to Bullen Hall. The two Plan View figures below illustrate the configuration of the near term (allowing parking access up to 900 East) and long term scenarios.

Plan View (800 East to 900 East) - Near Term



Plan View (800 East to 900 East) - Long Term

Renderings of what 700 North could look like with access restricted to buses, bikes, and pedestrians only are shown below.

Looking East on Aggie Blvd. - Street Level (from 800 East)

Looking West on Aggie Blvd. - Street Level

Other vehicle improvements in Phase 2 are located along 1200 East, which is proposed for a repaving and restriping in the Logan *Transportation Master Plan* to a three-lane cross-section. It is also recommended that a traffic signal be installed at the intersection of 1200 East and 1400 North to improve operations. Under existing conditions, this intersection operates at a failing level of service in the PM peak hour as an all-way stop and warrants a traffic signal based on vehicular volume. In the future 2040 conditions, this intersection is projected to operate at failing levels of service for both the AM and PM peak hours.

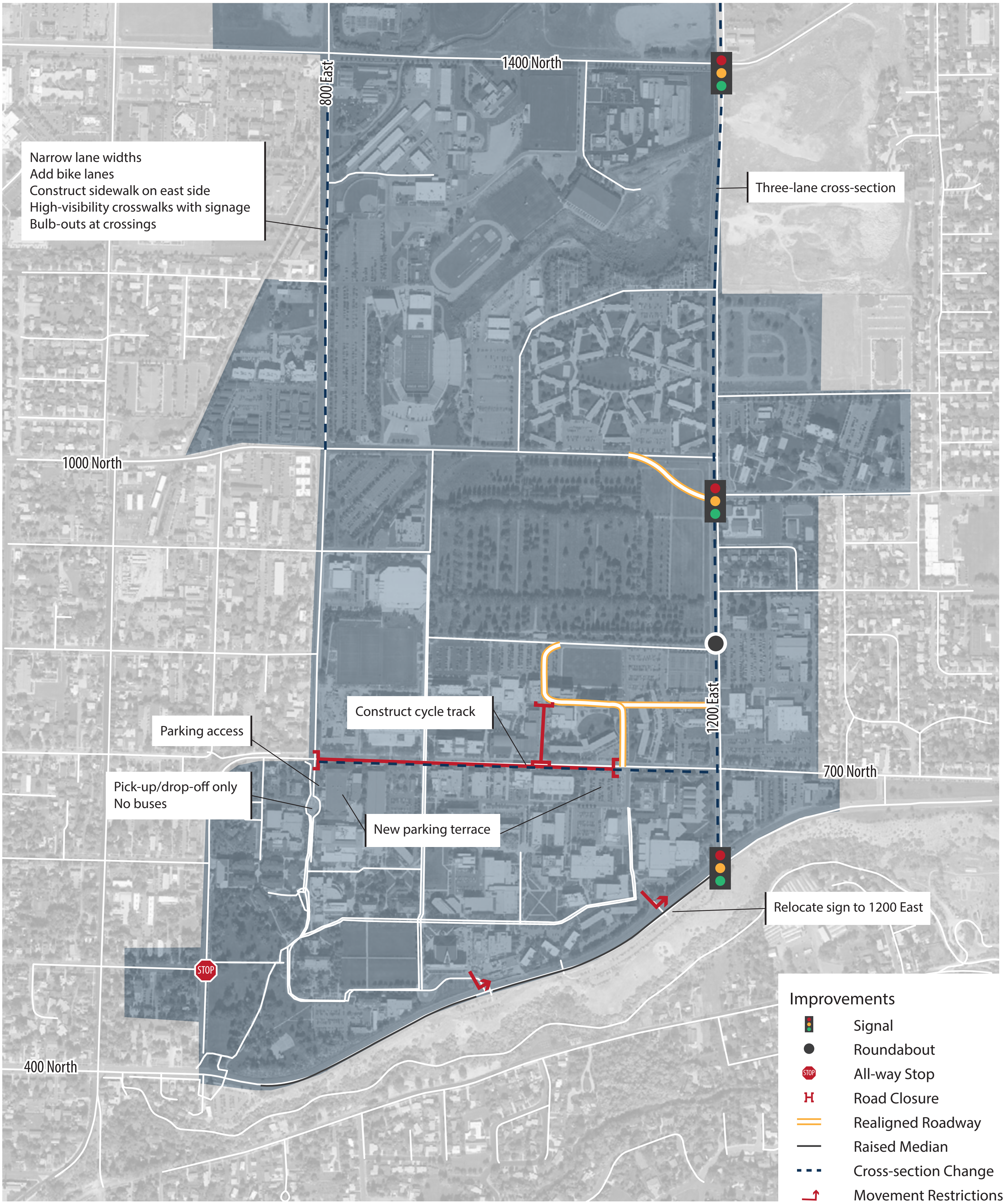
The most substantial change on 1200 East is proposed to occur at the intersection with 1000 North. Under existing conditions, this intersection is a three-legged intersection with an eastbound stop and heavy pedestrian volumes between USU campus residences, and Hillcrest Elementary School. This plan proposes to realign the intersection to connect the west and east legs of 1000 North at 1200 East and to signalize the resulting intersection. This improvement would require reallocating an unused and unsold portion of the cemetery.

Phase 2 vehicular improvements are shown in **Figure 14**.

Transit Improvements

Despite SRTP funding increase as a result of Phase 1 improvements, several unmet needs would remain:

- The operation of Routes 1, 4, and 7 every 15 minutes all day on all weekdays, including non-USU days
- The operation of the CVS Express extension to USU all day, as opposed to peak times
- The operation of Route CVN every 30 minutes all day, as opposed to peak times
- The extension of service span by two hours on all routes during weekdays and Saturdays
- Sunday service



Phase 2 Vehicular Circulation Improvements Project Cost Identification

figure 14

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Over the long term it is recommended that CVTD implement these unfunded recommendations. Additionally, CVTD should examine establishment of trunk line service which consolidates Lines 4 and 7 into a single frequent service. This service may also be consolidated with Route 1, if desired, which partially duplicates Route 4 service. The intent of trunk service is to create an enhanced bus line that serves major ridership corridors with frequent, fast, specially-branded service throughout the day. By providing 15 minute frequencies (or better) and eliminating the delay associated with transfers, this service could be convenient and time-competitive with driving. Such a service could also help spur transit-oriented development around its stops.

Additionally, the implementation of Sunday service is recommended to provide mobility for students and other transit users seven days a week. Sunday service will help reduce the need for car ownership for USU students, faculty, and staff.

Over the long term, USU should replace high-floor vehicles with low-floor vehicles on high ridership routes. Low-floor buses accommodate faster and easier boarding and alighting, reducing dwell times and resulting in more efficient operations. Low-floor buses typically also offer more amenities for standing passengers, which can increase carrying capacity without adding new service.

Over the long term, an expansion of service on typical non-instructional days is recommended to offer a dependable service year-round. This service would likely include lower-frequency versions of existing routes for both summer session services (approximately 45 days per year) and other non-instructional business days (approximately 53 days per year). Presently, summer student enrollment is less than 1/5th of student enrollment for spring or fall; additional growth is likely necessary to support summer transit services. That being said, the presence of faculty and staff outside of typical fall and spring instructional days offers a market for transit services. The justification of an expansion of such services will require a funding commitment from faculty/staff, since students are unlikely to support additional fees for services for which they do not receive a direct benefit.

For conceptual purposes only, it is assumed that both summer session and non-instructional days would offer consolidated 8th East Express service every 15 minutes all day. Additionally, a modified Campus Loop service could operate every 15 minutes during summer session. The cost of these services would be $32,900/year for summer session services, and $19,400 for non-instructional day services. Additional service could be added as demand warrants.

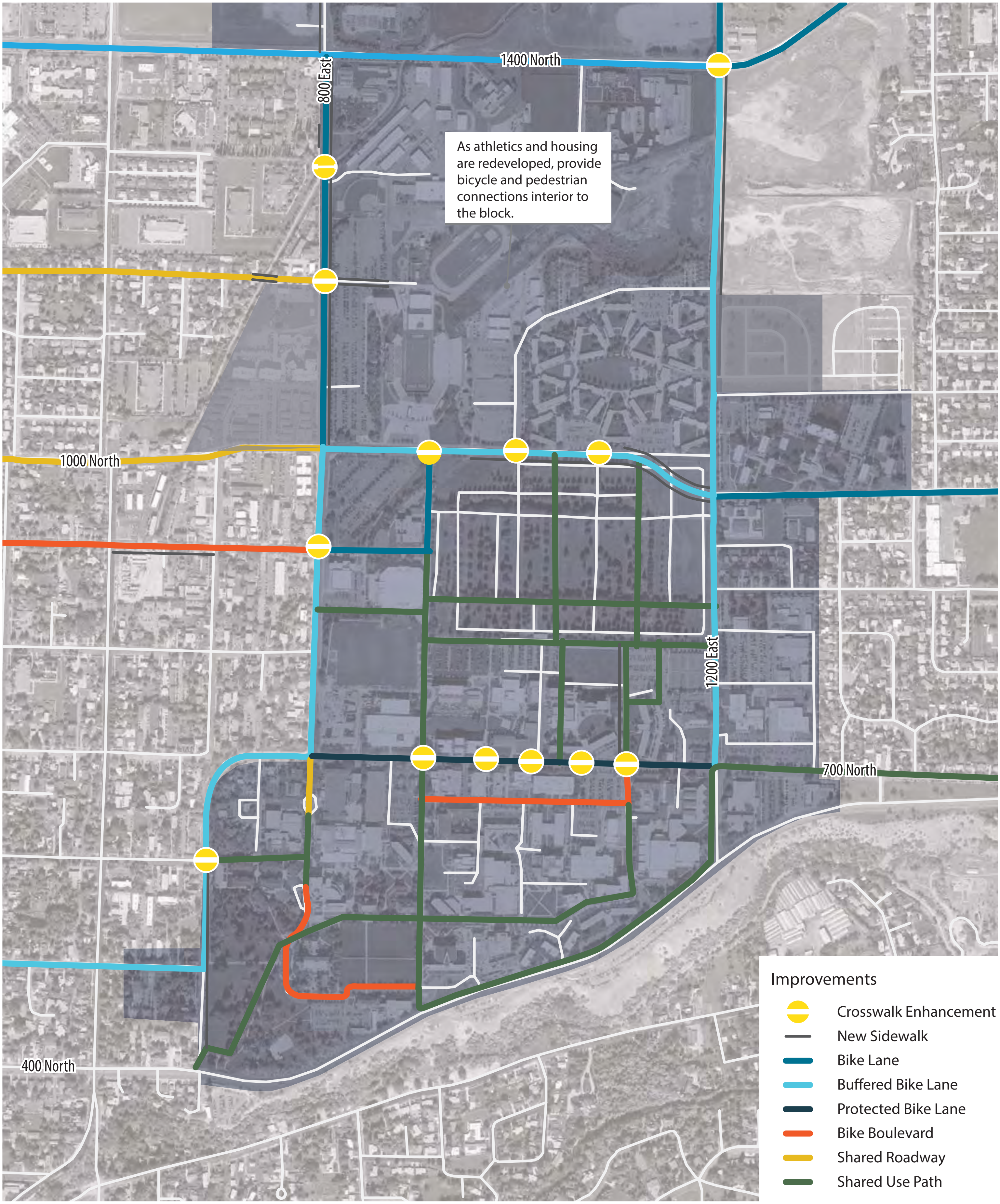
Bicycle and Pedestrian Improvements

Bicycle and pedestrian improvements in Phase 2 build significantly on the base network established in Phase 1. Nearest campus, a proposed shared use path would connect to the trail network east of campus via 700 North, and follow the south edge of campus until Champ Drive, where users could be directed to the bike boulevard that will be constructed in Phase 1. Other on-campus proposed facilities include a new east-west connection through the cemetery, as well as bike lanes on approximately 900 East and 900 North. Some proposed facilities will only become feasible as portions of campus redevelop; this assumption is inherent in some recommendations of this plan.

Many on-street bicycle facilities are proposed in Phase 2, consistent with the Logan City *Bicycle and Pedestrian Master Plan*. These include buffered bike lanes on 700 East, 500 North, and 1000 North; standard bike lanes on 1000 North east of 1200 East, and on 1200 East north of 1400 North; a bike boulevard on 900 North west of 800 East; and shared roadway routes on 1000 North and 1200 North. In addition to the bicycle improvements, sidewalk extensions are proposed to facilitate pedestrian access. These include a sidewalk to the Innovation campus on 800 East north of 1400 North; and sidewalks on the 1000 North road realignment east of the student housing complex. Additional improvements include buffered bike lanes on 1400 North west of 1200 East, and standard bike lanes on 1400 North east of 1200 East, consistent with recommendations for 1400 North in the Logan City *Bicycle and Pedestrian Master Plan*.

Corridor infrastructure should also be supplemented by on-site amenities and policies. In Phase 2, recommended actions on campus include installing a self-service bicycle repair station near Old Main, where cyclist traffic is high; installing covered bicycle parking at the library; implementing sidewalk improvements as identified in the sidewalk inventory proposed in Phase 1; and limiting maintenance vehicle traffic on campus pedestrian pathways during peak hours.

Phase 2 bicycle and pedestrian improvements are shown in **Figure 15**.



*Improvements on city roads should default to approved Logan Bicycle and Pedestrian Master Plan

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Phase 2 Bicycle and Pedestrian Improvements

figure 15

Phase 3 (10-25 years)

Parking Improvements

As the population on campus continues to grow and parking is removed through construction projects, new parking will need to be added to maintain the parking ratio of 0.30. This plan recommends a three-pronged approach to accomplish this, as shown in Figure 16.

First, there should a transfer of the State Vehicle parking lot on 1200 East to USU and state vehicles should be relocated off-site. This transfer will reallocate 198 spaces to students, staff, and/or faculty parking.

Second, it is recommended that the surface lot on the southwest corner of 1100 East and 700 North be replaced with a new parking garage with approximately 519 stalls. This lot should be priced appropriately to capture the value of its central campus location and high demand.

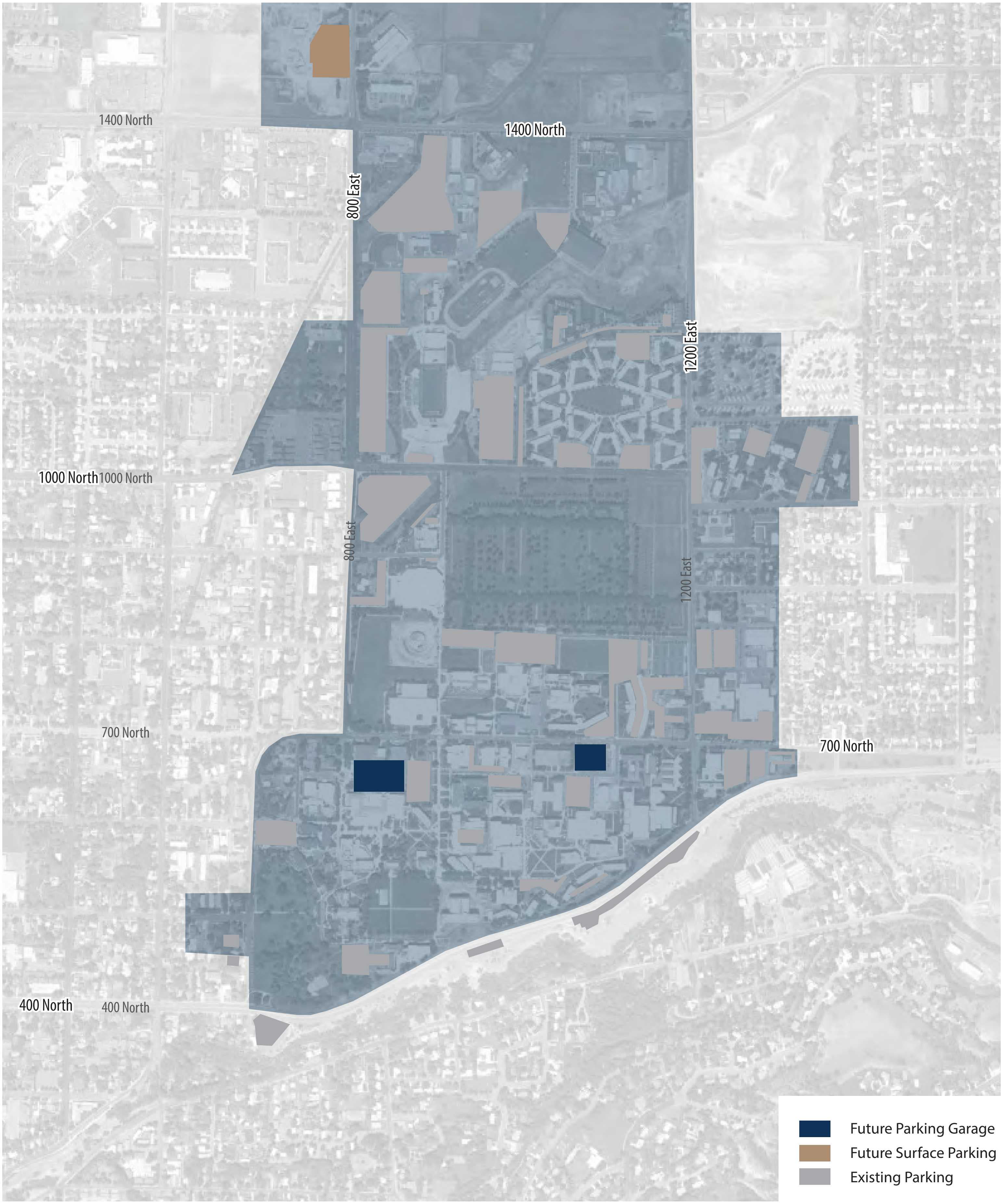
Third, a new potential off-central campus surface lot should be constructed (in coordination with the development goals of the Innovation Campus) in the quadrant north of 1400 North between 600 East and 800 East with approximately 693 stalls (alternative locations or a terrace could be considered). This lot would meet the demand of those who do not want to pay for central campus parking. Aggie Shuttle would provide service between this lot and the central campus. In addition, this surface lot should be equipped with safe, long-term bicycle lockers for those that wish to park-and-bike into central campus.

Transit Improvements

Ultimately, the expansion of the USU campus and associated growth impacts to Logan and the Cache Valley may warrant a larger transit investment in the form of BRT. Typical BRT systems offer dedicated transit lanes, enhanced stations, and level boarding – providing fast, frequent service that provides a rail-like experience. BRT has proven to be a highly successful investment for high demand corridors in similar mid-sized college towns like Eugene, Oregon and Fort Collins, Colorado. BRT represents a logical long-term goal for trunk service and merits further consideration.

Bicycle and Pedestrian Improvements

Other considerations for Phase 3 are programmatic in nature rather than infrastructural. For instance, campus facility planners should look for opportunities to create a grid of bicycle and pedestrian pathways in the outlying areas of campus as those locations redevelop. For instance, the land between 800 East – 1200 East and 1000 North – 1400 North currently has limited accessibility and few high-quality continuous routes for cyclists and pedestrians. As these areas redevelop and intensify, planners should incorporate a gridded network that connects to the facilities identified in



Phase 3 Parking Improvements

figure 16

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Phases 1 and 2 of this plan, to establish a pattern of routes throughout the entire USU property. USU should also develop a campus-wide bicycle wayfinding system, which should be implemented at a human scale and include information on major destinations, distances, and directions.

Prioritization

The top projects within each phase were identified for prioritization. These projects represent the inclusive multi-modal projects, safety enhancements, and campus land use changes that will have the most significant impact to improving USU's transportation system.

Table 28 | Top Priority Projects

Priority	Project	Description
Phase 1		
1	Campus Core North Roadway Modifications	Realignment of roadways within the Campus Core North area to address Edith Bowen pick-up/drop-off operations and reopening Bullen Hall. With these realignments, ensure bicycles are accommodated on roadways internal to the Campus Core North.
2	1200 East Roundabout	Construction of a roundabout at the intersection of 1200 East and 850 North.
3	700 North Modification	Construction of a protected bicycle facility between 800 East and 1200 East. Enhanced crosswalks between 800 East and 1200 East.
4	1200 East / US-89 Signalization	Signalization of the intersection of 1200 East and US-89.
5	800 East Modification	Modifying 800 East to accommodate bicycle lanes in each direction by narrowing lane widths; construction of a sidewalk on the eastern side of 800 East between 1000 North and 1400 North; signalized crosswalk at approximately 1200 North.
6	700 North Shared Use Path	Construction of a shared use path along 700 North between 1200 East and 1500 East, eventually leading to the Bonneville Shoreline Trail.
7	1200 East Buffered Bike Lanes	Construction of buffered bike lanes on 1200 East between 700 North and 1400 North.
8	Establish Transportation Demand Management (TDM) Coordinator staff position	Fund and support a TDM coordinator, responsible for implementing the short- and long-term TDM strategies identified in this plan.
9	Create Centralized TDM Webpage	Establish a "one stop shop" online for TDM strategies for campus travelers, linking to relevant TDM resources.

Table 28 | Top Priority Projects

Priority	Project	Description
Phase 2		
1	Big Blue Terrace Replacement	Construction of an underground parking structure beneath the new student center to replace the Big Blue Terrace.
2	Extension of 700 Modification	Vehicular restrictions between 800 East and Bullen Hall (could initially be phased from 900 East to Bullen Hall)
3	Additional Bus Stops	Bus service improvements through additional bus stops.
4	1000 North Modification	Realigning 1000 North to complete a four-way intersection at 1200 East; signalization of the intersection; construction of bicycle lanes and sidewalks along 1000 North.
5	800 East Bus Service	Consolidate the Stadium Express and 8th East Express/Innovation Aggie Shuttle routes into a single service
6	Bicycle Pilot Project	Conduct a pilot project to determine the feasibility of separating bicycle and pedestrian traffic in the Campus Core.
Phase 3		
1	Increase Student Housing and On-Campus Amenities	Construction of additional housing and on-site amenities to reduce vehicle trips to and from campus.
2	Completion of Bicycle Facilities to Campus	Work with Logan to complete proposed bicycle facilities to campus, as shown in the Bicycle and Pedestrian Master Plan.
3	Performance Hall Parking Garage	Replacement of surface lot with additional parking garage on the southwest corner of 700 North and Bullen Hall.

Funding

The opportunities to secure funds for parking and transportation projects are enhanced when approached collaboratively with local governmental partners and other related agencies. Project funding could potentially be derived from various sources, such as Cache Valley MPO, Logan City (partnership), State Legislature, and student and faculty fees. A "Student Transportation Fee" could be created to provide an ongoing and dedicated funding source that would support the campus transportation and sustainability goals. The plan for increased parking fees are also a funding resource that should be applied to transportation improvements. There may be opportunities to cooperatively build park-and-ride facilities (i.e. proposed surface lot on 800 East north 1400 North), transit improvements, and others using Federal Transit Administration funding or partner with private interests in a public-private development arrangement. Federal funding opportunities exist not only through Federal Transit Administration, but also Federal Highway Administration. Eligibility and acceptable project types vary as does the method of accessing the funding. Partnering with Cache Valley MPO and CVTD is likely to increase the range and gain broader access to funding opportunities and provide means of collaborating on projects that serve the broader community.

Federal Transit Administration (FTA 5339 and 5307) and Federal Highway Administration (Congestion Mitigation, Air Quality [CMAQ]) both have grants that several of the transportation plan improvements could be eligible for.

Without a dedicated funding source and a sustained effort to support the growth of alternative transportation programs going forward, the campus will not be able to meet its overall transportation and sustainability goals.

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Transportation Demand Management Strategies

USU has been leading the way to sustainability among state universities in Utah. Initiatives like Aggie Blue Bikes and Blue Goes Green show the University's commitment to ensuring a greener future in Cache Valley. USU currently operates many different TDM strategies, as described in the existing conditions section. However, if the University is going to meet the goals of this plan and of the Sustainability Plan, a more comprehensive TDM strategy is required. This section outlines TDM strategies recommended for implementation, and quantifies expected benefits.

There is no single transportation improvement project or transportation demand management solution that will fully offset the future traffic growth anticipated due to the growth of the campus. The effectiveness of any individual strategy ranges from minimal (<1 percent) to about 4 percent. In addition, because some TDM strategies are inter-related, such as vanpool programs and carpool matching, the sum of their effectiveness is not additive, because both affect similar groups of people.

In order to allow for future growth, USU must adopt a transportation approach that uses multiple strategies to reduce trips through TDM. These approaches must be varied enough and flexible enough to support students in their academic and personal lives. The short-list of recommended strategies is summarized in Table 29.

Table 29 | TDM Strategy Summary

Category	Strategy	Summary	Target Population
Support & Resources	Online Presence	Create an on-line clearing house of available TDM options.	All campus
Support & Resources	Hire a full-time TDM Coordinator	A full-time TDM coordinator can help implement programs and projects to reduce dependence on single-occupancy auto trips.	All campus
Support & Resources	Commute Trip Reduction Education	Create an education campaign aimed at increasing awareness of trip reduction strategies.	All campus
Support & Resources	Commute Club	Create a program to provide incentives to students, faculty, and staff for not driving to campus.	All campus
Support & Resources	Information to New Campus Users	Provide detailed information about the commute options available to new students and hires.	All campus
Parking	Raise Parking Fees	Tie parking rates to actual cost of providing parking (construction plus land value). Some push back on rate increases from campus community are anticipated, so should be phased over several years and strategies identified to limit spillover to off-campus areas.	All campus
Parking	Parking Permit Limits	Establish a distance boundary inside which students are ineligible to purchase a parking permit.	Students
Parking	Parking Cash-Out/Permit Return Incentive	Pay staff to forgo a parking permit, set at the value of the subsidy or benefit granted to staff to accept a parking permit. Pay students or employees to return their parking permit.	All campus
Parking	Park and Bike	Provide free or low-cost parking off-site, with secure bike lockers for people to leave their own bicycle to complete the trip.	All campus
Parking	Distance-Based Pricing	Differentiate the cost of a parking permit by distance from campus - permits for farther lots are cheaper, and permits for more convenient lots are more expensive. This is already in place and should continue to be in place.	All campus
Parking	Short-Term Parking Pricing	Provide the option to purchase weekly or daily passes (in-person and online options) in addition to semester or annual passes. Establish short-term metered spaces in the most convenient lots, priced to encourage one space open at all times.	Visitors, adjunct or part-time faculty

Table 29 | TDM Strategy Summary

Category	Strategy	Summary	Target Population
Parking	Carpool Pricing/Allocation	Allocate the most convenient parking spaces for carpools. Charge less for carpool permits. Establish certain parking lots as "carpool only" on red-air days.	All campus
Bicycling	Increased Bicycle Access to Campus	Develop a safe, well-marked network of bike facilities on campus, including bike lanes, off-street paths, and bike parking facilities.	All campus
Bicycling	Bikeshare	Develop a membership-based bikeshare program to facilitate short trips (less than the daily length provided by Aggie Blue Bikes) around campus. Tech-enabled options or low-tech options through a staffed bike check-out facility like ABB.	All campus
Bicycling	Secure Bicycle Storage	Install bike lockers where people can leave their own bicycle securely on campus.	All campus
Bicycling	Bike Center	Build a space which includes showers and a repair facility.	All campus
Bicycling	Bike Elevator	Install a mechanical pulley system to assist bicyclists ascend elevation changes, like a hill.	All campus
Transit	Vanpools	Implement vanpools to run from areas with a medium density of campus commuters.	All campus
Transit	Allow Bicycles on Transit	Ensure that all buses are outfitted with bike racks. Work with CVTD to exercise operator judgment in permitting bikes inside the bus when racks are full on the last run of the day or during inclement weather.	All campus
Transit	Reduce Bus Headways (Increase Frequency)	Work with CVTD to prioritize more buses per hour, with higher capacity if needed.	All campus
Transit	Improve Bus Routing	Work with CVTD to provide express routes, or reroutes to encourage ridership.	All campus
Transit	Improve Bus Stops	Implement real-time bus arrival displays, provide seating and shaded areas, and ensure adequate ADA access.	All campus
Transit	Long-Distance Buses	Provide convenient, long-distance buses to neighboring destinations (e.g., Ogden Commuter Rail Station).	All campus

Table 29 | TDM Strategy Summary

Category	Strategy	Summary	Target Population
Land Use	Housing	Require first-year and sophomore students to live on campus unless granted exemption, such as living locally with immediate family, because of medical condition, or because the student is married or must live with a dependent.	Students
Land Use	On-Campus Amenities	Provide additional retail and services on campus to allow students to meet more of their needs without a car.	All campus
Other Incentives	Sustainable Transportation Incentive Program	Incentivize staff to commute a certain percentage of their trips by a non-single-occupancy vehicle (transit, carpool, walking, biking, etc.).	Staff and faculty
Other Incentives	Student Incentives	Incentivize students to forgo a parking permit through weekly, monthly, or semester drawing for prizes, through direct payments, or through other incentives (e.g., bikes, running shoes, transit passes, etc.).	Students
Other Incentives	Guaranteed/Emergency Ride Home Program	Offer members of a commuter club a risk-free way to get home in an emergency if they are on campus without a car, by reimbursing the cost of a taxi ride.	Staff and faculty
Other Incentives	Ridematching Service	Offer a carpool matching service, generally provided by a third-party.	All campus
Other Incentives	Car Share Relocation and Expansion	Offer free or discounted membership to Zipcar or other carsharing service.	All campus
Other Incentives	Rental Car Vouchers	Provide rental car discounts or vouchers to people who forgo a parking pass.	All campus
Other Incentives	Commute Buddy Program	Provide new alternative commuters with a buddy who is experienced at the mode of alternative commuting. Incentivize participation through gift cards or cash.	All campus

Plan Components

The options presented in **Table 29** were refined based on feedback from the Steering Committee, application to USU, and potential benefits. **Table 30** summarizes the TDM strategies for USU and the potential effectiveness of each based on research compiled in Quantifying Greenhouse Gas Mitigation Measures (California Air Pollution Control Officers Association (CAPCOA), August 2010). This report is a resource for local agencies to quantify the benefit, in terms of reduced travel demand, of implementing various transportation management strategies. The TDM strategies have been grouped into four categories: Land Use, Neighborhood, Transit, and Commute Travel Reduction Strategies. These categories reflect the grouping of transportation strategies within the CAPCOA research. These groups are used to explain overlapping benefits of related strategies to avoid double counting potential trip reductions. Some TDM strategies are interrelated, such as vanpool program and carpool matching, and the sum of their effectiveness is not additive because both affect similar groups of people.

Table 30 | TDM Program Effectiveness

<table>
<tr><th rowspan="3">Category</th><th rowspan="3">USU Proposed Strategy</th><th rowspan="3">CAPCOA Strategy[1]</th><th colspan="4">Drive Alone Trip Reduction</th></tr>
<tr><th colspan="2">Individual</th><th colspan="2">Grouped</th></tr>
<tr><th>Low</th><th>High</th><th>Low</th><th>High</th></tr>
<tr><td rowspan="2">Land Use</td><td>Expanded on-campus housing</td><td>Land Use Diversity</td><td>1.0%</td><td>1.9%</td><td rowspan="2">2.0%</td><td rowspan="2">3.2%</td></tr>
<tr><td>More on-campus amenities</td><td>Land Use Diversity</td><td>1.0%</td><td>1.3%</td></tr>
<tr><td rowspan="3">Neighborhood</td><td>Car share relocation and expansion</td><td>Car-Sharing Program</td><td>0.7%</td><td>1.0%</td><td rowspan="3">0.7%</td><td rowspan="3">1.0%</td></tr>
<tr><td>Increased bicycle access to campus[2]</td><td>Incorporate Bike Lane Street Design</td><td>--</td><td>--</td></tr>
<tr><td>Secure bicycle storage[2]</td><td>Bicycle Parking</td><td>--</td><td>--</td></tr>
<tr><td>Transit System Improvements</td><td>Modify existing Aggie Shuttle operations</td><td>Service Frequency/Speed</td><td>0.4%</td><td>2.1%</td><td>0.4%</td><td>2.1%</td></tr>
<tr><td rowspan="4">Commute Trip Reduction</td><td>Commute Club and incentives</td><td>CTR Program – Voluntary</td><td>1.6%</td><td>3.1%</td><td rowspan="4">4.9%</td><td rowspan="4">13.6%</td></tr>
<tr><td>Encourage departments to allow flexible work schedules and staff participation in ridesharing programs</td><td>Alternative Work Schedule</td><td>0.7%</td><td>2.2%</td></tr>
<tr><td>Parking cash-out/permit return incentive</td><td>Employee Parking Cash-Out</td><td>0.2%</td><td>0.9%</td></tr>
<tr><td>Bikeshare[2]</td><td>Implement Bike-Sharing Program</td><td>--</td><td>--</td></tr>
</table>

Table 30 | TDM Program Effectiveness

Category	USU Proposed Strategy	CAPCOA Strategy[1]	Drive Alone Trip Reduction: Individual Low	Individual High	Grouped Low	Grouped High
	Establish on online presence, materials for new hires, and education for campus users	CTR Marketing	0.6%	2.0%		
	Increase annual permit parking fees	Price Workplace Parking	1.8%	5.4%		

1. Subset of 49 transportation demand management strategies identified within the CAPCOA framework.
2. These strategies were not quantified in the CAPCOA report. This does not imply the strategy is ineffective. It only demonstrated that at the time of the report development, existing literature did not provide a proper methodology for calculating its effectiveness.

As shown, the effectiveness of any individual strategy ranges from minimal (<1 percent) to about 5 percent. Due to overlapping benefits, the global reductions would not be additive and would amount to a 7.8 to 18.9 percent reduction in driving alone to campus. Commute trip reduction programs result in the greatest and lowest cost benefit and a trip reduction benefit between 4.9 and 13.6 percent. Increasing the amount of on-campus housing and amenities requires space to accommodate these uses as well as capital to construct but also provides substantial benefits in terms of reducing vehicle commute trips by students.

Short-Term Actions

Based on the existing conditions and the ongoing need for ways to reduce the pressure for on-campus parking, five short-term actions are discussed in this section with the goal of achieving an immediate decrease in the demand for parking.

Online Presence

The first step that should be taken by the University is establishing a one-stop location for all trip-reducing strategies. Currently, TDM strategies are distributed over the Parking & Transportation website and the Sustainability website.

The Parking & Transportation website is predominately focused on parking, which reinforces the idea that driving to campus is the easiest method of arrival. This website should be redesigned to have a primary focus on non-auto modes to campus and make information related to biking, walking, carpooling, and transit more accessible. For instance, the current site navigation is:

- Home
- Parking Information
- Account Management
- Game Day Parking

- Aggie Shuttle
- Motor Pool
- Vehicle Rentals
- Fleet Operations
- Contact Us
- USU Car Share
- USU Rideshare

Although there is a lot of information on parking, this site does not provide clear information about the benefits of carpooling including carpooling parking permits or locations. Additionally, there is no link on the Transportation website to Aggie Blue Bikes or any bicycle maps. Schedules of transit routes should also be posted to the Transportation website.

Provide Information to New Campus Users about Commute Options

It is essential to change people's perspectives about commuting to campus as early as possible and the earlier people try non-auto modes to campus, the easier it will be for this change to be permanent. The University should provide informational packets to new students and faculty as early and as often as possible, which detail commuting options and programs and the financial, environmental, and health benefits from choosing not to drive to campus.

Stanford University provides a pamphlet to all incoming students titled "Thriving at Stanford without a Car." This pamphlet documents how to get from Stanford to a variety of local destinations, including how far, how students can get there, and how long it will take. For Stanford, examples include getting the beach, Yosemite, San Francisco, shopping, movies, and other universities. In addition, the pamphlet provides contact information for a variety of transportation providers, both internal and external to the university.

Parking Fee Increases

Low cost and plentiful parking makes auto use more attractive. Communities and institutions where parking is expensive and roadways are congested typically have low rates of commuting by SOV. Aligning parking fees with the full cost of providing a parking space would make other modes of travel, including transit, bicycling and carpooling, more attractive. It could also generate revenue for a broader transportation program, like alternative transportation programs, incentive programs, and a full-time transportation coordinator. Pricing on-campus parking to reflect the actual cost to provide parking would substantially increase the cost of such parking. Based on past experience, substantial increases in pricing (15-20%) of parking have reduced the parking demand (>5%) as compared to modest price increases (3-7%) that generated little change in parking behavior.

Existing studies of commuter responses to parking price increases in urban settings predict decreases of 5 to 30 percent in parking demand in response to a 50 percent increase in price. Higher demand reductions occur in urban areas with good transit service and high base parking prices. Combined with other incentives, USU could see decreases in demand on the higher end of this range since transit service to the campus is relatively frequent.

Based on industry data, raising the parking rates is an effective way to reduce vehicle (auto) trips to campus. However, implementation of this strategy is challenging, as the campus community has expressed opposition to parking rate increases. USU's surrounding neighborhoods are not entirely comparable to the areas around many universities that have higher parking rates and/or parking permit restrictions. This is because the City of Logan generally does not charge for, or restrict, parking on adjacent streets. Additionally, parking management strategies may need to be implemented to limit off-campus spillover. If USU would raise parking rates, the reductions in parking demand and associated trips could be substantial as long as there remains a broad range of commute mode alternatives.

Hire a Full-Time Transportation Demand Management Coordinator

A full-time TDM coordinator can help implement programs and projects to reduce dependence on SOV trips. Creating a dedicated position is critically important to ensuring the ongoing success of TDM projects and programs. Supplementing this position with student workers or interns can help the TDM coordinator reach the student body, conduct outreach, collect data, and promote programs. This position could be paid for by parking fees, which will have more revenue once parking permit prices are increased for staff in addition to students.

Systematic and regular data collection on commute and travel patterns can help the TDM coordinator develop and target certain programs to particular groups for maximum effectiveness. Including home addresses could allow more-accurate GIS heat mapping of travel patterns.

Develop Incentive Program to Encourage Staff and Students to Shift Modes

The provision of financial incentives to encourage employees and students to use transit, carpool, bicycles, and other modes can improve the use of non-SOV modes. The incentive program can be financed by revenue from the student and staff parking permit sales. It can be implemented and managed by the TDM Coordinator and student workers. Several good examples of detailed incentive programs can be found at universities and colleges throughout California and can be used as a model for USU. They often include components like free daily parking passes for those who give up a long-term parking permit, raffle drawings, discounted transit passes, discounted car rentals, direct monetary payments, or coupons for bicycle purchases.

Stanford has a Commute Club where members use one or more of the offered TDM services to commute to work in modes other than driving alone. Members elect to bike, walk, carpool, or vanpool to work reducing the number of vehicles accessing and parking on the campus. Implementation of all of the programs within the commute club has led to substantial change in the proportion of trips made to and from Stanford by driving alone since the project was initiated in 2000. The university automatically enters students and staff who enroll in the Commute Club into semester drawings for prizes like $50 gift cards, cash prizes, or iPads; an RFID tag tracks off-peak auto commutes, while a smartphone application tracks active mode commutes. Drive-alone mode share decreased from 72% to 48% between 2002 and 2010.

Other educational institutions have similar programs. For instance, Santa Monica College pays $15/month for 30-49% chance to win, $25/month for 50-74%, and $30/month for 75-100% once participants have registered through the program website and logged comments. University of Tennessee Knoxville participates in Knoxville Regional Transportation Planning Organization's SmartTrips program which enters participants into quarterly gift card drawings for completing a certain number of alternative transportation commutes.

Commute Buddy Program

A key barrier to people trying other modes besides driving to campus is fear of the unknown. A potential solution to improve the first experience is to provide new alternative commuters with a buddy who is experienced at the mode of alternative commuting. Stanford University offers participants a $20 gift card each time they participate in the Commute Buddy program.

Parking Permit Limits

Parking permit limits establish a distance boundary inside of which, students are ineligible to purchase a parking permit. For USU, it is recommended to initially set a boundary at 0.5 miles from campus, with exceptions of students who live on campus and are geographically-challenged (such as directly to the south). This strategy has been implemented at UC Santa Barbara, where students who live within two miles of campus are not eligible to purchase a parking permit.

Parking Cash-Out/Permit Return Incentive

The university can pay staff to forgo a parking permit, set at the value of the subsidy or benefit granted to staff to accept a parking permit. Another option would pay students or employees to return their parking permit. Stanford University offers cash incentives to return an annual or academic year permit, between $25 for a two-month commitment and $100 for a five-month commitment. Permits initially cost $275 for a less convenient lot or $719 for a more convenient lot, per academic year (10 months). They also offer students and employees $25/month to join the Commute Club and forgo a long-term parking pass.

Carpool Pricing/Allocation

Many people may not at first be open to alternative commute modes. Carpooling can offer a great alternative for people who see automobile travel as their only option to campus. USU can promote carpooling by allocating the most convenient parking spaces for carpools, charging less for carpool permits, or establishing centralized lots as carpool-only. For instance, at UC Irvine, the price of parking permits are reduced from $62/month to $31/month for carpools of two, $21/month for carpools of three, and waives the fee for carpools of 4+ people. Another option would be to convert some parking lots to “carpool only” on poor air quality days; this could be established as an ongoing program throughout the year, so travelers would know how to plan ahead for their commute. Temporary "mirror-hanging" permits could be used for this program so that the purchased carpool pass could be used between more than one vehicle. The pass does not have to be designated to a specific group of individuals. Whichever method is utilized, the designated carpool parking lot would need to be operated by a parking attendant to verify the carpooling of each vehicle.

Increase Bicycle Access to Campus

Gaps in infrastructure can create a major barrier for would-be bicycle commuters. While USU generally provides good facilities for bicyclists, connections between on-campus and off-campus should be formalized. This plan and Logan's *Bicycle and Pedestrian Master Plan* call for increased bicycle facilities to and on the campus.

Implementing these plans will improve connections to campus for bicycle commuters, but implementation will depend on available funding from the City or grants and advocacy from local institutions and residents. Dedicated funding sources for pedestrian and bicycle projects continue to be reduced at the federal level. The University should partner with the City in implementing local routes.

Well-connected bicycle networks are linked to higher rates of bicycling. Better bicycle networks could encourage more affiliates, especially faculty and staff, to commute and run errands by bicycle rather than by car. Anecdotal evidence from major cities such as Portland, Oregon, and cities with large student populations, such as Davis, California, indicates that investments in bicycle infrastructure can pay off with high rates of bicycle commuting.

Additional Bicycle Parking and Storage on Campus

Secure bike storage can be provided in a number of effective ways, each targeted to a different type of bicycle commuter. Simple bicycle racks, located in convenient places through campus, can be sufficient for many commuters who rider shorter distances or only plan to stay on campus for a few hours at a time. Bicycle lockers can provide secure, longer-term storage options for commuters who may want to keep a bike on campus for daily errands or as a last-mile connector from remote lots, but do not plan to take the bicycle home every evening. It can also work well for commuters who may be more concerned with bike theft. While bicycle racks are generally free, bicycle lockers are often rented for an entire semester, similar to a gym locker or a library locker. As a rule of thumb, providing bicycle parking yields about a 0.5 percent benefit with regards to reducing drive-alone vehicle trips.

A bike center is a more resource-intensive option that can work well for commuters who ride long distances as well as casual or short-distance commuters. A bike center could include secure, indoor bike parking, shower facilities, lockers to store clothing and gear, and even a bicycle repair shop. The bike center can be accessed through membership in the Commute Club incentive program.

Bikeshare

USU can develop a membership-based bikeshare program to facilitate short trips around campus. In areas where origins and destinations are located nearby to each other, bikeshare trips can also replace short car trips. Although Aggie Blue Bikes provides bike use on a daily or three-month checkout, there may be desire for a bikeshare program that allows checkouts at multiple locations throughout campus. Stations could be placed at remote parking lots and shuttle stops on campus, as well as at major destinations, such as offices, dormitories and classroom buildings to reduce on-campus vehicle travel and encourage more efficient use of existing parking lots. This system could include tech-enabled options or low-tech options through a staffed bike check-out facility, similar to Aggie Blue Bikes.

Bikeshare has been found to replace car, transit, and walking trips. Early bikeshare adopters are likely to be people who already travel by walking, transit, and bicycle. But as many others use bike share throughout their day, travel to campus may change. USU can encourage bikeshare use by providing information on how to use the system to students, faculty, and staff.

Additional Bicycle Strategies

In addition to providing secure bicycle storage, other short-term actions could be taken to improve bicycle access to campus. Way-finding signage in the interim would improve access along safer or more direct paths. Maintaining bicycle markings and signage on campus would also help reinforce the idea that bicycling is an encouraged mode of transportation.

Car Share Relocation and Expansion

Car share allows people to have on-demand access to a vehicle during the day, if needed, on an hourly or daily basis. Car share vehicles serve two primary purposes for on-campus groups: for employees and students, an alternative mid-day mode for those who might take transit, walk, or bike to campus and may need a business vehicle; for on-campus residents, a substitute for owning a car for household-based trips.

Existing car share on campus is operated by Enterprise CarShare with two locations, the Stadium parking lot and near Bullen Hall. USU could consider focusing car share expansion at locations near existing or proposed on-campus residential complexes without dedicated or very limited parking to discourage individual car ownership.

USU could also offer free or discounted membership to Enterprise CarShare or other carsharing services. Stanford University provides reduced-rate memberships and $35 in driving credit to all students and employees, and offers additional credit for Commute Club members.

Flexible Schedule Participation (“Flex Scheduling”)

Flexible work schedule participation would reduce the number of peak period commute trips by employees. These alternative schedules could include flexible schedules for non-shift employees or compressed work weeks. This strategy could result in up to about a one percent reduction in vehicle trips to /from USU exclusive of other strategies. Table 31 summarizes the benefits of this program by various schedules and participation rates.

Table 31 | Reduction in Drive-Alone Vehicle Trips due to Telecommute/Flex Schedules

Schedule	Participation Rate[1]			
	1%	5%	10%	25%
9-Day/80-Hour Work Week	0.07%	0.35%	0.7%	1.75%
4-Day/40-Hour Work Week	0.15%	0.75%	1.5%	3.75%
Telecommute 1.5 Days/Week	0.22%	1.1%	2.2%	5.5%

1. Percentages incorporate a discount of 25% for rebound effects.

Source: CAPCOA, 2010

Strategies to Continue

USU already has some TDM options in place. Below are programs that USU should continue to fund and implement.

Distance-Based Pricing

Differentiate the cost of a parking permit by distance from campus – permits for farther lots are cheaper, and permits for more convenient lots are more expensive.

Expand Aggie Blue Bikes

Aggie Blue Bikes is a popular program on campus that provides students access to bicycles for daily use or on a three-month checkout. The program is very popular, often with a waiting list for check-outs. Expanding this program could increase the number of campus users with access to a bicycle, a goal of this plan.

Allow Bicycles on Transit

Ensure that all buses are outfitted with bike racks that can hold multiple bikes. Work with CVTD to exercise operator judgment in permitting bikes inside the bus when racks are full on the last run of the day or during inclement weather.

Reduce Bus Headways (Increase Frequency)

Work with CVTD to prioritize more buses per hour, with higher capacity if needed. Research has shown the positive effects on ridership of reducing headways. Increasing capacity by using bigger buses is important, but not at the expense of running fewer buses.

Improve Bus Routing

Work with CVTD to provide express routes, or redesign routes to encourage ridership.

Improve Bus Stops

Implement real-time bus arrival displays, and provide seating and shaded areas. Research has shown that improvements "outside the bus" can have significant positive effects on the perceptions of wait times, and therefore on ridership. In some instances, stops near campus lack a paved pathway for users to stand, wait, or access the bus. USU could partner with CVTD to identify stops that have high rates of use and that need more amenities, such as shelters, ADA access, benches, or other amenities.

Ridematching Service

USU recently adopted Zimride as the campus-wide ridematching service. This new, more-automated system has seen great success during the first semester of implementation and should be continued.

Long-Term Strategies

This section discusses long-term strategies, which require either a greater investment of resources or a more substantive change to land use policy. These strategies will be most effective when pursued in conjunction with the short-term actions described above.

Provide Student Housing On or Near Campus

The land use around campus is critical to encouraging long-term mode shift away from SOVs. If more students were able to live on campus, that would reduce the demand for parking on the core campus and increase the number of students who walk, bike, or take transit to class. Thus, increasing the number of people who live on campus would result in a net decrease in the auto mode share for the campus. Research suggests that increasing the diversity of a site by adding new housing can result in a substantial reduction in the number of vehicle trips generated by the site because residents no longer need to commute to other areas for work or school. If additional housing was constructed, the net benefit in terms of reduced vehicle trips would be equal to the auto trips that would have otherwise been made by the on-campus residents had they not chosen to live on campus.

When there's enough housing on campus, USU could go one step further and require first-year and sophomore students to live on campus unless granted exemption, such as living locally with immediate family, because of medical conditions, or because the student is married or must live with a dependent.

Encourage Retail and Services to Locate On Campus

Encouraging the development of mixed-use facilities on or directly adjacent to campus would help reduce the demand for parking. One reason commuters choose SOVs is to provide the flexibility to run errands during the day or before going home in the evening. On-campus retail opportunities like dry cleaning, grocery stores, a post office and banks would eliminate many commuters' need for a car to complete these additional trips. Instead, people could reach these destinations by walking or biking, without having to go very far from campus.

Services like daycare, in particular, could make an enormous difference in not only the number of single occupancy trips taken by students, faculty, and staff, but also in the overall quality of life experienced by working parents and students with children.

Long-Distance Buses

Providing convenient, long-distance buses to neighboring destinations (e.g. Ogden Commuter Rail Station) could help more students to make the decision to be car-fee. However, a long-distance bus operation may be cost prohibitive at this point. USU should do additional research into the feasibility of such an operation. Long-distance buses have been successful at other universities. For instance, UT Austin provides the Texas Express, a bus exclusively for those affiliated with the university that connects UT Austin with Dallas, Houston, and San Antonio.

Relative Cost

Table 32 summarizes the relative effectiveness and costs related to each of the strategies. Although providing additional on-campus housing provides the most substantial benefit in terms of reduced private vehicle trips, it is also the most expensive of the improvement measures. Providing additional amenities on campus would provide a medium to high level of effectiveness at a relatively moderate cost. In the table, the higher the level of effectiveness of strategies equals a potential for a larger percent reduction in single-occupant private vehicle trips.

Table 32 | Summary of TDM Costs and Effectiveness

Effectiveness	**High**	Increase annual parking permit fees (1.8 – 5.4%) Encourage flexible work schedules (0.7 – 2.2%) Establish online TDM presence, materials for new hires, and education for campus users (0.6 – 2.0%)	Commute Club and incentives (1.6 – 3.1%)	Modify existing Aggie Shuttle operations (0.44 – 2.1%) Additional on-campus housing (1.0 – 1.9 %)

Table 32 | Summary of TDM Costs and Effectiveness

	Medium		Provide on-campus amenities (1.0 – 1.3%) Increase bicycle access to campus	
	Low	Parking cash-out (0.2 – 0.9%) Promote/expand car share (0.7 – 1.0%)	Increase bicycle storage Bikeshare	
		Low	**Medium**	**High**
			Cost	

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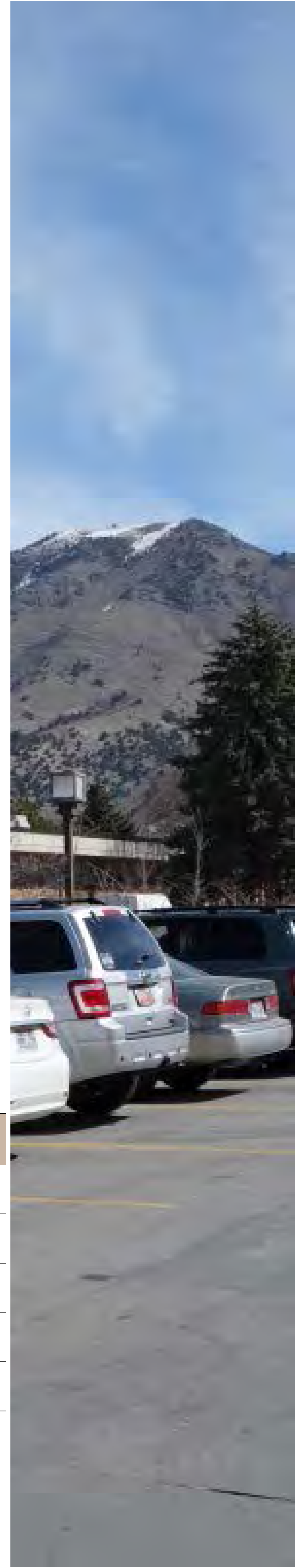
Cost Estimates



Conceptual planning-level construction costs for the recommended improvements have been developed and are listed by transportation mode: vehicular, parking, transit, bicycle, and pedestrian, as shown in the tables below. See **Appendix E** for more detailed cost estimates.

Bicycle & Pedestrian Cost Estimates

Table 33 shows the cost estimates for bicycle and pedestrian costs and **Figures 17** and **18** indicate the location of each corresponding project.

Table 33 | Bicycle and Pedestrian Cost Estimates

Project Type	Project Numbe r	Project Name	Cost
Phase 1			
Shared Use Path	1	Old Main Hill Shared Use Path (Existing 10' wide concrete path. Project only requires striping & signage)	$12,500
	2	Southside Campus Shared Use Path (Existing 10' wide concrete path. Project only requires striping & signage)	$30,200
	3	600 N 800 E Shared Use Path (Assumes 600ft of new construction switchbacks through Rock Garden)	$32,300
	4	900 E 850 N Shared Use Path (Existing 20' and 10' wide paths. Would need striping & signage)	$35,500
	5	1050 E Cemetery Shared Use Path (Existing 1000 East cemetery road, 15' Wide. Would need striping & signage)	$21,200

Table 33 | Bicycle and Pedestrian Cost Estimates

Project Type	Project Number	Project Name	Cost
Bike Boulevard	6	Champ Drive Bike Boulevard	$46,400
	7	Bullen Hall Bike Boulevard	$43,900
Protected Bike Lane	8	700 North (Aggie Boulevard)	Cost included in 700 North (Project #44)
Shared Roadway	9	800 E from Kiss-n-ride to Aggie Blvd Shared Roadway	$1,800
Shared Use Path	10	850 N & 1100 E Shared Use Path	$32,928
Buffered Bike Lane	11	800 E from Aggie Blvd to 1000 North Buffered Bike Lane	$12,800
Bike Lane	12	800 East from 1000 North to 1400 North	$11,400
Crosswalk Enhancement	13	800 E 900 N Crosswalk w/ HAWK	$104,200
	14	800 E 1200 N Crosswalk w/ HAWK	$104,200
	15	800 E 1300 N Crosswalk w/ HAWK	$104,200
	16	600 N Crosswalk w/o HAWK, all four legs	$13,600
	17	1400 North Crosswalk	$27,300
	18	1000 N 1050 East Crosswalk w/o HAWK	$13,600
	19	1000 N 950 and 900 East Crosswalks w/o HAWK	$27,200
New Sidewalk	20	1200 E Sidewalk	$80,300
	21	1000 N Cemetery Sidewalk	$12,200
	22	800 E (Westside) Sidewalk	$7,100
	23	Stadium Parking Sidewalk (Southside of road only)	$14,600
	24	800 E (Eastside) Sidewalk	$89,300
	25	North East Campus Sidewalk (Westside from end of existing sidewalk to 850 North)	$16,000
	26	Sidewalk on the east side of 700 East between 400 North and 600 North	$41,250
Shared Use Path	27	1200 E Shared Use Path (1200 E already contains some 5' wide sidewalk; full reconstruction assumed)	$15,000
Buffered Bike Lane	32	1200 E Buffered Bike Lane	$29,100
Phase 2			
Shared Use	27	Hwy 89 Shared Use Path	$15,000

Table 33 | Bicycle and Pedestrian Cost Estimates

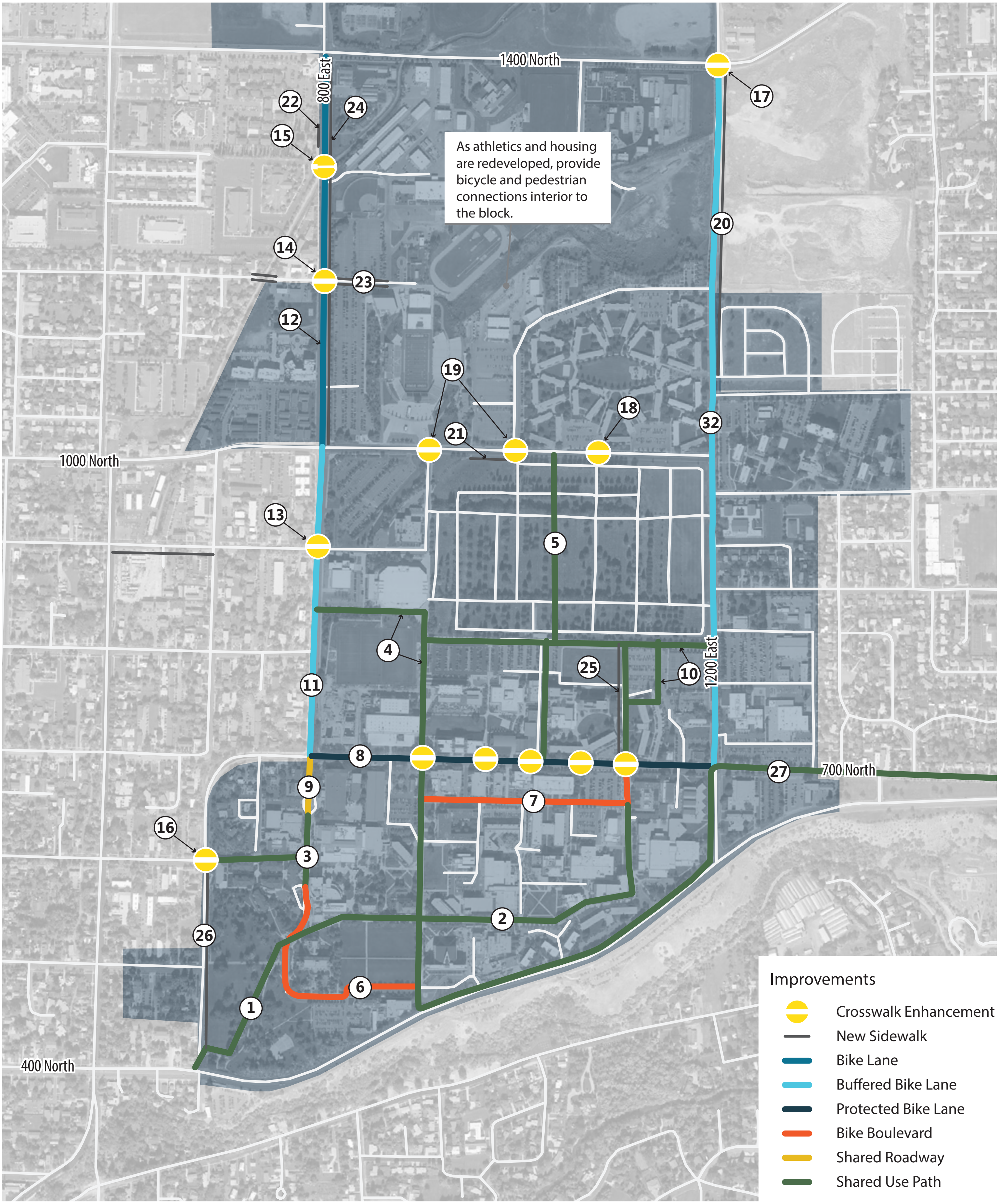
Project Type	Project Number	Project Name	Cost
Path	28	875 N Shared Use Path (Existing 16' wide asphalt road; signing and striping only assumed)	$19,300
	29	Shared Used Path East of Spectrum (Existing 20' Wide sidewalk. Signing and striping only assumed)	$4,000
Buffered Bike Lane	30	700 E Buffered Bike Lane	$11,900
	31	1000 N Buffered Bike Lane	$16,400
Bike Lane	33	900 N & 900 E Bike Lane	$6,000
New Sidewalk	34	1200 East 1000 North New Intersection (From end of 5-year plan sidewalk extension to construction of 950 North and 1200 East re-alignment)	$30,800
Phase 3			
Shared Used Path	35	1150 East Shared Use Path (Existing 15' Wide Path through Cemetery, would need signing and striping).	$12,600
Bike Lane	36	1400 N Bike Lane	$11,400

Transit Cost Estimates

Assuming 2014 costs, the total net increase in operating cost for all proposed service changes during the typical academic year is $9,000-$46,900 annually, depending upon the consolidation alternative selected for 800 East. Combined with the cost of providing some Aggie Shuttle service during summer and non-instructional days, the total net increase in operating costs for all proposed services is $61,300-$99,200 per year.

This package of service improvements would solidify the Aggie Shuttle as a dependable year-round transportation option for students, faculty, and staff, helping to orient campus growth around key transit corridors.

Table 34 shows the cost estimates for new shelters and amenities and **Figure 19** indicates the location of each corresponding project.

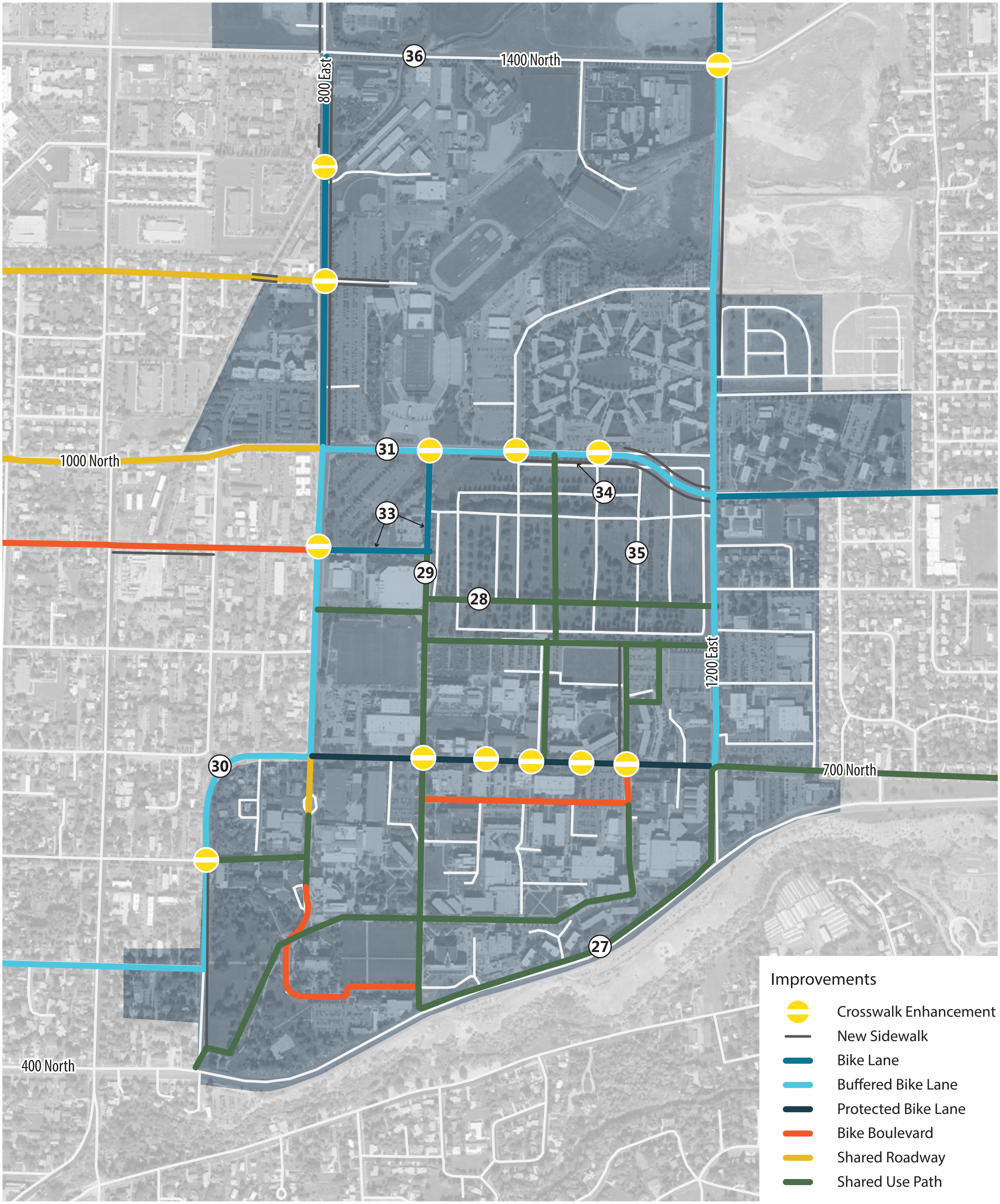


*Improvements on city roads should default to approved Logan Bicycle and Pedestrian Master Plan

Phase 1 Bicycle and Pedestrian Improvements Project Cost Identification

figure 17

UtahStateUniversity



*Improvements on city roads should default to approved Logan Bicycle and Pedestrian Master Plan

UtahStateUniversity

Phase 2 Bicycle and Pedestrian Improvements Project Cost Identification

figure 18

Table 34 | Transit Cost Estimates

Service	Description	Estimated Additional Cost ($2014)	Timeline
Expanded Evening Express	Extended service hours from 9 PM to 12 AM, Monday-Thursday, every 15 minutes	$12,000/year	0-5 years
Sunday Service, Off-Campus*	New Sunday service linking on-campus and off-campus destinations; hourly service from 10 AM - 6 PM	$7,500/year	0-5 years
Consolidation of Stadium Express and 8th East Express	Single service along 800 East	($14,000-$52,000/year)	5-10 years
Replace Campus Loop with bidirectional service on 700 North/1200 East	Modified service providing direct, bidirectional connection between new student housing areas and Taggart Student Center	No Change	5-10 years
More frequent service on modified Campus Loop	Between 3:30 PM and 6 PM, improve frequencies from every 15 minutes to every 7.5 minutes	$12,700/year	5-10 years
Weekend Daytime Service "Weekend/Evening Express"	Between 9 AM and 6 PM, serve Evening Express route every 15 minutes	$16,800/year	5-10 years
Saturday Evening Service[1] "Weekend/Evening Express"	Service between USU and Downtown Logan from 6:30 PM to 10 PM on Saturdays	$3,200/year	5-10 years
More Frequent Off-Campus Sunday Service[1]	Expansion of proposed Sunday service to every 30 minutes	$7,500/year	5-10 years
Holiday Service "Weekend/Evening Express"	Daytime Evening Express service during 4 school year holidays	$1,300/year	5-10 years
Total Net Increase in Annual Operating Cost for Service Changes		$9,000-$46,900/year	
Summer Session Services	8th East and Campus Loop services every 15 minutes	$32,900/year	When funding becomes available
Non-Instructional Day Services	8th East service every 15 minutes	$19,400/year	When funding becomes available
Total Increase in Annual Operating Cost for Summer & Non-Instructional Days		$52,300/year	

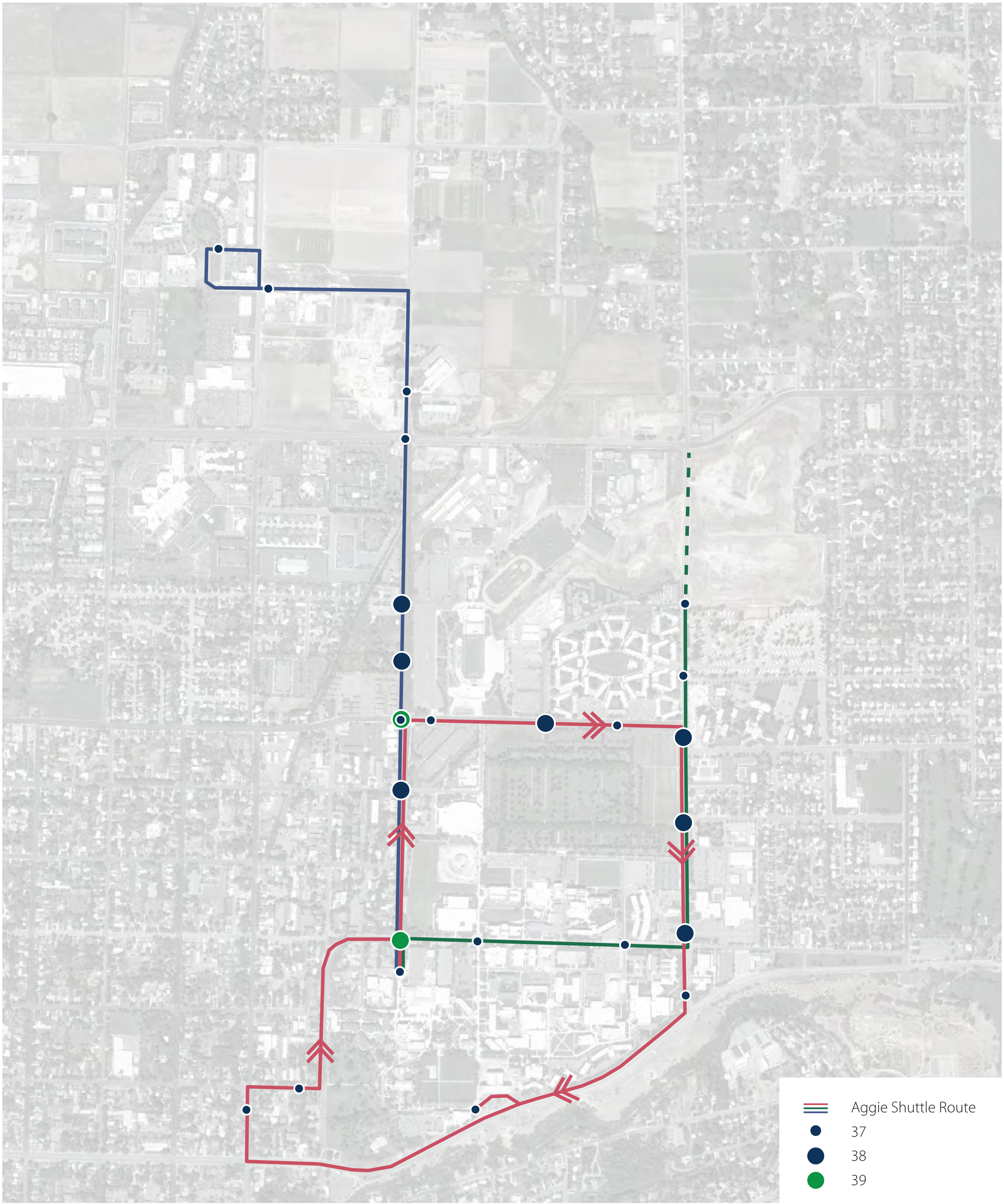
Table 34 | Transit Cost Estimates

Service	Description	Estimated Additional Cost ($2014)	Timeline
Total Increase in Operating Cost for all Proposed Changes		$61,300-$99,200/year	

2. Assumed in lieu of CVTD service expansion. The total cost of off-campus service to supplement CVTD is $18,200.
3. Depending upon consolidation alternative selected for 800 East.

Table 35 | Transit Shelter and Amenities Cost Estimates

Project Type	Project Number	Project Name	Cost
Bus Shelter & Amenities for Existing Aggie Shuttle Stops	37	Aggie Shuttle Route (16 Total, 4 assumed to already have shelters)	$144,000
Bus Shelter & Amenities for New Aggie Shuttle Stops	38	Aggie Shuttle Bus Shelter (7 Total)	$84,000
Bus Shelter & Amenities for New CVTD Stops	39	CVTD Route (2 Total)	$24,000



Campus Long Term Transit Improvements Project Cost Identification

figure 19

UtahStateUniversity

Vehicular Cost Estimates

Table 36 shows the cost estimates for new shelters and amenities and **Figures 20** and **21** indicate the location of each corresponding project.

Table 36 | Vehicular Cost Estimates

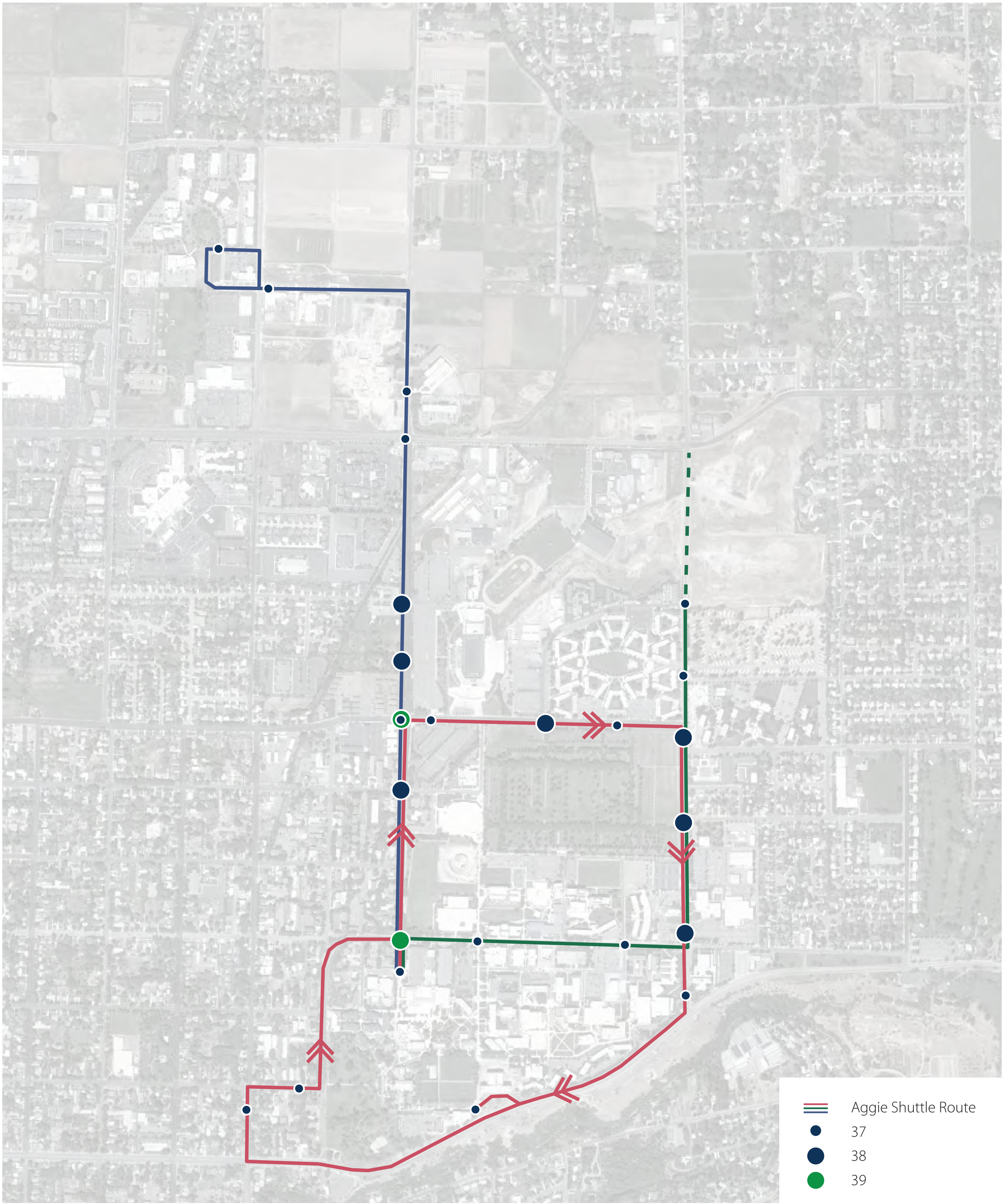
Project Type	Project Number	Project Name	Cost
Phase 1			
Signal	40	1200 East/US-89 Signal	$290,000
Roundabout	41	1200 East/850 North Roundabout	$450,000
All-Way Stop	42	500 North/700 East All-way Stop	$750
Realigned Roadway	43	North East Quadrant Road	$850,000
Cross-Section Change	44	Aggie Bullevard (800 East to 1200 East) (Includes all cross-sectional changes for all modes)	$986,300
	45	800 East (1000 North to 1400 North) (Only covers re-striping for narrower lanes)	$7,600
Movement Restrictions	46	Champ Drive/US-89Intersection Movement Restriction	$750
	47	550 North/US-89 Intersection Movement Restriction	$750
Sign Relocation	48	Highway Guide Sign Relocation Near 550 North/US-89	$1,200
Driveway Consolidation	49	Aggie Bullevard Driveway Consolidation	$2,800
Phase 2			
Signal	50	950 North/1200 East Signal	$280,000
	51	1400 North/1200 East Signal	$280,000
Realigned Roadway	52	Re-alignment of 1000 North from 1150 East to 1200 East	$384,300
Cross-section Change	53	1200 East (US-89 to 1400 North) Re-striping to three lanes	$10,000

Parking Cost Estimates

Table 37 shows the cost estimates for new parking facilities and **Figure 22** indicates the location of each corresponding project.

Table 37 | Parking Facility Cost Estimates

Project Type	Project Number	Project Name	Cost
New Parking	54	800 East 1400 North Surface Lot	$1,940,400
	55	1100 E. Aggie Bullevard New Parking Garage	$6,500,000
	56	Aggie Bullevard 800 East New Parking Garage	$N/A



Campus Long Term Transit Improvements Project Cost Identification

figure 19

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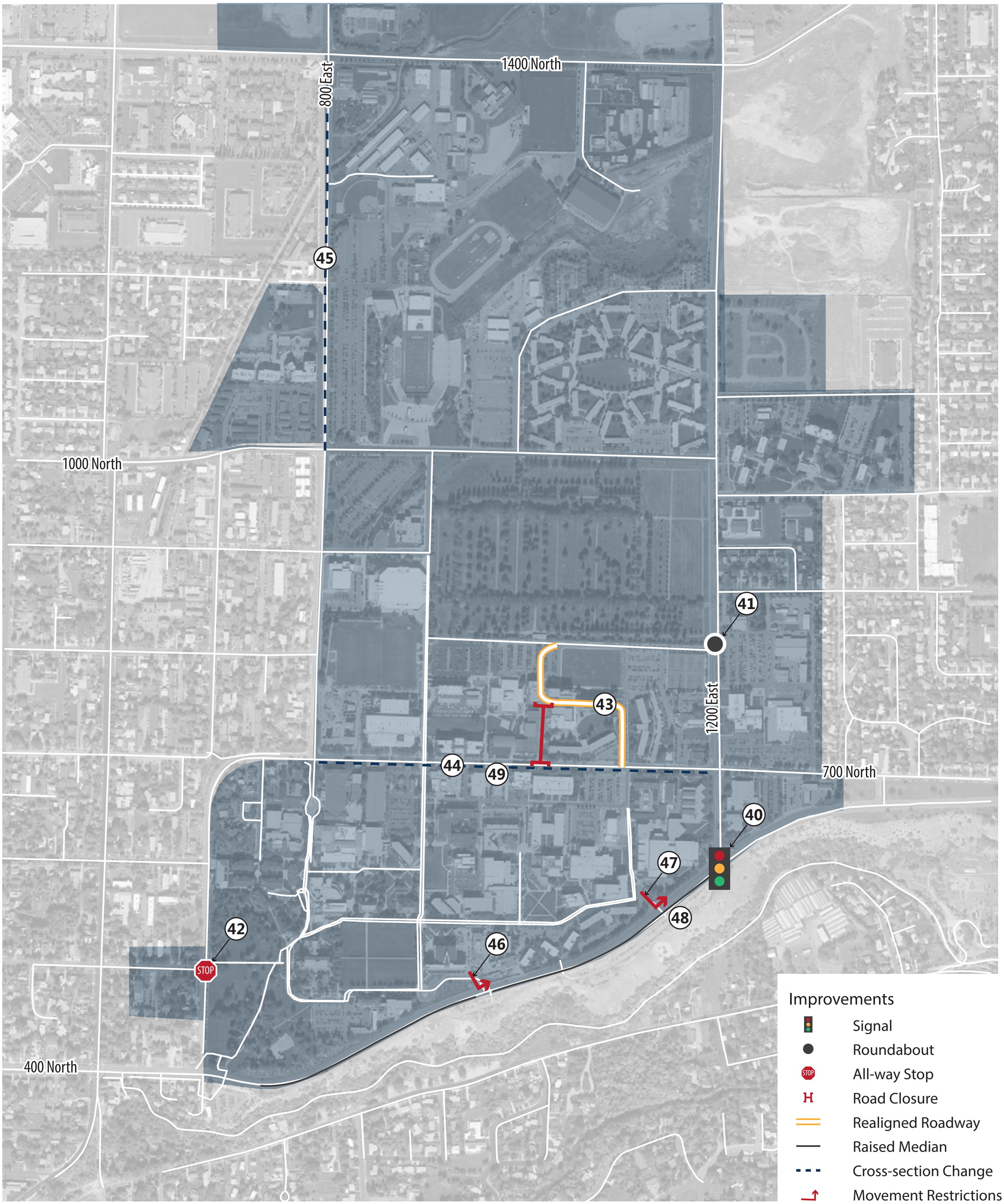

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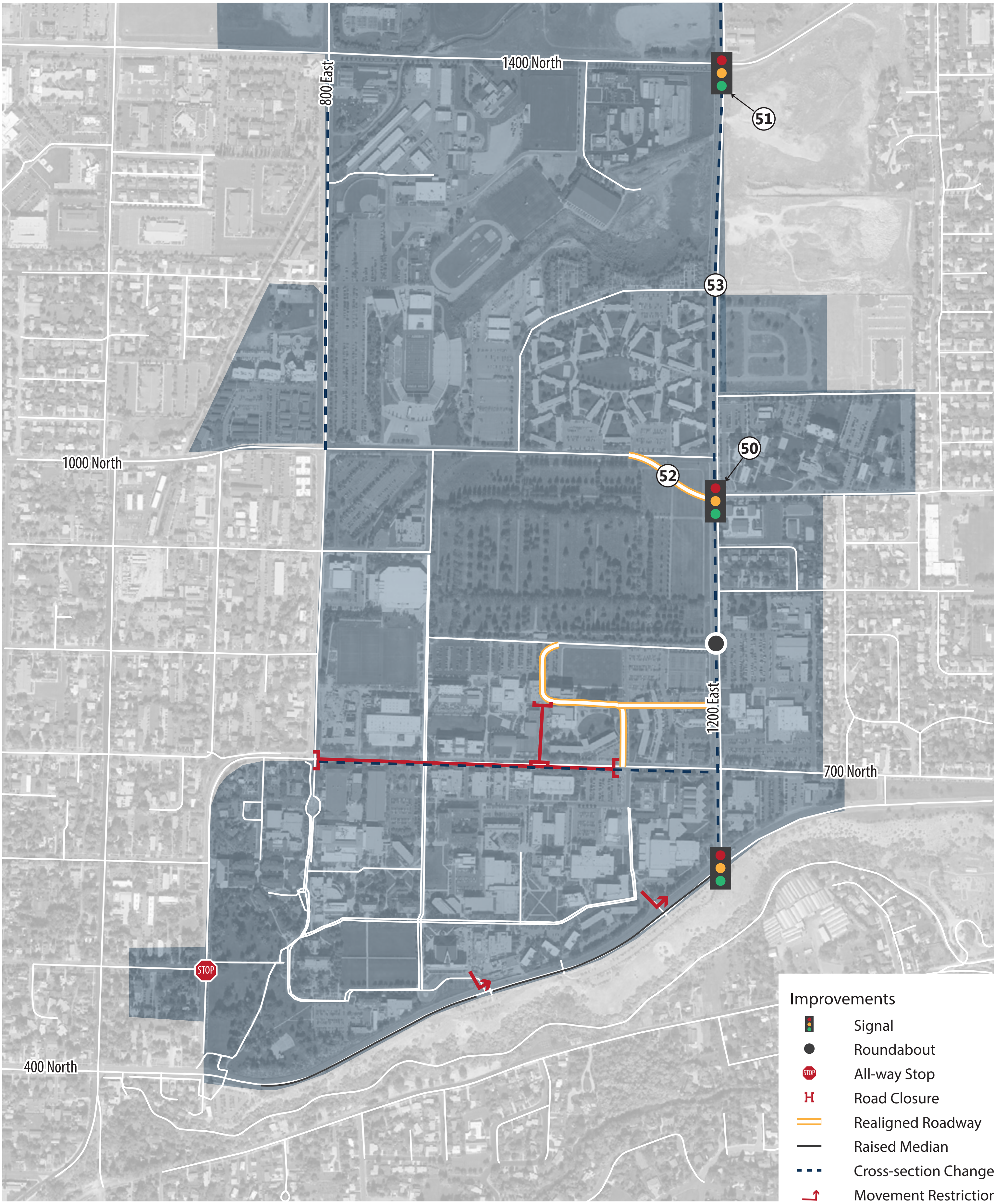
Phase 1 Vehicular Circulation Improvements Project Cost Identification

figure 20



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Phase 2 Vehicular Circulation Improvements Project Cost Identification

figure 21

Future Parking Areas Project Cost Identification

figure 22

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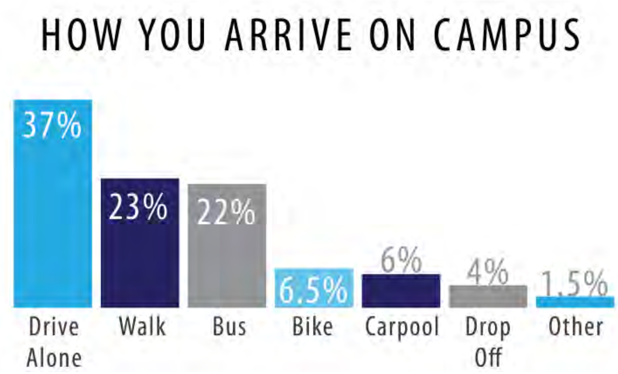
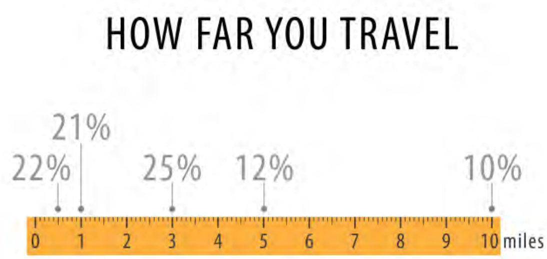
Public Outreach and Input

Public outreach is a key component of any master planning effort. The objective of this outreach was to reach a broad, diverse public in which to discuss ideas for an improved campus transportation environment at USU. Public outreach was conducted in a variety of ways including a campus-wide transportation survey, focus groups, and public open houses.

November 2014 Transportation Master Plan Survey

As part of this planning effort, a campus-wide transportation survey was conducted in November 2014. There was a total of 4,063 respondents to the survey. The survey's focus was on mode split to campus, existing conditions, desired improvements, and potential ways to change behavior. While driving alone remains the highest mode split on campus (37 percent), walking and riding the bus represent just under a quarter each of how people arrive to campus. Survey results indicate that there is room to improve active transportation modes to campus as 68 percent of the campus population travels three miles or less to campus.





Transit service on campus received positive reviews with 90 percent of users responding that CVTD service was excellent or good and 88 percent responding that Aggie Shuttle is excellent or good. The key reasons people use transit is comfort/convenience, cost, and weather-related reasons.

Most respondents who said they biked to campus frequently did so – 42 percent stated they bike every day to campus and almost 75 percent said they bike three or more times per week to campus. Most (71 percent) of bike trips to campus took 15 minutes or less and had portion of the trip occur along 700 North. Enjoyment, exercise, convenience, and cost were cited as the top reasons people biked to campus. Safety of bicyclists should be a top concern – a third of cyclists said they experienced a conflict on campus and 30 percent said they have been involved in an accident. The vast majority of these conflicts occurred on 700 North. Over time, most people who rode to campus their first year will ride less often after the first year (43 percent). The two primary reasons for bicycling less often were moving further away from campus and work or other obligations making bicycling less convenient. Improving and increase bike lanes and increased bicycle parking would encourage people to bike to campus.

Like bicycling, the top reasons for people to walk to campus were convenience, enjoyment, exercise, and cost. Most walking trips to campus, about 60 percent, were under 15 minutes. About half of pedestrians have encounter problems with bicyclists and skateboards – 28 percent each responded that they have experience conflicts with cyclists and have experience conflicts with skateboarders. The majority of these conflicts occurred on interior walkways in central campus. When asked where pedestrian improvements were needed on campus, the majority of locations were located along 700 North. The overall campus environment is safe and comfortable (95 percent).

People who drove to campus did so because it was convenient, comfortable, and allowed them to fulfill work responsibilities. Most people (70 percent) drove less than 15 minutes to campus. Although 54 percent of drivers stated that campus parking was fair and only minor changes were needed, 31 percent stated that parking was poor and major improvements were needed. Most people would not support relocating parking from central campus even with an increase in parking. However, 60 percent of people would support perimeter parking with shuttles (lower cost permits but further from destination) to parking structures on central campus (high cost permits but closer to destination).

Slightly less than half the survey respondents have environmental or personal health concerns during inversions. Also, slightly less than half of survey respondents stated that air quality does not play a role in their commute decisions. About 20 percent will continue to walk and bike to USU and another 20 percent will use a more sustainable method like carpooling or transit when an inversion is present.

The top three improvements stated in the survey are:

Transit

- Mobile device for tracking buses
- More frequent service
- Extended service hours

Walk

- Better sidewalks to campus
- Safer crosswalks
- More separated pathways from bicycles

Bike

- Improved bike lanes to campus
- More bike lanes and pathways
- More bike racks and covered bike parking

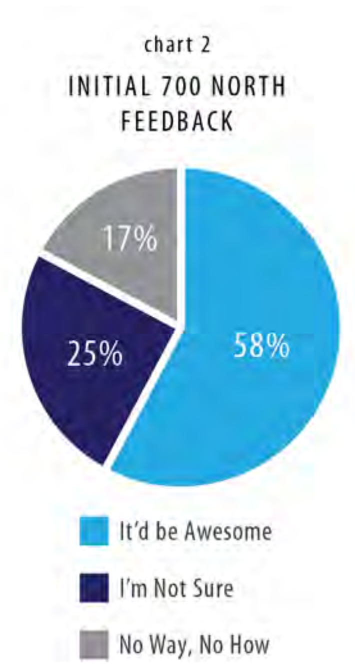
Full survey results are included in Appendix B.

Community Open Houses

There were two open houses held for the Transportation Master Plan. The purpose of the first open house was to get approval for vision, goals, and objectives by the community; to identify issues and potential alternatives; to gather initial feedback about changes to 700 North; and to educate the community about possible TDM solutions. The purpose of the second open house was to present the recommendations of the plan and obtain feedback for prioritizing the recommendations. Public open houses were advertised through campus email list-servs; flyers; the project website; and social media.

First Open House

The first open house was held during the Open Streets Festival on September 23, 2014. The project team presented information on the plan, including project goals, TDM solutions, and existing conditions. Preliminary feedback on potentially changing the cross-section of 700 North was gathered and indicated a positive response to changes, with concerns focused on parking access.



The main focus on the first open house was gathering input from the campus community how to improve the transportation system by collecting comments on a large floor aerial.

After the Open Streets Festival, the aerial map and the information boards were taken to a joint open house hosted by the City with the Logan Bicycle and Pedestrian Master Plan Study and the 400 North Corridor Study for additional input by the greater community. Comments could also be provided via written comments.

Written comments mentioned more bike lanes around campus, more wayfinding information, underground parking to protect open space and space for buildings, and later bus service.

Second Open House

The second open house was held in the Taggart Student Center on April 16, 2015. The proposed phased improvements were presented, with feedback taken regarding prioritization and TDM solutions. Over eighty people provided written comments during the second open house. In addition, open house materials were posted to the Parking and Transportation website along with a survey. Eighty people took the on-line survey. A total of 160 people filled out the survey between in-person at the open house and the on-line version. The two top TDM strategies that survey respondents wanted to see implemented included: Aggie Blue Bikes Expansion (10% in favor) and Aggie Shuttle Expansion (12%).

The most important elements of the Phase 1 plan were (in no particular order):

- Increased bus hours
- Bike lanes
- Pedestrian enhancements
- Fewer cars on campus
- 700 North modifications
- Signal at US-89/400 North
- 800 East improvements

For Phase 2, the most important elements were (in no particular order):

- 700 North modifications
- More buses and bus stops
- Bike lanes
- Improved pedestrian crossings

For Phase 3, the most important elements were (in no particular order):

- Additional parking garage and lot
- Bikeways
- 700 North modifications
- Bus routes/stops

Based on the total feedback from the Open House and on-line surveys, 59 percent of people were in favor of the proposed 700 North cross-section changes, while 41 percent were not. The results of the feedback regarding the proposed changes to 700 North were as follows:

- Open House (80 responses): 74 percent in favor / 26 percent not in favor

- On-line Survey (80 responses)P: 43 percent in favor / 56 percent not in favor

People who came to the Open House were far more likely to be in favor of closing 700 North than those who responded on the on-line survey. Given the interaction we had with the Open House attendees who initially were not in favor of the 700 North closure until they were able to understand that it was only a partial closure. The partial closure would still allow access to existing parking areas and permit bus service. Once Open House attendees gained this understanding the majority (74 percent) were in favor. The lack of understanding of what the actual closure was showed up in the on-line respondents who were less in favor of the changes.

Focus Groups

In addition to online surveys and open houses, the project team met with individual groups on campus to get more detailed feedback. These groups included:

- Parking and Transportation Services
- Police
- Utah Department of Transportation
- Cache Valley Transit District
- Logan City
- Student Advisory Council
- Student Services Directors
- Facilities and Operations
- Air Quality Sub Committee
- University Inn and Conference Center

Future Vision

There are many technologies that may not be suitable for the campus as it currently exist. This chapter presents various ideas that could be considered in the years to come as campus population continues to grow, as demand dictates, and as prices for technology decrease.

Bicycle Escalator

The elevation difference between the central core of campus and surrounding residential developments is often cited as a key reason more people do not bike to campus. To solve problems like this, Norway has installed a 'bike escalator' that mechanically pulls a bicyclist up a hill. It functions by having the bicyclist place his or her foot on a metal plate that is connected to a pulley system. The bicyclist remains on the bicycle and can bike away at the top of the hill.

Funicular

As the population grows and the capacity for transit becomes limited, alternative transportation modes that provide higher capacity and greater frequency need to be considered. A funicular is a railway with tram-like vehicles that operates on an incline. For USU, this type of technology could be used to connect the neighborhoods west of campus to the central core. Mobility between these two destinations is seen as a barrier for pedestrian and bicycle traffic, especially in the winter when maintenance may be limited.

In the United States, funiculars operate in many states, including one at the St. Regis Deer Crest Resort in Park City. There is a funicular that connects the urban center of Zurich to the main building of ETH Zurich, a university in Zurich.

Aerial Trams

A recent example of a new tram system is the Portland Aerial Tram that was constructed as a part of the Oregon Health & Science University Master Plan. The aerial tram connects two campuses that are physically separated, both vertically (500 feet) and horizontally (3,300 feet), and by a river. The tram consists of two stations and one intermediate tower. Two 79-passenger, cable supported cabins operate on 5-minute headways during the peak periods (950 passengers per hour). The travel time between stations is three minutes. The original ridership estimate was approximately 1,500 people per day, and actual ridership topped 3,700 riders per day in the first 10 months of operation. It became operational in 2007, and the cost to construct the system was $57 million, or a cost of $91 million per mile. The annual operating cost of that system is approximately $1.6 million. Aerial trams are typically cable suspended, driverless, and centrally operated. They can hold 60-80 passengers in one cabin and support point-to-point travel. In 2006, Portland installed an aerial tram system to connect a lower-elevation neighborhood to the Oregon Health & Science University campus.

Autonomous Vehicles

Autonomous vehicles could allow a wider range of users to travel in private automobiles, including people below 16 years of age, people with disabilities that previously precluded self-driving, and seniors who might lose their licenses. Let alone that being in a vehicle without the requirement to deal with the stresses of driving will make the driving experience more pleasant and time spent in vehicles more productive. How the rise of autonomous vehicles impacts travel to campus is uncertain.

On the one hand, autonomous vehicles could reduce the need to for parking on campus, as vehicles could be sent 'home' during the school/work day. Depending on the technology, this could potentially increase GHG emissions and decrease air quality within the region.

However, if autonomous vehicles make car-sharing and services like Uber easier, this could result in less need for a personal vehicle. The benefit of not owning a personal vehicle and paying for each trip is a greater consciousness of travel costs. With more and more apps that identify travel options (auto, taxi-like services, shared taxi-like services, transit, walk, bike, bike share, car share) people have greater awareness of their travel options, expected travel times, conditions of travel, and travel costs. It is highly possible that more people will opt for less expensive shared rides, be it fixed route transit, dynamic publicly offered rideshare systems, or organic private rideshare options, resulting in greater vehicle occupancy and fewer overall vehicles traveling.

APPENDIX

Appendix A – Level of Service Reports

Intersection	
Intersection Delay, s/veh	15.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	47	60	293	25	156	4	166	70	18	3	132	67
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	66	322	27	171	4	182	77	20	3	145	74
Number of Lanes	1	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	3
HCM Control Delay	14.6	15	19.1	14.8
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	65%	100%	0%	0%	14%	1%
Vol Thru, %	28%	0%	100%	0%	84%	65%
Vol Right, %	7%	0%	0%	100%	2%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	254	47	60	293	185	202
LT Vol	70	0	60	0	156	132
Through Vol	18	0	0	293	4	67
RT Vol	166	47	0	0	25	3
Lane Flow Rate	279	52	66	322	203	222
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.564	0.105	0.125	0.545	0.41	0.428
Departure Headway (Hd)	7.271	7.324	6.813	6.098	7.269	6.939
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	497	489	526	592	494	519
Service Time	5.018	5.07	4.559	3.843	5.022	4.69
HCM Lane V/C Ratio	0.561	0.106	0.125	0.544	0.411	0.428
HCM Control Delay	19.1	10.9	10.5	16	15	14.8
HCM Lane LOS	C	B	B	C	B	B
HCM 95th-tile Q	3.4	0.3	0.4	3.3	2	2.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	191	899	30	120	487	36	44	328	249	77	134	138
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.98		0.96	0.99		0.96
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Cap, veh/h	394	1559	51	239	1491	109	421	632	517	261	632	517
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.34	0.34	0.34	0.34	0.34	0.34
Sat Flow, veh/h	814	3586	118	527	3430	251	1039	1863	1524	761	1863	1524
Grp Volume(v), veh/h	220	536	531	138	304	297	51	377	286	89	154	159
Grp Sat Flow(s),veh/h/ln	814	1863	1842	527	1863	1818	1039	1863	1524	761	1863	1524
Q Serve(g_s), s	13.8	12.6	12.6	11.4	6.1	6.1	2.1	9.3	8.4	6.1	3.3	4.3
Cycle Q Clear(g_c), s	19.9	12.6	12.6	24.0	6.1	6.1	5.3	9.3	8.4	15.3	3.3	4.3
Prop In Lane	1.00		0.06	1.00		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	394	810	800	239	810	790	421	632	517	261	632	517
V/C Ratio(X)	0.56	0.66	0.66	0.58	0.38	0.38	0.12	0.60	0.55	0.34	0.24	0.31
Avail Cap(c_a), veh/h	394	810	800	239	810	790	511	793	649	326	793	649
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	12.4	12.4	23.1	10.5	10.6	15.1	15.1	14.8	21.5	13.1	13.5
Incr Delay (d2), s/veh	5.6	4.2	4.3	9.8	1.3	1.4	0.0	0.3	0.3	0.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.0	5.7	5.7	2.4	2.6	2.5	0.5	3.9	2.9	1.1	1.4	1.5
Lane Grp Delay (d), s/veh	22.9	16.6	16.7	33.0	11.9	11.9	15.1	15.5	15.2	21.8	13.2	13.6
Lane Grp LOS	C	B	B	C	B	B	B	B	B	C	B	B
Approach Vol, veh/h		1287			739			714			402	
Approach Delay, s/veh		17.7			15.8			15.3			15.3	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		6			2			8			4	
Phs Duration (G+Y+Rc), s		30.0			30.0			25.2			25.2	
Change Period (Y+Rc), s		6.0			6.0			6.5			6.5	
Max Green Setting (Gmax), s		24.0			24.0			23.5			23.5	
Max Q Clear Time (g_c+I1), s		21.9			26.0			11.3			17.3	
Green Ext Time (p_c), s		1.4			0.0			1.4			1.1	
Intersection Summary												
HCM 2010 Ctrl Delay			16.4									
HCM 2010 LOS			B									
Notes												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	58	119	20	80	49	211	362	41	73	210	106
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.70		0.57	0.72		0.57	0.89		0.77	0.92		0.77
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	315	527	257	320	527	257	466	963	628	364	963	628
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	833	1863	908	804	1863	908	821	1863	1214	753	1863	1214
Grp Volume(v), veh/h	118	85	175	29	118	72	310	532	60	107	309	156
Grp Sat Flow(s),veh/h/ln	833	1863	908	804	1863	908	821	1863	1214	753	1863	1214
Q Serve(g_s), s	7.6	2.1	10.3	1.7	2.9	3.7	21.0	11.6	1.5	6.7	5.8	4.3
Cycle Q Clear(g_c), s	10.5	2.1	10.3	3.7	2.9	3.7	26.8	11.6	1.5	18.3	5.8	4.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	315	527	257	320	527	257	466	963	628	364	963	628
V/C Ratio(X)	0.37	0.16	0.68	0.09	0.22	0.28	0.67	0.55	0.10	0.29	0.32	0.25
Avail Cap(c_a), veh/h	316	528	258	320	528	258	466	963	628	364	963	628
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.5	16.2	19.1	17.6	16.5	16.7	16.1	9.8	7.4	16.0	8.4	8.0
Incr Delay (d2), s/veh	0.7	0.1	7.1	0.1	0.2	0.6	7.3	2.3	0.3	2.0	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.5	0.9	2.6	0.3	1.3	0.8	4.5	4.6	0.4	1.3	2.2	1.1
Lane Grp Delay (d), s/veh	21.2	16.3	26.2	17.7	16.7	17.3	23.5	12.1	7.7	18.0	9.3	9.0
Lane Grp LOS	C	B	C	B	B	B	C	B	A	B	A	A
Approach Vol, veh/h		378			219			902			572	
Approach Delay, s/veh		22.4			17.0			15.7			10.8	
Approach LOS		C			B			B			B	

Timer				
Assigned Phs	4	8	2	6
Phs Duration (G+Y+Rc), s	22.9	22.9	37.0	37.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	17.0	17.0	31.0	31.0
Max Q Clear Time (g_c+I1), s	12.5	5.7	28.8	20.3
Green Ext Time (p_c), s	1.4	2.6	1.5	5.5

Intersection Summary	
HCM 2010 Ctrl Delay	15.7
HCM 2010 LOS	B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	63	169	28	12	85	101	25	37	14	213	46	77
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.78		0.67	0.79		0.67	0.62		0.59	0.58		0.61
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	190.0	186.3	190.0	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	0	1	0	1	1	0
Cap, veh/h	394	647	370	358	647	370	216	289	99	402	200	331
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.45	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	887	1863	1064	898	1863	1064	300	639	220	766	443	732
Grp Volume(v), veh/h	79	211	35	15	106	126	95	0	0	266	0	154
Grp Sat Flow(s),veh/h/ln	887	1863	1064	898	1863	1064	1159	0	0	766	0	1175
Q Serve(g_s), s	4.0	5.0	1.3	0.7	2.4	5.2	0.1	0.0	0.0	20.1	0.0	4.9
Cycle Q Clear(g_c), s	6.4	5.0	1.3	5.7	2.4	5.2	5.0	0.0	0.0	25.1	0.0	4.9
Prop In Lane	1.00		1.00	1.00		1.00	0.33		0.19	1.00		0.62
Lane Grp Cap(c), veh/h	394	647	370	358	647	370	603	0	0	402	0	531
V/C Ratio(X)	0.20	0.33	0.09	0.04	0.16	0.34	0.16	0.00	0.00	0.66	0.00	0.29
Avail Cap(c_a), veh/h	397	654	374	361	654	374	603	0	0	402	0	531
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.7	14.3	13.2	16.5	13.5	14.4	9.6	0.0	0.0	18.3	0.0	10.3
Incr Delay (d2), s/veh	0.2	0.3	0.1	0.0	0.1	0.5	0.6	0.0	0.0	8.3	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.9	2.2	0.3	0.2	1.0	1.3	0.8	0.0	0.0	4.4	0.0	1.4
Lane Grp Delay (d), s/veh	15.9	14.6	13.3	16.5	13.6	15.0	10.1	0.0	0.0	26.6	0.0	11.7
Lane Grp LOS	B	B	B	B	B	B	B			C		B
Approach Vol, veh/h		325			247			95			420	
Approach Delay, s/veh		14.8			14.5			10.1			21.1	
Approach LOS		B			B			B			C	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		26.8			26.8			33.0			33.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		21.0			21.0			27.0			27.0	
Max Q Clear Time (g_c+I1), s		8.4			7.7			7.0			27.1	
Green Ext Time (p_c), s		2.5			2.6			2.6			0.0	
Intersection Summary												
HCM 2010 Ctrl Delay			16.8									
HCM 2010 LOS			B									
Notes												

Intersection	
Intersection Delay, s/veh	4.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	237	845	516	89	66	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	0	30	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	296	1056	645	111	82	154

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	645	0	-	0	1766	323
Stage 1	-	-	-	-	645	-
Stage 2	-	-	-	-	1121	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	936	-	-	-	# 75	673
Stage 1	-	-	-	-	484	-
Stage 2	-	-	-	-	273	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	936	-	-	-	# 51	673
Mov Capacity-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	484	-
Stage 2	-	-	-	-	187	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	29

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	936	-	-	-	141	673
HCM Lane V/C Ratio	0.317	-	-	-	0.585	0.228
HCM Control Delay (s)	10.617	-	-	-	61.4	11.9
HCM Lane LOS	B				F	B
HCM 95th %tile Q(veh)	1.366	-	-	-	3	0.876

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	69	221	272	47	254	71	166	111	13	159	250	68
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	0.99		1.00	0.99		0.98	0.98		0.98
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	1	1	1	1	2	0
Cap, veh/h	351	597	489	331	597	505	544	844	701	649	1278	341
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.45	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	1035	1863	1527	871	1863	1576	1030	1863	1547	1232	2820	752
Grp Volume(v), veh/h	72	230	283	49	265	74	173	116	14	166	170	161
Grp Sat Flow(s),veh/h/ln	1035	1863	1527	871	1863	1576	1030	1863	1547	1232	1863	1709
Q Serve(g_s), s	3.1	5.1	8.2	2.4	6.0	1.8	6.5	1.9	0.3	4.8	2.9	3.0
Cycle Q Clear(g_c), s	9.1	5.1	8.2	7.5	6.0	1.8	9.5	1.9	0.3	6.7	2.9	3.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.44
Lane Grp Cap(c), veh/h	351	597	489	331	597	505	544	844	701	649	844	775
V/C Ratio(X)	0.21	0.39	0.58	0.15	0.44	0.15	0.32	0.14	0.02	0.26	0.20	0.21
Avail Cap(c_a), veh/h	488	844	692	447	844	714	544	844	701	649	844	775
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	14.0	15.0	16.9	14.3	12.8	11.6	8.4	8.0	10.4	8.7	8.7
Incr Delay (d2), s/veh	0.3	0.4	1.1	0.2	0.5	0.1	1.5	0.3	0.1	0.9	0.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.7	2.0	2.7	0.5	2.4	0.6	1.7	0.8	0.1	1.3	1.2	1.1
Lane Grp Delay (d), s/veh	18.2	14.4	16.1	17.1	14.8	13.0	13.1	8.8	8.0	11.4	9.2	9.4
Lane Grp LOS	B	B	B	B	B	B	B	A	A	B	A	A
Approach Vol, veh/h		585			388			303			497	
Approach Delay, s/veh		15.7			14.7			11.2			10.0	
Approach LOS		B			B			B			A	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		23.0			23.0			30.0			30.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		24.0			24.0			24.0			24.0	
Max Q Clear Time (g_c+I1), s		11.1			9.5			11.5			8.7	
Green Ext Time (p_c), s		3.7			3.9			3.0			3.2	
Intersection Summary												
HCM 2010 Ctrl Delay			13.1									
HCM 2010 LOS			B									
Notes												

Intersection	
Intersection Delay, s/veh	102.1

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Vol, veh/h	1	6	18	6	4	314	493	361	71	6	267	30
Conflicting Peds, #/hr	87	0	0	0	0	87	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	8	23	8	5	403	632	463	91	8	342	38

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	2135	2342	364	2050	2369	277	468	0	0	641	0	0
Stage 1	1859	1859	-	464	464	-	-	-	-	-	-	-
Stage 2	276	483	-	1586	1905	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	28	36	633	32	34	720	1090	-	-	939	-	-
Stage 1	76	122	-	548	562	-	-	-	-	-	-	-
Stage 2	707	551	-	113	115	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	4	13	587	9	12	668	1090	-	-	939	-	-
Mov Capacity-2 Maneuver	4	13	-	9	12	-	-	-	-	-	-	-
Stage 1	30	48	-	214	517	-	-	-	-	-	-	-
Stage 2	276	507	-	38	45	-	-	-	-	-	-	-

Approach	NB	SB	NE	SW
HCM Control Delay, s	$ 310	$ 453	7	0

Minor Lane / Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	1090	-	-	34	220	939	-	-
HCM Lane V/C Ratio	0.58	-	-	0.943	1.888	0.008	-	-
HCM Control Delay (s)	12.756	-	-	$ 310.3	$ 453.2	8.866	-	-
HCM Lane LOS	B			F	F	A		
HCM 95th %tile Q(veh)	3.878	-	-	3.347	29.673	0.025	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	13	232	103	256	487	28
Conflicting Peds, #/hr	23	0	33	0	0	33
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	249	111	275	524	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1059	595	577	0	-	0
Stage 1	562	-	-	-	-	-
Stage 2	497	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	249	504	996	-	-	-
Stage 1	571	-	-	-	-	-
Stage 2	611	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	207	481	969	-	-	-
Mov Capacity-2 Maneuver	207	-	-	-	-	-
Stage 1	560	-	-	-	-	-
Stage 2	518	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24	3	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	969	-	449	-	-
HCM Lane V/C Ratio	0.114	-	0.587	-	-
HCM Control Delay (s)	9.194	0	23.8	-	-
HCM Lane LOS	A	A	C		
HCM 95th %tile Q(veh)	0.386	-	3.676	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	106	117	61	16	69	45	22	130	22	62	239	61
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.93		0.85	0.90		0.91	0.93		0.87	0.91		0.87
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Cap, veh/h	550	752	545	480	752	583	420	1438	532	501	1438	532
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	1140	1863	1350	1019	1863	1443	901	3725	1378	1057	3725	1378
Grp Volume(v), veh/h	147	162	85	22	96	62	31	181	31	86	332	85
Grp Sat Flow(s),veh/h/ln	1140	1863	1350	1019	1863	1443	901	1863	1378	1057	1863	1378
Q Serve(g_s), s	5.3	3.2	2.3	0.8	1.8	1.5	1.4	1.8	0.8	3.3	3.4	2.3
Cycle Q Clear(g_c), s	7.2	3.2	2.3	4.1	1.8	1.5	4.8	1.8	0.8	5.0	3.4	2.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	550	752	545	480	752	583	420	1438	532	501	1438	532
V/C Ratio(X)	0.27	0.22	0.16	0.05	0.13	0.11	0.07	0.13	0.06	0.17	0.23	0.16
Avail Cap(c_a), veh/h	609	849	616	533	849	658	420	1438	532	501	1438	532
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.9	11.1	10.8	12.4	10.7	10.6	13.4	11.3	11.0	12.9	11.8	11.5
Incr Delay (d2), s/veh	0.3	0.1	0.1	0.0	0.1	0.1	0.3	0.2	0.2	0.7	0.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.3	1.2	0.6	0.2	0.7	0.5	0.3	0.7	0.3	0.8	1.4	0.8
Lane Grp Delay (d), s/veh	13.2	11.2	11.0	12.5	10.8	10.7	13.8	11.5	11.2	13.7	12.2	12.1
Lane Grp LOS	B	B	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		394			180			243			503	
Approach Delay, s/veh		11.9			10.9			11.7			12.4	
Approach LOS		B			B			B			B	

Timer				
Assigned Phs	4	8	2	6
Phs Duration (G+Y+Rc), s	29.0	29.0	28.0	28.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	26.0	26.0	22.0	22.0
Max Q Clear Time (g_c+I1), s	9.2	6.1	6.8	7.0
Green Ext Time (p_c), s	2.3	2.4	3.5	3.5

Intersection Summary	
HCM 2010 Ctrl Delay	11.9
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	20	0	201	316	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	0	218	343	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	561	343	343	0	-	0
Stage 1	343	-	-	-	-	-
Stage 2	218	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	489	700	1216	-	-	-
Stage 1	719	-	-	-	-	-
Stage 2	818	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	489	700	1216	-	-	-
Mov Capacity-2 Maneuver	489	-	-	-	-	-
Stage 1	719	-	-	-	-	-
Stage 2	818	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1216	-	700	-	-
HCM Lane V/C Ratio	-	-	0.031	-	-
HCM Control Delay (s)	0	-	10.3	-	-
HCM Lane LOS	A		B		
HCM 95th %tile Q(veh)	0	-	0.096	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	31	62	134	203	385	191
Conflicting Peds, #/hr	60	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	35	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	72	156	236	448	222

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1167	619	730	0	-	0
Stage 1	619	-	-	-	-	-
Stage 2	548	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	214	489	874	-	-	-
Stage 1	537	-	-	-	-	-
Stage 2	579	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	159	465	874	-	-	-
Mov Capacity-2 Maneuver	159	-	-	-	-	-
Stage 1	510	-	-	-	-	-
Stage 2	452	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25	4	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	874	-	283	-	-
HCM Lane V/C Ratio	0.178	-	0.382	-	-
HCM Control Delay (s)	10.01	-	25.4	-	-
HCM Lane LOS	B		D		
HCM 95th %tile Q(veh)	0.646	-	1.72	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	283	52	20	16	7	134
Conflicting Peds, #/hr	105	67	27	0	0	27
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	60	-	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	368	68	26	21	9	174

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	48	0	0	0	835	153
Stage 1	-	-	-	-	100	-
Stage 2	-	-	-	-	735	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1559	-	-	-	304	893
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	-	-
Time blocked-Platoon, %		-		-		
Mov Capacity-1 Maneuver	1423	-	-	-	# 0	797
Mov Capacity-2 Maneuver	-	-	-	-	# 0	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	# 0	-

Approach	EB	NB	SB
HCM Control Delay, s	7	0	Error

Minor Lane / Major Mvmt	NBL	NBT	EBL	EBR	SBLn1	SBLn2
Capacity (veh/h)	-	-	1423	-	0	797
HCM Lane V/C Ratio	-	-	0.258	-	Error	0.218
HCM Control Delay (s)	-	-	8.408	-	Error	10.8
HCM Lane LOS			A		Error	B
HCM 95th %tile Q(veh)	-	-	1.037	-	Error	0.829

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	33	14	6	1	1	1	14	231	54	24	137	26
Conflicting Peds, #/hr	5	0	155	155	0	5	5	0	57	57	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	44	19	8	1	1	1	19	308	72	32	183	35

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	957	991	412	968	972	556	372	0	0	535	0	0
Stage 1	419	419	-	536	536	-	-	-	-	-	-	-
Stage 2	538	572	-	432	436	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	237	246	640	233	252	531	1186	-	-	1033	-	-
Stage 1	612	590	-	529	523	-	-	-	-	-	-	-
Stage 2	527	504	-	602	580	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	186	176	531	167	180	440	1130	-	-	984	-	-
Mov Capacity-2 Maneuver	186	176	-	167	180	-	-	-	-	-	-	-
Stage 1	521	495	-	451	445	-	-	-	-	-	-	-
Stage 2	488	429	-	523	486	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	33			22			0			1		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1130	-	-	198	217	984	-	-
HCM Lane V/C Ratio	0.017	-	-	0.357	0.018	0.033	-	-
HCM Control Delay (s)	8.239	0	-	32.9	21.9	8.781	0	-
HCM Lane LOS	A	A		D	C	A	A	
HCM 95th %tile Q(veh)	0.05	-	-	1.52	0.056	0.101	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	22
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	55	200	148	6	129	4	270	108	23	4	63	66
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	60	220	163	7	142	4	297	119	25	4	69	73
Number of Lanes	1	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	3
HCM Control Delay	13.2	13.9	36.9	12.6
HCM LOS	B	B	E	B

Lane	NBLn1	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	67%	100%	0%	0%	4%	3%
Vol Thru, %	27%	0%	100%	0%	93%	47%
Vol Right, %	6%	0%	0%	100%	3%	50%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	401	55	200	148	139	133
LT Vol	108	0	200	0	129	63
Through Vol	23	0	0	148	4	66
RT Vol	270	55	0	0	6	4
Lane Flow Rate	441	60	220	163	153	146
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.843	0.127	0.429	0.285	0.322	0.286
Departure Headway (Hd)	7.021	7.541	7.03	6.313	7.6	7.049
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	520	477	514	571	475	510
Service Time	4.721	5.258	4.746	4.03	5.323	4.782
HCM Lane V/C Ratio	0.848	0.126	0.428	0.285	0.322	0.286
HCM Control Delay	36.9	11.4	14.9	11.5	13.9	12.6
HCM Lane LOS	E	B	B	B	B	B
HCM 95th-tile Q	8.7	0.4	2.1	1.2	1.4	1.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	141	481	59	193	653	65	53	153	80	38	296	266
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	0.99		0.98	0.99		0.98
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Cap, veh/h	387	1633	199	467	1674	166	236	523	434	362	523	434
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	702	3250	397	834	3331	329	815	1863	1546	1114	1863	1546
Grp Volume(v), veh/h	148	289	279	203	384	371	56	161	84	40	312	280
Grp Sat Flow(s),veh/h/ln	702	1863	1784	834	1863	1798	815	1863	1546	1114	1863	1546
Q Serve(g_s), s	9.7	5.3	5.3	11.0	7.5	7.5	3.7	3.9	2.4	1.7	8.3	9.2
Cycle Q Clear(g_c), s	17.1	5.3	5.3	16.3	7.5	7.5	12.0	3.9	2.4	5.6	8.3	9.2
Prop In Lane	1.00		0.22	1.00		0.18	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	387	936	897	467	936	903	236	523	434	362	523	434
V/C Ratio(X)	0.38	0.31	0.31	0.43	0.41	0.41	0.24	0.31	0.19	0.11	0.60	0.64
Avail Cap(c_a), veh/h	387	936	897	467	936	903	480	1081	898	695	1081	898
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.4	8.5	8.5	13.3	9.0	9.0	23.1	16.3	15.8	18.5	17.9	18.2
Incr Delay (d2), s/veh	2.9	0.9	0.9	2.9	1.3	1.4	0.2	0.1	0.1	0.0	0.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.7	2.1	2.0	2.3	3.0	2.9	0.7	1.7	0.9	0.4	3.7	3.3
Lane Grp Delay (d), s/veh	17.2	9.3	9.4	16.2	10.3	10.4	23.3	16.5	15.9	18.6	18.3	18.8
Lane Grp LOS	B	A	A	B	B	B	C	B	B	B	B	B
Approach Vol, veh/h		716			958			301			632	
Approach Delay, s/veh		11.0			11.6			17.6			18.6	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		6			2			8			4	
Phs Duration (G+Y+Rc), s		35.0			35.0			22.7			22.7	
Change Period (Y+Rc), s		6.0			6.0			6.5			6.5	
Max Green Setting (Gmax), s		29.0			29.0			33.5			33.5	
Max Q Clear Time (g_c+I1), s		19.1			18.3			14.0			11.2	
Green Ext Time (p_c), s		4.3			4.5			1.3			1.3	
Intersection Summary												
HCM 2010 Ctrl Delay			13.8									
HCM 2010 LOS			B									
Notes												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	144	56	147	21	51	55	91	255	9	32	304	80
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.86		0.82	0.88		0.82	0.97		0.94	0.96		0.94
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	428	559	390	401	559	390	438	892	709	507	892	709
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	1072	1863	1298	986	1863	1298	885	1863	1481	1008	1863	1481
Grp Volume(v), veh/h	180	70	184	26	64	69	114	319	11	40	380	100
Grp Sat Flow(s),veh/h/ln	1072	1863	1298	986	1863	1298	885	1863	1481	1008	1863	1481
Q Serve(g_s), s	7.9	1.5	6.3	1.1	1.4	2.1	5.3	5.8	0.2	1.4	7.2	2.0
Cycle Q Clear(g_c), s	9.3	1.5	6.3	2.6	1.4	2.1	12.5	5.8	0.2	7.3	7.2	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	428	559	390	401	559	390	438	892	709	507	892	709
V/C Ratio(X)	0.42	0.13	0.47	0.06	0.11	0.18	0.26	0.36	0.02	0.08	0.43	0.14
Avail Cap(c_a), veh/h	540	755	526	505	755	526	438	892	709	507	892	709
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.1	13.8	15.5	14.7	13.8	14.0	13.4	8.9	7.4	11.2	9.3	7.9
Incr Delay (d2), s/veh	0.7	0.1	0.9	0.1	0.1	0.2	1.4	1.1	0.0	0.3	1.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.0	0.6	1.9	0.2	0.6	0.6	1.1	2.4	0.1	0.3	3.0	0.7
Lane Grp Delay (d), s/veh	17.8	13.9	16.4	14.8	13.9	14.3	14.8	10.0	7.5	11.5	10.7	8.3
Lane Grp LOS	B	B	B	B	B	B	B	B	A	B	B	A
Approach Vol, veh/h		434			159			444			520	
Approach Delay, s/veh		16.6			14.2			11.2			10.3	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		22.3			22.3			32.0			32.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		22.0			22.0			26.0			26.0	
Max Q Clear Time (g_c+I1), s		11.3			4.6			14.5			9.3	
Green Ext Time (p_c), s		2.0			2.4			3.9			4.7	

Intersection Summary			
HCM 2010 Ctrl Delay			12.7
HCM 2010 LOS			B

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	107	116	23	21	148	192	37	35	17	165	32	116
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.89		0.79	0.85		0.79	0.71		0.58	0.66		0.60
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	190.0	186.3	190.0	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	0	1	0	1	1	0
Cap, veh/h	387	670	452	448	670	452	235	201	82	403	97	355
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	879	1863	1258	1033	1863	1258	339	472	193	888	228	832
Grp Volume(v), veh/h	124	135	27	24	172	223	104	0	0	192	0	172
Grp Sat Flow(s),veh/h/ln	879	1863	1258	1033	1863	1258	1004	0	0	888	0	1060
Q Serve(g_s), s	6.5	2.8	0.8	0.9	3.7	7.8	0.4	0.0	0.0	10.7	0.0	6.2
Cycle Q Clear(g_c), s	10.2	2.8	0.8	3.7	3.7	7.8	6.6	0.0	0.0	17.3	0.0	6.2
Prop In Lane	1.00		1.00	1.00		1.00	0.41		0.19	1.00		0.78
Lane Grp Cap(c), veh/h	387	670	452	448	670	452	519	0	0	403	0	452
V/C Ratio(X)	0.32	0.20	0.06	0.05	0.26	0.49	0.20	0.00	0.00	0.48	0.00	0.38
Avail Cap(c_a), veh/h	446	795	537	517	795	537	519	0	0	403	0	452
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.3	12.4	11.8	13.7	12.7	14.0	10.0	0.0	0.0	17.1	0.0	11.0
Incr Delay (d2), s/veh	0.5	0.1	0.1	0.0	0.2	0.8	0.9	0.0	0.0	4.0	0.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.4	1.2	0.2	0.2	1.5	2.3	0.8	0.0	0.0	2.6	0.0	1.8
Lane Grp Delay (d), s/veh	16.8	12.6	11.8	13.8	12.9	14.8	10.9	0.0	0.0	21.1	0.0	13.4
Lane Grp LOS	B	B	B	B	B	B	B			C		B
Approach Vol, veh/h		286			419			104			364	
Approach Delay, s/veh		14.3			14.0			10.9			17.5	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		26.2			26.2			30.0			30.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		24.0			24.0			24.0			24.0	
Max Q Clear Time (g_c+I1), s		12.2			9.8			8.6			19.3	
Green Ext Time (p_c), s		2.8			3.1			2.5			1.2	

Intersection Summary			
HCM 2010 Ctrl Delay			14.9
HCM 2010 LOS			B

Notes

Intersection	
Intersection Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	64	522	774	47	56	148
Conflicting Peds, #/hr	3	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	0	30	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	74	600	890	54	64	170

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	890	0	-	0	1337	448
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	447	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	757	-	-	-	145	558
Stage 1	-	-	-	-	361	-
Stage 2	-	-	-	-	611	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	755	-	-	-	131	557
Mov Capacity-2 Maneuver	-	-	-	-	255	-
Stage 1	-	-	-	-	361	-
Stage 2	-	-	-	-	551	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	17

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	755	-	-	-	255	557
HCM Lane V/C Ratio	0.097	-	-	-	0.252	0.305
HCM Control Delay (s)	10.282	-	-	-	23.8	14.3
HCM Lane LOS	B				C	B
HCM 95th %tile Q(veh)	0.323	-	-	-	0.973	1.285

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	92	338	169	25	401	86	15	221	399	76	134	85
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.93	0.97		0.89	0.98		0.97	0.99		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	1	1	1	1	2	0
Cap, veh/h	299	734	582	329	734	554	516	742	611	357	867	508
Arrive On Green	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	835	1863	1477	832	1863	1407	1114	1863	1536	753	2179	1275
Grp Volume(v), veh/h	100	367	184	27	436	93	16	240	434	83	123	115
Grp Sat Flow(s),veh/h/ln	835	1863	1477	832	1863	1407	1114	1863	1536	753	1863	1591
Q Serve(g_s), s	6.2	8.6	5.0	1.5	10.7	2.5	0.5	5.1	13.7	4.9	2.5	2.7
Cycle Q Clear(g_c), s	16.9	8.6	5.0	10.1	10.7	2.5	3.2	5.1	13.7	10.1	2.5	2.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.80
Lane Grp Cap(c), veh/h	299	734	582	329	734	554	516	742	611	357	742	633
V/C Ratio(X)	0.33	0.50	0.32	0.08	0.59	0.17	0.03	0.32	0.71	0.23	0.17	0.18
Avail Cap(c_a), veh/h	331	806	639	361	806	609	516	742	611	357	742	633
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.5	13.2	12.1	17.0	13.8	11.4	12.3	12.0	14.6	15.5	11.2	11.3
Incr Delay (d2), s/veh	0.7	0.5	0.3	0.1	1.0	0.1	0.1	1.2	6.8	1.5	0.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.2	3.4	1.5	0.3	4.2	0.7	0.1	2.2	5.5	0.9	1.0	1.0
Lane Grp Delay (d), s/veh	21.2	13.7	12.4	17.1	14.8	11.5	12.4	13.2	21.4	17.0	11.7	11.9
Lane Grp LOS	C	B	B	B	B	B	B	B	C	B	B	B
Approach Vol, veh/h		651			556			690			321	
Approach Delay, s/veh		14.5			14.4			18.3			13.1	
Approach LOS		B			B			B			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		28.8			28.8			29.0			29.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		25.0			25.0			23.0			23.0	
Max Q Clear Time (g_c+I1), s		18.9			12.7			15.7			12.1	
Green Ext Time (p_c), s		3.1			4.9			2.8			3.6	

Intersection Summary			
HCM 2010 Ctrl Delay			15.5
HCM 2010 LOS			B

Notes

Intersection	
Intersection Delay, s/veh	51.5

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Vol, veh/h	33	16	8	35	3	406	277	251	19	2	285	37
Conflicting Peds, #/hr	30	0	0	0	0	30	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	39	19	9	41	4	478	326	295	22	2	335	44

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1192	1402	189	1231	1391	219	409	0	0	348	0	0
Stage 1	988	988	-	392	392	-	-	-	-	-	-	-
Stage 2	204	414	-	839	999	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	143	139	821	134	141	785	1146	-	-	1208	-	-
Stage 1	265	323	-	604	605	-	-	-	-	-	-	-
Stage 2	779	591	-	326	319	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	40	94	800	86	96	765	1146	-	-	1208	-	-
Mov Capacity-2 Maneuver	40	94	-	86	96	-	-	-	-	-	-	-
Stage 1	185	225	-	421	589	-	-	-	-	-	-	-
Stage 2	290	575	-	211	223	-	-	-	-	-	-	-

Approach	NB	SB	NE	SW
HCM Control Delay, s	295	115	5	0

Minor Lane / Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	1146	-	-	57	458	1208	-	-
HCM Lane V/C Ratio	0.284	-	-	1.176	1.141	0.002	-	-
HCM Control Delay (s)	9.385	-	-	295	115.4	7.986	-	-
HCM Lane LOS	A			F	F	A		
HCM 95th %tile Q(veh)	1.179	-	-	5.683	18.584	0.006	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	586	13	0	911	11	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	637	14	0	990	12	0	0	0	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1002	0	0	651	0	0	1139	1646	326	1314	1647	501
Stage 1	-	-	-	-	-	-	644	644	-	996	996	-
Stage 2	-	-	-	-	-	-	495	1002	-	318	651	-
Follow-up Headway	2	-	-	2	-	-	4	4	3	4	4	3
Pot Capacity-1 Maneuver	687	-	-	931	-	-	156	98	670	116	98	515
Stage 1	-	-	-	-	-	-	428	466	-	262	320	-
Stage 2	-	-	-	-	-	-	525	318	-	668	463	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	687	-	-	931	-	-	156	98	670	116	98	515
Mov Capacity-2 Maneuver	-	-	-	-	-	-	156	98	-	116	98	-
Stage 1	-	-	-	-	-	-	428	466	-	262	320	-
Stage 2	-	-	-	-	-	-	525	318	-	668	463	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	0

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	0	687	-	-	931	-	-	0
HCM Lane V/C Ratio	Error	-	-	-	-	-	-	Error
HCM Control Delay (s)	0	0	-	-	0	-	-	0
HCM Lane LOS	A	A			A			A
HCM 95th %tile Q(veh)	Error	0	-	-	0	-	-	Error

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	5.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	31	190	162	388	262	29
Conflicting Peds, #/hr	19	7	18	0	0	18
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	221	188	451	305	34

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1169	359	357	0	-	0
Stage 1	341	-	-	-	-	-
Stage 2	828	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	213	685	1202	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	163	664	1184	-	-	-
Mov Capacity-2 Maneuver	163	-	-	-	-	-
Stage 1	709	-	-	-	-	-
Stage 2	333	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22	2	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1184	-	464	-	-
HCM Lane V/C Ratio	0.159	-	0.554	-	-
HCM Control Delay (s)	8.615	0	22	-	-
HCM Lane LOS	A	A	C		
HCM 95th %tile Q(veh)	0.565	-	3.302	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	86	99	53	22	158	95	49	218	30	53	223	98
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.91	0.93		0.94	0.93		0.88	0.93		0.88
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Cap, veh/h	455	704	543	509	704	565	468	1500	562	493	1500	562
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	1044	1863	1437	1120	1863	1495	939	3725	1397	1005	3725	1397
Grp Volume(v), veh/h	100	115	62	26	184	110	57	253	35	62	259	114
Grp Sat Flow(s),veh/h/ln	1044	1863	1437	1120	1863	1495	939	1863	1397	1005	1863	1397
Q Serve(g_s), s	4.0	2.2	1.5	0.9	3.7	2.7	2.3	2.4	0.8	2.3	2.4	2.9
Cycle Q Clear(g_c), s	7.7	2.2	1.5	3.1	3.7	2.7	4.7	2.4	0.8	4.7	2.4	2.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	455	704	543	509	704	565	468	1500	562	493	1500	562
V/C Ratio(X)	0.22	0.16	0.11	0.05	0.26	0.19	0.12	0.17	0.06	0.13	0.17	0.20
Avail Cap(c_a), veh/h	558	886	684	619	886	712	468	1500	562	493	1500	562
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.4	11.3	11.1	12.3	11.7	11.4	12.0	10.5	10.0	12.0	10.5	10.6
Incr Delay (d2), s/veh	0.2	0.1	0.1	0.0	0.2	0.2	0.5	0.2	0.2	0.5	0.3	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.9	0.9	0.5	0.2	1.4	0.8	0.5	0.9	0.3	0.6	1.0	1.0
Lane Grp Delay (d), s/veh	14.6	11.4	11.1	12.3	11.9	11.6	12.5	10.7	10.2	12.5	10.7	11.4
Lane Grp LOS	B	B	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		277			320			345			435	
Approach Delay, s/veh		12.5			11.8			11.0			11.2	
Approach LOS		B			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		26.6			26.6			28.0			28.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		26.0			26.0			22.0			22.0	
Max Q Clear Time (g_c+I1), s		9.7			5.7			6.7			6.7	
Green Ext Time (p_c), s		2.4			2.5			3.7			3.7	
Intersection Summary												
HCM 2010 Ctrl Delay			11.5									
HCM 2010 LOS			B									
Notes												

Intersection	
Intersection Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	15	0	334	298	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	16	0	363	324	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	687	324	324	0	-	0
Stage 1	324	-	-	-	-	-
Stage 2	363	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	413	717	1236	-	-	-
Stage 1	733	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	413	717	1236	-	-	-
Mov Capacity-2 Maneuver	413	-	-	-	-	-
Stage 1	733	-	-	-	-	-
Stage 2	704	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1236	-	717	-	-
HCM Lane V/C Ratio	-	-	0.023	-	-
HCM Control Delay (s)	0	-	10.1	-	-
HCM Lane LOS	A		B		
HCM 95th %tile Q(veh)	0	-	0.07	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	5.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	101	76	54	249	213	49
Conflicting Peds, #/hr	44	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	35	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	113	85	61	280	239	55

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	712	311	338	0	-	0
Stage 1	311	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	399	729	1221	-	-	-
Stage 1	743	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	352	702	1221	-	-	-
Mov Capacity-2 Maneuver	352	-	-	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	619	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19	1	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1221	-	448	-	-
HCM Lane V/C Ratio	0.05	-	0.444	-	-
HCM Control Delay (s)	8.103	-	19.3	-	-
HCM Lane LOS	A		C		
HCM 95th %tile Q(veh)	0.157	-	2.235	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	185	22	31	31	9	263
Conflicting Peds, #/hr	76	27	7	0	0	7
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	60	-	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	215	26	36	36	10	306

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	43	0	0	0	545	119
Stage 1	-	-	-	-	115	-
Stage 2	-	-	-	-	430	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1566	-	-	-	446	933
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	-	-
Time blocked-Platoon, %		-		-		
Mov Capacity-1 Maneuver	1467	-	-	-	# 0	869
Mov Capacity-2 Maneuver	-	-	-	-	# 0	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	# 0	-

Approach	EB	NB	SB
HCM Control Delay, s	7	0	Error

Minor Lane / Major Mvmt	NBL	NBT	EBL	EBR	SBLn1	SBLn2
Capacity (veh/h)	-	-	1467	-	0	869
HCM Lane V/C Ratio	-	-	0.147	-	Error	0.352
HCM Control Delay (s)	-	-	7.875	-	Error	11.4
HCM Lane LOS			A		Error	B
HCM 95th %tile Q(veh)	-	-	0.514	-	Error	1.593

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	32	4	2	27	18	26	6	141	8	11	248	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	39	5	2	33	22	31	7	170	10	13	299	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	549	527	307	526	530	175	314	0	0	180	0	0
Stage 1	333	333	-	189	189	-	-	-	-	-	-	-
Stage 2	216	194	-	337	341	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	446	456	733	462	455	868	1246	-	-	1396	-	-
Stage 1	681	644	-	813	744	-	-	-	-	-	-	-
Stage 2	786	740	-	677	639	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	409	448	733	451	447	868	1246	-	-	1396	-	-
Mov Capacity-2 Maneuver	409	448	-	451	447	-	-	-	-	-	-	-
Stage 1	677	637	-	808	740	-	-	-	-	-	-	-
Stage 2	731	736	-	662	632	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14	13	0	0

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1246	-	-	423	546	1396	-	-
HCM Lane V/C Ratio	0.006	-	-	0.108	0.157	0.009	-	-
HCM Control Delay (s)	7.906	0	-	14.5	12.8	7.604	0	-
HCM Lane LOS	A	A		B	B	A	A	
HCM 95th %tile Q(veh)	0.018	-	-	0.361	0.552	0.029	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	61.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	55	60	445	50	175	10	265	145	35	5	265	80
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	60	66	489	55	192	11	291	159	38	5	291	88
Number of Lanes	1	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	3
HCM Control Delay	60.2	31.8	76.7	64.4
HCM LOS	F	D	F	F

Lane	NBLn1	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	60%	100%	0%	0%	21%	1%
Vol Thru, %	33%	0%	100%	0%	74%	76%
Vol Right, %	8%	0%	0%	100%	4%	23%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	445	55	60	445	235	350
LT Vol	145	0	60	0	175	265
Through Vol	35	0	0	445	10	80
RT Vol	265	55	0	0	50	5
Lane Flow Rate	489	60	66	489	258	385
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	1	0.159	0.164	1	0.695	0.955
Departure Headway (Hd)	9.312	9.467	8.967	8.266	9.693	8.936
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	396	379	400	440	374	408
Service Time	7.012	7.216	6.716	6.015	7.418	6.663
HCM Lane V/C Ratio	1.235	0.158	0.165	1.111	0.69	0.944
HCM Control Delay	76.7	14	13.5	72.2	31.8	64.4
HCM Lane LOS	F	B	B	F	D	F
HCM 95th-tile Q	12	0.6	0.6	12.7	5	10.9

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	350	1060	30	195	575	120	40	770	375	240	315	235
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.97	1.00		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Cap, veh/h	275	1443	40	161	1196	249	312	730	600	120	730	600
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	677	3607	101	442	2991	624	783	1863	1532	416	1863	1532
Grp Volume(v), veh/h	402	629	623	224	411	388	46	885	431	276	362	270
Grp Sat Flow(s),veh/h/ln	677	1863	1845	442	1863	1752	783	1863	1532	416	1863	1532
Q Serve(g_s), s	13.8	18.3	18.4	5.6	10.2	10.2	2.8	23.5	14.3	0.0	8.8	7.8
Cycle Q Clear(g_c), s	24.0	18.3	18.4	24.0	10.2	10.2	11.6	23.5	14.3	23.5	8.8	7.8
Prop In Lane	1.00		0.05	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	275	745	738	161	745	701	312	730	600	120	730	600
V/C Ratio(X)	1.46	0.84	0.84	1.39	0.55	0.55	0.15	1.21	0.72	2.30	0.50	0.45
Avail Cap(c_a), veh/h	275	745	738	161	745	701	312	730	600	120	730	600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.1	16.3	16.3	29.3	13.9	13.9	18.2	18.3	15.4	30.0	13.8	13.5
Incr Delay (d2), s/veh	225.7	11.3	11.4	207.7	2.9	3.1	0.1	108.3	3.6	610.4	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	21.1	9.3	9.3	11.6	4.5	4.3	0.5	31.9	5.5	22.1	3.8	2.7
Lane Grp Delay (d), s/veh	251.9	27.6	27.7	237.0	16.8	17.0	18.3	126.6	19.0	640.4	14.0	13.7
Lane Grp LOS	F	C	C	F	B	B	B	F	B	F	B	B
Approach Vol, veh/h		1654			1023			1362			908	
Approach Delay, s/veh		82.1			65.1			88.9			204.3	
Approach LOS		F			E			F			F	

Timer												
Assigned Phs		6			2			8			4	
Phs Duration (G+Y+Rc), s		30.0			30.0			30.0			30.0	
Change Period (Y+Rc), s		6.0			6.0			6.5			6.5	
Max Green Setting (Gmax), s		24.0			24.0			23.5			23.5	
Max Q Clear Time (g_c+I1), s		26.0			26.0			25.5			25.5	
Green Ext Time (p_c), s		0.0			0.0			0.0			0.0	

Intersection Summary			
HCM 2010 Ctrl Delay			102.9
HCM 2010 LOS			F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	135	85	115	20	115	80	210	390	40	110	215	175
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.77		0.62	0.77		0.62	0.90		0.75	0.92		0.75
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	329	590	311	342	590	311	404	900	574	304	900	574
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	840	1863	981	829	1863	981	752	1863	1189	728	1863	1189
Grp Volume(v), veh/h	199	125	169	29	169	118	309	574	59	162	316	257
Grp Sat Flow(s),veh/h/ln	840	1863	981	829	1863	981	752	1863	1189	728	1863	1189
Q Serve(g_s), s	14.0	2.9	8.5	1.6	4.1	5.6	22.7	13.8	1.6	12.8	6.3	8.6
Cycle Q Clear(g_c), s	18.1	2.9	8.5	4.5	4.1	5.6	29.0	13.8	1.6	26.6	6.3	8.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	329	590	311	342	590	311	404	900	574	304	900	574
V/C Ratio(X)	0.61	0.21	0.54	0.08	0.29	0.38	0.76	0.64	0.10	0.53	0.35	0.45
Avail Cap(c_a), veh/h	329	590	311	342	590	311	404	900	574	304	900	574
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.2	15.0	16.9	16.7	15.4	15.9	19.6	11.6	8.4	21.5	9.6	10.2
Incr Delay (d2), s/veh	3.1	0.2	2.0	0.1	0.3	0.8	12.9	3.4	0.4	6.5	1.1	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.1	1.3	2.1	0.3	1.8	1.3	5.7	5.8	0.4	2.6	2.6	2.4
Lane Grp Delay (d), s/veh	25.4	15.2	18.9	16.8	15.7	16.7	32.5	15.0	8.8	28.0	10.7	12.7
Lane Grp LOS	C	B	B	B	B	B	C	B	A	C	B	B
Approach Vol, veh/h		493			316			942			735	
Approach Delay, s/veh		20.6			16.2			20.4			15.2	
Approach LOS		C			B			C			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		25.0			25.0			35.0			35.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		19.0			19.0			29.0			29.0	
Max Q Clear Time (g_c+I1), s		20.1			7.6			31.0			28.6	
Green Ext Time (p_c), s		0.0			3.4			0.0			0.3	
Intersection Summary												
HCM 2010 Ctrl Delay			18.3									
HCM 2010 LOS			B									
Notes												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	215	40	15	110	130	35	50	20	275	60	100
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.80		0.67	0.82		0.67	0.66		0.59	0.61		0.61
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	190.0	186.3	190.0	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	0	1	0	1	1	0
Cap, veh/h	375	648	371	327	648	371	208	264	92	383	199	331
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.45	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	860	1863	1065	869	1863	1065	283	584	205	791	440	734
Grp Volume(v), veh/h	100	269	50	19	138	162	131	0	0	344	0	200
Grp Sat Flow(s),veh/h/ln	860	1863	1065	869	1863	1065	1072	0	0	791	0	1174
Q Serve(g_s), s	5.5	6.6	1.9	1.0	3.1	7.0	0.4	0.0	0.0	19.9	0.0	6.7
Cycle Q Clear(g_c), s	8.7	6.6	1.9	7.6	3.1	7.0	7.1	0.0	0.0	27.0	0.0	6.7
Prop In Lane	1.00		1.00	1.00		1.00	0.34		0.19	1.00		0.63
Lane Grp Cap(c), veh/h	375	648	371	327	648	371	564	0	0	383	0	530
V/C Ratio(X)	0.27	0.41	0.13	0.06	0.21	0.44	0.23	0.00	0.00	0.90	0.00	0.38
Avail Cap(c_a), veh/h	377	654	374	330	654	374	564	0	0	383	0	530
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.8	14.9	13.3	17.8	13.7	15.0	9.9	0.0	0.0	22.3	0.0	10.9
Incr Delay (d2), s/veh	0.4	0.4	0.2	0.1	0.2	0.8	1.0	0.0	0.0	26.2	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.2	2.8	0.5	0.2	1.3	1.7	1.2	0.0	0.0	7.8	0.0	2.0
Lane Grp Delay (d), s/veh	17.2	15.3	13.5	17.8	13.9	15.8	10.9	0.0	0.0	48.5	0.0	12.9
Lane Grp LOS	B	B	B	B	B	B	B			D		B
Approach Vol, veh/h		419			319			131			544	
Approach Delay, s/veh		15.5			15.1			10.9			35.4	
Approach LOS		B			B			B			D	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		26.8			26.8			33.0			33.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		21.0			21.0			27.0			27.0	
Max Q Clear Time (g_c+I1), s		10.7			9.6			9.1			29.0	
Green Ext Time (p_c), s		3.0			3.2			3.5			0.0	
Intersection Summary												
HCM 2010 Ctrl Delay			22.7									
HCM 2010 LOS			C									
Notes												

Intersection	
Intersection Delay, s/veh	50.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	325	1160	945	165	105	190
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	0	30	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	406	1450	1181	206	131	238

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1181	0	-	0	2719	591
Stage 1	-	-	-	-	1181	-
Stage 2	-	-	-	-	1538	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	587	-	-	-	# 17	450
Stage 1	-	-	-	-	254	-
Stage 2	-	-	-	-	163	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	587	-	-	-	# 5	450
Mov Capacity-2 Maneuver	-	-	-	-	# 39	-
Stage 1	-	-	-	-	254	-
Stage 2	-	-	-	-	# 50	-

Approach	EB	WB	SB
HCM Control Delay, s	5	0	$ 470

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	587	-	-	-	39	450
HCM Lane V/C Ratio	0.692	-	-	-	3.365	0.528
HCM Control Delay (s)	23.765	-	-	-	$ 1279.9	21.6
HCM Lane LOS	C				F	C
HCM 95th %tile Q(veh)	5.435	-	-	-	14.846	3.012

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	135	220	415	200	275	115	250	250	15	240	580	135
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		1.00	0.99		0.97	0.98		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	1	1	1	1	2	0
Cap, veh/h	384	714	589	346	714	605	306	776	643	468	1212	282
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	973	1863	1536	762	1863	1577	707	1863	1543	1082	2908	677
Grp Volume(v), veh/h	141	229	432	208	286	120	260	260	16	250	386	359
Grp Sat Flow(s),veh/h/ln	973	1863	1536	762	1863	1577	707	1863	1543	1082	1863	1723
Q Serve(g_s), s	7.4	5.2	14.5	15.8	6.7	3.0	15.8	5.7	0.4	12.2	9.2	9.2
Cycle Q Clear(g_c), s	14.1	5.2	14.5	21.0	6.7	3.0	25.0	5.7	0.4	17.9	9.2	9.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.39
Lane Grp Cap(c), veh/h	384	714	589	346	714	605	306	776	643	468	776	718
V/C Ratio(X)	0.37	0.32	0.73	0.60	0.40	0.20	0.85	0.33	0.02	0.53	0.50	0.50
Avail Cap(c_a), veh/h	384	714	589	346	714	605	306	776	643	468	776	718
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.6	13.0	15.9	20.4	13.5	12.3	24.3	11.9	10.3	17.9	12.9	12.9
Incr Delay (d2), s/veh	0.6	0.3	4.7	2.9	0.4	0.2	24.3	1.2	0.1	4.3	2.3	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	1.6	2.0	5.3	2.9	2.7	1.0	5.8	2.6	0.1	3.4	3.9	3.7
Lane Grp Delay (d), s/veh	19.2	13.3	20.6	23.3	13.8	12.5	48.7	13.0	10.4	22.2	15.2	15.4
Lane Grp LOS	B	B	C	C	B	B	D	B	B	C	B	B
Approach Vol, veh/h		802			614			536			995	
Approach Delay, s/veh		18.3			16.8			30.2			17.0	
Approach LOS		B			B			C			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		29.0			29.0			31.0			31.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		23.0			23.0			25.0			25.0	
Max Q Clear Time (g_c+I1), s		16.5			23.0			27.0			19.9	
Green Ext Time (p_c), s		3.3			0.0			0.0			3.3	

Intersection Summary		
HCM 2010 Ctrl Delay		19.7
HCM 2010 LOS		B

Notes

Intersection	
Intersection Delay, s/veh	38.1

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Vol, veh/h	5	10	20	10	5	315	905	665	130	10	350	30
Conflicting Peds, #/hr	87	0	0	0	0	87	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	13	26	13	6	404	1160	853	167	13	449	38

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	3683	3943	597	3421	4008	331	574	0	0	1106	0	0
Stage 1	3343	3343	-	581	581	-	-	-	-	-	-	-
Stage 2	340	600	-	2840	3427	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	# 2	# 3	446	# 3	# 3	665	# 995	-	-	627	-	-
Stage 1	8	20	-	467	498	-	-	-	-	-	-	-
Stage 2	648	488	-	17	18	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	-	# 3	414	-	# 3	617	# 995	-	-	627	-	-
Mov Capacity-2 Maneuver	-	# 3	-	-	# 3	-	-	-	-	-	-	-
Stage 1	8	19	-	467	452	-	-	-	-	-	-	-
Stage 2	216	443	-	# 5	17	-	-	-	-	-	-	-

Approach	NB	SB	NE	SW
HCM Control Delay, s	Error	Error	55	0

Minor Lane / Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	# 995	-	-	Error	Error	627	-	-
HCM Lane V/C Ratio	1.166	-	-	Error	Error	0.02	-	-
HCM Control Delay (s)	103.39	-	-	Error	Error	10.861	-	-
HCM Lane LOS	F			Error	Error	B		
HCM 95th %tile Q(veh)	33.605	-	-	Error	Error	0.063	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	57

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	55	335	125	325	600	95
Conflicting Peds, #/hr	23	0	33	0	0	33
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	360	134	349	645	102

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1337	752	770	0	-	0
Stage 1	719	-	-	-	-	-
Stage 2	618	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	169	410	844	-	-	-
Stage 1	483	-	-	-	-	-
Stage 2	538	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	130	391	821	-	-	-
Mov Capacity-2 Maneuver	130	-	-	-	-	-
Stage 1	474	-	-	-	-	-
Stage 2	421	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	221		3		0	

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	821	-	305	-	-
HCM Lane V/C Ratio	0.164	-	1.375	-	-
HCM Control Delay (s)	10.241	0	221.2	-	-
HCM Lane LOS	B	A	F		
HCM 95th %tile Q(veh)	0.583	-	21.581	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	240	170	55	15	95	95	20	180	20	140	345	145
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.86	0.92		0.92	0.95		0.86	0.91		0.86
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Cap, veh/h	529	798	584	462	798	622	319	1355	497	443	1355	497
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1050	1863	1363	977	1863	1451	722	3725	1366	1001	3725	1366
Grp Volume(v), veh/h	333	236	76	21	132	132	28	250	28	194	479	201
Grp Sat Flow(s),veh/h/ln	1050	1863	1363	977	1863	1451	722	1863	1366	1001	1863	1366
Q Serve(g_s), s	16.5	4.8	1.9	0.8	2.5	3.3	1.7	2.6	0.8	9.5	5.4	6.3
Cycle Q Clear(g_c), s	19.0	4.8	1.9	5.6	2.5	3.3	7.1	2.6	0.8	12.1	5.4	6.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	529	798	584	462	798	622	319	1355	497	443	1355	497
V/C Ratio(X)	0.63	0.30	0.13	0.05	0.17	0.21	0.09	0.18	0.06	0.44	0.35	0.40
Avail Cap(c_a), veh/h	570	871	638	500	871	679	319	1355	497	443	1355	497
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.0	10.8	10.0	12.6	10.1	10.4	16.0	12.5	11.9	16.7	13.4	13.7
Incr Delay (d2), s/veh	2.0	0.2	0.1	0.0	0.1	0.2	0.5	0.3	0.2	3.1	0.7	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.9	1.8	0.5	0.2	0.9	1.0	0.3	1.1	0.2	2.4	2.3	2.1
Lane Grp Delay (d), s/veh	18.0	11.0	10.1	12.7	10.2	10.5	16.6	12.8	12.2	19.8	14.1	16.1
Lane Grp LOS	B	B	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		645			285			306			874	
Approach Delay, s/veh		14.5			10.6			13.1			15.9	
Approach LOS		B			B			B			B	

Timer				
Assigned Phs	4	8	2	6
Phs Duration (G+Y+Rc), s	30.7	30.7	27.0	27.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	27.0	27.0	21.0	21.0
Max Q Clear Time (g_c+I1), s	21.0	7.6	9.1	14.1
Green Ext Time (p_c), s	2.2	3.9	4.9	3.5

Intersection Summary	
HCM 2010 Ctrl Delay	14.3
HCM 2010 LOS	B

Notes

Intersection						
Intersection Delay, s/veh	0.8					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	20	40	220	415	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	43	239	451	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	777	451	451	0	-	0
Stage 1	451	-	-	-	-	-
Stage 2	326	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	365	608	1109	-	-	-
Stage 1	642	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	349	608	1109	-	-	-
Mov Capacity-2 Maneuver	349	-	-	-	-	-
Stage 1	642	-	-	-	-	-
Stage 2	698	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11	1	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1109	-	608	-	-
HCM Lane V/C Ratio	0.039	-	0.036	-	-
HCM Control Delay (s)	8.379	0	11.1	-	-
HCM Lane LOS	A	A	B		
HCM 95th %tile Q(veh)	0.122	-	0.111	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	8.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	45	80	165	260	485	250
Conflicting Peds, #/hr	60	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	35	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	93	192	302	564	291

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1455	769	915	0	-	0
Stage 1	769	-	-	-	-	-
Stage 2	686	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	143	401	745	-	-	-
Stage 1	457	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	96	381	745	-	-	-
Mov Capacity-2 Maneuver	96	-	-	-	-	-
Stage 1	434	-	-	-	-	-
Stage 2	353	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	73	4	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	745	-	184	-	-
HCM Lane V/C Ratio	0.258	-	0.79	-	-
HCM Control Delay (s)	11.5	-	73.2	-	-
HCM Lane LOS	B		F		
HCM 95th %tile Q(veh)	1.025	-	5.352	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	360	65	25	20	10	175
Conflicting Peds, #/hr	105	67	27	0	0	27
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	60	-	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	468	84	32	26	13	227

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	53	0	0	0	1053	158
Stage 1	-	-	-	-	118	-
Stage 2	-	-	-	-	935	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1553	-	-	-	226	887
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	-	-
Time blocked-Platoon, %		-		-		
Mov Capacity-1 Maneuver	1417	-	-	-	# 0	791
Mov Capacity-2 Maneuver	-	-	-	-	# 0	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	# 0	-

Approach	EB		NB		SB	
HCM Control Delay, s	7		0		Error	

Minor Lane / Major Mvmt	NBL	NBT	EBL	EBR	SBLn1	SBLn2
Capacity (veh/h)	-	-	1417	-	0	791
HCM Lane V/C Ratio	-	-	0.33	-	Error	0.287
HCM Control Delay (s)	-	-	8.786	-	Error	11.4
HCM Lane LOS			A		Error	B
HCM 95th %tile Q(veh)	-	-	1.459	-	Error	1.189

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	45	20	10	5	5	5	20	195	70	30	175	35
Conflicting Peds, #/hr	5	0	155	155	0	5	5	0	57	57	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	60	27	13	7	7	7	27	260	93	40	233	47

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1014	1054	469	1027	1030	519	435	0	0	508	0	0
Stage 1	492	492	-	515	515	-	-	-	-	-	-	-
Stage 2	522	562	-	512	515	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	217	226	594	213	233	557	1125	-	-	1057	-	-
Stage 1	558	548	-	543	535	-	-	-	-	-	-	-
Stage 2	538	510	-	545	535	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	162	158	493	141	163	462	1072	-	-	1007	-	-
Mov Capacity-2 Maneuver	162	158	-	141	163	-	-	-	-	-	-	-
Stage 1	470	455	-	458	451	-	-	-	-	-	-	-
Stage 2	482	430	-	453	444	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	49	26	1	1

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1072	-	-	177	195	1007	-	-
HCM Lane V/C Ratio	0.025	-	-	0.565	0.103	0.04	-	-
HCM Control Delay (s)	8.444	0	-	48.9	25.6	8.723	0	-
HCM Lane LOS	A	A		E	D	A	A	
HCM 95th %tile Q(veh)	0.076	-	-	2.976	0.338	0.124	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	40.2
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	70	235	240	15	150	10	415	215	45	10	130	85
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	77	258	264	16	165	11	456	236	49	11	143	93
Number of Lanes	1	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	3
HCM Control Delay	17.9	18.1	70.8	19.8
HCM LOS	C	C	F	C

Lane	NBLn1	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	61%	100%	0%	0%	9%	4%
Vol Thru, %	32%	0%	100%	0%	86%	58%
Vol Right, %	7%	0%	0%	100%	6%	38%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	675	70	235	240	175	225
LT Vol	215	0	235	0	150	130
Through Vol	45	0	0	240	10	85
RT Vol	415	70	0	0	15	10
Lane Flow Rate	742	77	258	264	192	247
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	1	0.177	0.558	0.519	0.452	0.544
Departure Headway (Hd)	8.031	8.277	7.777	7.078	8.461	7.919
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	460	432	462	506	425	452
Service Time	5.731	6.048	5.548	4.848	6.241	5.703
HCM Lane V/C Ratio	1.613	0.178	0.558	0.522	0.452	0.546
HCM Control Delay	70.8	12.8	20	17.3	18.1	19.8
HCM Lane LOS	F	B	C	C	C	C
HCM 95th-tile Q	13	0.6	3.3	2.9	2.3	3.2

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	245	570	50	290	730	215	45	360	130	140	710	480
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	0.99		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Cap, veh/h	192	1352	118	308	1107	326	120	730	600	302	730	600
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	517	3379	294	735	2767	814	396	1863	1532	834	1863	1532
Grp Volume(v), veh/h	282	361	351	333	565	521	52	414	149	161	816	552
Grp Sat Flow(s),veh/h/ln	517	1863	1810	735	1863	1718	396	1863	1532	834	1863	1532
Q Serve(g_s), s	8.3	8.6	8.7	15.3	15.7	15.7	0.0	10.4	3.9	11.2	23.5	20.6
Cycle Q Clear(g_c), s	24.0	8.6	8.7	24.0	15.7	15.7	23.5	10.4	3.9	21.7	23.5	20.6
Prop In Lane	1.00		0.16	1.00		0.47	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	192	745	724	308	745	687	120	730	600	302	730	600
V/C Ratio(X)	1.47	0.48	0.49	1.08	0.76	0.76	0.43	0.57	0.25	0.53	1.12	0.92
Avail Cap(c_a), veh/h	192	745	724	308	745	687	120	730	600	302	730	600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.4	13.4	13.4	25.3	15.5	15.5	30.0	14.3	12.3	22.7	18.3	17.4
Incr Delay (d2), s/veh	238.1	2.2	2.3	75.0	7.1	7.7	0.9	0.7	0.1	1.0	70.8	19.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	15.3	3.8	3.7	10.7	7.4	7.0	0.8	4.5	1.4	2.3	24.3	10.2
Lane Grp Delay (d), s/veh	266.6	15.6	15.7	100.3	22.6	23.2	30.9	14.9	12.4	23.7	89.1	36.5
Lane Grp LOS	F	B	B	F	C	C	C	B	B	C	F	D
Approach Vol, veh/h		994			1419			615			1529	
Approach Delay, s/veh		86.9			41.0			15.7			63.2	
Approach LOS		F			D			B			E	

Timer												
Assigned Phs		6			2			8			4	
Phs Duration (G+Y+Rc), s		30.0			30.0			30.0			30.0	
Change Period (Y+Rc), s		6.0			6.0			6.5			6.5	
Max Green Setting (Gmax), s		24.0			24.0			23.5			23.5	
Max Q Clear Time (g_c+I1), s		26.0			26.0			25.5			25.5	
Green Ext Time (p_c), s		0.0			0.0			0.0			0.0	

Intersection Summary		
HCM 2010 Ctrl Delay		55.1
HCM 2010 LOS		E

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	230	75	135	20	70	85	85	265	10	55	330	135
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.74		0.62	0.77		0.62	0.92		0.75	0.88		0.75
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	355	590	311	344	590	311	330	900	574	417	900	574
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	850	1863	981	820	1863	981	695	1863	1189	857	1863	1189
Grp Volume(v), veh/h	338	110	199	29	103	125	125	390	15	81	485	199
Grp Sat Flow(s),veh/h/ln	850	1863	981	820	1863	981	695	1863	1189	857	1863	1189
Q Serve(g_s), s	16.6	2.6	10.4	1.6	2.4	6.0	9.2	8.2	0.4	4.1	10.9	6.2
Cycle Q Clear(g_c), s	19.0	2.6	10.4	4.2	2.4	6.0	20.1	8.2	0.4	12.3	10.9	6.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	355	590	311	344	590	311	330	900	574	417	900	574
V/C Ratio(X)	0.95	0.19	0.64	0.08	0.17	0.40	0.38	0.43	0.03	0.19	0.54	0.35
Avail Cap(c_a), veh/h	355	590	311	344	590	311	330	900	574	417	900	574
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.2	14.9	17.6	16.4	14.8	16.1	17.8	10.1	8.1	14.1	10.8	9.6
Incr Delay (d2), s/veh	35.3	0.2	4.4	0.1	0.1	0.8	3.3	1.5	0.1	1.0	2.3	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	8.4	1.1	2.7	0.3	1.0	1.4	1.7	3.3	0.1	0.9	4.5	1.7
Lane Grp Delay (d), s/veh	59.5	15.0	22.0	16.5	15.0	16.9	21.1	11.6	8.2	15.2	13.1	11.3
Lane Grp LOS	E	B	C	B	B	B	C	B	A	B	B	B
Approach Vol, veh/h		647			257			530			765	
Approach Delay, s/veh		40.4			16.1			13.8			12.9	
Approach LOS		D			B			B			B	
Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		25.0			25.0			35.0			35.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		19.0			19.0			29.0			29.0	
Max Q Clear Time (g_c+I1), s		21.0			8.0			22.1			14.3	
Green Ext Time (p_c), s		0.0			3.5			3.8			6.2	
Intersection Summary												
HCM 2010 Ctrl Delay			21.6									
HCM 2010 LOS			C									
Notes												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	140	150	30	30	190	245	50	45	25	210	45	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.87		0.67	0.79		0.67	0.70		0.59	0.65		0.61
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	190.0	186.3	190.0	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	0	1	0	1	1	0
Cap, veh/h	310	652	374	371	652	374	212	172	78	333	112	374
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.45	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	745	1863	1068	905	1863	1068	282	382	174	843	248	832
Grp Volume(v), veh/h	175	188	38	38	238	306	149	0	0	262	0	244
Grp Sat Flow(s),veh/h/ln	745	1863	1068	905	1863	1068	838	0	0	843	0	1080
Q Serve(g_s), s	13.7	4.4	1.4	1.9	5.7	15.7	2.2	0.0	0.0	15.1	0.0	9.6
Cycle Q Clear(g_c), s	19.4	4.4	1.4	6.3	5.7	15.7	11.9	0.0	0.0	27.0	0.0	9.6
Prop In Lane	1.00		1.00	1.00		1.00	0.42		0.21	1.00		0.77
Lane Grp Cap(c), veh/h	310	652	374	371	652	374	462	0	0	333	0	486
V/C Ratio(X)	0.56	0.29	0.10	0.10	0.37	0.82	0.32	0.00	0.00	0.79	0.00	0.50
Avail Cap(c_a), veh/h	310	652	374	371	652	374	462	0	0	333	0	486
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.8	14.1	13.1	16.4	14.5	17.8	11.4	0.0	0.0	23.9	0.0	11.7
Incr Delay (d2), s/veh	2.4	0.2	0.1	0.1	0.3	13.4	1.8	0.0	0.0	17.0	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.6	1.9	0.4	0.4	2.4	5.1	1.4	0.0	0.0	5.4	0.0	2.7
Lane Grp Delay (d), s/veh	24.1	14.3	13.3	16.5	14.9	31.2	13.3	0.0	0.0	40.9	0.0	15.4
Lane Grp LOS	C	B	B	B	B	C	B			D		B
Approach Vol, veh/h		401			582			149			506	
Approach Delay, s/veh		18.5			23.5			13.3			28.6	
Approach LOS		B			C			B			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		27.0			27.0			33.0			33.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		21.0			21.0			27.0			27.0	
Max Q Clear Time (g_c+I1), s		21.4			17.7			13.9			29.0	
Green Ext Time (p_c), s		0.0			1.7			3.4			0.0	

Intersection Summary			
HCM 2010 Ctrl Delay			22.9
HCM 2010 LOS			C

Notes

Intersection	
Intersection Delay, s/veh	18.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	90	715	1420	90	90	230
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	0	30	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	112	894	1775	112	112	288

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1775	0	-	0	2447	888
Stage 1	-	-	-	-	1775	-
Stage 2	-	-	-	-	672	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	346	-	-	-	# 26	# 287
Stage 1	-	-	-	-	121	-
Stage 2	-	-	-	-	469	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	346	-	-	-	# 18	# 287
Mov Capacity-2 Maneuver	-	-	-	-	# 86	-
Stage 1	-	-	-	-	121	-
Stage 2	-	-	-	-	316	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	148

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	346	-	-	-	86	287
HCM Lane V/C Ratio	0.325	-	-	-	1.308	1.002
HCM Control Delay (s)	20.337	-	-	-	287.8	93.1
HCM Lane LOS	C				F	F
HCM 95th %tile Q(veh)	1.38	-	-	-	8.359	10.415

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	170	360	275	30	475	110	35	520	540	105	285	190
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		1.00	0.99		0.97	1.00		0.97
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	1	1	1	1	1	2	0
Cap, veh/h	249	714	589	294	714	605	401	776	643	210	873	563
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	807	1863	1536	763	1863	1577	889	1863	1543	507	2095	1351
Grp Volume(v), veh/h	177	375	286	31	495	115	36	542	562	109	263	232
Grp Sat Flow(s),veh/h/ln	807	1863	1536	763	1863	1577	889	1863	1543	507	1863	1583
Q Serve(g_s), s	9.6	9.3	8.5	2.0	13.4	2.9	1.7	14.4	20.0	10.6	5.8	6.0
Cycle Q Clear(g_c), s	23.0	9.3	8.5	11.3	13.4	2.9	7.7	14.4	20.0	25.0	5.8	6.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.85
Lane Grp Cap(c), veh/h	249	714	589	294	714	605	401	776	643	210	776	660
V/C Ratio(X)	0.71	0.53	0.49	0.11	0.69	0.19	0.09	0.70	0.87	0.52	0.34	0.35
Avail Cap(c_a), veh/h	249	714	589	294	714	605	401	776	643	210	776	660
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.5	14.3	14.0	18.6	15.5	12.3	14.6	14.4	16.1	25.6	11.9	12.0
Incr Delay (d2), s/veh	9.0	0.7	0.6	0.2	2.9	0.2	0.4	5.2	15.3	8.9	1.2	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	3.1	3.8	2.8	0.3	5.8	1.0	0.4	7.0	9.6	2.0	2.4	2.2
Lane Grp Delay (d), s/veh	35.5	15.0	14.6	18.8	18.4	12.5	15.0	19.6	31.3	34.5	13.1	13.4
Lane Grp LOS	D	B	B	B	B	B	B	B	C	C	B	B
Approach Vol, veh/h		838			641			1140			604	
Approach Delay, s/veh		19.2			17.4			25.2			17.1	
Approach LOS		B			B			C			B	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		29.0			29.0			31.0			31.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		23.0			23.0			25.0			25.0	
Max Q Clear Time (g_c+I1), s		25.0			15.4			22.0			27.0	
Green Ext Time (p_c), s		0.0			4.2			2.3			0.0	

Intersection Summary			
HCM 2010 Ctrl Delay			20.6
HCM 2010 LOS			C

Notes

Intersection	
Intersection Delay, s/veh	4.4

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Vol, veh/h	35	20	10	35	5	410	510	460	35	5	370	50
Conflicting Peds, #/hr	87	0	0	0	0	87	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	45	26	13	45	6	526	654	590	45	6	474	64

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	2347	2645	404	2308	2635	356	625	0	0	722	0	0
Stage 1	2007	2007	-	606	606	-	-	-	-	-	-	-
Stage 2	340	638	-	1702	2029	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	# 19	# 23	596	# 21	23	640	952	-	-	876	-	-
Stage 1	61	102	-	451	485	-	-	-	-	-	-	-
Stage 2	648	469	-	95	100	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	-	# 6	553	-	# 6	594	952	-	-	876	-	-
Mov Capacity-2 Maneuver	-	# 6	-	-	# 6	-	-	-	-	-	-	-
Stage 1	# 18	30	-	131	447	-	-	-	-	-	-	-
Stage 2	73	432	-	# 4	29	-	-	-	-	-	-	-

Approach	NB	SB	NE	SW
HCM Control Delay, s	Error	Error	8	0

Minor Lane / Major Mvmt	NEL	NET	NER	NBLn1	SBLn1	SWL	SWT	SWR
Capacity (veh/h)	952	-	-	Error	Error	876	-	-
HCM Lane V/C Ratio	0.687	-	-	Error	Error	0.007	-	-
HCM Control Delay (s)	16.637	-	-	Error	Error	9.14	-	-
HCM Lane LOS	C			Error	Error	A		
HCM 95th %tile Q(veh)	5.705	-	-	Error	Error	0.022	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	76.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	100	265	225	480	315	90
Conflicting Peds, #/hr	23	0	33	0	0	33
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	285	242	516	339	97

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1410	443	458	0	-	0
Stage 1	410	-	-	-	-	-
Stage 2	1000	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	153	615	1103	-	-	-
Stage 1	670	-	-	-	-	-
Stage 2	356	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	# 101	587	1073	-	-	-
Mov Capacity-2 Maneuver	# 101	-	-	-	-	-
Stage 1	657	-	-	-	-	-
Stage 2	239	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	$ 302	3	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1073	-	253	-	-
HCM Lane V/C Ratio	0.225	-	1.551	-	-
HCM Control Delay (s)	9.329	0	$ 302.4	-	-
HCM Lane LOS	A	A	F		
HCM 95th %tile Q(veh)	0.866	-	23.656	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	200	145	50	20	220	200	50	310	30	120	315	235
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.87	0.92		0.92	0.96		0.86	0.93		0.86
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Cap, veh/h	394	838	618	508	838	656	296	1304	475	347	1304	475
Arrive On Green	0.45	0.45	0.45	0.45	0.45	0.45	0.35	0.35	0.35	0.35	0.35	0.35
Sat Flow, veh/h	802	1863	1374	1012	1863	1458	670	3725	1357	857	3725	1357
Grp Volume(v), veh/h	278	201	69	28	306	278	69	431	42	167	438	326
Grp Sat Flow(s),veh/h/ln	802	1863	1374	1012	1863	1458	670	1863	1357	857	1863	1357
Q Serve(g_s), s	20.5	4.0	1.7	1.1	6.5	7.8	5.1	5.1	1.2	10.7	5.2	12.3
Cycle Q Clear(g_c), s	27.0	4.0	1.7	5.0	6.5	7.8	10.3	5.1	1.2	15.8	5.2	12.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	394	838	618	508	838	656	296	1304	475	347	1304	475
V/C Ratio(X)	0.71	0.24	0.11	0.06	0.37	0.42	0.23	0.33	0.09	0.48	0.34	0.69
Avail Cap(c_a), veh/h	394	838	618	508	838	656	296	1304	475	347	1304	475
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.9	10.2	9.6	11.7	10.9	11.2	18.1	14.3	13.1	20.1	14.4	16.7
Incr Delay (d2), s/veh	5.6	0.1	0.1	0.0	0.3	0.4	1.8	0.7	0.4	4.7	0.7	7.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	4.2	1.5	0.5	0.2	2.4	2.3	0.9	2.1	0.4	2.5	2.1	4.6
Lane Grp Delay (d), s/veh	25.5	10.3	9.6	11.8	11.1	11.6	20.0	15.0	13.4	24.8	15.1	24.5
Lane Grp LOS	C	B	A	B	B	B	B	B	B	C	B	C
Approach Vol, veh/h		548			612			542			931	
Approach Delay, s/veh		17.9			11.4			15.5			20.1	
Approach LOS		B			B			B			C	

Timer												
Assigned Phs		4			8			2			6	
Phs Duration (G+Y+Rc), s		33.0			33.0			27.0			27.0	
Change Period (Y+Rc), s		6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s		27.0			27.0			21.0			21.0	
Max Q Clear Time (g_c+I1), s		29.0			9.8			12.3			17.8	
Green Ext Time (p_c), s		0.0			5.0			4.9			2.2	

Intersection Summary			
HCM 2010 Ctrl Delay			16.7
HCM 2010 LOS			B

Notes

Intersection	
Intersection Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	20	0	430	385	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	0	467	418	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	885	418	418	0	-	0
Stage 1	418	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	315	635	1141	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	631	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	315	635	1141	-	-	-
Mov Capacity-2 Maneuver	315	-	-	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	631	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11	0	0

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1141	-	635	-	-
HCM Lane V/C Ratio	-	-	0.034	-	-
HCM Control Delay (s)	0	-	10.9	-	-
HCM Lane LOS	A		B		
HCM 95th %tile Q(veh)	0	-	0.106	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection						
Intersection Delay, s/veh	13.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	135	95	70	315	270	65
Conflicting Peds, #/hr	60	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	35	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	157	110	81	366	314	76
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	941	412	450	0	-	0
Stage 1	412	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Follow-up Headway	4	3	2	-	-	-
Pot Capacity-1 Maneuver	292	640	1110	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	591	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	244	608	1110	-	-	-
Mov Capacity-2 Maneuver	244	-	-	-	-	-
Stage 1	636	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Approach	EB		NB		SB	
HCM Control Delay, s	52		2		0	

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1110	-	324	-	-
HCM Lane V/C Ratio	0.073	-	0.825	-	-
HCM Control Delay (s)	8.5	-	52.1	-	-
HCM Lane LOS	A		F		
HCM 95th %tile Q(veh)	0.237	-	7.085	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	235	30	40	40	15	335
Conflicting Peds, #/hr	105	67	27	0	0	27
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	60	-	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	305	39	52	52	19	435

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	79	0	0	0	793	184
Stage 1	-	-	-	-	183	-
Stage 2	-	-	-	-	610	-
Follow-up Headway	2	-	-	-	4	3
Pot Capacity-1 Maneuver	1519	-	-	-	321	858
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	-	-
Time blocked-Platoon, %		-		-		
Mov Capacity-1 Maneuver	1386	-	-	-	# 0	765
Mov Capacity-2 Maneuver	-	-	-	-	# 0	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	# 0	-

Approach	EB	NB	SB
HCM Control Delay, s	7	0	Error

Minor Lane / Major Mvmt	NBL	NBT	EBL	EBR	SBLn1	SBLn2
Capacity (veh/h)	-	-	1386	-	0	765
HCM Lane V/C Ratio	-	-	0.22	-	Error	0.569
HCM Control Delay (s)	-	-	8.329	-	Error	15.7
HCM Lane LOS			A		Error	C
HCM 95th %tile Q(veh)	-	-	0.842	-	Error	3.635

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection												
Intersection Delay, s/veh	11.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	45	5	5	35	25	35	10	180	10	15	315	20
Conflicting Peds, #/hr	5	0	155	155	0	5	5	0	57	57	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	60	7	7	47	33	47	13	240	13	20	420	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1096	1063	645	1063	1070	459	602	0	0	408	0	0
Stage 1	628	628	-	428	428	-	-	-	-	-	-	-
Stage 2	468	435	-	635	642	-	-	-	-	-	-	-
Follow-up Headway	4	4	3	4	4	3	2	-	-	2	-	-
Pot Capacity-1 Maneuver	191	223	472	201	221	602	975	-	-	1151	-	-
Stage 1	471	476	-	605	585	-	-	-	-	-	-	-
Stage 2	575	580	-	467	469	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	117	162	392	154	161	499	929	-	-	1096	-	-
Mov Capacity-2 Maneuver	117	162	-	154	161	-	-	-	-	-	-	-
Stage 1	404	405	-	518	501	-	-	-	-	-	-	-
Stage 2	456	497	-	420	399	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	65	45	0	0

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	929	-	-	128	210	1096	-	-
HCM Lane V/C Ratio	0.014	-	-	0.573	0.603	0.018	-	-
HCM Control Delay (s)	8.932	0	-	65.4	45.2	8.346	0	-
HCM Lane LOS	A	A		F	E	A	A	
HCM 95th %tile Q(veh)	0.044	-	-	2.842	3.43	0.056	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Appendix B – Signal Warrants

FEHR PEERS

		Sheet No	1	of	1
		Project	USU TMP		
Major Street	US-89	Scenario	Existing Conditions		
Minor Street	Champ Drive	Peak Hour	AM		

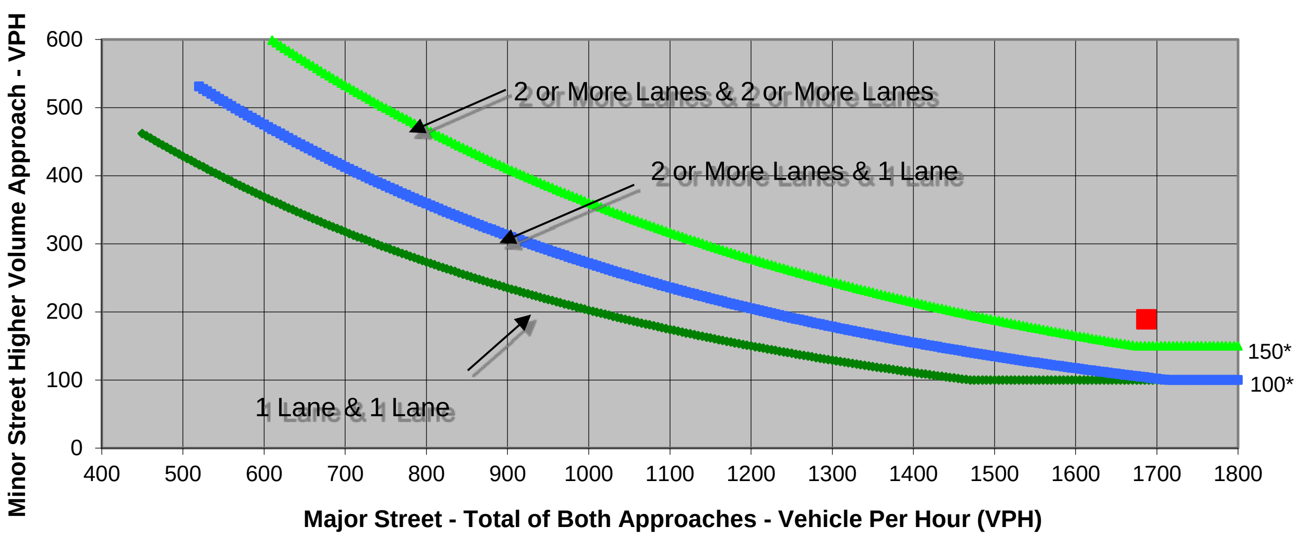
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	66	237	0
Through	0	0	845	516
Right	0	123	0	89
Total	0	189	1,082	605

Major Street Direction

	North/South
x	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street US-89	Minor Street Champ Drive	Warrant Met
Number of Approach Lanes	**2**	**1**	**YES**
Traffic Volume (VPH) *	**1,687**	**189**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Sheet No	1	of	1	

Major Street	1200 East
Minor Street	1400 North
Project	USU TMP
Scenario	Existing Conditions
Peak Hour	AM

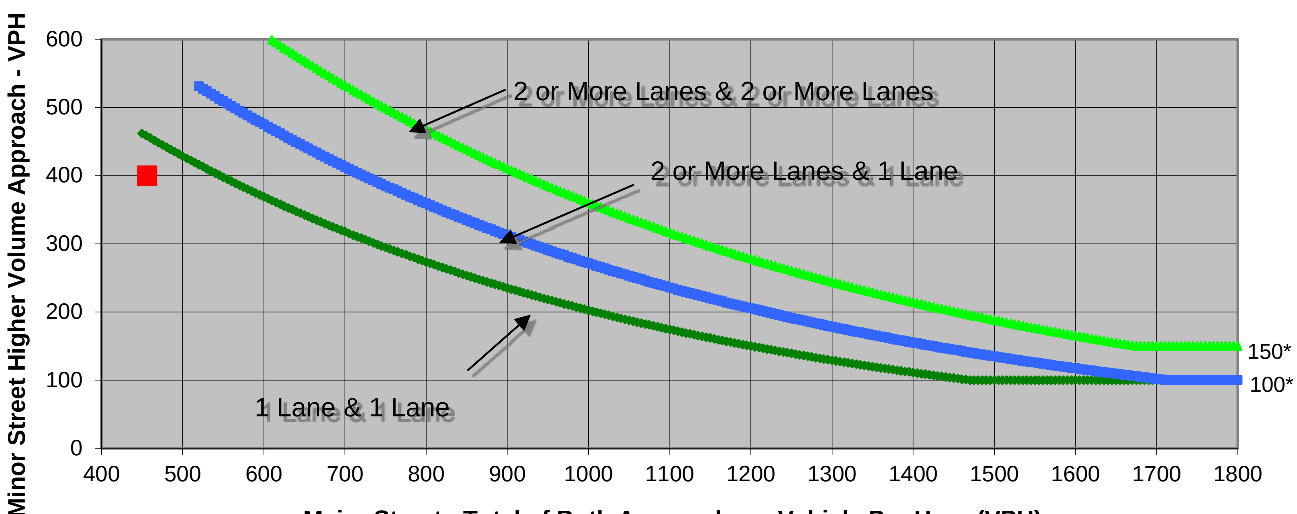
Turn Movement Volumes

	NB	SB	EB	WB
Left	166	3	47	25
Through	70	132	60	156
Right	18	67	293	4
Total	254	202	400	185

Major Street Direction

x	North/South
	East/West

Figure 4C-3. Warrant 3, Peak Hour



Major Street - Total of Both Approaches - Vehicle Per Hour (VPH)

* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street 1200 East	Minor Street 1400 North	Warrant Met
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**456**	**400**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR & PEERS

Sheet No	1	of	1

Major Street	1200 East
Minor Street	1000 North

Project	USU TMP
Scenario	Existing Conditions
Peak Hour	AM

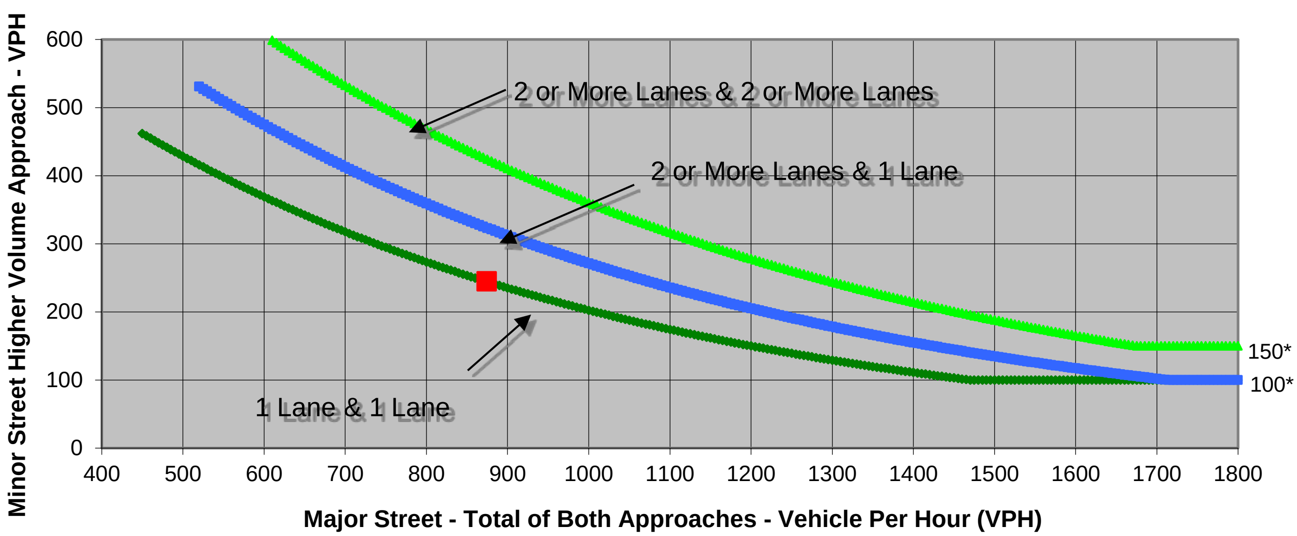
Turn Movement Volumes

	NB	SB	EB	WB
Left	103	0	13	25
Through	256	487	0	156
Right	0	28	232	4
Total	359	515	245	185

Major Street Direction

x	North/South
	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street 1200 East	Minor Street 1000 North	Warrant Met
Number of Approach Lanes	**1**	**1**	**YES**
Traffic Volume (VPH) *	**874**	**245**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Sheet No	1	of	1	

Major Street	1200 East
Minor Street	850 North
Project	USU TMP
Scenario	Existing Conditions
Peak Hour	AM

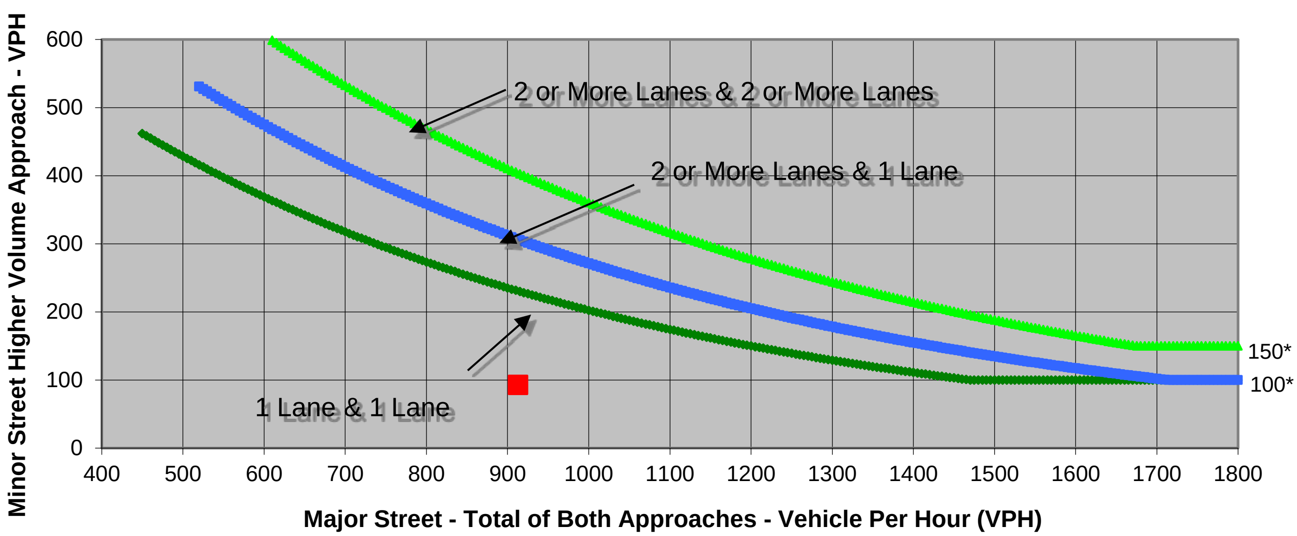
Turn Movement Volumes

	NB	SB	EB	WB
Left	134	0	31	0
Through	203	385	0	0
Right	0	191	62	0
Total	337	576	93	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street 1200 East	Minor Street 850 North	Warrant Met
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**913**	**93**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Sheet No	1	of	1	
Project	USU TMP			
Scenario	Existing Conditions			
Peak Hour	AM			

Major Street US-89
Minor Street 1200 East

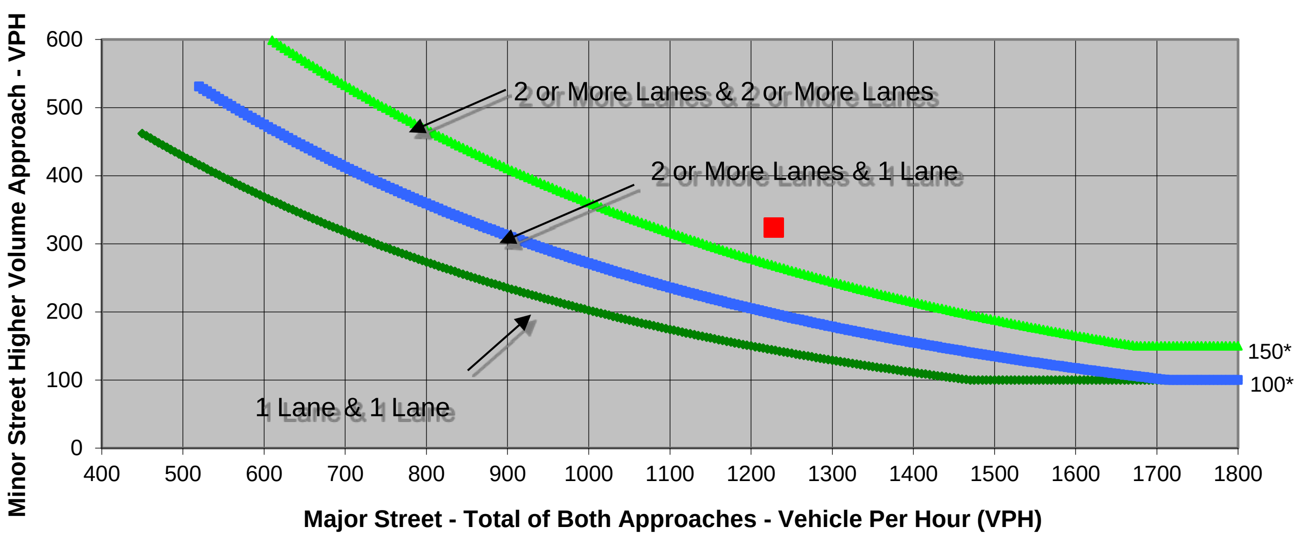
Turn Movement Volumes

	NB	SB	EB	WB
Left	1	6	493	6
Through	6	4	361	267
Right	18	314	71	30
Total	25	324	925	303

Major Street Direction

	North/South
x	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street US-89	Minor Street 1200 East	Warrant Met
Number of Approach Lanes	**2**	**1**	**YES**
Traffic Volume (VPH) *	**1,228**	**324**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

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Sheet No	1	of	1	

Major Street	US-89
Minor Street	Champ Drive
Project	USU TMP
Scenario	Existing Conditions
Peak Hour	PM

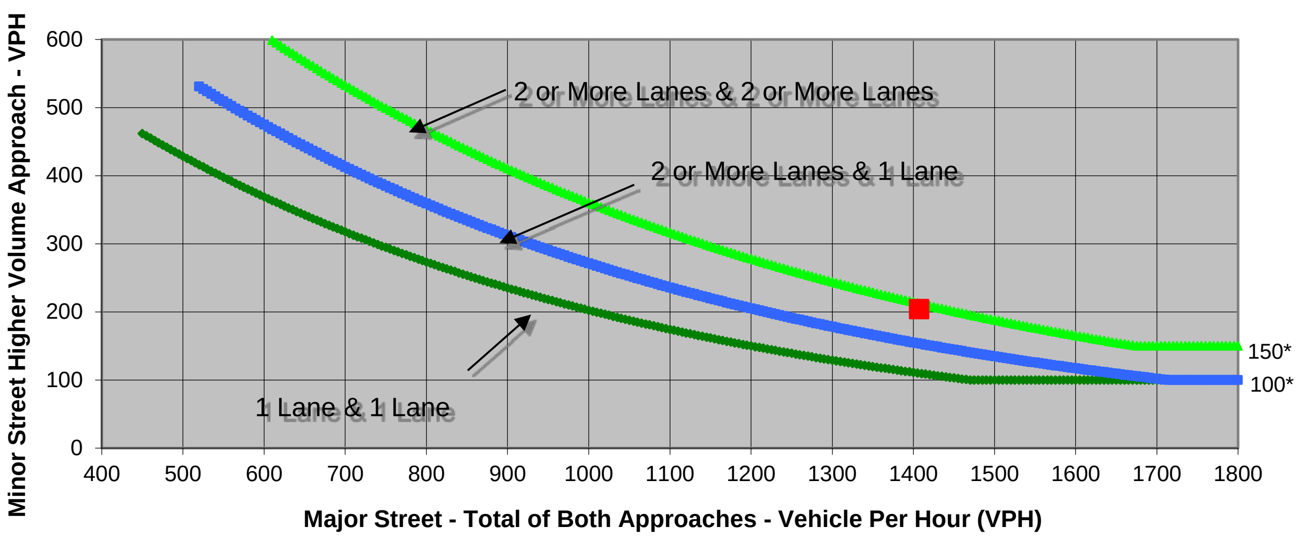
Turn Movement Volumes

	NB	SB	EB	WB
Left	0	56	64	0
Through	0	0	522	774
Right	0	148	0	47
Total	0	204	586	821

Major Street Direction

	North/South
x	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street US-89	Minor Street Champ Drive	Warrant Met
Number of Approach Lanes	**2**	**1**	**YES**
Traffic Volume (VPH) *	**1,407**	**204**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Sheet No	1	of	1		

Major Street	1200 East
Minor Street	1400 North

Project	USU TMP
Scenario	Existing Conditions
Peak Hour	PM

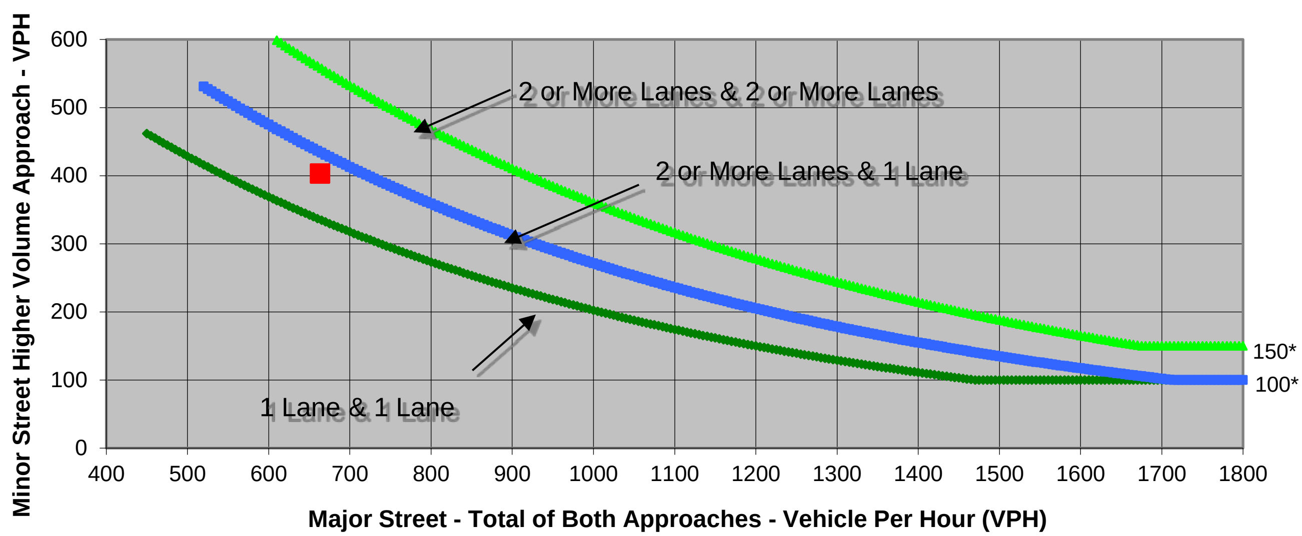
Turn Movement Volumes

	NB	SB	EB	WB
Left	270	0	55	6
Through	108	213	200	129
Right	23	49	148	4
Total	401	262	403	139

Major Street Direction

x	North/South
	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street 1200 East	Minor Street 1400 North	Warrant Met
Number of Approach Lanes	**1**	**1**	**YES**
Traffic Volume (VPH) *	**663**	**403**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR & PEERS

Sheet No	1	of	1

Major Street	1200 East
Minor Street	1000 North
Project	USU TMP
Scenario	Existing Conditions
Peak Hour	PM

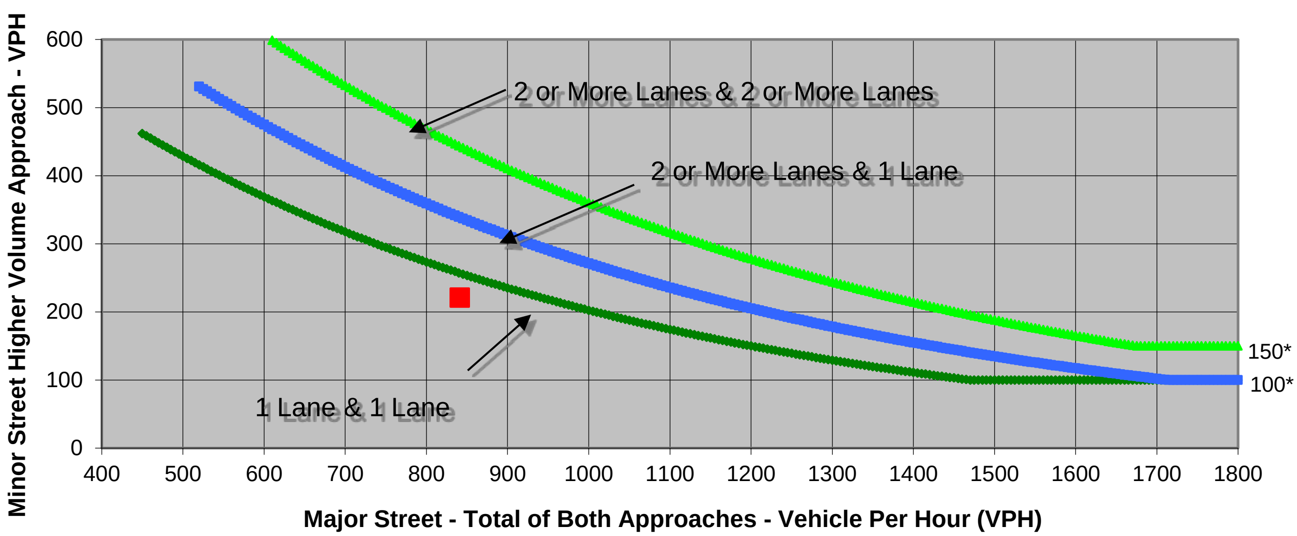
Turn Movement Volumes

	NB	SB	EB	WB
Left	162	0	31	25
Through	388	262	0	156
Right	0	29	190	4
Total	550	291	221	185

Major Street Direction

x	North/South
	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street 1200 East	Minor Street 1000 North	Warrant Met
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**841**	**221**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

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Sheet No	1	of	1	

Major Street	1200 East
Minor Street	850 North

Project	USU TMP
Scenario	Existing Conditions
Peak Hour	PM

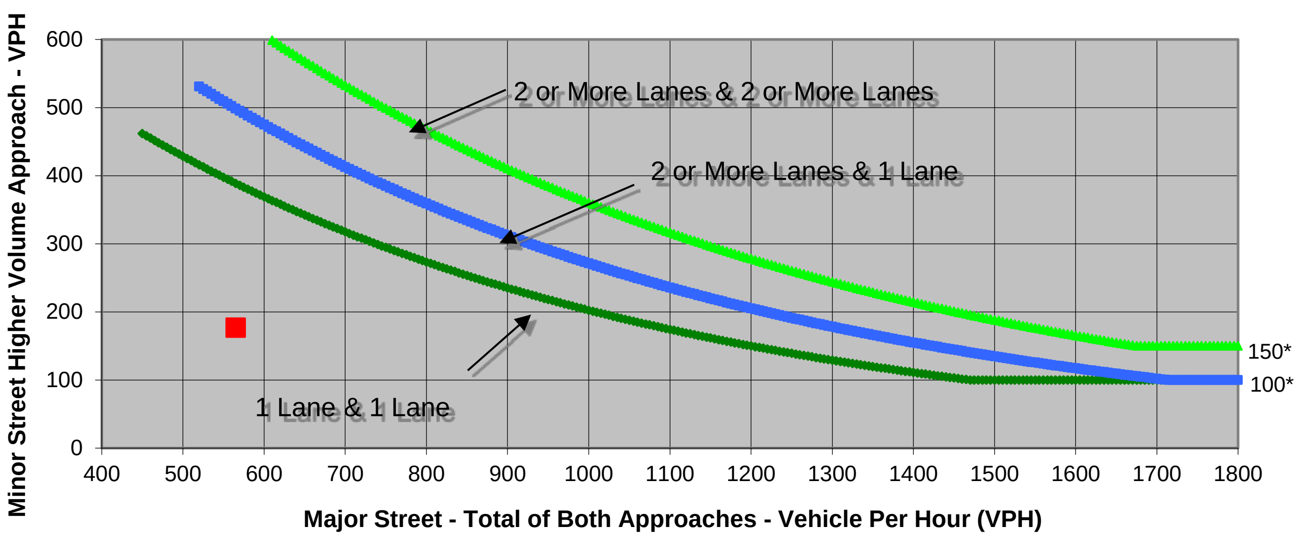
Turn Movement Volumes

	NB	SB	EB	WB
Left	54	0	101	0
Through	249	213	0	0
Right	0	49	76	0
Total	303	262	177	0

Major Street Direction

x	North/South
	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street 1200 East	Minor Street 850 North	Warrant Met
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**565**	**177**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

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Sheet No	1	of	1
Project	USU TMP		
Scenario	Existing Conditions		
Peak Hour	PM		

Major Street	US-89
Minor Street	1200 East

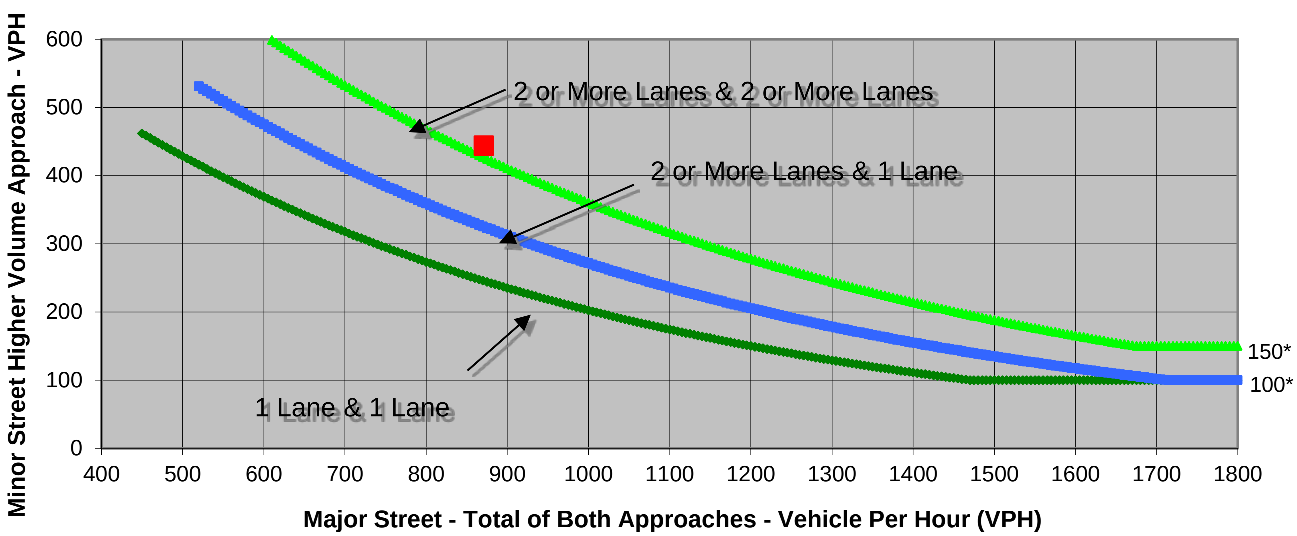
Turn Movement Volumes

	NB	SB	EB	WB
Left	33	35	277	2
Through	16	3	251	285
Right	8	406	19	37
Total	57	444	547	324

Major Street Direction

	North/South
x	East/West

Figure 4C-3. Warrant 3, Peak Hour



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *Manual on Uniform Traffic Control Devices*

	Major Street US-89	Minor Street 1200 East	Warrant Met
Number of Approach Lanes	**2**	**1**	**YES**
Traffic Volume (VPH) *	**871**	**444**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

Appendix C – Transit Memorandum

Utah State University Transportation Master Plan

DRAFT Transit Analysis

Prepared for:
Utah State University

Prepared by:
FEHR PEERS

January 2nd, 2014

14-1021

Table of Contents

1 INTRODUCTION

A key objective of the Transportation Master Plan is the development of a transit plan which supports sustainable growth and circulation on campus and the surrounding Cache Valley community. The Campus Master Plan anticipates significant growth and associated increases in student, faculty, and staff populations. Transit services offered by USU (the Aggie Shuttle) and the Cache Valley Transit District (CVTD) play a critical role in supporting future expansion and growth. This chapter offers a comprehensive assessment of transit services in and around the USU campus to support goals of relieving traffic congestion and parking needs, enhancing mobility choices, reducing air pollution, and improving quality of life. Ultimately, this chapter seeks to outline the necessary steps to make transit more efficient, convenient, and enjoyable to use.

The following transit analysis is divided into two parts:

- Section 2 evaluates the performance of existing transit services, including how the network meets the needs of future campus expansion
- Section 3 offers recommendations for both USU and CVTD, focusing on opportunities to expand funding, improve the efficiency of operations and rider experience, and alternatives for future service expansion

2 EVALUATION OF EXISTING TRANSIT SERVICES

2.1 OVERVIEW OF TRANSIT SERVICES

The USU campus is served by two transit providers: the university-run Aggie Shuttle, which provides on-campus circulation, and the Cache Valley Transit District (CVTD), which provides regional transit services. CVTD and the Aggie Shuttle each offer very successful services: they serve a combined three million passengers annually, and approximately 90 percent of respondents in the USU Survey rate each service as “good” or “excellent.” This section provides an overview of existing transit services.

2.1.1 Aggie Shuttle

The Aggie Shuttle provides free transit services to the USU campus when the university is in session (153 academic days per year). It is funded by a student transportation fee but open to the public. Four lines presently operate at varying frequencies between 7 a.m. and 6/6:30pm: the Stadium Express, Campus Loop/Housing Express, 8th Street East Express/Innovation, and South Campus Express. In addition, the Evening Express offers service between 5:30 p.m. and 9:30 p.m. **Figures 1 and 2** provide maps of the Aggie Shuttle’s daytime and evening operations, while **Table 1** shows daily hours of operation and frequency by time of day.

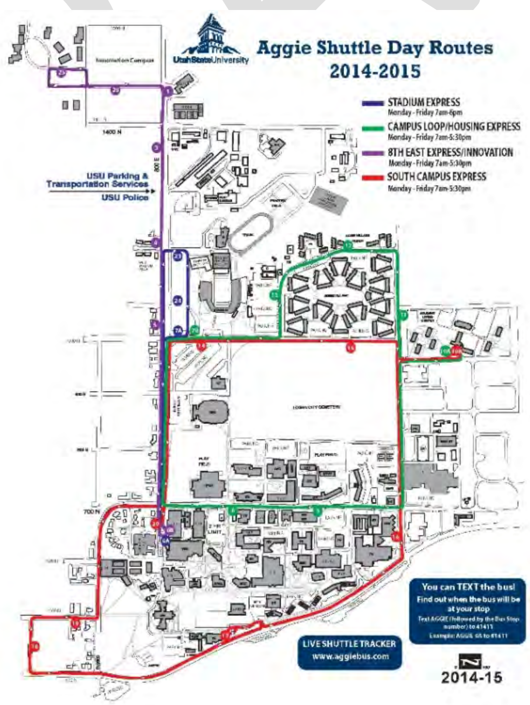


Figure 1: Map of Aggie Shuttle Daytime Operations

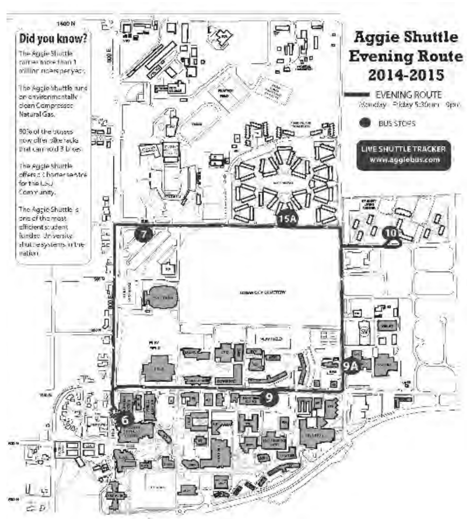


Figure 2: Map of Aggie Shuttle Evening Operations

Table 1: USU Shuttle Operations

Route	Total Daily Hours of Operation	Frequency by Time of Day					
		7 a.m. -8 a.m.	8 a.m. - 10 a.m.	10 a.m. - 12:30 p.m.	12:30 p.m.- 3:30 p.m.	3:30 p.m.- 6:00 p.m.	5:30 p.m.- 9:30 p.m.
Stadium Express	**19**	8	4	4	4	8*	
8th East Express	**21.5**	7.5	5	7.5	7.5	15	
Campus Loop	**21.5**	7.5	5	7.5	7.5	15	
So. Campus Express	**15.5**	18	9	9	18	18	
Evening Express	**4**						10

*Operates until 6:30pm

The Aggie Shuttle system serves over 1.1 million passengers per year, an increase of 4.4 percent between the 2012-2013 and 2013-2014 academic years. Over 7,000 passengers ride the Aggie Shuttle per day when USU is in session. Ridership is most heavily concentrated around the 800 East, 700 North, and 1200 East corridors.

The total budget for the Aggie Shuttle during the 2013-2014 academic year was $870,162. Of this total, $393,943 went toward shuttle operations, $395,535 went toward debt service for equipment costs, and $80,684 went toward charter operations. For the 2014-2015 academic year, it is anticipated that Aggie Shuttle operations will cost approximately $414,000.

2.1.2 CVTD

CVTD provides free transit services to the Cache Valley region. Service is provided Monday-Friday, typically from 6:10 a.m. to 8:40 p.m., and on Saturdays from 10:10 a.m. to 6:40 p.m (specific service hours depend on the route). No service is provided on Sundays. Services are funded by a combination of local sales tax and federal dollars.

The CVTD network is designed as a hub-and-spoke system in which all lines converge on a single transit center in the City of Logan. The Transit Center facilitates transfers via a service "pulse," in which all lines converge every 30, 60, or 90 minutes. USU is served by four CVTD routes: routes 1/1EXT, 2, 4, and CVN. A description of each route is provided below, followed by a system wide overview.

- Route 1/1EXT connects the Transit Center and northeast Logan via 700 East through the USU campus. It offers 15 minute headways from 8 a.m. to 10:30 a.m. and 3 p.m. to 6 p.m. when USU is in session, and 30 minute headways at all other times
- Route 2 connects the Transit Center and USU Innovation campus. It offers 30 minute headways.
- Route 4 connects the Transit Center and USU campus via 600 East and 700 North. It offers 30 minute headways
- Route CVN connects the transit center and northern Cache Valley via the USU campus. It offers 45 minute headways during weekdays and 90 minute headways during weekends

Figure 3 displays a map of CVTD operations, while **Table 2** shows daily hours of operation and frequency by time of day.

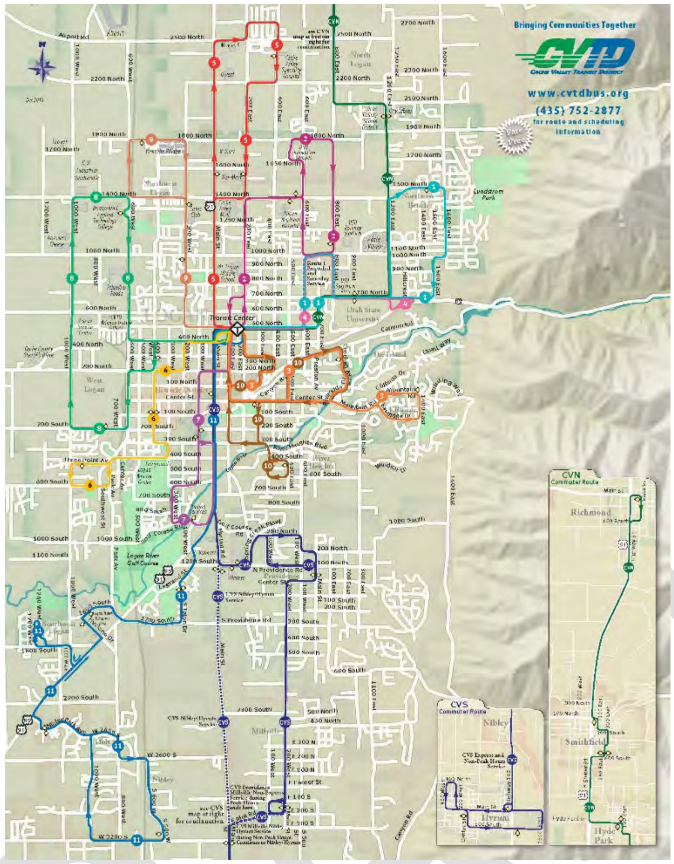


Figure 3: CVTD System Map

Table 2: CVTD Operations

Service Frequency & Span			
Route	**Frequency**	**Span (Weekday)**	**Span (Saturday)**
1/1EXT	15 mins*	8 a.m. - 10:30 a.m.*; 3 p.m. - 6 p.m.*	--
	30 mins	All other times from 6:11 a.m. - 8:41 p.m.	10:11 a.m. - 6:41 p.m.
2	30 mins	6:13 a.m. - 8:43 p.m.	10:13 a.m. - 6:43 p.m.
3	60 mins	6:05 a.m. - 8:30 a.m. ; 3 p.m. - 8:30 p.m.	10:05 a.m. - 6:27 p.m.
4	30 mins	7 a.m. - 8:22 p.m.	--
5	30 mins	6:09 a.m. - 8:39 p.m.	10:09 a.m. - 6:39 p.m.

Service Frequency & Span			
6	30 mins	6:12 a.m. - 8:42 p.m.	10:12 a.m. - 6:42 p.m.
7	30 mins	6:09 a.m. - 8:39 p.m.	10:09 a.m. - 6:39 p.m.
8	30 mins	6:08 a.m. - 6:08 p.m.	--
9	30 mins	6:10 a.m. - 8:40 p.m.	10:10 a.m. - 6:40 p.m.
10	60 mins	6:40 a.m. - 8:47 p.m.	10:30 a.m. - 6:40 p.m.
11	60 mins	5:30 a.m. - 5:46 p.m.	10:30 a.m. - 5:46 p.m.
CVN	45 mins	5:45 a.m. - 6:47 p.m.	--
	90 mins	--	10:15 a.m. - 6:45 p.m.
CVS	75 mins	6:30 a.m. - 6:10 p.m.	10:15 a.m. - 6:33 p.m.
CVS Express	60 mins	4:50 a.m. - 8:35 a.m.; 2 p.m. - 6:35 p.m.	--
FC Connection	4 trips daily	Morning/evening peak	--

*On weekdays while USU is in session

2.2 TRANSIT SERVICE GOALS & OUTCOMES

Before identifying performance metrics to evaluate transit service on and around the USU campus, it is necessary to define the transit service goals for both the USU Shuttle and CVTD bus service as it relates to the Campus Master Plan. Broadly speaking, transit networks can be oriented toward two main goals:

1. Maximizing ridership, to concentrate resources on the most productive corridors in order to reduce automobile trips, parking demands, and air pollution
2. Maximizing coverage, to serve all areas of a community and meet the needs of transit-dependent populations

These goals are not mutually exclusive: providing frequent, direct, and efficient transit service can both support ridership growth and improve mobility for transit-dependent populations; providing service across a wide area creates a larger catchment area to attract ridership. Both ridership and coverage are valuable elements of a transit network that require a balancing act to serve everyone's needs.

The Campus Master Plan prioritizes multimodal access to reduce automobile trips and air pollution while accommodating growth. Transit plays an integral role in this vision: it offers students, faculty, staff, and visitors the freedom to commute and circulate around campus without needing a car. The university's ability to support transit service and grow in a manner which supports transit ridership will offer a number of benefits, including but not limited to a reduction of parking demand, cost of living, and environmental impacts. Accordingly, the evaluation methodology of this analysis are weighted toward maximizing ridership via frequent, efficient, and dependable service that offers a convenient alternative to driving.

2.3 EVALUATION METHODOLOGY

The following evaluation methodology id intended to identify the opportunities, constraints, and needs for both the USU Shuttle and CVTD bus services. This methodology is broken into two categories: service characteristics and performance. These metrics will be examined on both a network and route-by-route basis.

2.3.3 Service Characteristics

2.3.3.1 Frequency & Span

Frequency measures how often a bus runs: a high frequency bus runs every 15 minutes or greater, while a low frequency bus may run every 30, 45, or 60 minutes. Frequency is a key indicator for mobility because it determines the degree of freedom and spontaneity for a transit rider: riders are generally comfortable casually showing up a service that runs every 15 minutes or more throughout the day, but services that run less often usually requires consultation of a schedule. Frequency is especially important for routes that facilitate short trips: if a passenger can walk to their destination in less time than it takes to wait for the next bus, the utility of the route diminishes.

Span measures when a service runs. Span is closely related to frequency in fostering mobility by granting riders the freedom to travel when needed – mornings, afternoons, evenings and/or weekends.

2.3.3.2 Speed/Linearity

Speed indicates how fast a service runs from point A to point B. Because a direct, linear service is almost always faster than a circuitous or indirect route, speed is closely related to linearity. Speed must always be examined in the context of frequency, since the importance of speed is eroded if a passenger has to wait a long time for the bus to arrive.

2.3.3.3 Reliability

Reliability reveals how trustworthy a service is. A reliable service is predictable and dependable, while an unreliable service can be subject to delays, run off schedule, and miss transfer opportunities.

2.3.3.4 Connectivity/Coverage

Connectivity and coverage measure how many people, jobs, and destinations are served by a particular transit service. Connectivity and coverage often come into balance with frequency and speed: more bus lines that zig-zag across neighborhoods maximize connectivity and coverage, but can come at the expense of frequent, fast service. As a rule of thumb, a ¼ mile coverage area (about a five minute walk) is generally appropriate to measure the walkshed of a bus stop. This coverage area may vary based on terrain, weather, design, safety, and other obstacles, as well as the frequency and speed of a particular transit line (people are often willing to walk farther for frequent, fast service).

2.3.3.5 Simplicity & Legibility

The simplicity and legibility of a transit network indicates how easy it is to understand and navigate. A simple, legible network is user-friendly and encourages ridership, whereas a complicated, illegible network serves as a barrier to riding.

2.3.3.6 Civility

Civility encompasses the amenities, attractiveness, and safety associated with a transit service, particularly as it relates to stops and vehicles. It is important for bus stops to serve as a safe, pleasant, and distinctive place. Important features include shelters (to protect from rain, snow, and wind), benches, a trash receptacle, user-friendly wayfinding signage and maps, appropriate lighting, and safe pedestrian access (via sidewalks and crosswalks).

The civility of bus vehicles similarly plays an important role. Low-floor buses are preferable to allow for easy access and egress for people of all ages and abilities; high-floor buses are more challenging for mobility-impaired passengers or passengers carrying heavy bags (slower dwell times also affect frequency, speed, and reliability). Similarly, bike access is another important factor: bike racks on buses promote inclusive multimodal travel.

2.3.4 Service Performance

2.3.4.7 Passenger Trips

Passenger trips (ridership) shows how many passengers are using a bus route. Passenger trips are typically measures in boardings, but the distribution of alightings is also important for an assessment of travel patterns.

2.3.4.8 Passengers per Revenue Hour

Passengers per revenue hour reveals the relative productivity of a bus route – how many passengers ride the route relative to how much service is provided. As a general rule, routes below 20 passengers per revenue hour are low-performing, while routes above 50 passengers per revenue hour are high performing.

2.3.4.9 Cost per Passenger

Cost per passenger measures the cost of operations (labor, fuel, and maintenance) for every passenger served. This cost excludes the fixed cost of debt service for equipment.

2.3.4.10 Small Transit Intensive Cities (STIC) Program Performance

The Small Transit Intensive Cities (STIC) program is administered by the Federal Transit Administration (FTA) to provide operational funding assistance for high-performing transit agencies in urbanized areas with a population less than 200,000. STIC funds support bus operations and preventative maintenance. CVTD receives funding through this program; therefore, it is important to review the performance of CVTD (and the Aggie Shuttle) in the context of the STIC program. The STIC program allocates funding through six categories that measure performance. For each category in which an agency meets or exceeds the industry average (for urbanized areas with populations between 200,000 and 999,999), it receives $192,016. The performance categories include:

- Passenger miles traveled per vehicle revenue mile
- Passenger miles traveled per vehicle revenue hour
- Vehicle revenue miles per capita
- Vehicle revenue hours per capita
- Passenger miles traveled per capita
- Passengers per capita

2.4 AGGIE SHUTTLE PERFORMANCE EVALUATION

This section evaluates the performance of the Aggie Shuttle system. It is divided into two parts: a route-by-route analysis, and a system wide analysis.

2.4.1 8th East Express/Innovation

2.4.1.1 Frequency/Span

The 8th East Express/Innovation route operates frequent service throughout most of the day. On average, it offers five minute headways (three buses) during the morning peak and 7.5 minute headways (two buses) until 3:30 p.m.. From 3:30 p.m. to 6 p.m., its headways decrease to 15 minutes (one bus).

Table 3: 8th East Express/Innovation Operations

Time of Day	7 a.m. - 8 a.m.	8 a.m. - 10 a.m.	10 a.m. - 3:30 p.m.	3:30 p.m. - 6 p.m.
Frequency	7.5 minutes	5 minutes	7.5 minutes	15 minutes

The 8th East/Innovation route does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

2.4.1.2 Speed/Linearity

The 8th East Express/Innovation route provides a fast, direct connection between the Innovation Campus and the Student Center (about seven to eight minutes travel time). However, it offers indirect service for in between destinations along 800 East due to the route's lack of northbound stops (which were omitted because of the lack of crosswalks and east side sidewalk). Passengers traveling to student housing along 800 East from the student center must either overshoot their destination and double-back on foot, or continue riding the bus through the Innovation Center until it returns to a southbound stop. Both scenarios result in circuitous trips for anyone traveling to intermediate destinations along the 800 East corridor. Similarly, no direct connection is provided between the 800 East/Stadium Lot area and the Innovation Campus.

2.4.1.3 Reliability

The 8th East Express/Innovation route generally experiences reliable operations with minimal delay.

2.4.1.4 Connectivity/Coverage

The 8th East Express/Innovation route provides incomplete connectivity and coverage along the corridor due to its lack of northbound stops. As discussed above, the lack of northbound stops diminishes the ability of transit to serve the 800 East corridor between 700 North and 1400 North; bidirectional stop pairs are needed. The intersection of 800 East and 900 North also represents an opportunity area for transit service given its high concentration of student housing.

2.4.1.5 Service Performance

The 8th East Express/Innovation performs strongly. The route carries an average of 1,864 riders per day. The highest ridership stops are the Taggart Student Center (706/day), Oakridge (560/day), Innovation (194/day), and Old Farm (178/day). The 8th East Express/Innovation route serves 89 passengers per revenue hour and costs $0.38 per passenger, indicating a highly efficient service.

2.4.2 Campus Loop/Housing Express

2.4.2.1 Frequency/Span

The Campus Loop/Housing Express route operates frequent service throughout most of the day. On average, it offers five minute headways (three buses) during the morning peak and 7.5 minute headways (two buses) until 3:30 p.m. From 3:30 p.m. to 6 p.m., its headways decrease to 15 minutes (one bus).

Table 4: Campus Loop/Housing Express Operations

Time of Day	7 a.m. - 8 a.m.	8 a.m. - 10 a.m.	10 a.m. - 3:30 p.m.	3:30 p.m.- 6 p.m.
Frequency	7.5 minutes	5 minutes	7.5 minutes	15 minutes

The 8th East/Innovation route does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

2.4.2.2 Speed/Linearity

As a one-way loop, the Campus Loop/Housing Express route serves some trips better than others. For passengers traveling from Aggie Village to main campus, the route offers a convenient and fast connection. For other passengers, like those traveling from the Student Living Center to the east side of main campus, riding the bus is the same speed as walking (and can be slower, when factoring in headways).

2.4.2.3 Reliability

The Campus Loop/Housing Express experiences several sources of delay that impact its reliability. Most notably, the 700 North segment through campus is routinely congested as a result of heavy pedestrian volumes crossing the street and the ensuing automobile queues. Other sources of delay include the route’s four unprotected left turns and operations through the Aggie Village parking lot.

2.4.2.4 Connectivity/Coverage

The Campus Loop/Housing Express serves as the primary means of circulating among the main campus and on-campus student housing, and offers good connectivity to these areas. However, in some locations, the route's wide stop spacing creates a missed opportunity for transit connectivity. In particular, the lack of stops at the intersections of 700 North/800 East, 700 North/1200 East, and 800 East/900 North creates gaps in coverage. Additionally, as a one-way loop, the route lacks the ability to provide an east-west connection across campus along 700 North despite a strong (and growing) market for cross-campus trips.

2.4.2.5 Service Performance

The Campus Loop/Housing Express performs strongly. The route carries an average of 1,801 passengers per day. The highest ridership stops include Veterinary Science (430/day), South Stadium (372/day), Lundstrum (269/day), and Industrial Science (241/day). The route serves 86 passengers per revenue hour as a cost of $0.40 per passenger, indicating a highly efficient service.

2.4.3 Stadium Express

2.4.3.1 Frequency/Span

The Stadium Express operates very frequent service through most of the day. On average, it offers 4.5 minute headways (two buses) between 8 a.m. and 3:30 p.m., and 9 minute headways (one bus) from 7-8 a.m. and 3:30 p.m.-6:30 p.m.. The 8th East/Innovation route does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

Table 5: Stadium Express Operations

Time of Day	7 a.m. - 8 a.m.	8 a.m. - 3:30 p.m.	3:30 p.m.- 6:30 p.m.
Frequency	9 minutes	4.5 minutes	9 minutes

2.4.3.2 Speed/Linearity

The Stadium Express offers a fast, direct connection between the stadium parking lot and the Taggart Student Center without any route diversions.

2.4.3.3 Reliability

The Stadium Express generally offers reliable service but is commonly subject to delay during peak hours. Delays on the route result from three sources: heavy passenger volumes boarding and alighting, congestion when exiting the stadium lot, and the left turn from 1000 North to 800 East. While run times can be as low as eight minutes roundtrip during off-peak hours, 10-11 minutes is not uncommon during peak hours.

2.4.3.4 Connectivity/Coverage

The Stadium Express is primarily oriented around serving the stadium parking lot. The lack of crosswalks on 800 East hinder the ability for passengers to safely cross the street and use the route for other purposes. As a consequence, the Stadium Express offers limited connectivity to the existing and planned student housing areas on the 800 East corridor.

2.4.3.5 Service Performance

The Stadium Express experiences the largest passenger volumes of any Aggie Shuttle route. On average, it serves 2,634 passengers per day, split evenly between the stadium lot stops and the Taggart Student Center. The route serves 139 passengers per revenue hour at a cost of $0.24 per passenger – a very efficient service.

2.4.4 South Campus Express

2.4.4.1 Frequency/Span

The South Campus Express is the least frequent Aggie Shuttle route. On average, it offers 9 minute headways (two buses) between 8 a.m. and 12:30 p.m., and 18 minute headways (one bus) from 7-8 a.m. and 12:30 p.m.-6 p.m. The South Campus Express does not provide service on weeknights, weekends, summer instructional days, or non-instructional days.

Table 6: South Campus Express Operations

Time of Day	7 a.m. - 8 a.m.	8 a.m. - 12:30 p.m.	12:30 p.m.-6 p.m.
Frequency	18 minutes	9 minutes	18 minutes

2.4.4.2 Speed/Linearity

The South Campus Express operates as a large one-way loop, generally resulting in slow travel times for many trips. For trips between Aggie Village and South Campus, the service is faster than other Aggie Shuttle routes; however, for trips from South Campus, it is usually faster to walk to another Aggie Shuttle route that offers more frequent and direct service.

2.4.4.3 Reliability

The South Campus Express generally provides reliable service. The primary location for delay is the unsignalized right turn from Champ Dr onto US-89.

2.4.4.4 Connectivity/Coverage

The South Campus Express is oriented toward maximizing connectivity and coverage for the Aggie Shuttle network. It offers valuable service to areas of campus that are otherwise not served by transit, including South Campus and the downhill areas west of campus.

2.4.4.5 Service Performance

The South Campus Express performs strongly. On average, it serves 1,024 passengers per day, distributed relatively evenly throughout the route with the exception of Lundstrum, which serves 316 passengers per day. The route serves 73 passengers per revenue hour at a cost of $0.50 per passenger, indicating a very efficient service.

2.4.5 Evening Express

2.4.5.6 Frequency/Span

The Evening Express runs Monday-Friday from 5:30 p.m. to 9:30 p.m. On average, it offers 10 minute headways (one bus). The hours of operation are more limited compared to the hours of the library, which is typically open until midnight Monday-Thursday. The Evening Express does not provide service on weekends, summer instructional days, or non-instructional days.

Table 7: Evening Express Operations

Time of Day	5:30 p.m. - 9:30 p.m.
Frequency	10 minutes

2.4.5.7 Speed/Linearity

The Evening Express operates as a small one-way loop, which offers fast trips around campus with limited diversions.

2.4.5.8 Reliability

The Evening Express generally experiences reliable operations given limited traffic congestion in the evenings.

2.4.5.9 Connectivity/Coverage

The Evening Express offers good coverage of the main campus and student housing areas. Its primary role is to facilitate trips between the library, labs, and instructional buildings to student housing and the stadium parking lot.

2.4.5.10 Service Performance

As a service oriented toward access as opposed to productivity, the Evening Express performs reasonably well, but not as strongly as other Aggie Shuttle routes. On average, it serves 132 passengers per day use the route, three-quarters of whom board at main campus stops including the Taggart Student Center, Veterinary Sciences, and Industrial Sciences stops. The route serves 44 passengers per revenue mile, with a cost of $1.01 per ride.

2.4.6 Systemwide Evaluation

2.4.6.1 Simplicity & Legibility

The relative complexity of the Aggie Shuttle's operations hinders its ability to attract new riders from students, faculty, staff, and visitors who may not take full advantage of its services. From a network-level perspective, the Aggie Shuttle has a relatively complex route structure. The network's split services, layered one-way routes, and varying frequencies throughout the day can create a barrier to attracting new users. From a stop-level perspective, a lack of signage and wayfinding similarly makes using the Aggie Shuttle challenging for riders who are not already well-versed in the system. While some stops feature distinctive shelters and are easy to find, others are marked by limited signage, often attached to the back of another street sign. System maps and schedules are not always available at stops. While these factors may not play significantly impact existing riders, they hinder the attractiveness of the system for new riders.

Figure 4: Aggie Shuttle stops at times lack visibility, such as this Evening Express stop at Aggie Village

2.4.6.2 Civility

The Aggie Shuttle's bus stop facilities provide inconsistent accommodations. As noted above, some stops contain nice shelters and wayfinding signage, creating a convenient and user-friendly rider experience; others, however, provide minimal signage and no amenities. Accordingly, stop improvements were the third-most requested improvement in the USU Survey. To attract and sustain ridership, shelters, benches, and lighting are necessary features at all stops.

The Aggie Shuttle bus fleet is generally in good condition and meets the needs of riders. Over time, the phasing of low-floor buses is preferable to the existing high-floor bus operations to improve the ease of access and egress for people of all ages and abilities. The Aggie Shuttle provides excellent bicycle capacity.

2.4.6.3 STIC Program Performance

The Aggie Shuttle does not receive STIC funding and is ineligible to directly receive STIC funds without collaboration with CVTD.

2.4.7 Summary & Conclusions

The Aggie Shuttle is a high-performing transit service that plays an integral role in the USU transportation network. It offers very frequent and mostly reliable service that covers the majority of campus destinations.

Table 8: Aggie Shuttle Performance Analysis

Aggie Shuttle 2013-2014 Performance Analysis			
Route	**Passengers per Day**	**Passengers per Revenue Hour**	**Cost per Passenger**
8th East Express/Innovation	1,864	88.8	$0.38
Campus Loop	1,801	85.8	$0.40
Stadium Express	2,634	138.6	$0.24
South Campus Express	1,024	73.1	$0.50
Evening Express	132	44.0	$1.01
Total	*7,455*	*126.4*	*$0.36*

In evaluating the Aggie Shuttle, areas for improvement include:

- Eliminating the redundancy of service along 800 East through improvements in pedestrian infrastructure
- Improving the reliability of operations on 700 North by reducing conflicts with other modes
- Expanding the span of service
- Improving bus stop facilities and access to bus information
- Phasing out the use of one-way loops for core campus circulation during the day

These concepts will be expanded upon in Section 3 – Recommendations.

2.5 CVTD

This section evaluates the performance of the CVTD Shuttle system. It examines systemwide performance and anticipated changes resulting from the 2012 Short Range Transit Plan.

2.5.1 System-wide Evaluation

2.5.1.1 Frequency & Span

CVTD operates relatively infrequent service to access USU, posing a major obstacle to growing transit ridership to campus. Most CVTD service operates every 30 minutes, requiring passengers to consult a schedule and plan ahead. In a city where most trips are less than 20 minutes by driving, a 30 minute wait acts as a significant deterrent for riding transit – especially in bad weather. Route 1 operates at 15 minute headways during peak hours, a frequency that offers greater flexibility where more passengers are able to casually show up without planning ahead. Consequently, Route 1 is the most heavily used line in the CVTD system. More frequent service was the second-most requested improvement for CVTD in the USU Survey.

The span of CVTD service is generally sufficient for basic commuting and mobility needs of the Cache Valley region, but longer span is needed to serve the needs of the growing USU population. While CVTD ends service at 8:40 p.m. on weeknights, some evening activities, classes, and labs last well beyond that, and the Merrill-Cazier Library stays open until midnight. Accordingly, students, faculty, or staff living off-campus who stay late have few choices other than driving. CVTD's weekend span of service also limits mobility for students living on-campus: the lack of Saturday evening and Sunday service limits the ability of students to live without a car and still run errands or go to a restaurant. As a result, many students who ride CVTD also still must own cars. Extended service hours was the third-most requested improvement in the USU Survey.

2.5.1.2 Speed/Linearity

The hub-and-spoke design of the CVTD network results in longer trips times that can be indirect or circuitous. Although CVTD offers excellent access and coverage throughout the Cache Valley, a majority of trips to campus rely on a transfer at the Transit Center to access campus, which can add a delay of 5-10 minutes per trip. Transferring plays an integral role in a successful transit network; however, the lack of direct service creates a barrier for some transit connections with significant existing and latent demand – most notably the northwest Logan-USU and Downtown-USU connections.

2.5.1.3 Reliability

CVTD offers very reliable operations. Only two percent of all scheduled trips result in missed transfers.[1] However, despite this reliable performance, a higher than expected number of survey respondents desired improvements to reliability (the fifth-most requested improvement, out of ten). This disproportionate response may result from the delays circulating through campus via 700 North, as previously discussed. Additionally, it may be an issue of perception of reliability, which is influenced by two factors: frequency and real-time arrival information. A single negative experience, such as a missed transfer or an uncertain arrival, can create the perception of unreliable service and serve as a deterrent to ridership. Enhanced

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[1] Short Range Transit Plan, CVTD, 2012

frequency and real-time arrival information help improve the perception of reliability by mitigating the negative impacts of a bad experience like a missed transfer or uncertain arrival.

2.5.1.4 Connectivity/Coverage

The CVTD network provides strong coverage throughout the Cache Valley region: most households are within less than ¼ mile of a bus line, and most destinations are accessible by bus.

2.5.1.5 Simplicity & Legibility

Due to the large number of routes (15) and complexity of individual alignments, the CVTD system can be challenging to understand for people who are not frequent riders. Varying frequencies and spans between routes are not effectively communicated via existing maps, and the system does not participate in third-party mapping tools such as Google Maps.

2.5.1.6 Civility

Like the Aggie Shuttle, CVTD provides inconsistent bus stop facilities: some CVTD stops are clearly marked with benches, shelters, and signage, while others have minimal street presence despite experiencing high ridership. According to the USU Survey, stop improvements were the fourth-most requested improvement. Given the infrequent service on most CVTD routes, the addition of shelters, benches, lighting, and signage are needed at bus stops to create a more accommodating place to wait for the bus.

Additionally, improving passenger access to information will help improve the CVTD rider experience. CVTD presently lacks bus tracking capabilities and consequently does not offer a mobile application for real time arrival information – an omission that makes riding the bus less convenient and adds uncertainty for when the bus will arrive.

2.5.1.7 Service Performance

USU students, faculty, staff, and visitors represent an integral part of CVTD's ridership. CVTD's two busiest routes travel through the USU Campus: Route 1 serves approximately 1,360 passengers per day, while Route 4 serves 988 passengers per day. The majority of these passengers are traveling between the Transit Center or the residential areas west of campus, and Veterinary Sciences or Industrial Sciences stops. Two additional routes, Route 2 and CVN, travel through campus.

A summary of CVTD service performance is provided in **Table 9**. **Figures 5 and 6** illustrate ridership for outbound trips on Routes 1 and 4 (from the 2012 SRTP).

Table 9: CVTD Performance Analysis

CVTD Performance Analysis (2011 Data)		
Route	**Passengers per Day**	**Passengers per Revenue Mile**
Route 1	1,360	68.0
Route 2	766	50.9
Route 4	988	68.4
CVN	555	28.6

Route 1 Outbound Weekday Boarding & Alighting Activity

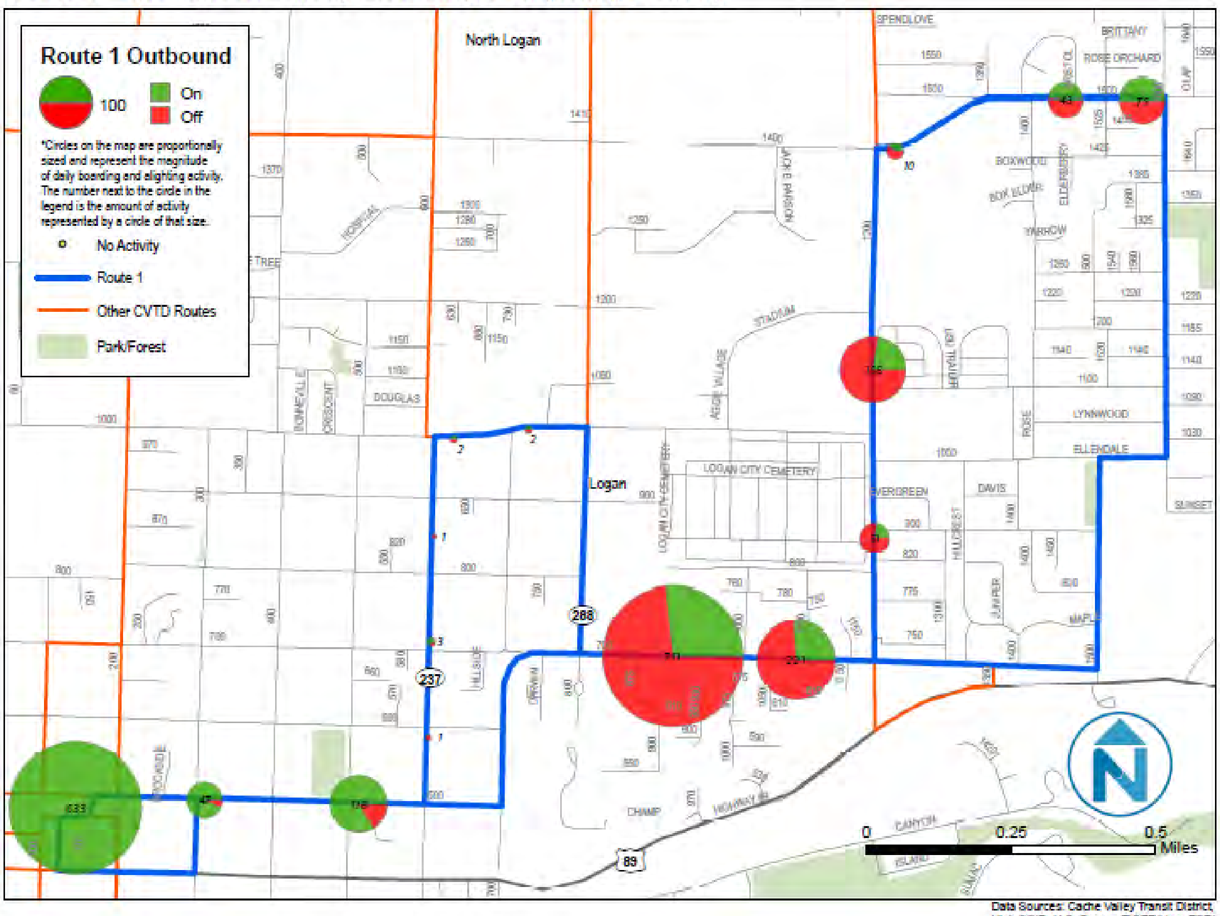


Figure 5: Route 1 Outbound Ridership (2012 SRTP)

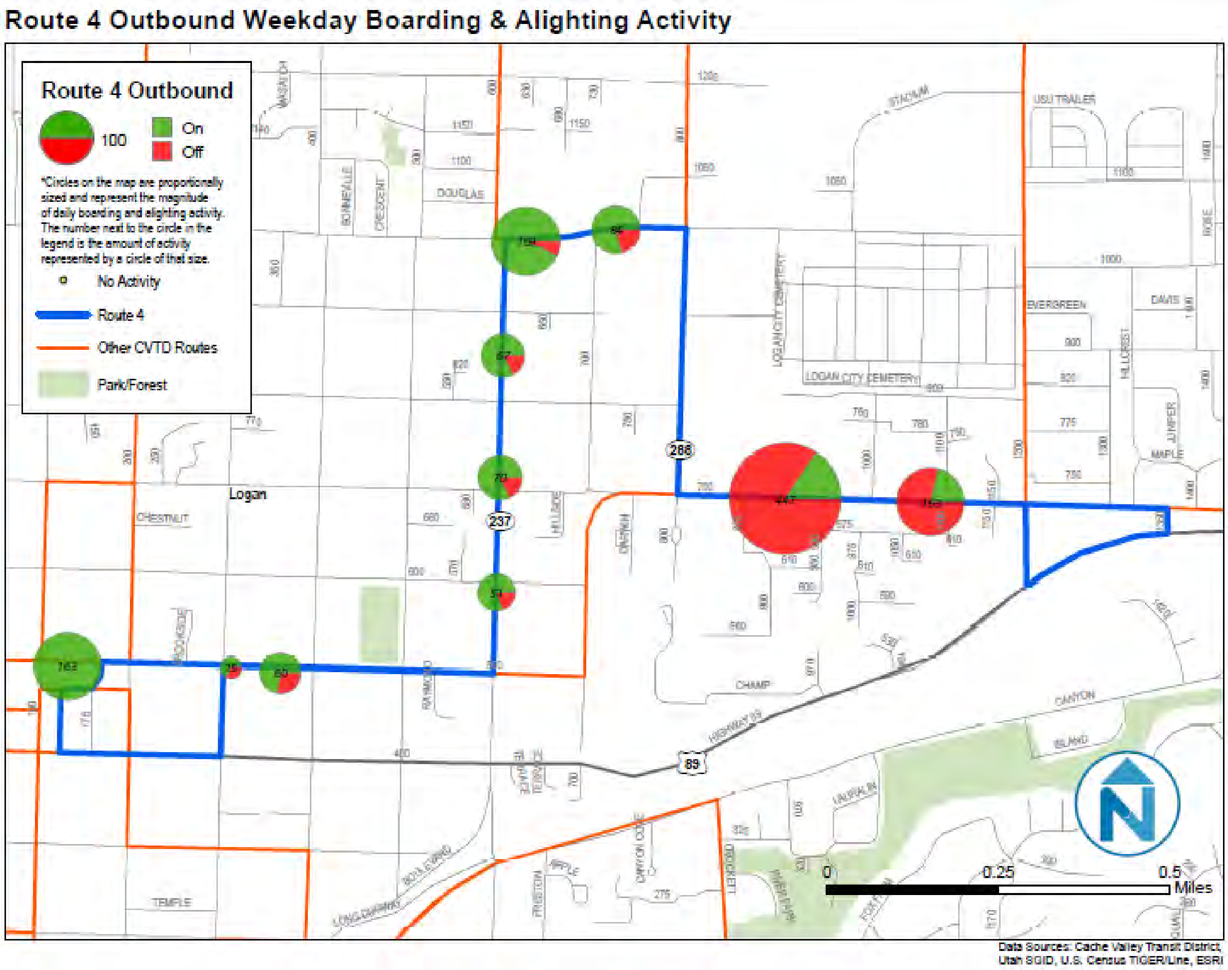


Figure 6: Route 4 Outbound Ridership (2012 SRTP)

2.5.1.8 STIC Performance

For the FY-2014 STIC apportionment, CVTD received $576,049 for exceeding three of the six performance criteria. CVTD significantly exceeded the STIC thresholds for each performance criteria: passenger miles per vehicle revenue mile (+31 percent over performance threshold), passenger miles per vehicle revenue hour (+17 percent), and passenger trips per capita (+51 percent). CVTD did not exceed three criteria: vehicle revenue miles per capita (-17 percent), passenger miles per capita (-12 percent), and passenger miles per capita (-11 percent). In essence, CVTD experiences very high ridership, but operates less service over a shorter distance compared to the performance thresholds.

Table 10: 2014 Small Transit Intensive Cities Performance Data and Apportionment Projections for Consolidated CVTD-USU Reporting

Category	Passenger Miles per Vehicle Revenue Mile	Passenger Miles per Vehicle Revenue Hour	Vehicle Revenue Miles per Capita	Vehicle Revenue Hours per Capita	Passenger Miles per Capita	Passenger Trips per Capita	Number of Criteria Met or Exceeded	STIC Funding Allocation
STIC Thresholds (2014)	*6.33*	*104.59*	*10.62*	*0.68*	*82.42*	*13.22*		
CVTD (2014)	8.30	122.55	8.84	0.60	73.33	20.00	3	$576,049

2.5.1.1 Summary & Short Range Transportation Plan

CVTD operates a highly efficient system that plays a key role in facilitating access to USU and offering mobility choices for students, faculty, staff, and visitors. It offers a strong base of regional transit services to build upon as the campus expands. For USU, the primary challenge to growing CVTD ridership to/from campus is the limited frequency and span of service – 15 minute weekday frequencies and more evening and weekend service is needed to improve its convenience. Additionally, faster, more direct service, real-time arrival information, and stop improvements is needed. Upon achieving these service levels, CVTD will provide a more viable alternative for students, faculty, and staff. However, all of these improvements are presently limited by financial constraints.

CVTD has already began planning for service improvements and expansions through its 2012 Short Range Transportation Plan (SRTP). The SRTP offers a number of recommendations that will change service to USU, likely to be implemented by 2017. Most notably, the SRTP recommends the termination of service along Routes 2 and 9 and reallocating these resources to an extension of Routes 4 and 5. This reconfiguration would offer significant benefits to USU by creating a direct connection between the dense neighborhoods of northwestern Logan and the USU Innovation Center, Logan Regional Hospital, Aggie Village, and the main campus. To be cost-neutral, it is anticipated that headways will remain at 30 minutes for both Routes 4 and 5.

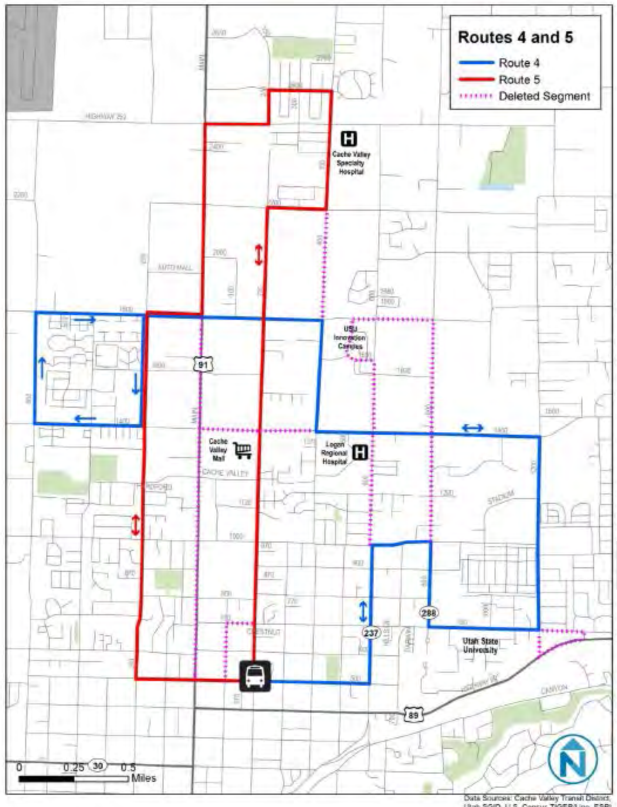


Figure 7: Proposed Service Changes to Routes 2, 4, 5, and 9

CVTD outlines two scenarios for expanding transit service, as additional funding becomes available:

- With $300,000 in additional funding, CVTD proposes operating Route 4 every 15 minutes during peak hours on weekdays when USU is in session. It also proposes operating Route 7 every 15 minutes during peak hours to meet capacity needs on a heavily-used route, and increasing service on the CVN to 30 minute peak frequencies.
- With $1,000,000 in additional funding, CVTD proposes operating Routes 4 and 7 every 15 minutes all day when USU is in session, expanding service hours for two additional hours per day, and increasing frequencies on Routes 12, CVS, and CVN.

These service expansions will focus on CVTD's most productive routes, including those that serve the USU campus. Increased frequency and span over service will both increase ridership and enhance competitiveness for STIC funding – which, in turn, can lead to more service and ridership. It is in the best interest of USU for CVTD to fully implement its SRTP and to continue growing service beyond these recommendations, so that transit may serve as an attractive choice for a multitude of trips and users.

3 RECOMMENDATIONS

The performance evaluation has demonstrated that USU and CVTD operate highly successful transit services that serve a significant amount of riders. To build upon this success and accommodate campus growth, it is necessary to expand funding and achieve operational efficiencies to implement more frequent, efficient, user-friendly service. Once additional resources are available, the USU Shuttle and CVTD bus systems can expand service to meet future needs.

This section offers three recommendations:

1. Coordinate with CVTD to seek additional funding, specifically by way of the Small Transit Intensive Cities Program by the Federal Transit Administration
2. Invest in operational efficiencies and rider experience, through capital improvements that improve pedestrian access, reduce conflicts between buses and other modes, and create more interconnected and user-friendly systems
3. Consolidate and enhance service, to grow ridership in key opportunity areas on campus and region-wide

3.1 COORDINATE WITH CVTD TO SEEK ADDITIONAL FUNDING

Closer coordination between CVTD and USU offers opportunities to expand transit funding to improve existing service. This section evaluates how CVTD and the Aggie Shuttle can collaborate to grow funding for transit in the region.

3.1.1 Small Transit Intensive Cities (STIC) Program

The Small Transit Intensive Cities (STIC) program offers an opportunity to expand transit funding for CVTD and USU. CVTD and USU staff have expressed a desire for closer coordination in order to potentially improve their competitiveness for STIC funding. In 2014, CVTD received $576,049 by qualifying for three of the six performance categories. These funds support bus operations and preventative maintenance.

According to correspondence with the FTA Region 8 office, formula apportionment for the STIC program is based upon all services that meet the statutory definition of public transportation (being open to the public and compliant with the Americans with Disabilities Act).[2] All services that are reported to the National Transit Database (NTD) are eligible, regardless of who operates the service. Because the USU

[2] Email correspondence with Donna Douville, Acting Deputy Regional Administrator of FTA Region 8 office, 25 November 2014

Shuttle meets these requirements, they are eligible for STIC funding; however, their services are currently not included in CVTD's reporting to the NTD.

The joint reporting of USU and CVTD operations data to the NTD would likely increase their apportionment through the STIC program. Based on 2014 estimates, CVTD-USU would exceed five performance categories by reporting together, as opposed to three by CVTD reporting without USU:

- Three categories continued to exceed performance thresholds: passenger miles per vehicle revenue mile, and passenger miles per vehicle revenue mile would decrease in value, but continue to securely exceed the thresholds; passenger trips per capita would significantly increase in value
- Two additional categories would exceed performance thresholds that currently do not: vehicle revenue hours per capita and passenger miles per capita
- Vehicle revenue miles per capita would remain below the performance threshold, but increase to a value close to meeting the threshold if service is expanded.

The changes to specific metrics are shown in **Table 11** below; criteria which exceed the thresholds are shown in green; criteria which do not exceed the thresholds are shown in red.

Table 11: 2014 Small Transit Intensive Cities Performance Data and Apportionment Projections for Consolidated CVTD-USU Reporting[3]

Category	Passenger Miles per Vehicle Revenue Mile	Passenger Miles per Vehicle Revenue Hour	Vehicle Revenue Miles per Capita	Vehicle Revenue Hours per Capita	Passenger Miles per Capita	Passenger Trips per Capita	Number of Criteria Met or Exceeded	STIC Funding Allocation
STIC Thresholds (2014)	*6.33*	*104.59*	*10.62*	*0.68*	*82.42*	*13.22*		
CVTD (Existing)	8.30	122.55	8.84	0.60	73.33	20.00	3	$576,049
CVTD (with USU)*	8.02	113.61	10.20	0.72	81.82	32.12	5	$960,080
Total Projected Increase in STIC Funding								***$384,031***

*Excluding charter services and Water Lab service. Passenger miles for Aggie Shuttle estimated by Fehr & Peers through analysis of ridership patterns

Additionally, it is worth noting that joint reporting could create a positive feedback loop: an increase in STIC funding would allow for more service, which will increase vehicle revenue miles, vehicle revenue hours, passenger miles, and passenger trips – leading to stronger STIC performance and potentially more funding.

In order to jointly report to the NTD and share this resulting increase in STIC funding, CVTD and USU would need to develop a subgrantee agreement which details responsibilities of each party. Joint reporting would hold CVTD accountable for the Aggie Shuttle's compliance with federal laws (including, but not limited to, ADA, Title VI of the Civil Rights Act, and the Equal Opportunity Employment Program). Consequently, the subgrantee agreement between CVTD and USU would detail:

- Proposed allocation of STIC funding
- ADA Compliance Reporting, as it relates to Aggie Shuttle capital improvements
- Title VI Compliance Reporting, as it relates to Aggie Shuttle service changes
- Equal Opportunity Employment Program compliance
- Joint planning and performance review processes, to ensure close coordination in making changes that may affect future STIC funding

In developing this subgrantee agreement, close coordination with the FTA Region 8 office is recommended.

While $384,000 in additional STIC funding will provide opportunities for service expansions, it is unlikely that this sum will prove sufficient for service expansions to reach levels that meet existing and future demand. For this reason, the pursuit of additional funding will be necessary.

3.1.2 Additional Funding Sources

As the USU campus and Cache Valley region grows, additional funding will be necessary to support enhanced service by CVTD as well as the Aggie Shuttle. Potential funding sources for the Aggie Shuttle and CVTD include:

- Transit fee for faculty and staff
- Parking surcharge (for all users)
- Increase in student fees
- Regional sales tax measure
- Transit fares
- Federal grants

A brief discussion of each measure is below.

3.1.2.1 Transit Fee for Faculty and Staff

A transit fee for faculty and staff is worthy of consideration to offer greater equity in funding the Aggie Shuttle. Presently, faculty and staff do not financially contribute to the service, yet they receive benefits from the shuttle service.

3.1.2.2 Parking Surcharge

A surcharge on parking serves as both a means of increasing funding for transit and as a TDM measure to help manage parking supply. Revenues from a parking surcharge could be reinvested in Aggie Shuttle and/or CVTD services to support shuttle services that connect to satellite parking lots and improve access to campus by CVTD.

3.1.2.3 Increase in Student Fees

An increase in student fees is generally well-received as a means of enhancing transit service: almost 60 percent of students support an increase of up to $10 for transit. Such an increase could result in up to $270,000 annually. However, it is recommended that other funding measures are pursued before increasing student fees, given that students already shoulder the full cost burden of the Aggie Shuttle service despite its benefits to the entire university population. Any increase should also clearly articulate the additional services provided so that students may have an active role in prioritizing what services they want to expand (i.e. daytime, weeknights, weekends, etc.).

3.1.2.4 Regional Sales Tax Measure

A regional sales tax increase has been under discussion by CVTD to increase transit funding region-wide. A 0.25% increase in sales tax would generate $2.8 million per year (a 50 percent increase in revenue). The proposed sales tax increase would help fund real time vehicle tracking, increased frequency of services, more direct connections to USU, and cleaner, more fuel-efficient buses. Should CVTD pursue a ballot measure to increase sales tax, it is recommended that USU support this measure to enhance transit services to campus and reduce transportation impacts of campus expansion, including traffic congestion, parking demand, and air pollution.

3.1.2.5 Transit Fares

The implementation of fares is not recommended at this time for either CVTD or the Aggie Shuttle. As noted in the CVTD SRTP, the implementation of fares is likely to cost a significant amount to implement, reduce ridership (jeopardizing STIC funding), and increase travel times. Similar negative impacts are anticipated if the Aggie Shuttle introduced fares.

3.1.2.6 Federal Grants

A number of federal grant opportunities exist to invest in capital improvements and lifeline transportation services. The availability and scope of these grants is constantly changing. USU should play an active role in supporting CVTD's pursuit of these grants, as needed.

3.2 INVEST IN OPERATIONAL EFFICIENCIES AND RIDER EXPERIENCE

The transit operations of CVTD and the Aggie Shuttle are adversely affected by some on-campus street infrastructure that results in higher operating costs, slower travel times, and less accessibility and convenience for riders. This section evaluates high-priority investments in operational efficiencies and rider experience that will reduce operating costs and improve the rider experience. The implementation of these capital improvements will help attract new riders and improve performance for STIC funding.

The following capital improvements are proposed:

- A redesign of 700 North
- A redesign of 800 East
- Improvements to the Transit Center at the Taggart Student Center
- Stop additions and enhancements
- Low-floor buses
- Improved access to bus information

For projects that result in changes to the street right-of-way, close coordination with the City of Logan is also necessary, since the City has jurisdiction over most roadways. These improvements are discussed in greater detail later in this memo; this section provides an overview of their benefits to transit operations and ridership.

3.2.1 700 North

The current configuration of 700 North poses challenges for bus operations due to frequent conflicts between modes. 700 North bisects the USU main campus; it serves as a major cross-campus route for people walking, biking, riding transit, and driving. People biking and walking repeatedly cross 700 North at both designated crosswalks and at other undesignated locations. As a result, conflicts between buses and other modes frequently occur.

The current configuration of 700 North is particularly challenging for bus operations: it is the busiest stretch in the CVTD system, yet it is also the most unreliable and biggest source of delay for CVTD and the Aggie Shuttle. Approximately 4,200 bus passengers ride through campus on 700 North per day (3,000

CVTD passengers and 1,200 Aggie Shuttle passengers). These passengers are subject to delays from three sources: high volumes of pedestrians crossing the street at crosswalks, pedestrians who "jaywalk," and vehicle queues. Pedestrian volumes crossing 700 North are sizable throughout the day, particularly between classes; this activity is unavoidable on a pedestrian-oriented campus like USU. However, delays at crosswalks are compounded by resulting vehicle queues that back up along the street. Rather than pulling up to a crosswalk and waiting a few seconds for a break in pedestrians, buses must wait behind other vehicles that are each waiting for a break. These queues also encourage more jaywalking when cars are traveling slowly or are stopped. Therefore, a delay of a few seconds becomes a delay of minutes at a time.

Improving bus operations on 700 North is not only crucial for existing service, but also planned service expansions. As detailed in Section 2.3, 700 North represents an opportunity for expanded bus service by both CVTD and the Aggie Shuttle. To successfully grow service and ridership, the reliability of 700 North must be addressed.

A five-part solution is recommended to reduce conflicts and improve operating speeds:

1. The construction of a median featuring a small fence to limit pedestrian crossings outside of designated crosswalks, similar to the fence along Champ Dr.
2. The restriction of automobile traffic on 700 North for local access only between 800 East and 1200 East.
3. The construction of a cycle track, to separate bicycle traffic from bus traffic
4. High-visibility markings at crosswalks, to alert all users of a potential conflict point
5. The establishment of an education campaign to promote better bus-pedestrian and bus-bicycle interactions.

Combined, these measures will improve bus operating speeds and reliability through 700 North, benefitting all bus riders and reducing conflicts between modes. The median fence will contain pedestrian crossings to designated crosswalks, creating a more predictable and safer street environment. The restriction of automobile traffic will reduce queues and resulting delays, limiting the compounding delay effect that presently occurs. High-visibility crosswalks and an educational campaign will also help promote safer, more orderly interactions – particularly to alert pedestrians that buses are present and need to cross. This campaign could feature signage at crosswalks such as "Give the Bus a Break" to encourage letting the bus pass. A safety education campaign could prove particularly useful, however, in promoting safe bus-bike interactions to ensure that both parties are informed of best practices.

While these improvements may not fully eliminate conflicts and delays, they will address two of the three key sources. As a result, CVTD and the Aggie Shuttle will be able to run more efficient bus service through the corridor.

Timeline: 0-5 years

3.2.2 800 East

A redesign of 800 East presents an opportunity to improve transit service and accessibility while reducing operating costs. The 800 East corridor is the Aggie Shuttle's busiest, comprising half of the system's ridership (about 4,500 per day when USU is in session). All four routes travel along at least a portion of 800 East, connecting to housing, parking, and the Innovation Campus. The east side of 800 East is a dense and growing area for student housing as well. However, despite its heavy transit use, the existing design of 800 East is designed to facilitate fast automobile travel at the expense of pedestrian, bicycle, and transit accessibility: the street is 90 feet wide, lacks a sidewalk along the east side adjacent to the stadium, and has no crosswalks for a ½ mile stretch between 1000 North and 1400 North.

Due to the lack of pedestrian facilities on 800 East, Aggie Shuttle service is split into two lines to reduce the need to cross the street: the Stadium Express and 8th East Express/Innovation. The intent of this split configuration is to allow direct shuttle access for passengers traveling to/from the stadium parking lot without crossing 800 East. The 8th East Express/Innovation route has no northbound stops; passengers traveling to the west side of 800 East are expected to continue riding to the innovation campus and back to the southbound stops at 1200 North and 1000 North – a diversion of approximately 10 minutes.

This route configuration has several unintended consequences:

- A redundancy of bus service, which increases operating costs by $14,000-$52,000 per year
- Passengers still jaywalk across 800 East where there is no crosswalk between 1000 North and 1400 North, creating potential conflicts with fast-moving vehicles
- Passengers who access the east side of 800 East without jaywalking are penalized with a diversion of 10 minutes per trip
- Less frequent service to the Innovation Campus and student housing
- Bus capacity constraints at the Taggart Student Union turnaround
- More complex and less user-friendly bus service

To improve transit conditions on 800 East, it is recommended that the Stadium Express and 8th East Express/Innovation routes are combined into a single service to reduce costs, provide more frequent service, and better serve existing demand. Three consolidation alternatives are possible:

1. Consolidation while maintaining the same frequencies (4-5 minutes peak, eight minutes off-peak) would reduce operating costs by 25 percent ($52,000/year). In this scenario, three buses would operate at during peak hours, as opposed to five as currently operate. This scenario would expand

service capacity to the Stadium Lot, but decrease capacity on the corridor as a whole, which may be an issue if peak demand is high for travel to the Innovation Campus.

2. Consolidation while increasing frequency and capacity during the morning peak, offering under four minute headways from 8 a.m. to 10 a.m. Four buses would operate during the morning peak in this scenario (the busiest time of day). Service would mirror Scenario 1 otherwise. This scenario would reduce operating costs by 20 percent ($41,800/year).
3. Consolidation while increasing frequency and capacity during the school day, offering under four minute headways from 8 a.m. to 3:30 p.m. Four buses would operate for most of the day under this scenario. This scenario would offer for a savings of seven percent ($14,000/year).

Table 12: 800 East Service Alternatives

Route	Total Daily Hours of Operation	Frequency	Operations Cost
Stadium Express	19	8-10 minutes (7 a.m. -8 a.m., 3:30 p.m.-6:30pm) 4-5 minutes (8 a.m. -3:30 p.m.)	$96,600
8th East Express/ Innovation	21.5	13-15 minutes (3:30-6pm) 7-8 minutes (7 a.m. -8 a.m., 10 a.m. -3:30 p.m.) 4-5 minutes (8 a.m. -10 a.m.)	$109,300
Total Hours of Operation	*40.5*	*Estimated Annual Operations Cost*	*$205,900*
Alternative 1: Maintain Existing Frequency			
8th East/ Innovation, Scenario 1	30.5	7-8 minutes (7 a.m. -8 a.m , 3:30-6:30pm) 4-5 minutes (8 a.m. -3:30 p.m.)	$154,000
		Scenario 1: Estimated Annual Savings	*$51,900 (-25%)*
Alternative 2: Increase Morning Peak Frequency			
8th East/Innovation, Scenario 2	32.5	7-8 minutes (7 a.m. -8 a.m. , 3:30-6:30pm) 4-5 minutes (10 a.m. -3:30 p.m.) 3-4 minutes (8 a.m. -10 a.m.)	$164,100/year
		Scenario 2: Estimated Annual Savings	*$41,800 (-20%)*

Alternative 3: Increase School Day Frequency			
8th East/Innovation, Scenario 3	38	7-8 minutes (7 a.m. -8 a.m. , 3:30-6:30pm) 3-4 minutes (8 a.m. -3:30 p.m.)	$191,900
		Scenario 3: Estimated Annual Savings	*$14,000 (-7%)*

In order to consolidate these services, however, it is first necessary to redesign 800 East to become a more pedestrian-friendly and transit-friendly street. USU and the City of Logan should pursue a design which narrows crossing distances, adds a sidewalk on the east side, adds new northbound bus stops at 1000 North, 1200 North, and adds high visibility crosswalks with appropriate signage to accompany each bus stop. An additional northbound and southbound stop could be added between 1000 North and 1200 North to maximize access to the stadium lot, if desired. A new stop is also recommended at 900 North to serve additional housing and provide a downhill-uphill connection.

While there will be capital costs for these improvements, the annual operating costs savings, enhanced pedestrian accessibility, and improved transit service will result in lower expenses and fewer conflicts over the long term. These savings could be reinvested into additional service on the 800 East corridor, or elsewhere on the USU campus.

Timeline: 0-5 years

3.2.3 Transit Center Improvements

The construction of a transit center has been under consideration by USU to concentrate transit services at a single hub on campus. A transit center offers the ability to centralize transit services on campus to create a combined facility for both CVTD and the Aggie Shuttle, which are not always well connected. However, the construction of a new transit center is not recommended at this time due to a lack of centrally-located sites, geometric constraints of multiple divergent through-routes, and the potentially high cost. Instead, stop improvements at the intersection of 700 North/800 East are recommended to better facilitate transfers between CVTD and the Aggie Shuttle.

Presently, there are two stops on the USU campus with particularly high ridership: the Taggart Student Union turnaround (2,100 boardings per day) and Veterinary Science Building (1,300 boardings per day). However, these stops are separated by a relatively long distance of over 800 feet, which discourages transferring between the two systems. To better integrate and connect CVTD and Aggie Shuttle services, this transfer distance should be reduced.

One alternative to improve connections between CVTD and the Aggie Shuttle is to expand the small transit center at the Taggart Student Center turnaround. However, this alternative is not ideal: the turnaround has capacity constraints and is unable to hold more buses. Additionally, a route diversion into the turnaround (or any other potential site) would result in delays for CVTD routes that run along 700 North, resulting in longer travel times for all passengers traveling through the corridor. This alternative is not recommended for these reasons.

To improve connections between CVTD and the Aggie Shuttle, targeted improvements to the 700 North/800 East intersection and Taggart Student Center turnaround are recommended. These include:

- Adding CVTD (and Campus Loop) stops on the far-side of the intersection, reducing transfer distances to 250-400 feet (a decrease of 50-75 percent)
- Installing high-visibility crosswalks and other pedestrian improvements
- Expanding stop areas at Taggart Student Center turnaround
- Wayfinding signage, maps, and real-time arrival information at both stops

The consolidation of the 8th East/Innovation and Stadium Express routes should also help alleviate bus storage capacity issues at the Taggart Student Union turnaround. However, as transit service grows at this location, additional design modifications may be warranted to provide priority to buses, such as restrictions for automobile access. Overall, it is anticipated that these improvements will cost significantly less than the construction of a new transit center or major expansion of existing facilities.

These intersection improvements will have a relatively lower cost in lieu of the construction of a new transit center, and will preserve land to be available for other university uses. Over the long run, similar improvements are recommended at the intersection of 1400 North and 800 East, which will become another key transfer point.

Timeline: 0-5 years

3.2.4 Stop Additions and Enhancements

Enhancing bus stops represents a key opportunity for improving the experience of bus riders. While some CVTD and Aggie Shuttle stops already include basic components like wind-protected shelters, benches, wayfinding signage, trash cans, and convenient pedestrian access, many others do not. Improvements to shelters and lighting was one of the top four recommendations of the USU Survey for both CVTD and the Aggie Shuttle. Both CVTD and the Aggie Shuttle should strive to make these components standard at both on-campus and off-campus stops in order to make riding the bus a pleasant experience regardless of weather or time of day. At key high-volume stops, real-time arrival information displays are also recommended.

The addition of new stops at key gaps is also recommended to improve transit connectivity and accessibility. In some locations around campus, stop spacing is rather wide relative to the high concentration of activity. The Aggie Shuttle and CVTD should add stops at select locations, including:

- 700 North/800 East, for both CVTD and Aggie Shuttle service, as discussed in 2.2.3
- 700 North/1200 East, for both CVTD and Aggie Shuttle service
- 800 East/900 North, for Aggie Shuttle service (all routes, noted above in 2.2.4)
- 800 East/1000 North and 1200 East northbound (8^{th} East/Innovation, noted above in 2.2.4)
- 700 North at the Veterinary Sciences Building, for the Evening Express

Timeline: 0-5 years

3.2.5 Low-Floor Buses

Over the long term, USU should replace high-floor vehicles with low-floor vehicles on high ridership routes. Low-floor buses accommodate faster and easier boarding and alighting, reducing dwell times and resulting in more efficient operations. Low-floor buses typically also offer more amenities for standing passengers, which can increase carrying capacity without adding new service.

Timeline: 10-25 years

3.2.6 Information Accessibility

Both CVTD and USU should strive to improve information accessibility for riders. Presently, the Aggie Shuttle offers real-time bus tracking via a mobile phone app, website, and text message service, while CVTD publishes schedules on bus service. Enhancing information access for both CVTD and the Aggie Shuttle offers an opportunity to improve the experience of existing riders and attract new riders. The following improvements are recommended:

- The Aggie Shuttle should publish frequencies for each route by time of day to better inform riders. Frequencies vary by time of day on most routes, so it is difficult for riders to plan ahead without knowing when a bus operates at five minute versus 15 minute headways.
- CVTD and the Aggie Shuttle should include maps and schedule information at all stops, as previously discussed,
- CVTD should implement real-time bus tracking to provide live schedule updates to riders and alerts them to potential delays. According to the USU Survey, real-time bus tracking was the most

desired improvement for CVTD. If possible, CVTD should collaborate with USU to create a single integrated bus tracking platform with similar mobile app, website, and text message capabilities

- CVTD should update its website to feature a more user-friendly map interface and improve mobile capabilities.
- Both CVTD and USU should collaborate with third-party trip planning services like Google Transit to improve the accessibility of trip planning information. These services allow riders to easily plan their trips and help make transit more accessible to people who are not regular riders. These services are free of charge; it is only necessary to submit operations data.

Timeline: 0-5 years

3.3 EXPAND SERVICE

The implementation of targeted capital improvements and an expansion of operational funding will set the stage for service expansions for both CVTD and the Aggie Shuttle. This section outlines recommendations to expand transit service that creates a convenient alternative to driving for USU students, faculty, and staff. These service expansions have the potential to play a vital role in supporting the growth of USU by reducing traffic, air pollution, and parking needs while enhancing quality of life in the Cache Valley.

3.3.1 CVTD

To enhance transit connections between the Cache Valley and USU campus, it is recommended that CVTD implement the recommendations of the SRTP as funding becomes available. The expansion of transit services throughout Logan and beyond directly benefits USU because all students, faculty, and staff experience increased mobility and choice. As frequency and span of service is increased, the convenience of riding CVTD is enhanced; ridership will increase as a result.

While all recommendations in the SRTP provide benefits to USU, in particular, key campus access priorities include:

- Increased frequency to 15 minutes (all day) on Routes 4 and 7, and to 30 minutes (peak) for Route CVN
- Rerouting Route 4 (and corresponding changes to Routes 2, 5, and 9) to provide a direct connection between northwest Logan and the USU campus
- Expanding the span of evening service from 8:30pm to 10:30pm on weekdays and 6:30pm to 8:30pm on Saturdays

In its SRTP, CVTD splits these improvements into two packages: a $300,000 increase in operating costs, and a $1,000,000 increase in operating costs. The $300,000 package includes 15 minute peak service for Routes 4 and 7, while the $1,000,000 package includes 15 minute all day service as well as a number of other improvements. Rerouting Route 4 is cost-neutral improvement expected to occur between now and 2017. It is likely that an increase in STIC funding could cover the $300,000 package; additional funding is needed from other sources to further expand service. Additionally, each package requires a capital investment to purchase new buses.

The SRTP estimates that the $300,000 package would increase ridership by 814 passengers per day (168,240 per year, an 8 percent increase), while the $1 million package would increase ridership by 1,894 passengers per day (474,679 per year, a 24 percent increase).

Timeline: 0-5 years, or as funding becomes available

Even with an additional $1 million in annual operating costs, several unmet needs would remain:

- The operation of Routes 1, 4, and 7 every 15 minutes all day on all weekdays, including non-USU days
- The operation of the CVS Express extension to USU all day, as opposed to peak times
- The operation of Route CVN every 30 minutes all day, as opposed to peak times
- Extend service span by two hours on all routes during weekdays and Saturdays
- Sunday service

Over the long term it is recommended that CVTD implements these unfunded recommendations. Additionally, CVTD should examine establishment of trunk line service which consolidates Lines 4 and 7 into a single frequent service. This service may also be consolidated with Route 1, if desired, which partially duplicates Route 4 service. The intent of trunk service is to create an enhanced bus line that serves major ridership corridors with frequent, fast, specially-branded service throughout the day. By providing 15 minute frequencies (or better) and eliminating the delay associated with transfers, this service could be convenient and time-completive with driving. Such a service could also help spur transit-oriented development around its stops.

Additionally, the implementation of Sunday service is recommended to provide mobility for students and other transit users seven days a week. Sunday service will help reduce the need to for car ownership for USU students, faculty, and staff.

Timeline: 10 years

Ultimately, the expansion of the USU campus and associated growth impacts to Logan and the Cache Valley may warrant a larger transit investment in the form of bus rapid transit (BRT). Typical BRT systems offer dedicated transit lanes, enhanced stations, and level boarding – providing fast, frequent service that provides a rail-like experience. BRT has proven to be a highly successful investment for high demand corridors in similar mid-sized college towns like Eugene, Oregon and Fort Collins, Colorado. BRT represents a logical long-term goal for trunk service and merits further consideration.

Timeline: 25 years

The implementation of any service changes will consequently change performance of CVTD in the STIC Program. It is anticipated that all input values will increase. These changes may result in increased STIC funding: vehicle revenue miles per capita and vehicle revenue hours per capita may will increase, potentially to levels of meeting a sixth performance threshold. However, the effect on passenger miles per vehicle revenue mile and passenger miles per vehicle revenue hour is unclear, depending on how ridership responds to these changes. Since these performance criteria already significantly exceed the threshold (with and without the Aggie Shuttle), it is likely that no change will occur. Nevertheless, further analysis is necessary to examine future service changes as they relate to STIC funding.

3.3.2 Aggie Shuttle

The role of the Aggie Shuttle in transporting USU students, faculty, staff, and visitors will continue to grow as the campus expands. The resulting changes of Aggie Shuttle services may broadly focus on the following areas:

- Extended service hours (nights and weekends)
- More frequent service
- Summer, non-instructional, and holiday service
- New routes

This section provides evaluates these alternatives and offers recommendations for prioritization and conceptual cost estimates for each. These cost estimates were generated by calculating the cost of bus operations and maintenance per hour, excluding the fixed costs of debt service for the buses (since these payments will occur regardless of bus service levels).

3.3.2.1 Extended Service Hours (Nights & Weekends)

Over the short term, the USU Survey identified extending service hours – both nights and weekends – as its highest priority recommendation. Presently, service ends at 9pm on weeknights, despite the fact that some USU facilities such as the Merrill-Cazier Library are open until 12am. Weekend service, particularly on Sundays, also represents a critical need to support students who live without access to a car, providing access to groceries, shopping, dining, and other typical weekend trips.

An expansion of weeknight service is highly recommended to improve mobility during late night hours. The Evening Express hours of operation should be extended to 12am (Monday-Thursday) to match the hours of operation for the library and other facilities. This expansion of service would cost approximately $12,000 per year, and represents a high priority for USU in the short term.

The Evening Express service should also be expanded to weekends during the day as a new Weekend/Evening Express. Much like the evening service, the weekend service would provide on-campus circulation for students to access the library and other facilities. This service could operate on Saturdays, Sundays, and holidays (Labor Day, Fall Holiday, Martin Luther King Day, and President's Day) while school is in session, both during the day and evenings to mirror hours of operation for other campus facilities. The feasibility of these services are largely dependent upon campus residential growth, so these services are recommended at a later stage of implementation. Weekend daytime service would cost $16,800 per year for 28 weekends per year when school is in session. Holiday service would cost an additional $1,300 per year.

The Aggie Shuttle should also consider launching weekend off-campus service to supplement services provided by CVTD. Saturday evening and Sunday service represents a lower regional priority for CVTD relative to improving weekday service, but it is a higher priority for USU students to enhance mobility and quality of life for USU students and reduce the need to own a car. Initially, a Sunday route could provide basic coverage of Downtown Logan, the USU campus, and shopping destinations in Logan via hourly service. If this program proves successful, it could be expanded to serve additional areas with high concentrations of USU students. Saturday evening service between USU and Downtown Logan is also warranted to improve access to dining and entertainment options for USU students without needing a car. CVTD service currently stops around 6:40 p.m. on Saturdays. USU could potentially partner with CVTD to implement these services.

Sunday service that runs hourly from 10 a.m. to 6pm, 28 Sundays per year (during regular instructional days) would cost approximately $7,500 per year, and represents a high priority. A service operating every 30 minutes would double costs to $15,000 per year. Saturday evening service from 6:30 p.m. to 10 p.m., 28 Saturdays a year would cost $3,200/year.

3.3.2.2 More Frequent Service

Aggie Shuttle service expansion should be targeted along two corridors: the 800 East corridor, connecting the Taggart Student Center and Innovation Campus, and the 700 North/1200 East corridor, connecting the Taggart Student Center and student housing areas. These corridors contain the highest concentrations of existing ridership and significant planned growth.

Frequent, bidirectional service on the 700 North/1200 East corridor would facilitate cross-campus trips on 700 North and provide a direct connection to growing student housing areas on 1000 North. This service would likely be implemented through realigning the Campus Loop route. This alignment would reduce travel times for students by providing a point-to-point service. It would also offer direct bidirectional connections across campus, linking with the 800 East route. This route would likely terminate at the Taggart Student Center. This change in service itself would result in no changes to frequency or annual cost; however, it is recommended that frequencies are increased between 3:30 p.m. and 6pm from every 15 minutes to every 7.5, which would cost approximately $12,700 per year. It is worth noting that the implementation of this service would benefit from a partial redesign of 700 North as discussed in Section 2.2; otherwise, this service may be subject to delays.

It is assumed that the South Campus Express route will be maintained at service levels similar to existing operations. The South Campus Express provides coverage to relatively lower-activity areas of the USU campus not served by the two lines described above, including 1000 North, Champ Dr, and downhill areas west of campus.

As growth occurs on 800 East and 1200 East, the needs for late night service will also change. Over time, a bidirectional U-shaped service along 800 East, 700 North, and 1200 East should replace the existing Evening Express loop to serve growth north of 1000 North.

3.3.2.3 Summer and Non-Instructional Day Service

Over the long term, an expansion of service on typical non-instructional days is recommended to offer a dependable service year-round. This service would likely include lower-frequency versions of existing routes for both summer session services (approximately 45 days per year) and other non-instructional business days (approximately 53 days per year). Presently, summer student enrollment is less than $1/5^{th}$ student enrollment for spring or fall; additional growth is likely necessary to support summer transit services. That being said, the presence of faculty and staff outside of typical Fall and Spring instructional days offers a market for transit services. The justification of an expansion of such services will require a funding commitment from faculty/staff, since students are unlikely to support additional fees for services for which they do not receive a direct benefit.

For conceptual purposes only, it is assumed that both summer session and non-instructional days would offer consolidated 8^{th} East Express service every 15 minutes all day. Additionally, a modified Campus Loop service could operate every 15 minutes during summer session. The cost of these services would be

$32,900/year for summer session services, and $19,400 for non-instructional day services. Additional service could be added as demand warrants.

3.3.2.4 New Routes

As previously discussed, two new routes are recommended: the rerouting of Campus Loop service to bidirectional service along the 700 North/1200 East corridor, and the establishment of Saturday evening and Sunday service that connects to key destinations within Logan. Otherwise, no new routes are recommended. The present Aggie Shuttle network provides sufficient coverage and connectivity throughout the campus, placing most destinations and residences will be within a five minute walk a shuttle stop (pending the stop additions discussed in Section 3.2.4). The addition of new routes would redirect resources away from the Aggie Shuttle's already productive routes; instead, an expansion of frequency and span of existing services is recommended.

3.3.2.5 Summary

A summary of proposed service enhancements are below:

Service	Description	Estimated Additional Cost ($2014)	Timeline
Expanded Evening Express	Extended service hours from 9pm to 12am, Monday-Thursday, every 15 minutes	$12,000/year	0-5 years
Sunday Service, Off-Campus*	New Sunday service linking on-campus and off-campus destinations. Hourly service from 10 a.m. -6pm	$7,500/year	0-5 years
Consolidation of Stadium Express and 8th East Express	Single service along 800 East	($14,000-$52,000/year)	5-10 years
Replace Campus Loop with bidirectional service on 700 North/1200 East	Modified service provides direct, bidirectional connection between new student housing areas and Taggart Student Center	No Change	5-10 years
More frequent service on modified Campus Loop	Between 3:30 p.m. and 6pm, improve frequencies from every 15 minutes to every 7.5 minutes	$12,700/year	5-10 years
Weekend Daytime Service "Weekend/Evening Express"	Between 9am and 6pm, serve Evening Express route every 15 minutes	$16,800/year	5-10 years

Saturday Evening Service* "Weekend/Evening Express"	Service between USU and Downtown Logan from 6:30 to 10pm on Saturdays	$3,200/year	5-10 years
More Frequent Off-Campus Sunday Service*	Expansion of proposed Sunday service to every 30 minutes	$7,500/year	5-10 years
Holiday Service "Weekend/Evening Express"	Daytime Evening Express service during 4 schoolyear holidays	$1,300/year	5-10 years
Total Net Increase in Annual Operating Cost for Service Changes		*$9,000-$46,900/year*	
Summer Session Services	8th East and Campus Loop services every 15 minutes	$32,900/year	When funding becomes available
Non-Instructional Day Services	8th East service every 15 minutes	$19,400/year	When funding becomes available
Total Increase in Annual Operating Cost for Summer & Non-Instructional Days		*$52,300/year*	
Total Increase in Operating Cost for all Proposed Changes		***$61,300-$99,200/year***	

*Assumed in lieu of CVTD service expansion. The total cost of off-campus service to supplement CVTD is $18,200.

**Depending upon consolidation alternative selected for 800 East

Assuming 2014 costs, the total net increase in operating cost for all proposed service changes during the typical academic year is $9,000-$46,900 annually, depending upon the consolidation alternative selected for 800 East. Combined with the cost of providing some Aggie Shuttle service during summer and non-instructional days, the total net increase in operating costs for all proposed services is $61,300-$99,200 per year.

This package of service improvements would solidify the Aggie Shuttle as a dependable year-round transportation option for students, faculty, and staff, helping to orient campus growth around key transit corridors.

4 CONCLUSION

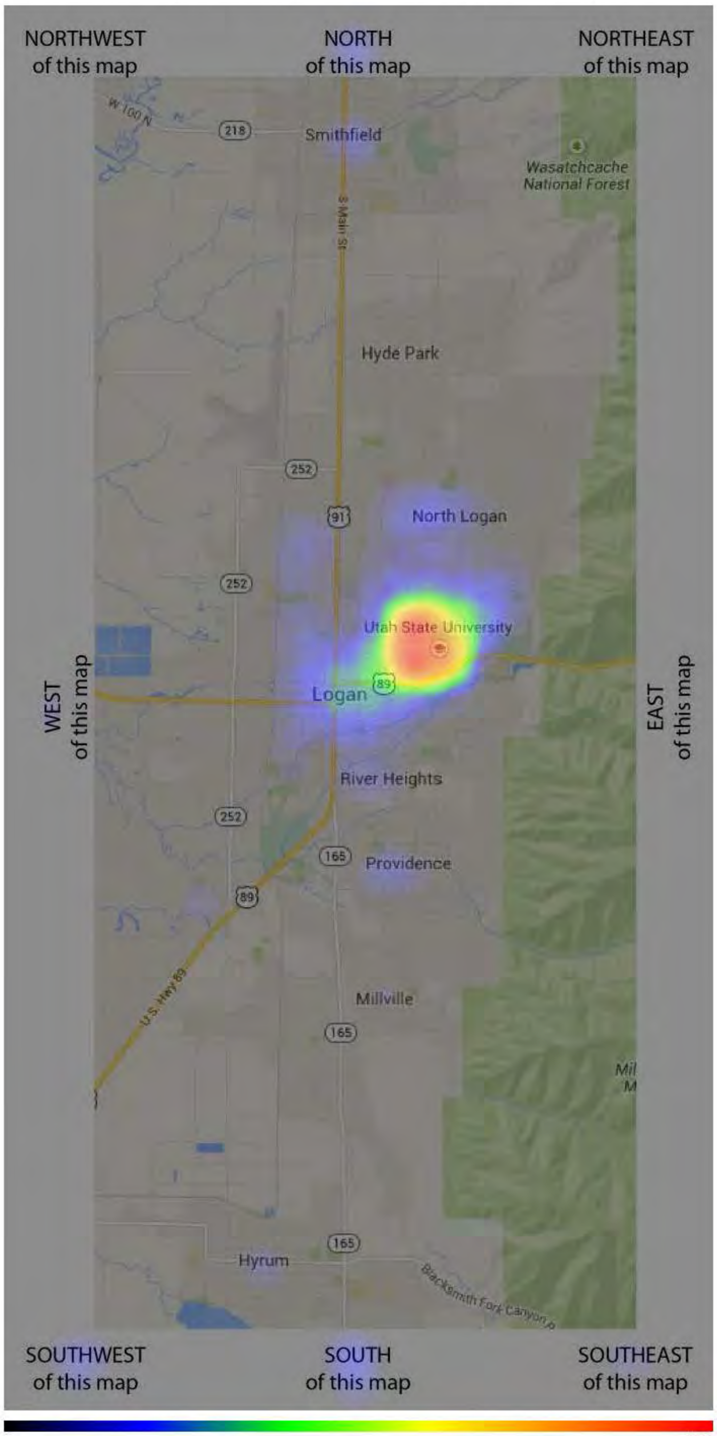
The USU campus already experiences strong and growing transit ridership for both the Aggie Shuttle and CVTD. Over the long term, a robust expansion of transit service is needed to accommodate anticipated campus growth while reducing impacts related to traffic, parking demand, and air pollution. The recommendations detailed in this report build upon this success to offer more abundant transit service that meets the needs of students, faculty, staff, and visitors. Through closer coordination between USU, CVTD, and the City of Logan, these needs can be met via incremental investments and service expansions. Ultimately, a thriving transit system will enhance mobility and quality of life for the USU and Cache Valley community.

Appendix D – Transportation Master Plan Survey Results

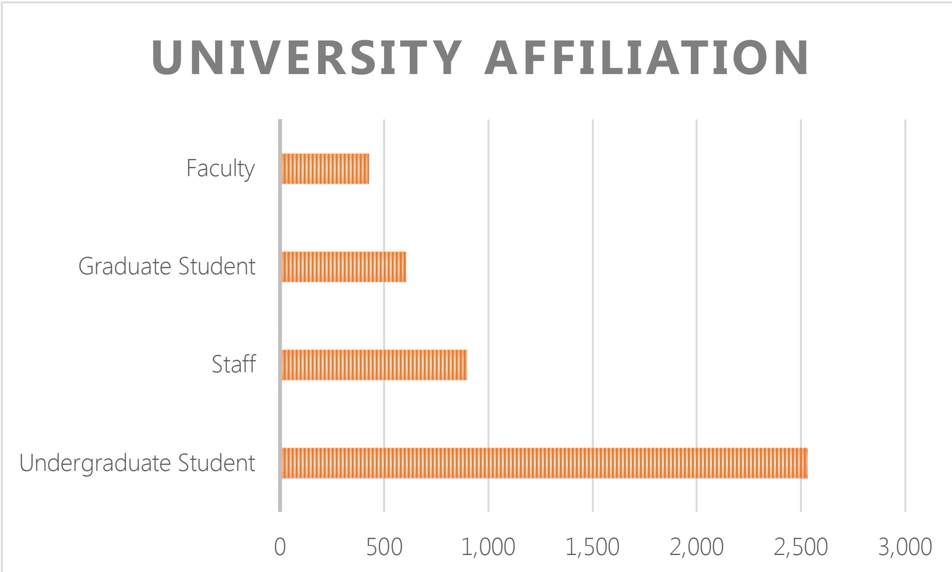
Demographics

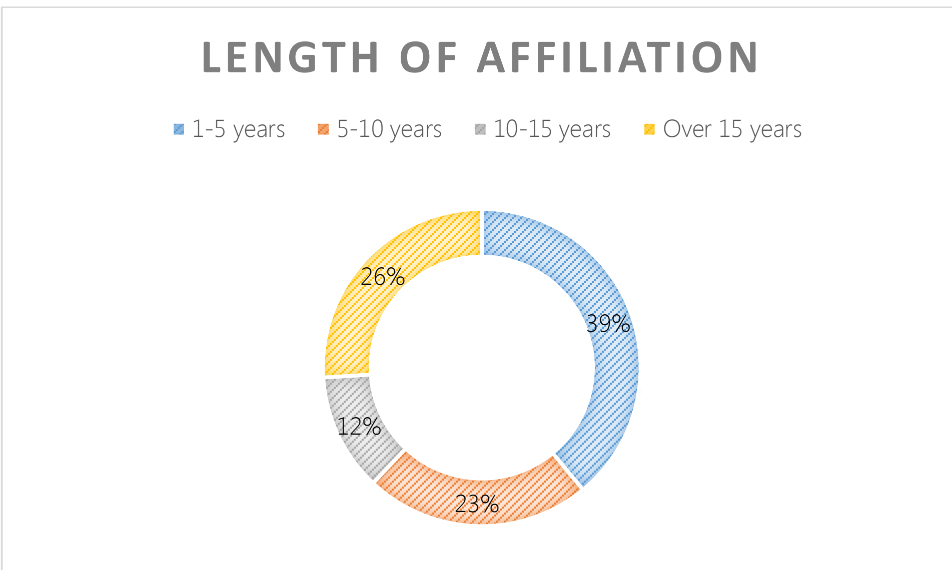
Where you currently live

1. Please mark on the map below where you currently live.

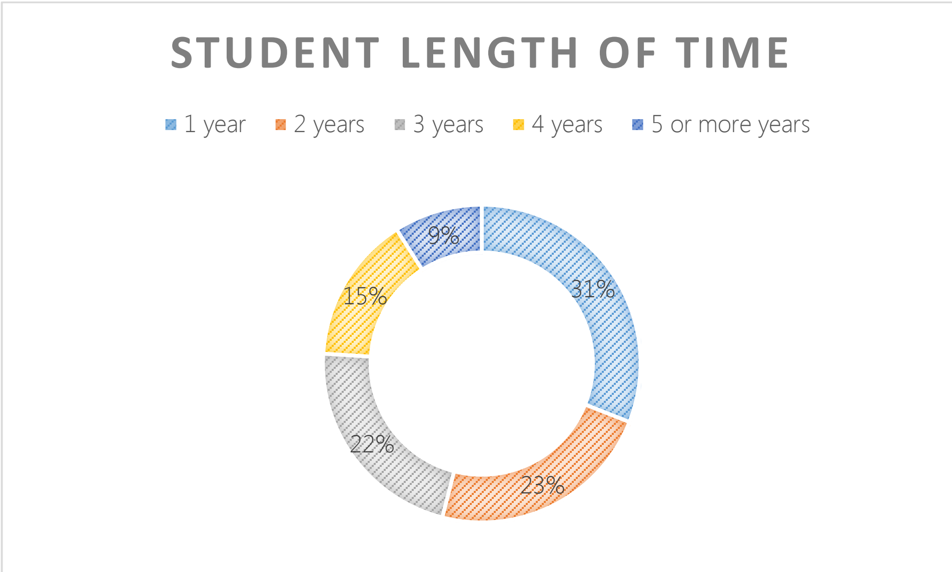


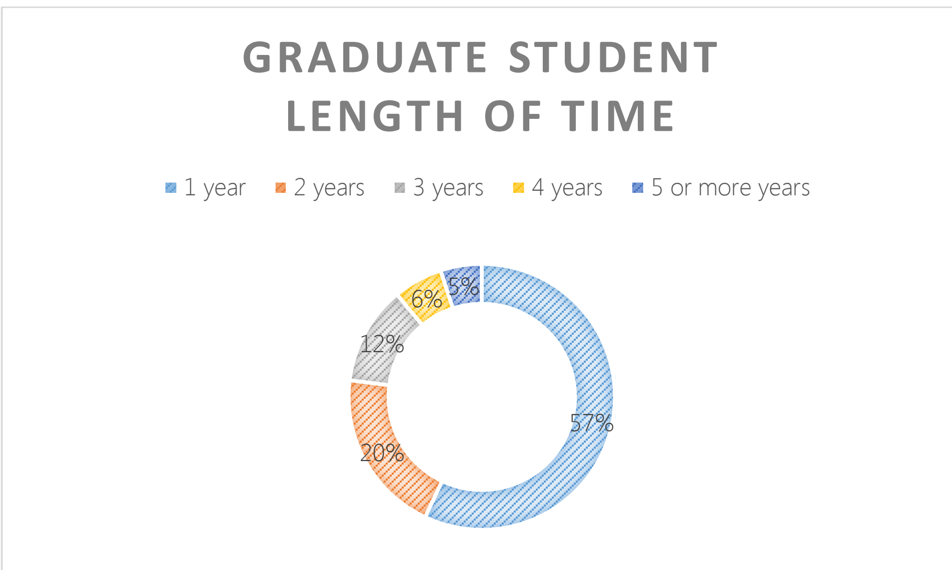
Affiliation with Utah State University



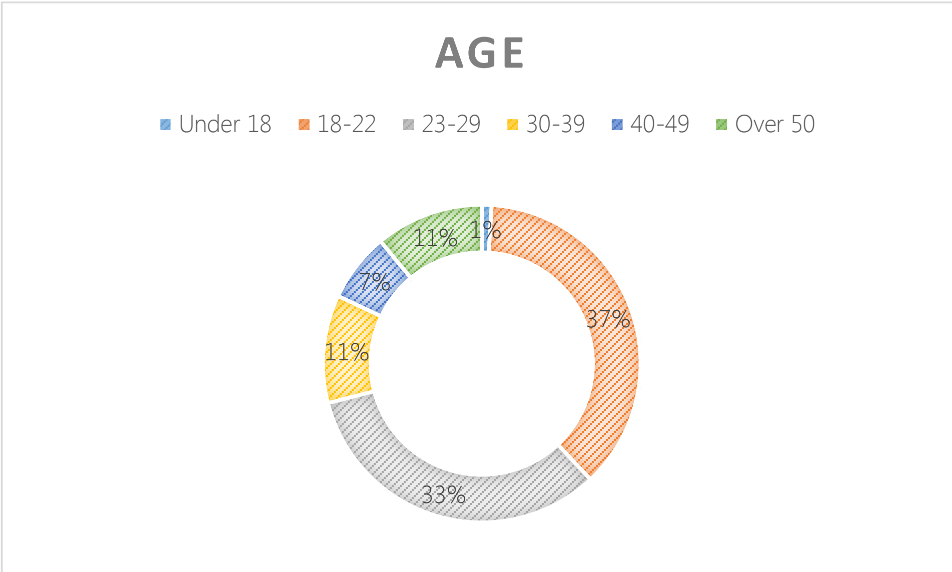


Length of Time at USU

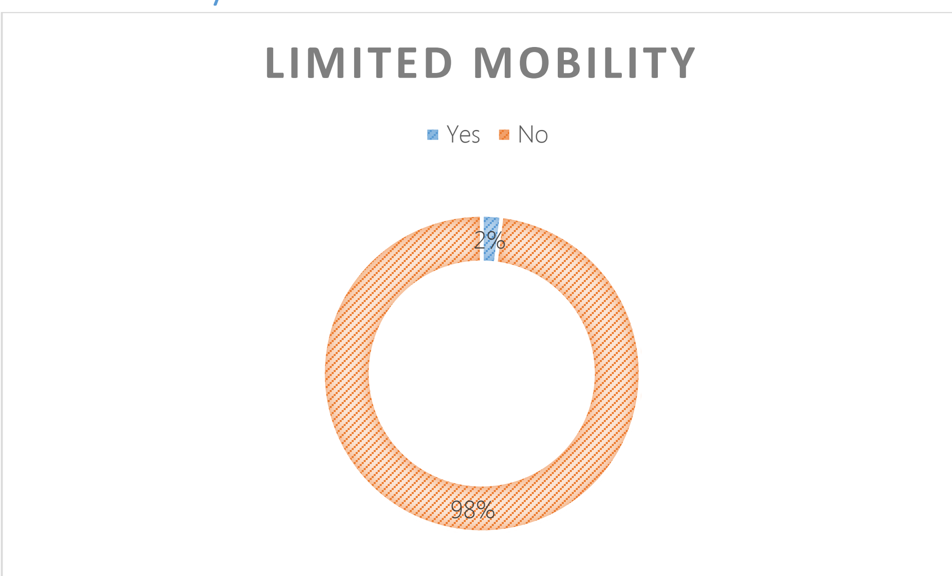




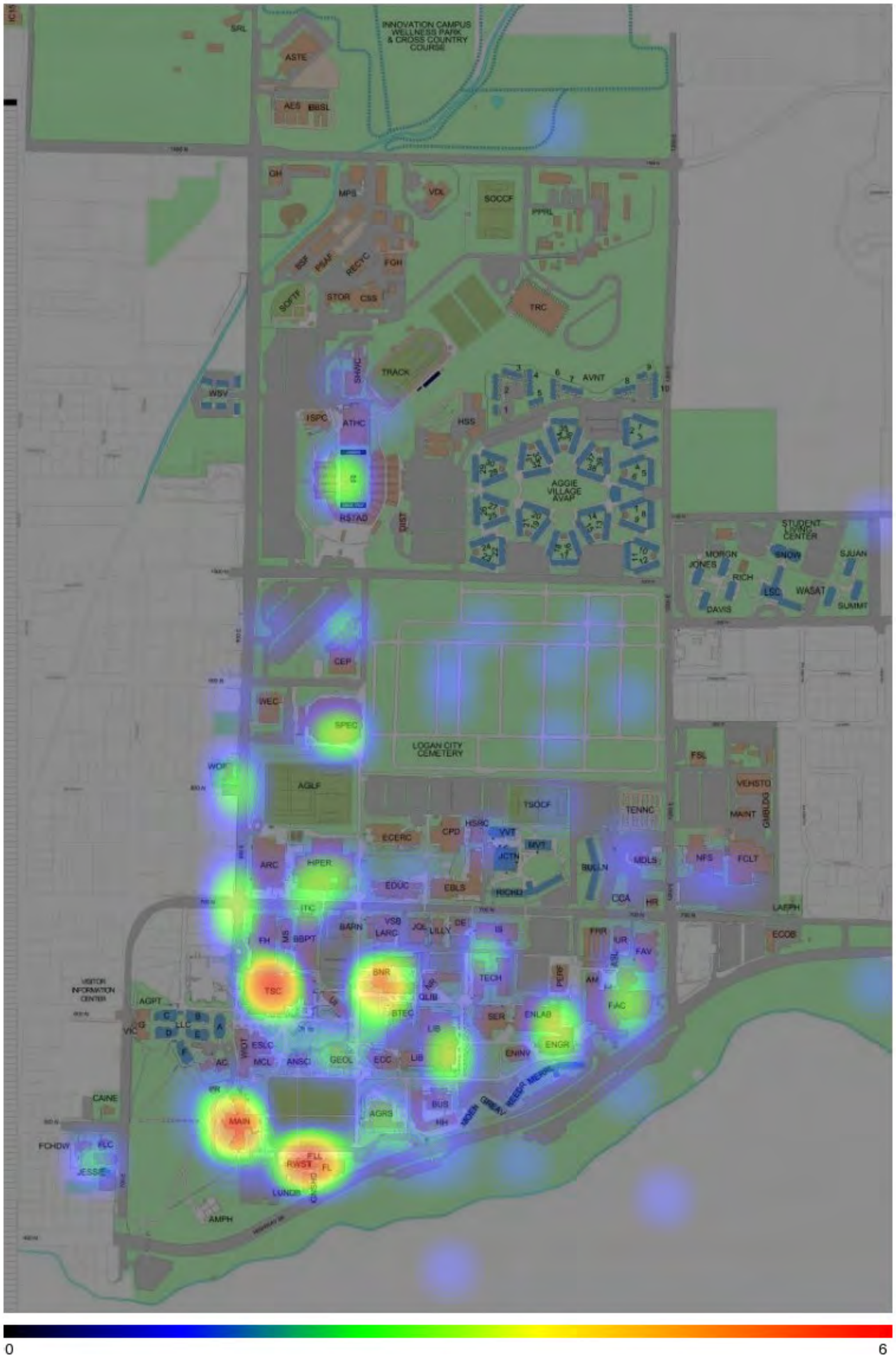
Age



Limited Mobility

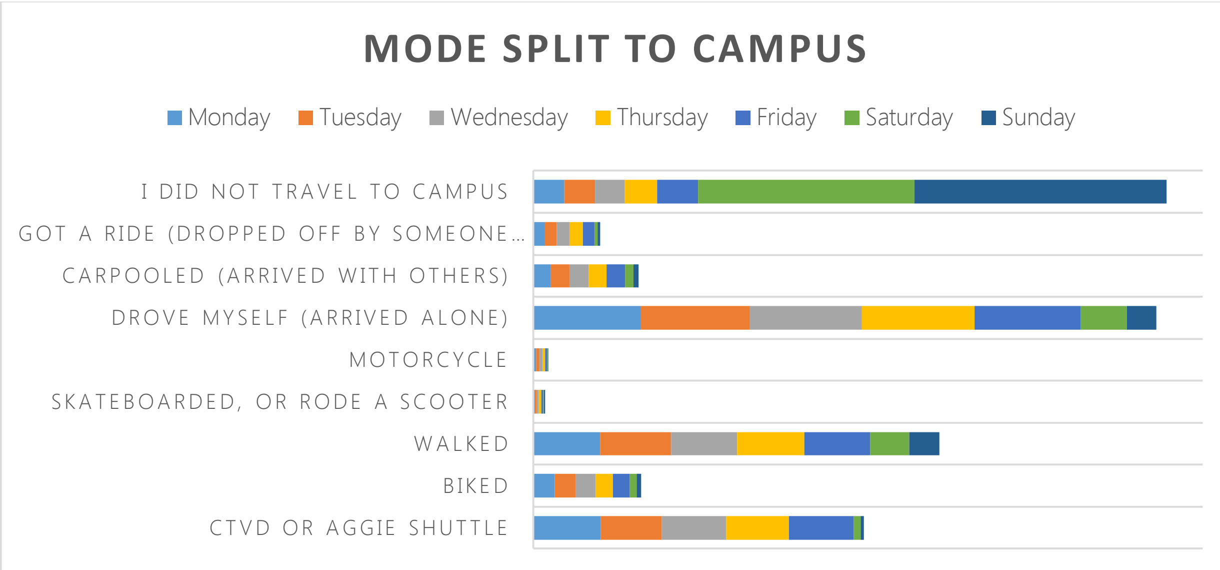


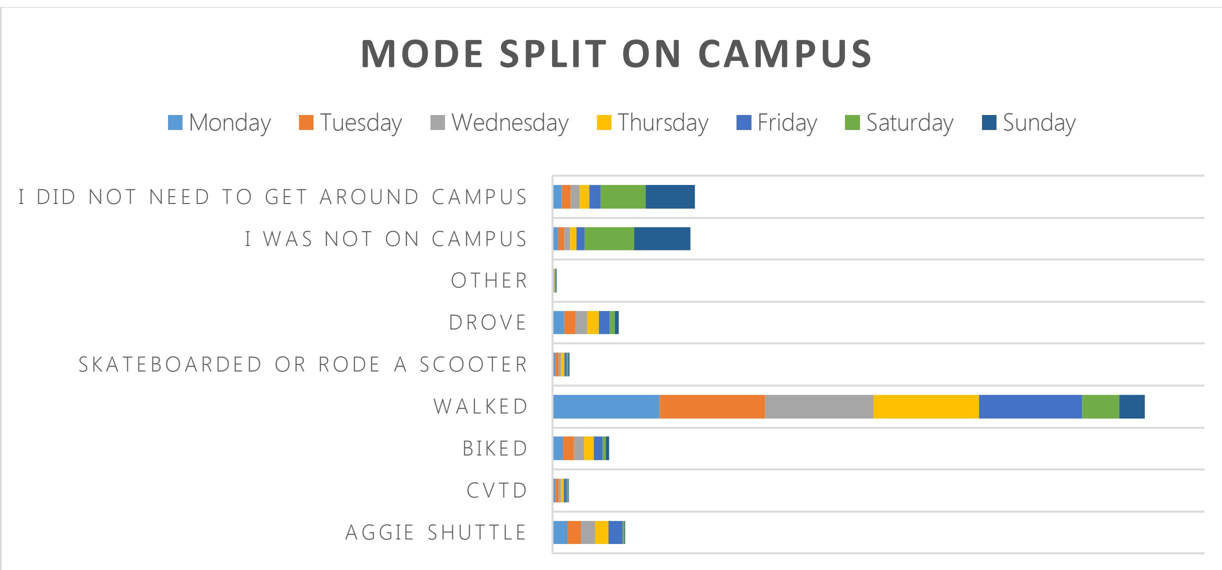
8. Please mark on the map below areas that are difficult to access due to lack of ADA compliance.



Mode Split

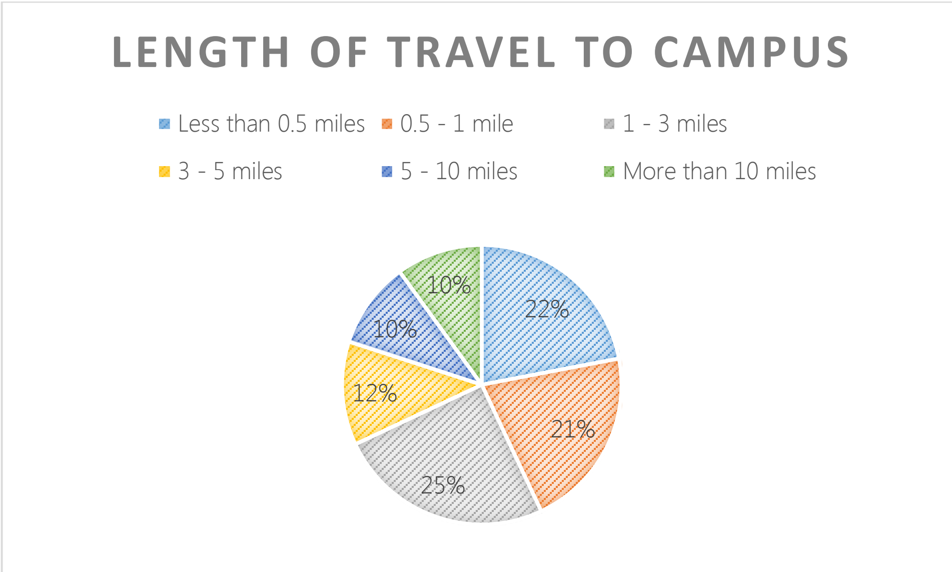
Transportation to/around Campus

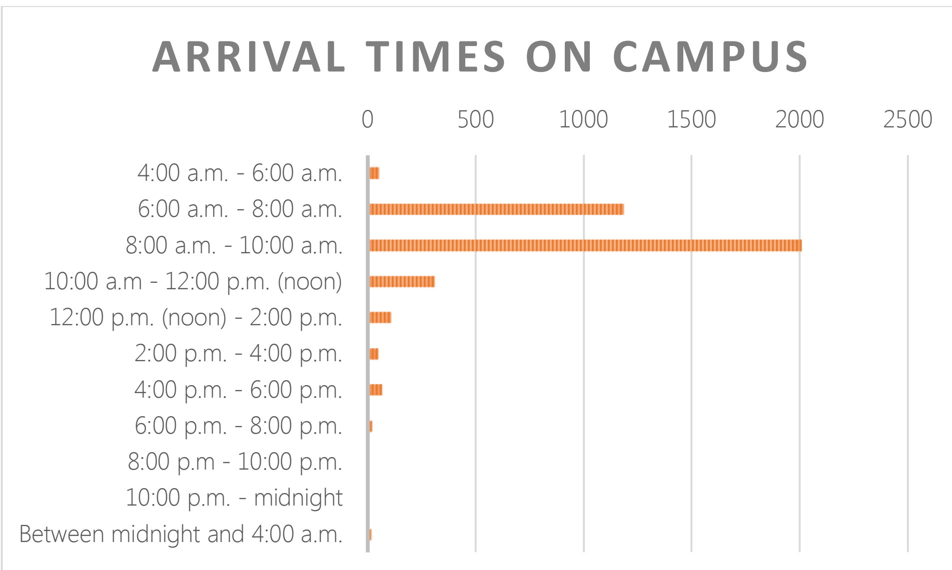


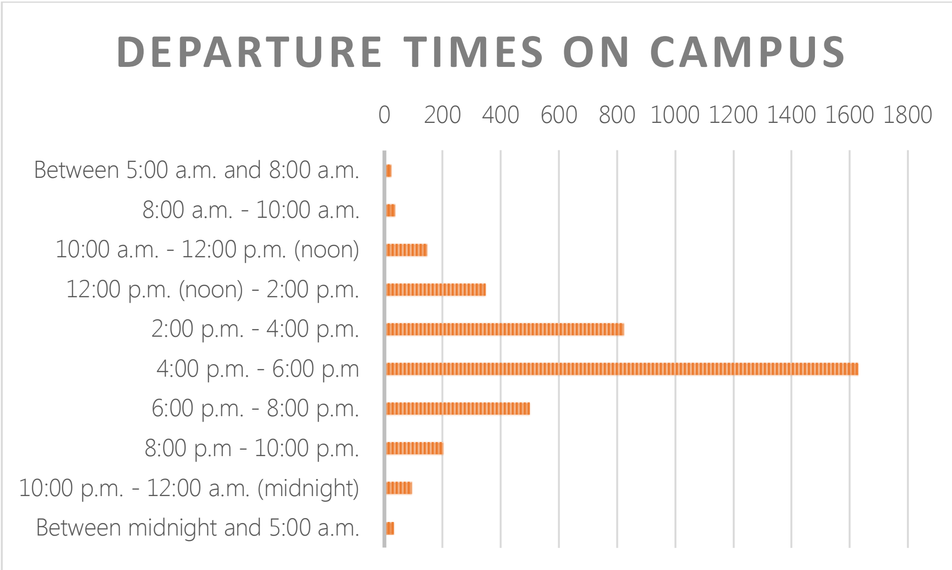


Arrival and Departure

Most people (68%) travel less than 3 miles to campus. Arrival times on campus are generally between 6 AM and 10 AM; departure times on campus are also traditional – 4 PM to 6 PM.


LENGTH OF TRAVEL TO CAMPUS
Less than 0.5 miles
0.5 - 1 mile
1 - 3 miles
3 - 5 miles
5 - 10 miles
More than 10 miles
22%
21%
25%
12%
10%
10%


ARRIVAL TIMES ON CAMPUS
0
500
1000
1500
2000
2500
4:00 a.m. - 6:00 a.m.
6:00 a.m. - 8:00 a.m.
8:00 a.m. - 10:00 a.m.
10:00 a.m - 12:00 p.m. (noon)
12:00 p.m. (noon) - 2:00 p.m.
2:00 p.m. - 4:00 p.m.
4:00 p.m. - 6:00 p.m.
6:00 p.m. - 8:00 p.m.
8:00 p.m - 10:00 p.m.
10:00 p.m. - midnight
Between midnight and 4:00 a.m.



DEPARTURE TIMES ON CAMPUS
0
200
400
600
800
1000
1200
1400
1600
1800
Between 5:00 a.m. and 8:00 a.m.
8:00 a.m. - 10:00 a.m.
10:00 a.m. - 12:00 p.m. (noon)
12:00 p.m. (noon) - 2:00 p.m.
2:00 p.m. - 4:00 p.m.
4:00 p.m. - 6:00 p.m
6:00 p.m. - 8:00 p.m.
8:00 p.m - 10:00 p.m.
10:00 p.m. - 12:00 a.m. (midnight)
Between midnight and 5:00 a.m.

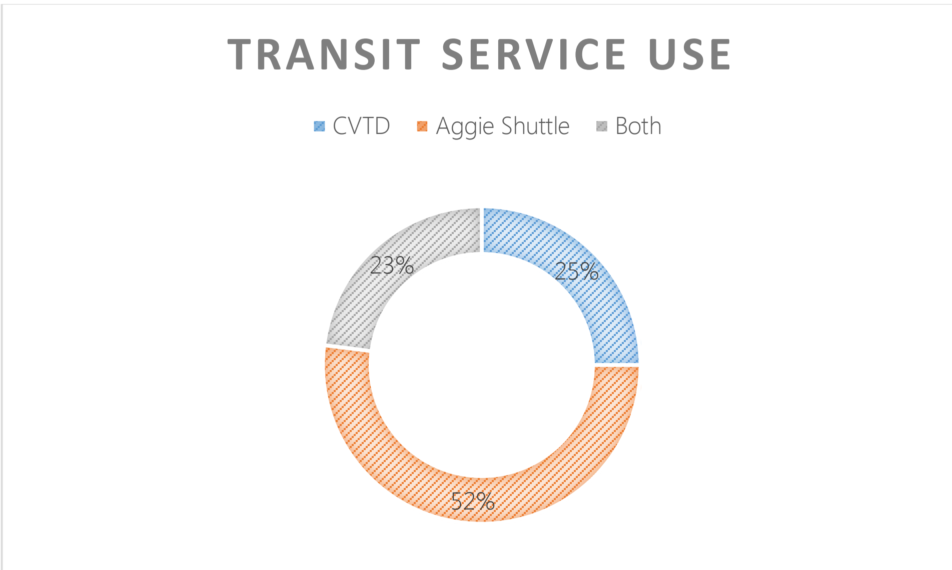
Existing Conditions

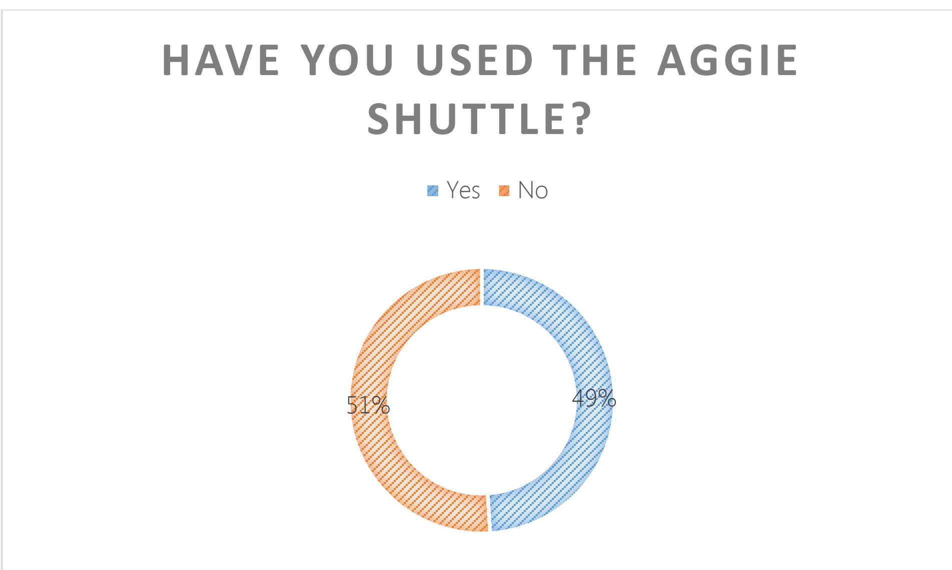
Transit Use

About 75% of transit riders use Aggie Shuttle and about 50% use CVTD. About a quarter use both. However, only half the respondents have used Aggie Shuttle to get around campus.

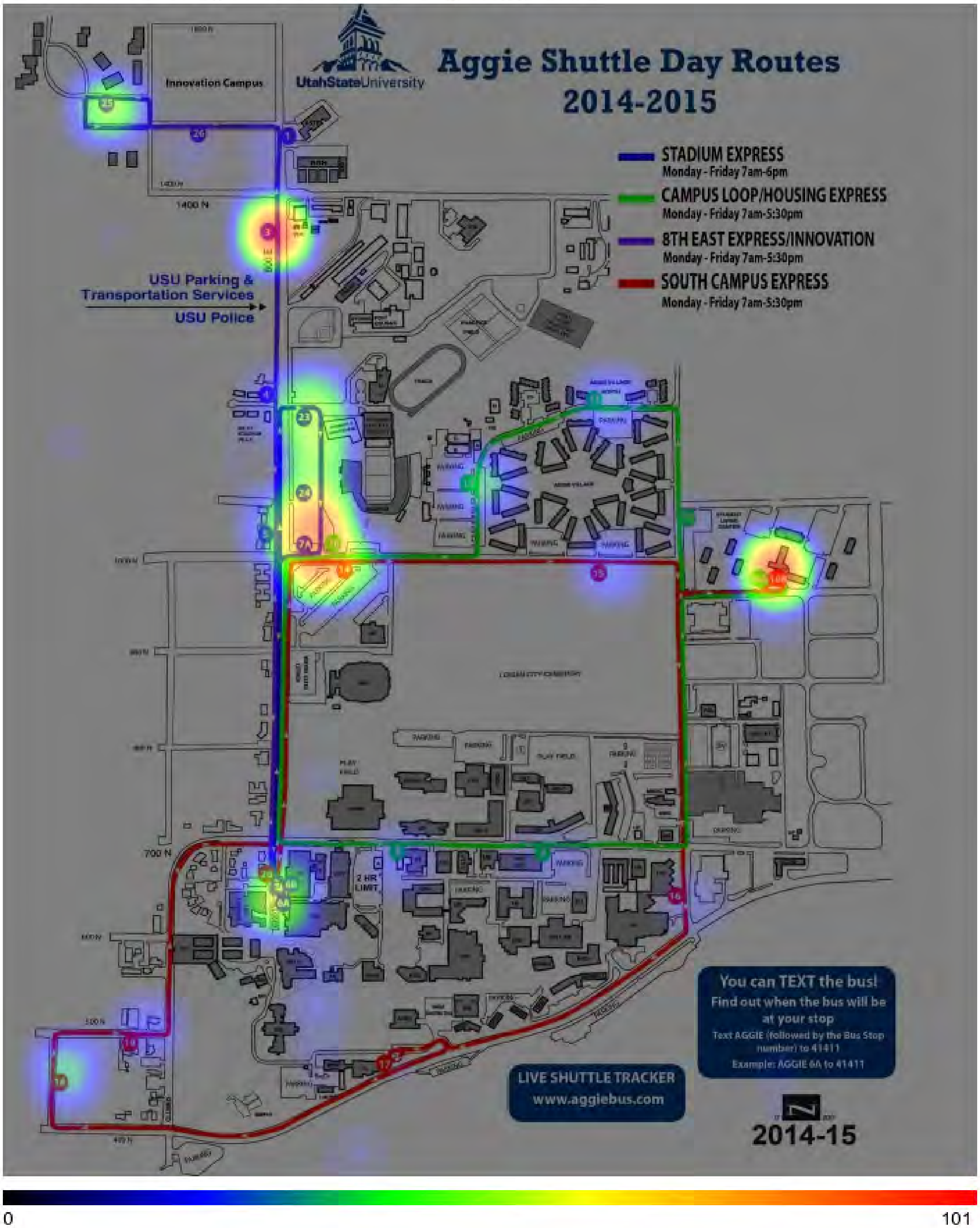
The key reason people use transit is for comfort/convenience followed by cost and weather-related reasons.

90% of people think CVTD is excellent or good and 88% think Aggie Shuttle is excellent or good.

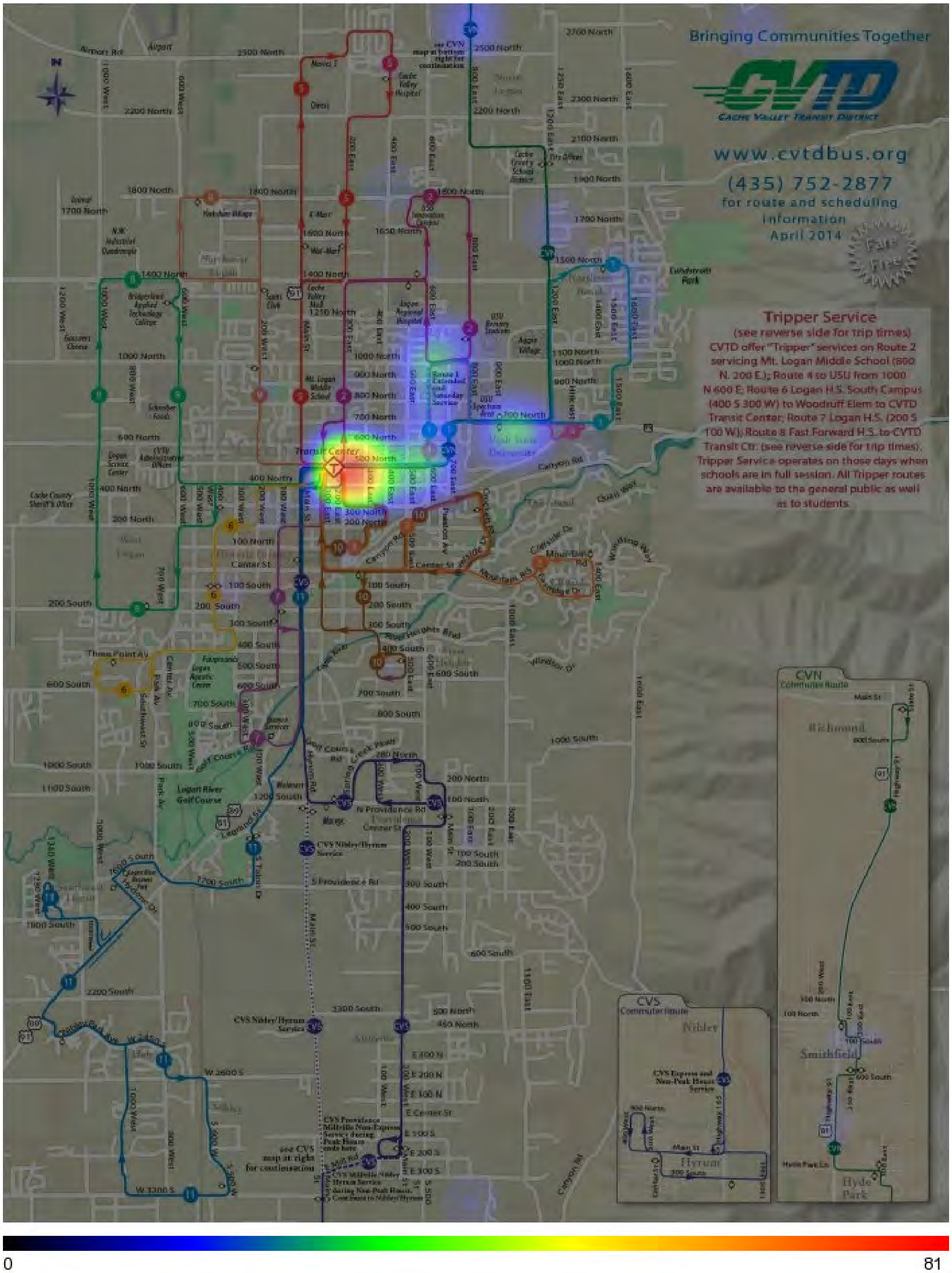


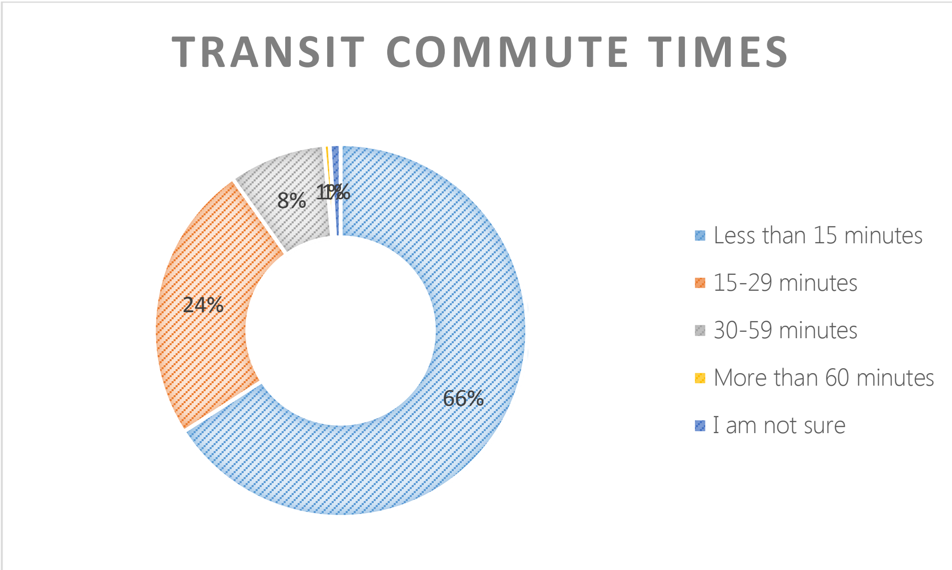


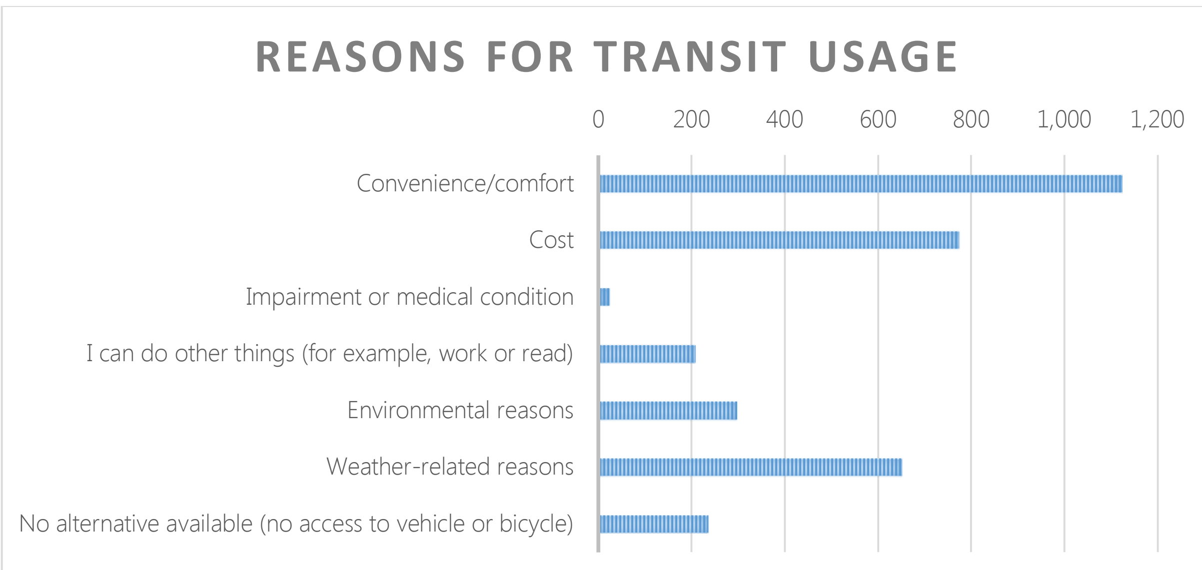
15. Please mark on the map below where you start riding the Aggie Shuttle.

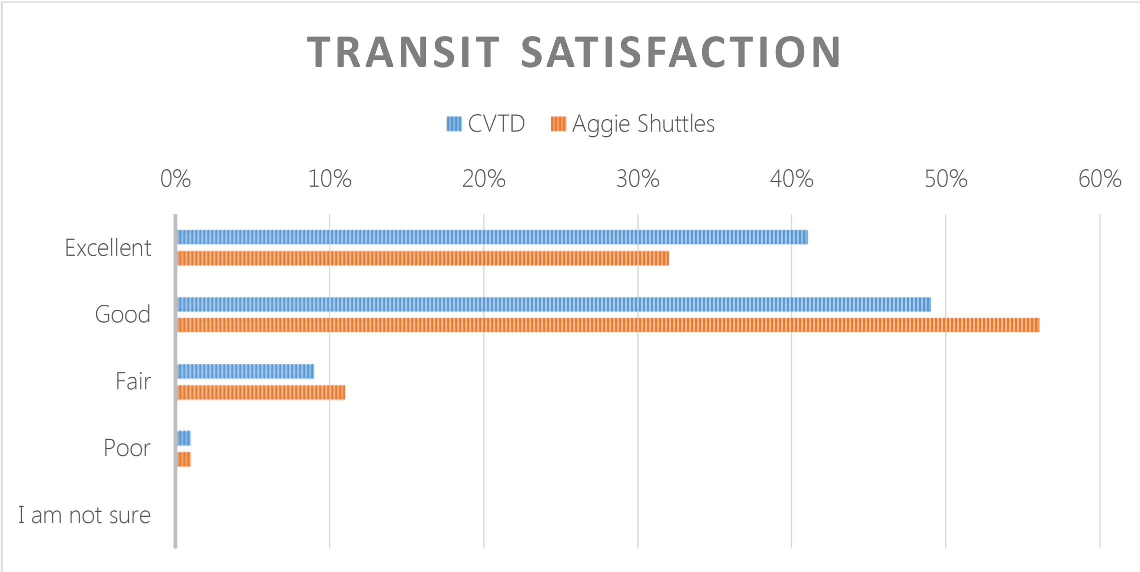


16. Please mark on the map below where you start riding CVTD.



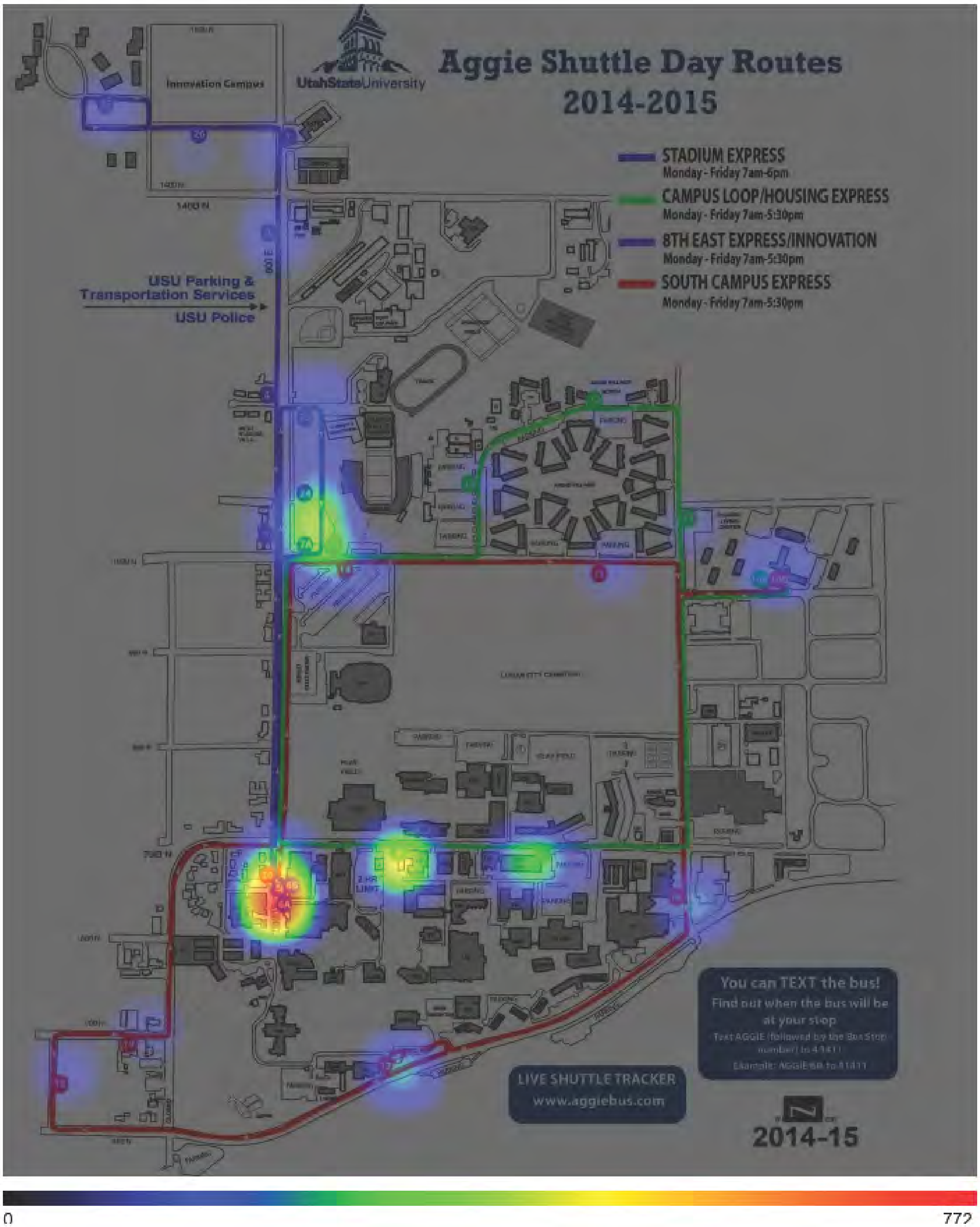

TRANSIT COMMUTE TIMES
66%
24%
8%
Less than 15 minutes
15-29 minutes
30-59 minutes
More than 60 minutes
I am not sure


REASONS FOR TRANSIT USAGE
0
200
400
600
800
1,000
1,200
Convenience/comfort
Cost
Impairment or medical condition
I can do other things (for example, work or read)
Environmental reasons
Weather-related reasons
No alternative available (no access to vehicle or bicycle)



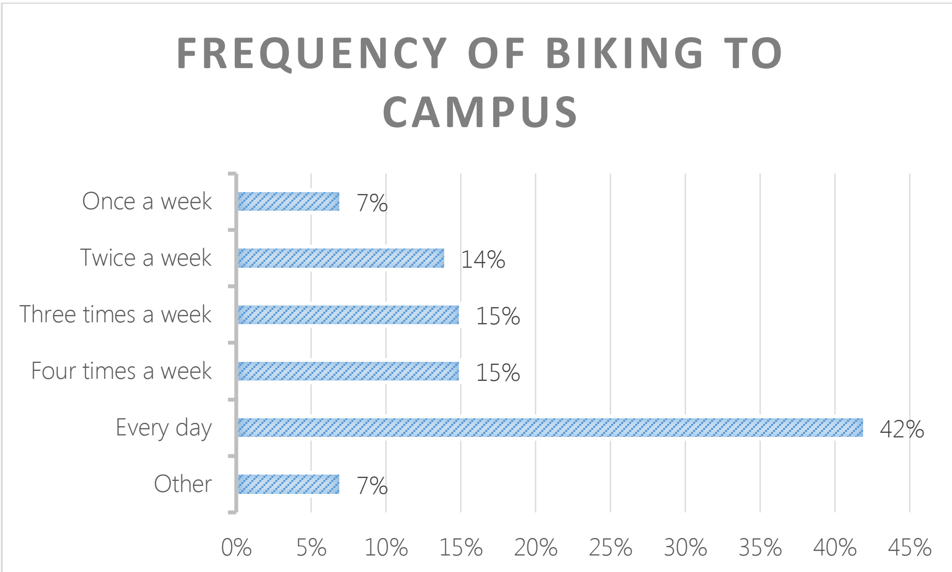
TRANSIT SATISFACTION
CVTD
Aggie Shuttles
0%
10%
20%
30%
40%
50%
60%
Excellent
Good
Fair
Poor
I am not sure

84. Please mark on the map below the Aggie Shuttle stops you most frequently use. (If you do not use any of the shuttle stops please move onto the next question.)



Bicycle Use

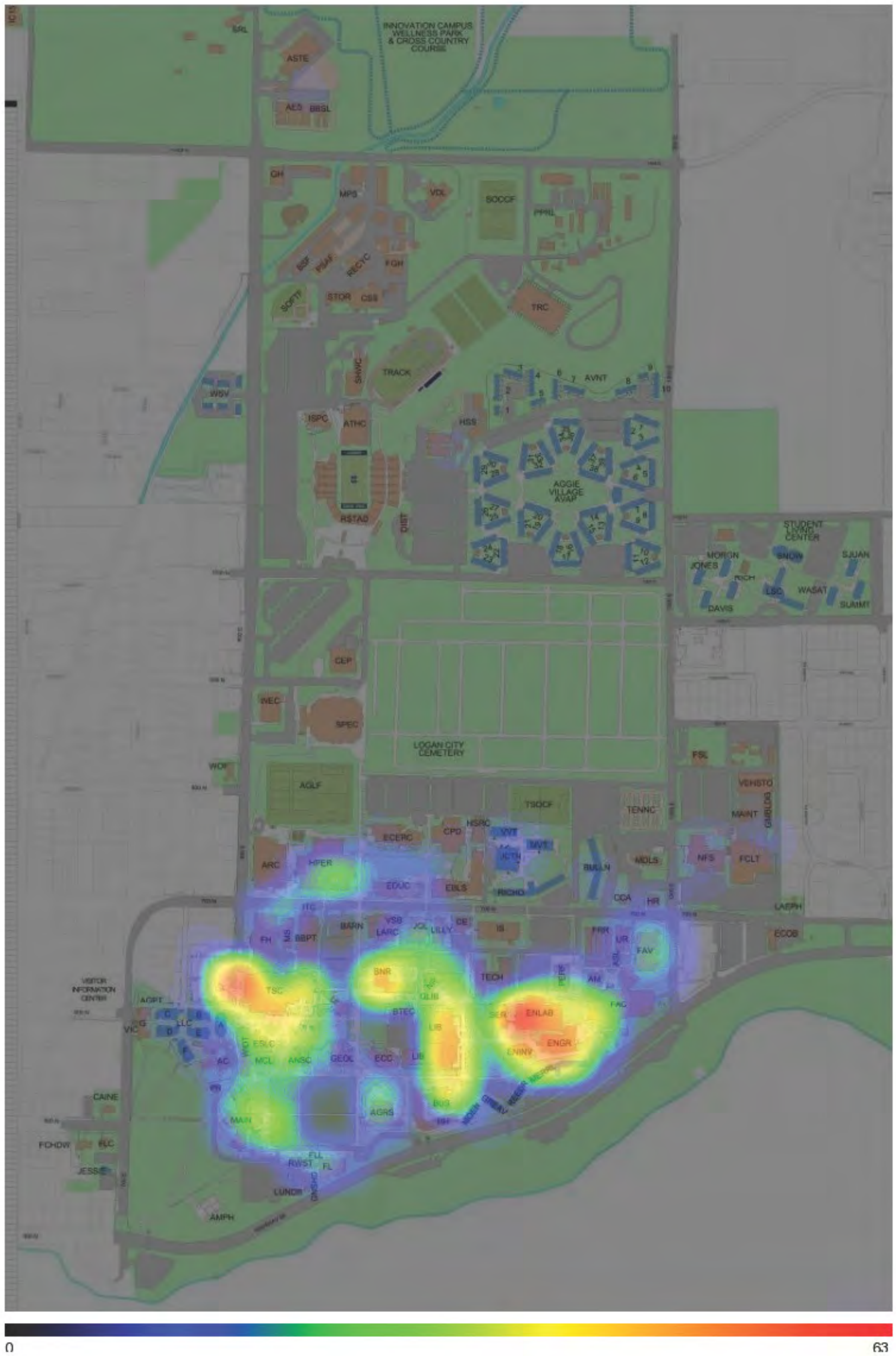
Bicyclists

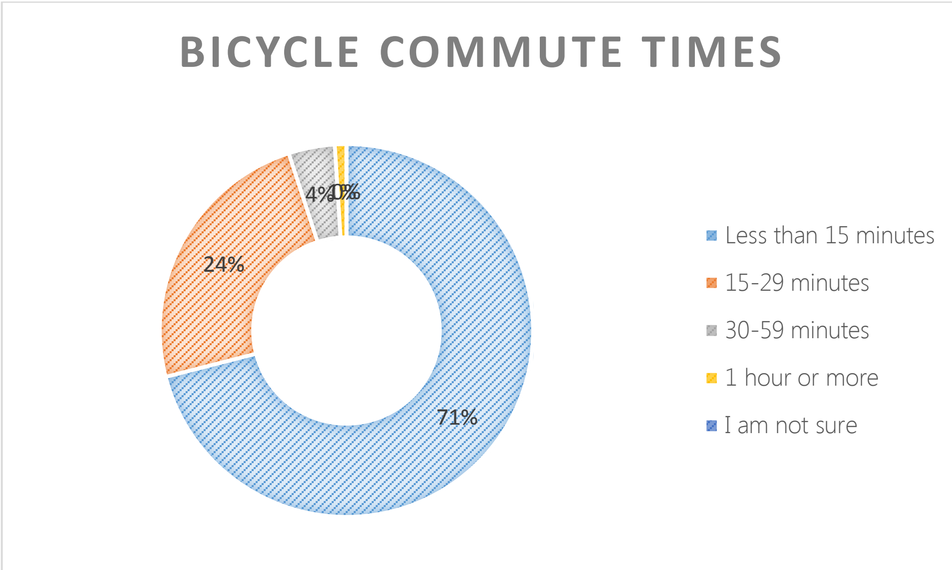


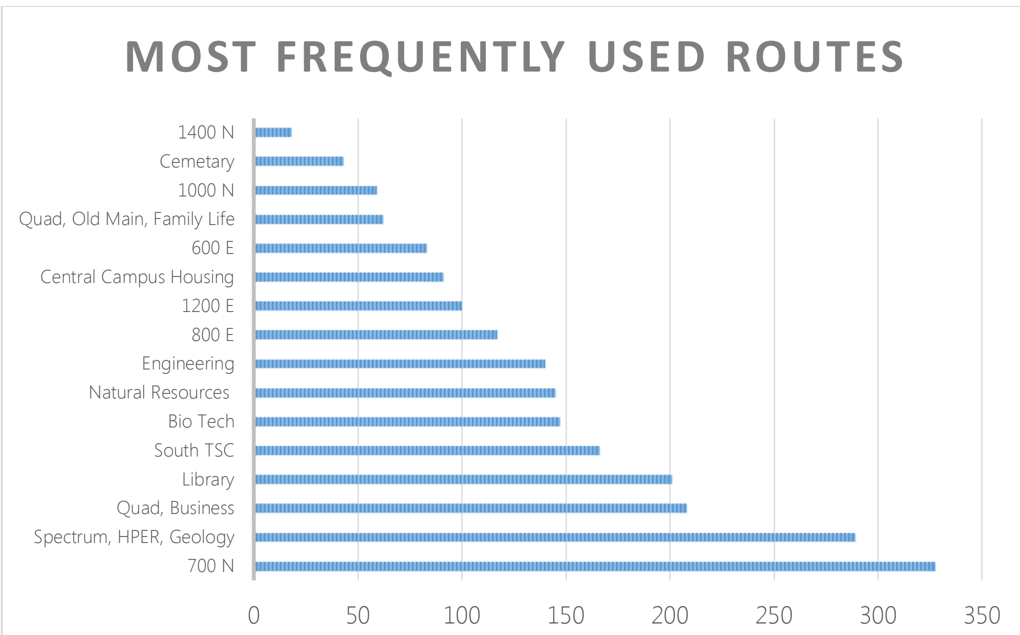
23. Please mark on the map below your starting point when biking to campus.

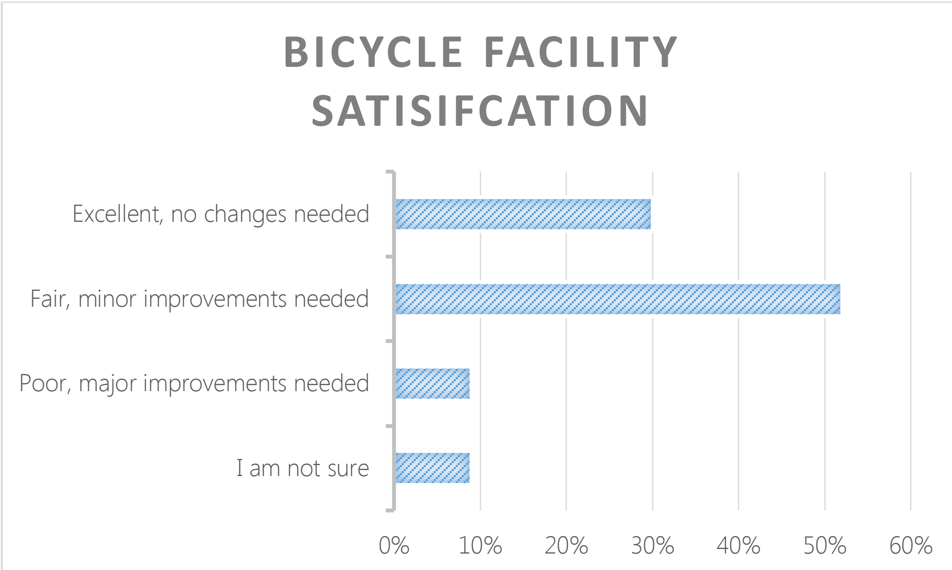
24 Please mark on the map below your ending point when biking to campus. (If this varies day to day, please select multiple destinations.)

33. Please mark on the map below where you usually park your bike on campus.



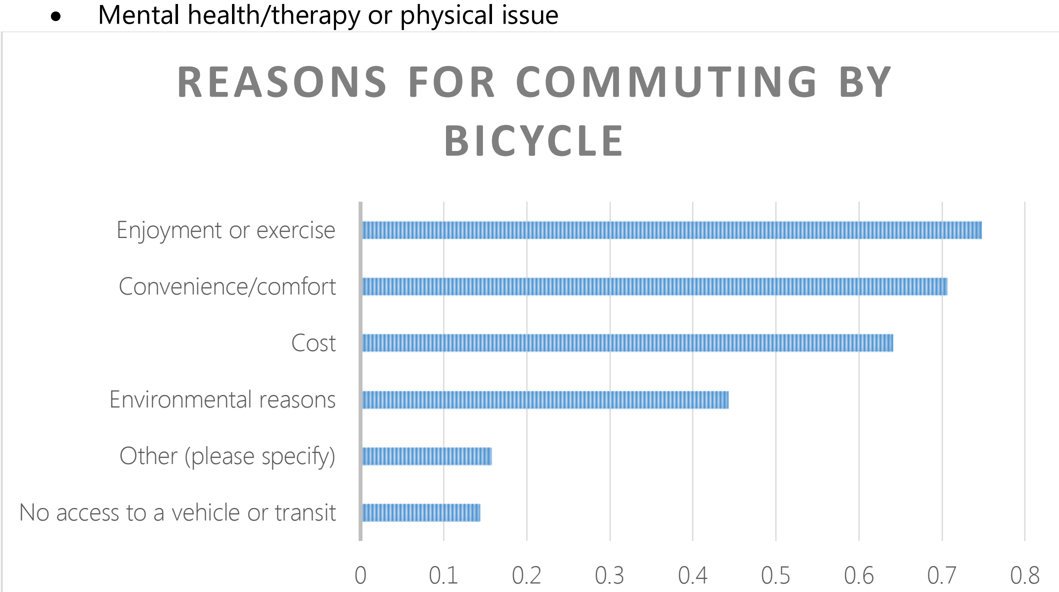

BICYCLE COMMUTE TIMES
4%
0%
1%
24%
71%
Less than 15 minutes
15-29 minutes
30-59 minutes
1 hour or more
I am not sure


MOST FREQUENTLY USED ROUTES
1400 N
Cemetary
1000 N
Quad, Old Main, Family Life
600 E
Central Campus Housing
1200 E
800 E
Engineering
Natural Resources
Bio Tech
South TSC
Library
Quad, Business
Spectrum, HPER, Geology
700 N
0
50
100
150
200
250
300
350

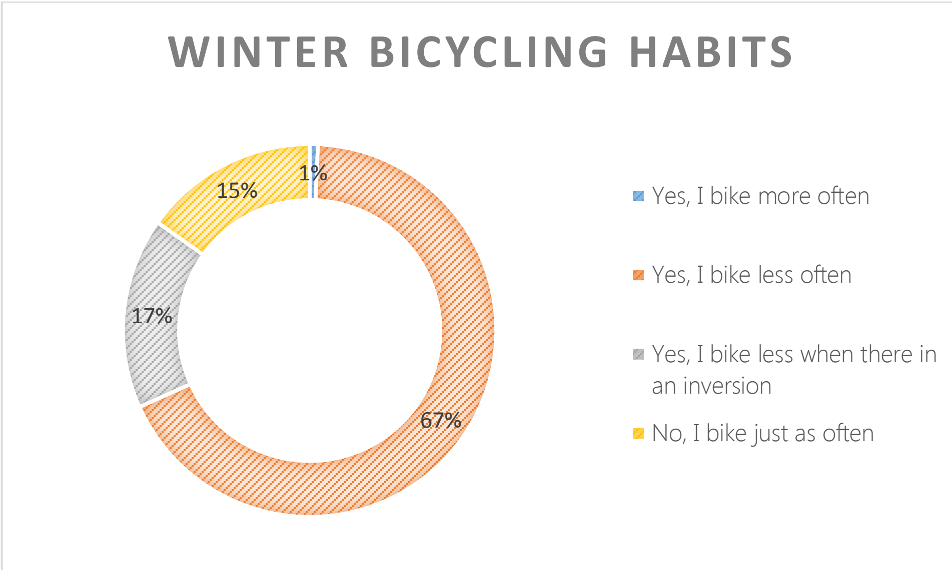


The most popular reasons for bicycling to campus were enjoyment/exercise, convenience/comfort, and cost. A number of people mentioned other reasons for bicycling, such as:

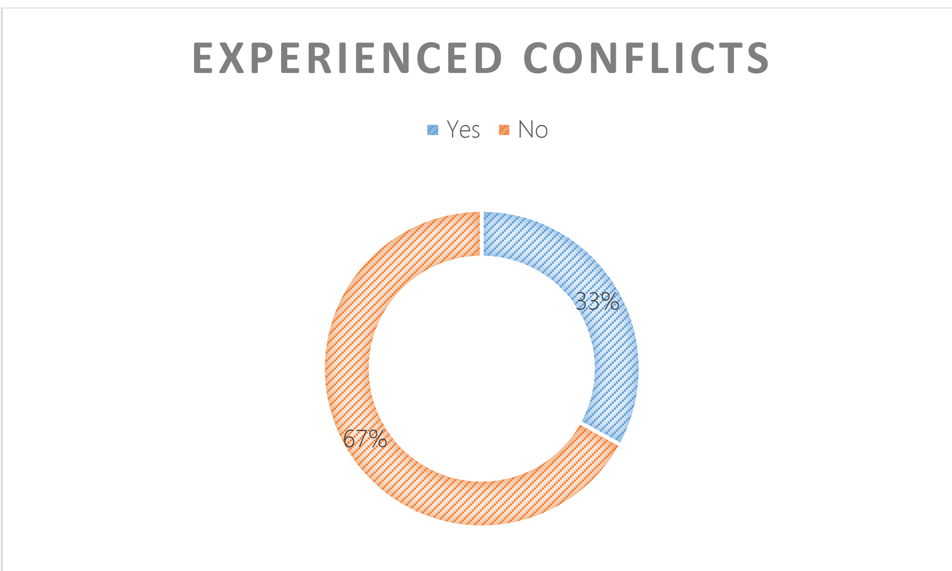
- Efficiency and speed
- Closer/better parking for bicycle than car
- Faster than the bus/bus schedule is bad
- Bus does not run late enough
- Not enough room on the bus for bikes
- Limited access to a vehicle
- Faster than walking
- Repair at Aggie Blue Bikes
- Mental health/therapy or physical issue



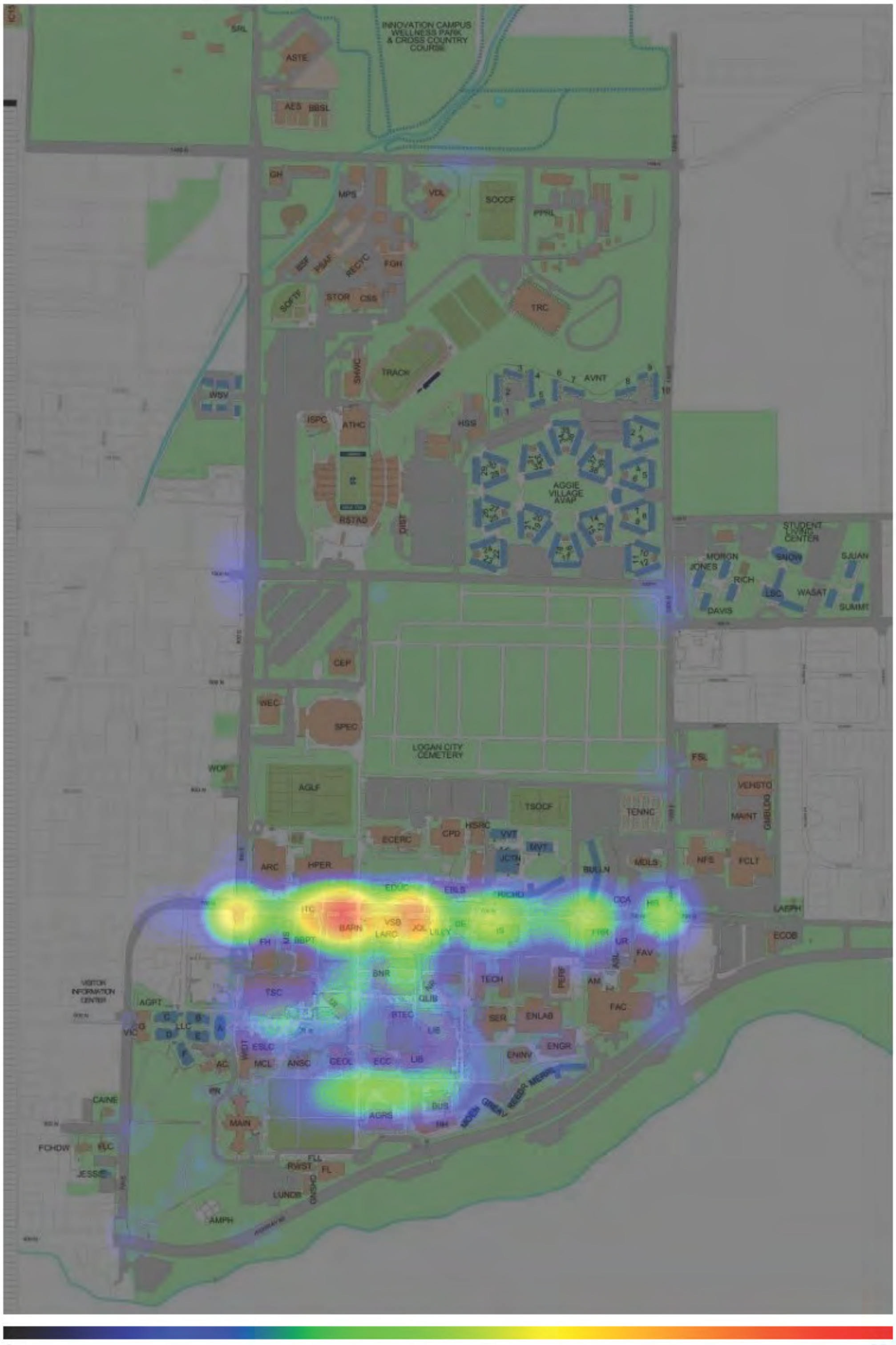
However, winter reducing the amount of bicycling for the majority of people.

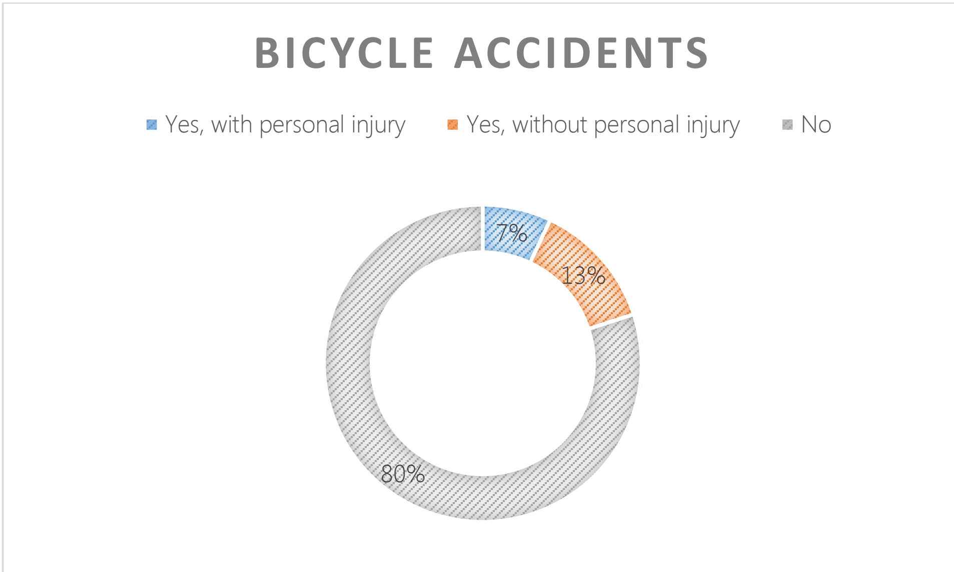


About a third of people have experienced conflicts while on a bicycle and about 20% of bicyclists have experienced an accident.



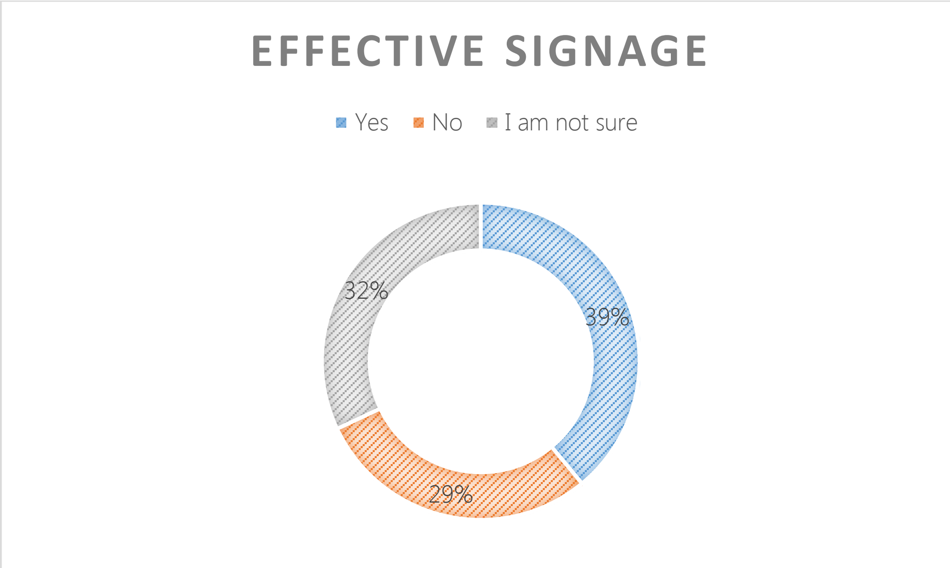
36. Please mark on the map below where these conflicts most often occur.




BICYCLE ACCIDENTS
Yes, with personal injury
Yes, without personal injury
No
7%
13%
80%

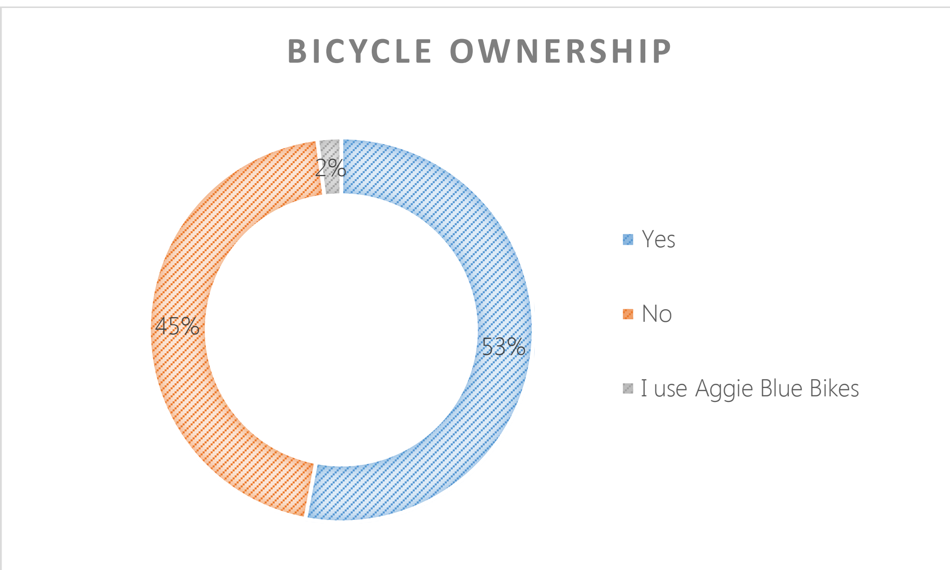
39. Please mark on the map below the location of the biking accident.

On the issue of effective signage, there is no clear consensus.

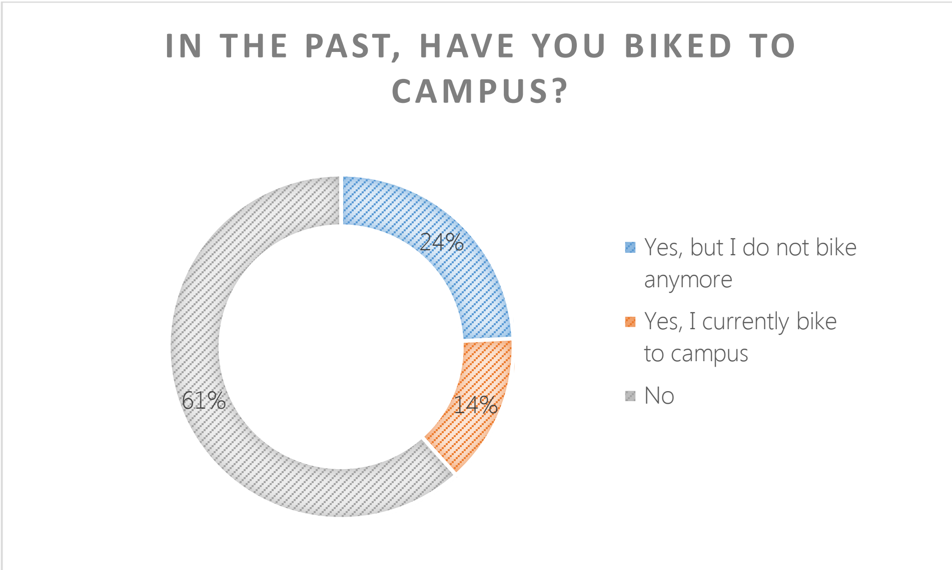


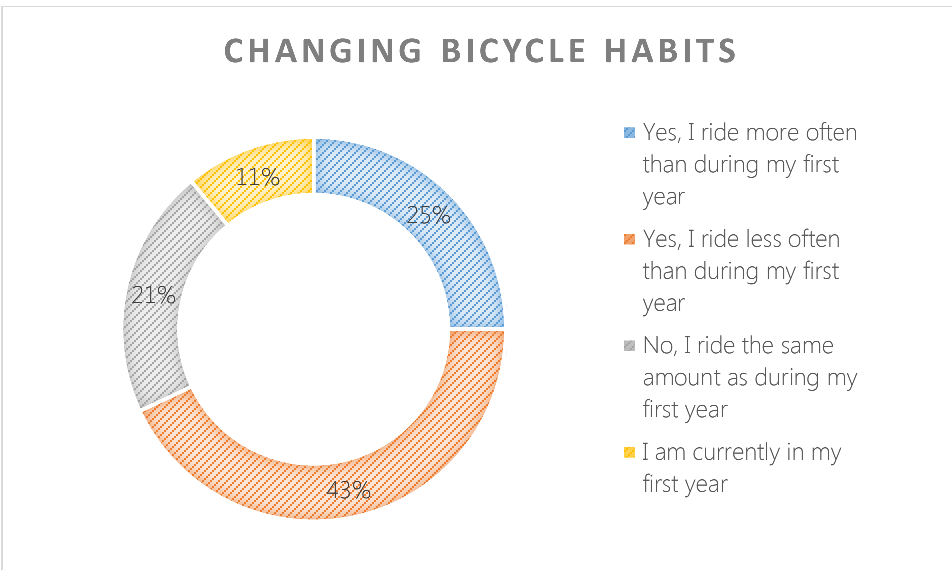
Everyone

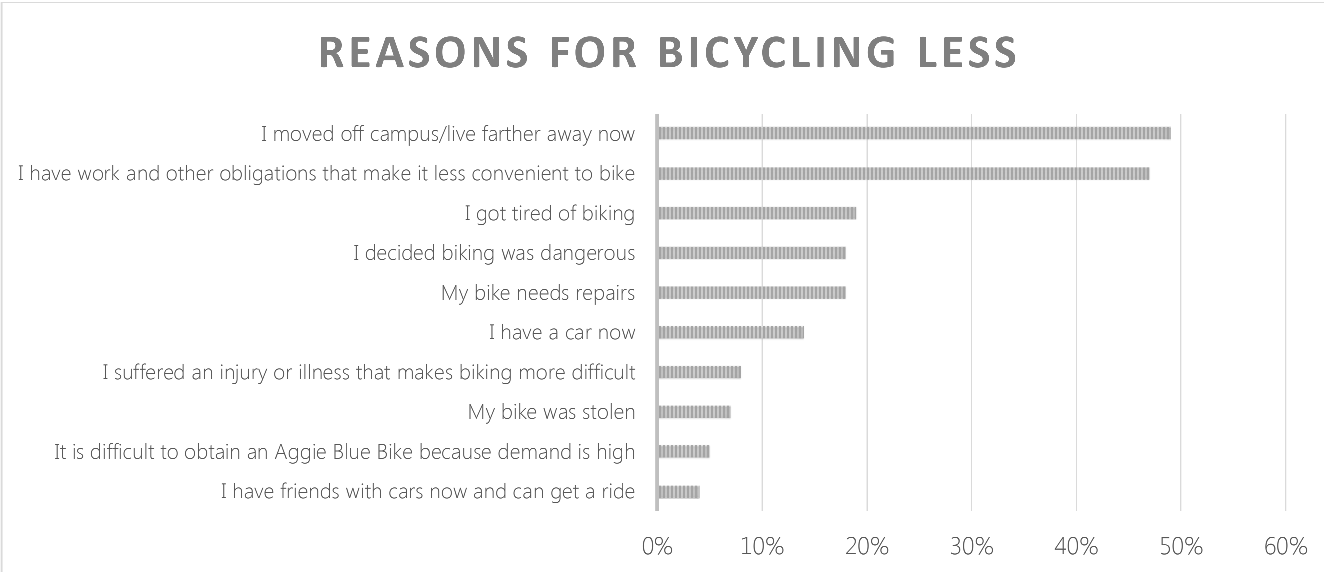
About half of survey respondents own their own bike and 2% use Aggie Blue Bikes.

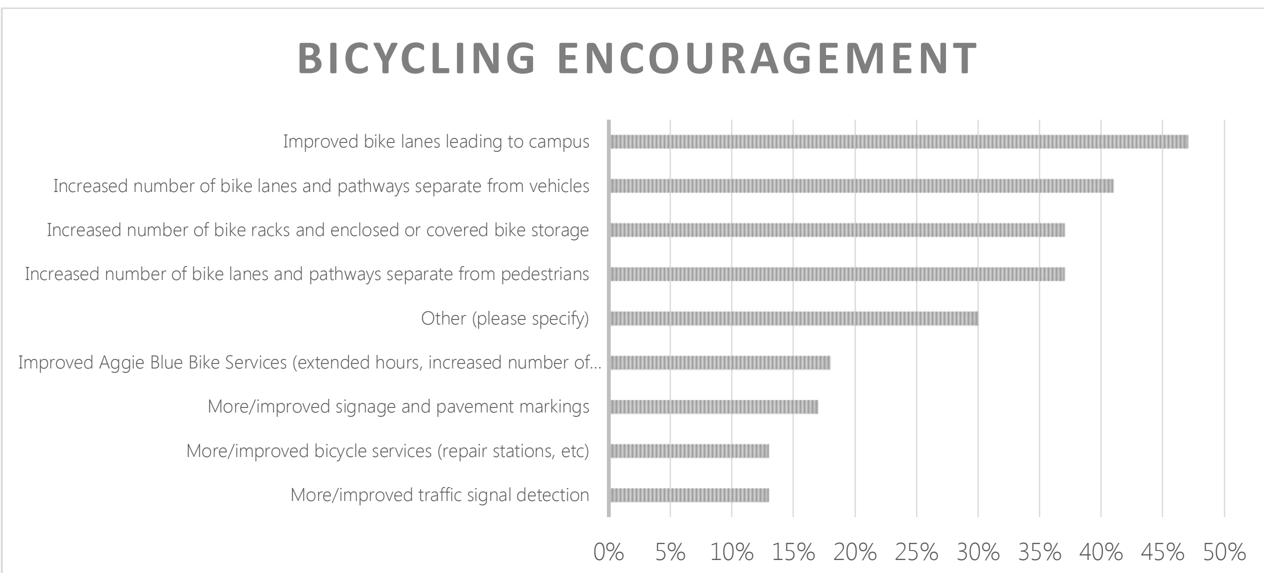


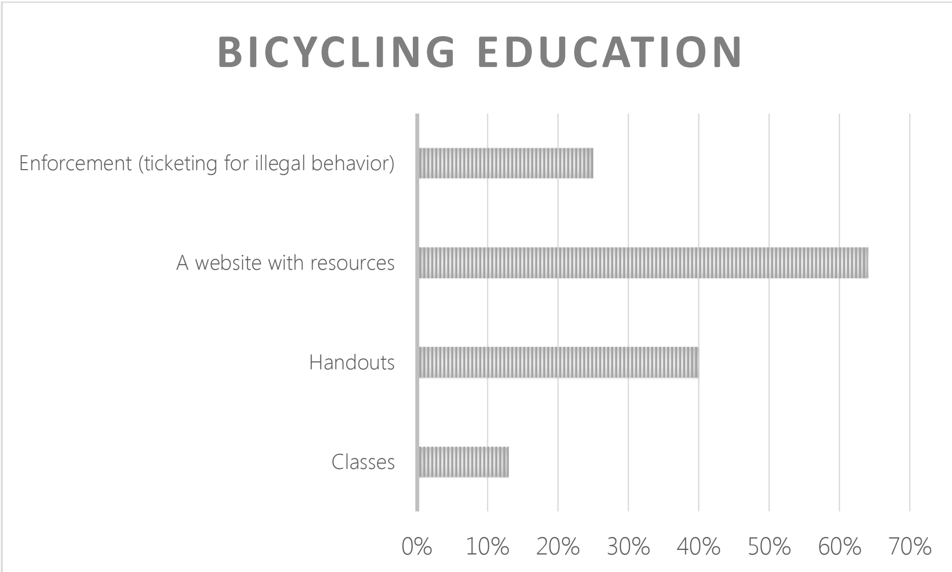
40% have biked to campus at one point, while about 14% still do. About a quarter of people ride more often than they did during their first year at USU, while 43% less ride often. The two primary reasons for bicycling less often were moving further away from campus and work or other obligations making bicycling less convenient. Improving and increase bike lanes and increased bicycle parking would encourage people to bike to campus. Elevation, owning/fixing a bike, living closer to campus, and better weather were listed as other things that would encourage someone to ride to campus.


IN THE PAST, HAVE YOU BIKED TO CAMPUS?
24%
14%
61%
Yes, but I do not bike anymore
Yes, I currently bike to campus
No


CHANGING BICYCLE HABITS
11%
25%
21%
43%
Yes, I ride more often than during my first year
Yes, I ride less often than during my first year
No, I ride the same amount as during my first year
I am currently in my first year

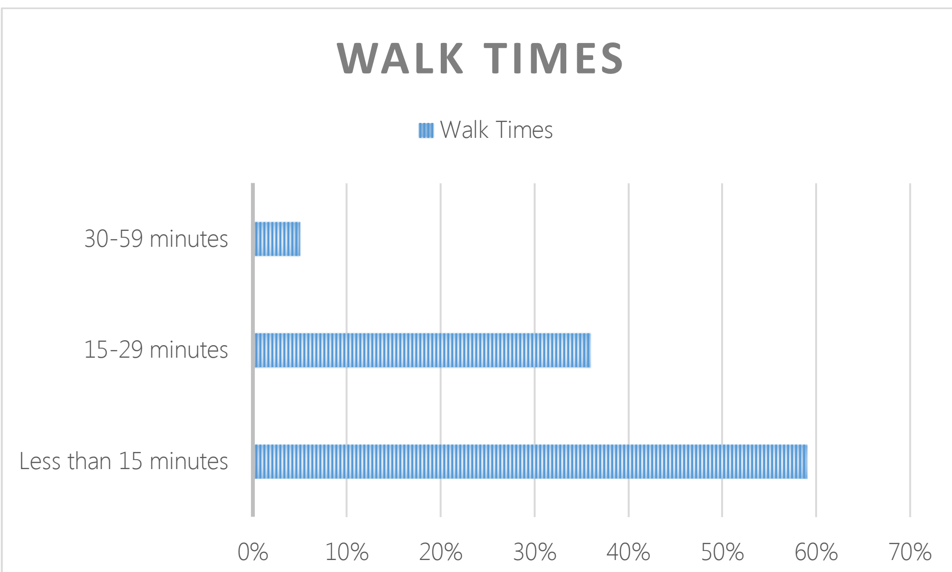

REASONS FOR BICYCLING LESS
I moved off campus/live farther away now
I have work and other obligations that make it less convenient to bike
I got tired of biking
I decided biking was dangerous
My bike needs repairs
I have a car now
I suffered an injury or illness that makes biking more difficult
My bike was stolen
It is difficult to obtain an Aggie Blue Bike because demand is high
I have friends with cars now and can get a ride
0%
10%
20%
30%
40%
50%
60%


BICYCLING ENCOURAGEMENT
Improved bike lanes leading to campus
Increased number of bike lanes and pathways separate from vehicles
Increased number of bike racks and enclosed or covered bike storage
Increased number of bike lanes and pathways separate from pedestrians
Other (please specify)
Improved Aggie Blue Bike Services (extended hours, increased number of...
More/improved signage and pavement markings
More/improved bicycle services (repair stations, etc)
More/improved traffic signal detection
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%

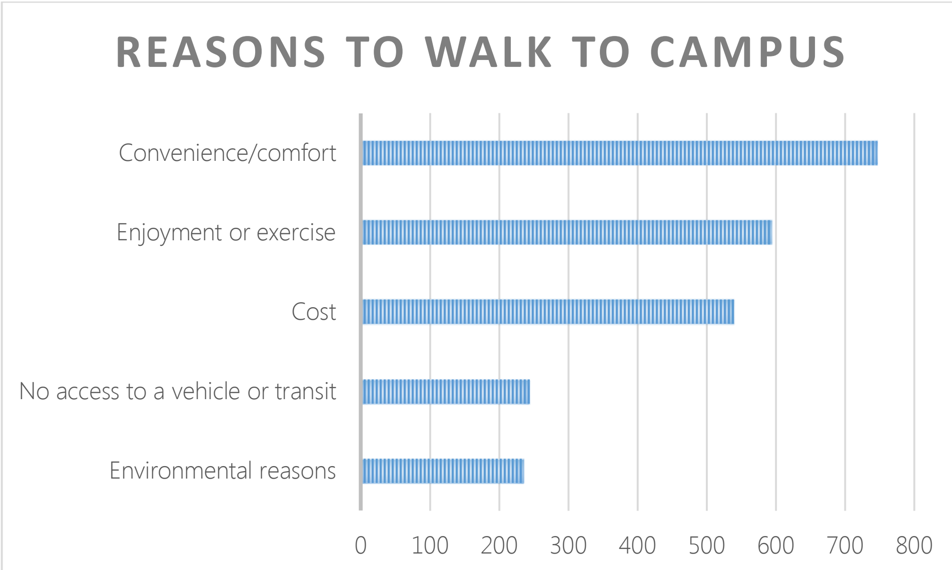


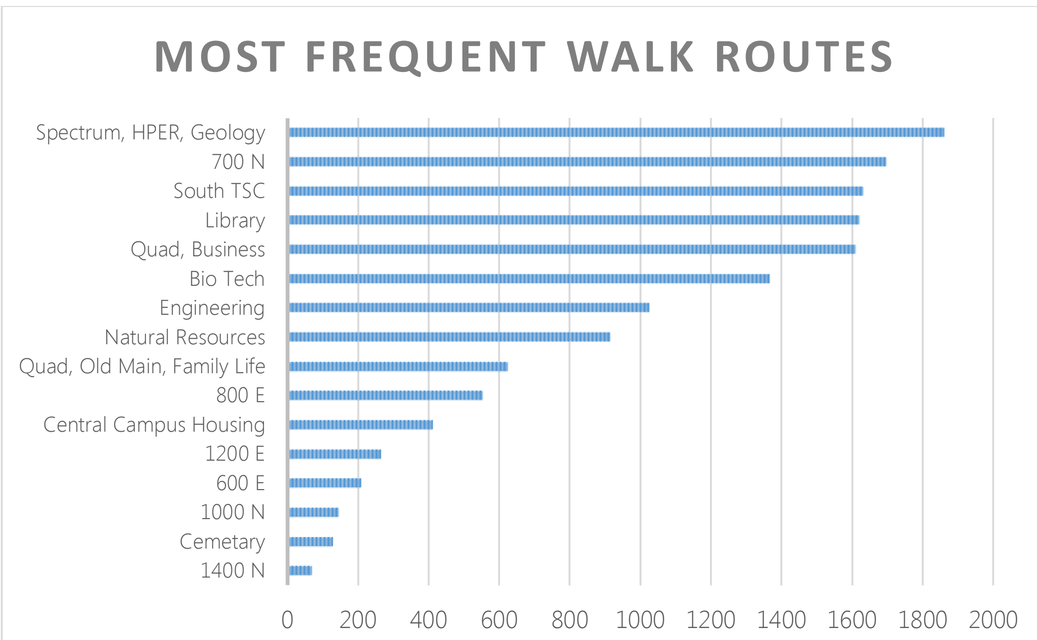
Walking

Pedestrian Commute

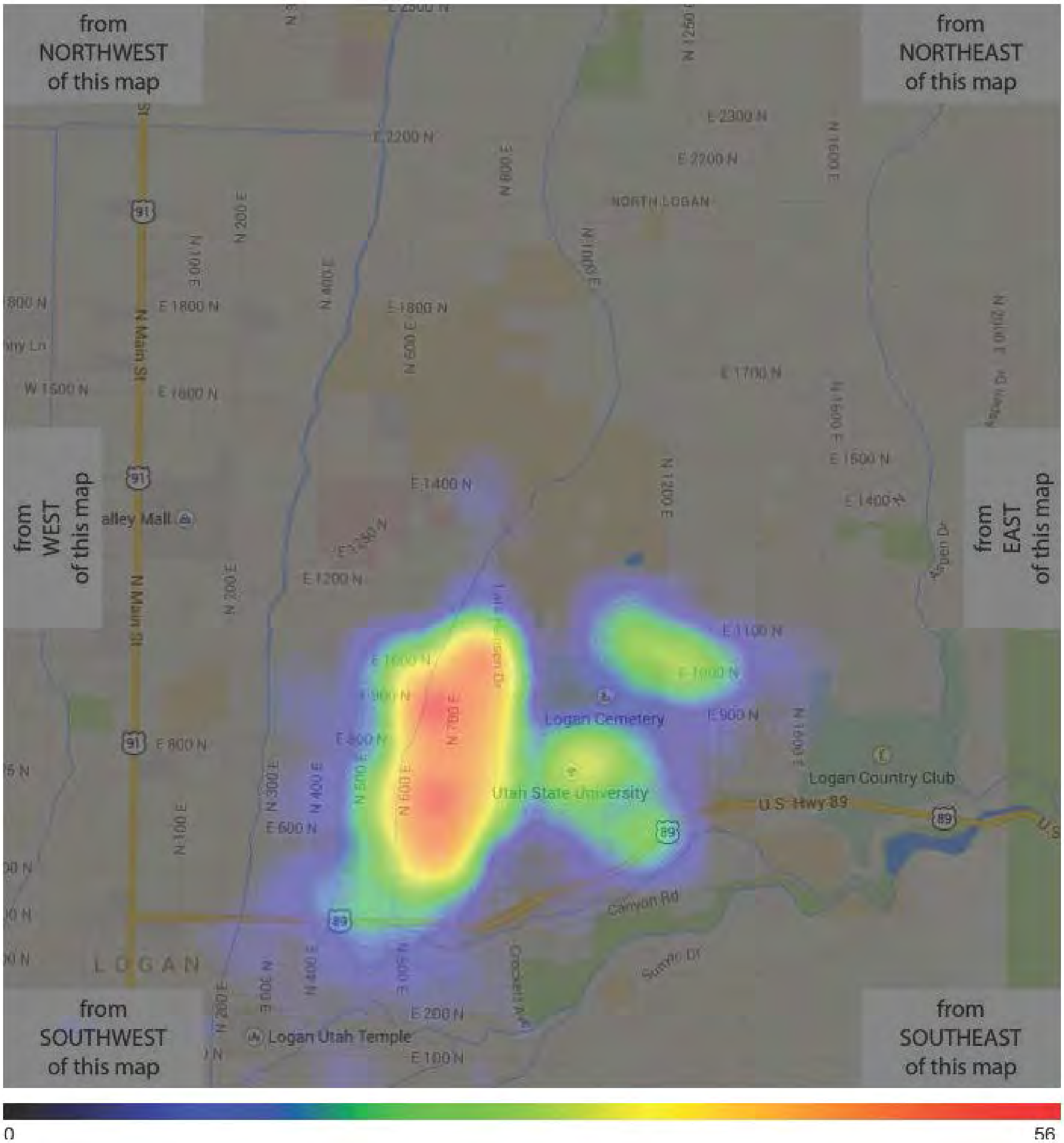


The top three reasons to walk to campus are convenience/comfort, enjoyment/exercise, and cost.


REASONS TO WALK TO CAMPUS
Convenience/comfort
Enjoyment or exercise
Cost
No access to a vehicle or transit
Environmental reasons
0
100
200
300
400
500
600
700
800

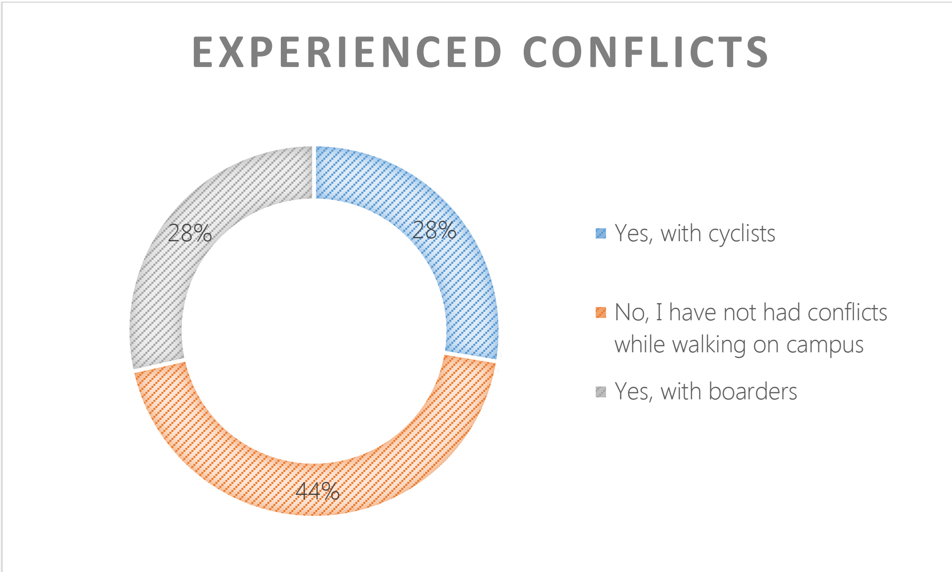

MOST FREQUENT WALK ROUTES
Spectrum, HPER, Geology
700 N
South TSC
Library
Quad, Business
Bio Tech
Engineering
Natural Resources
Quad, Old Main, Family Life
800 E
Central Campus Housing
1200 E
600 E
1000 N
Cemetary
1400 N
0
200
400
600
800
1000
1200
1400
1600
1800
2000

40. Please mark on the map below your starting point when walking to campus.



41. Please mark on the map below your ending point when walking to campus. (If this varies day to day, please select multiple destinations.)

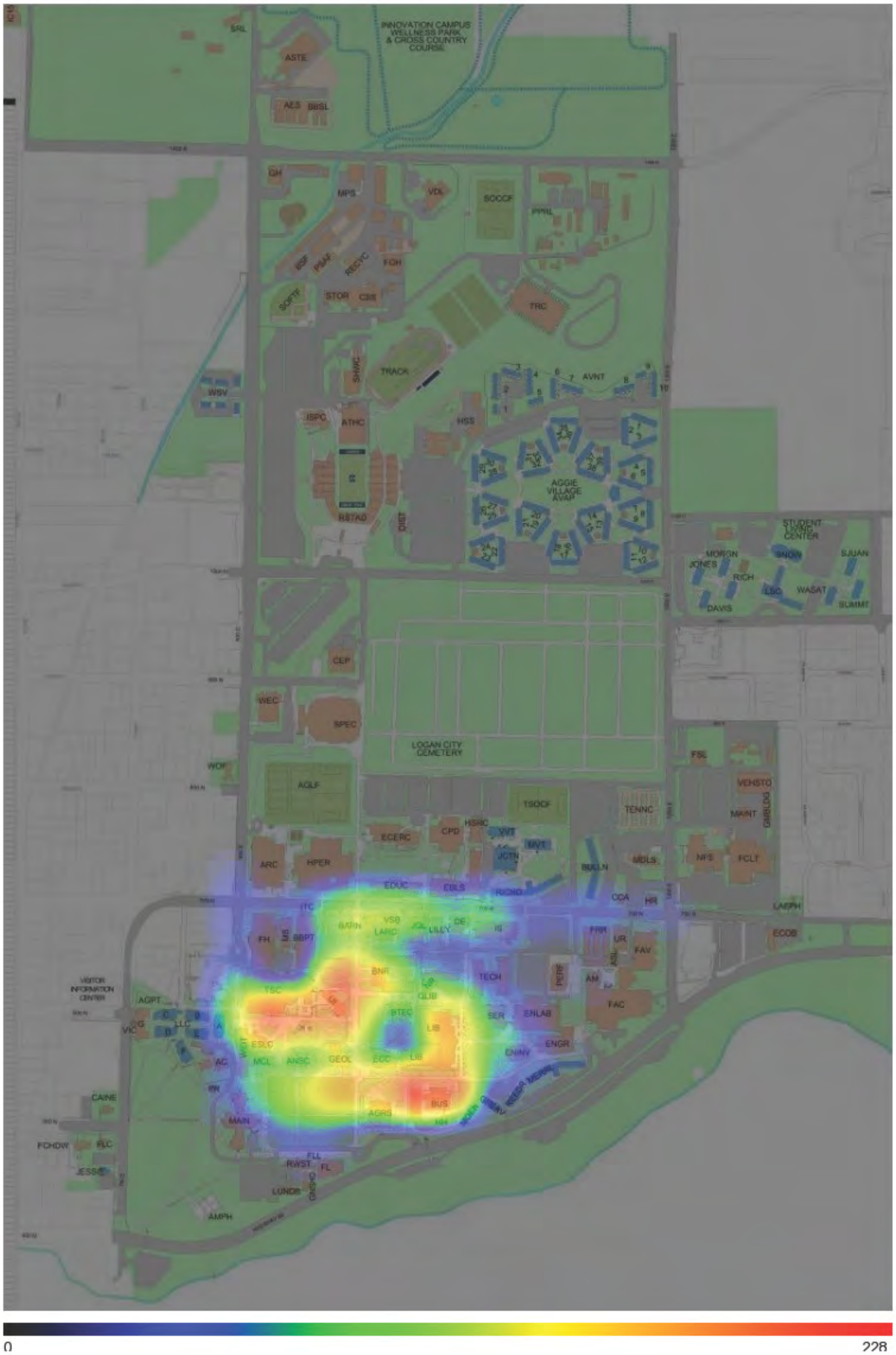
Many pedestrians on campus have experience conflicts with bicyclists and skateboarders/scooters.


EXPERIENCED CONFLICTS
28%
28%
44%
Yes, with cyclists
No, I have not had conflicts while walking on campus
Yes, with boarders

46. Please mark on the map below where these conflicts with cyclists occur.

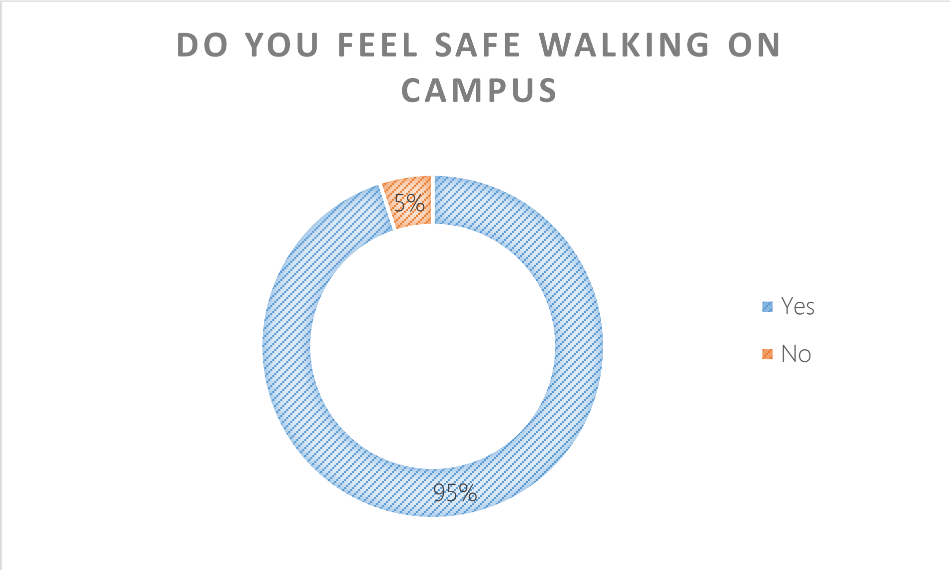
0 240

47. Please mark on the map below where these conflicts with boarders occur.



Everyone

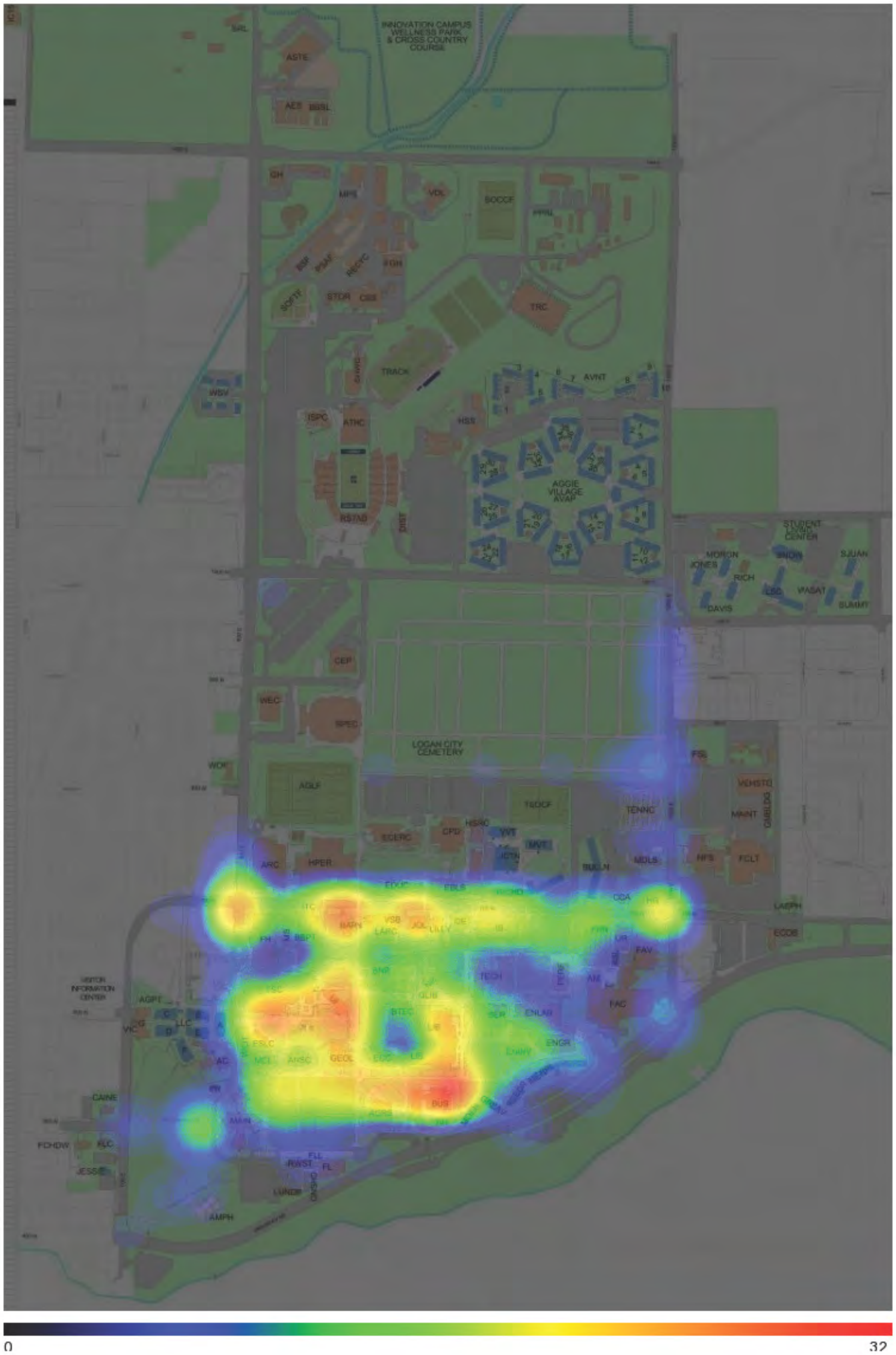
Almost everyone feels safe and comfortable walking on campus.



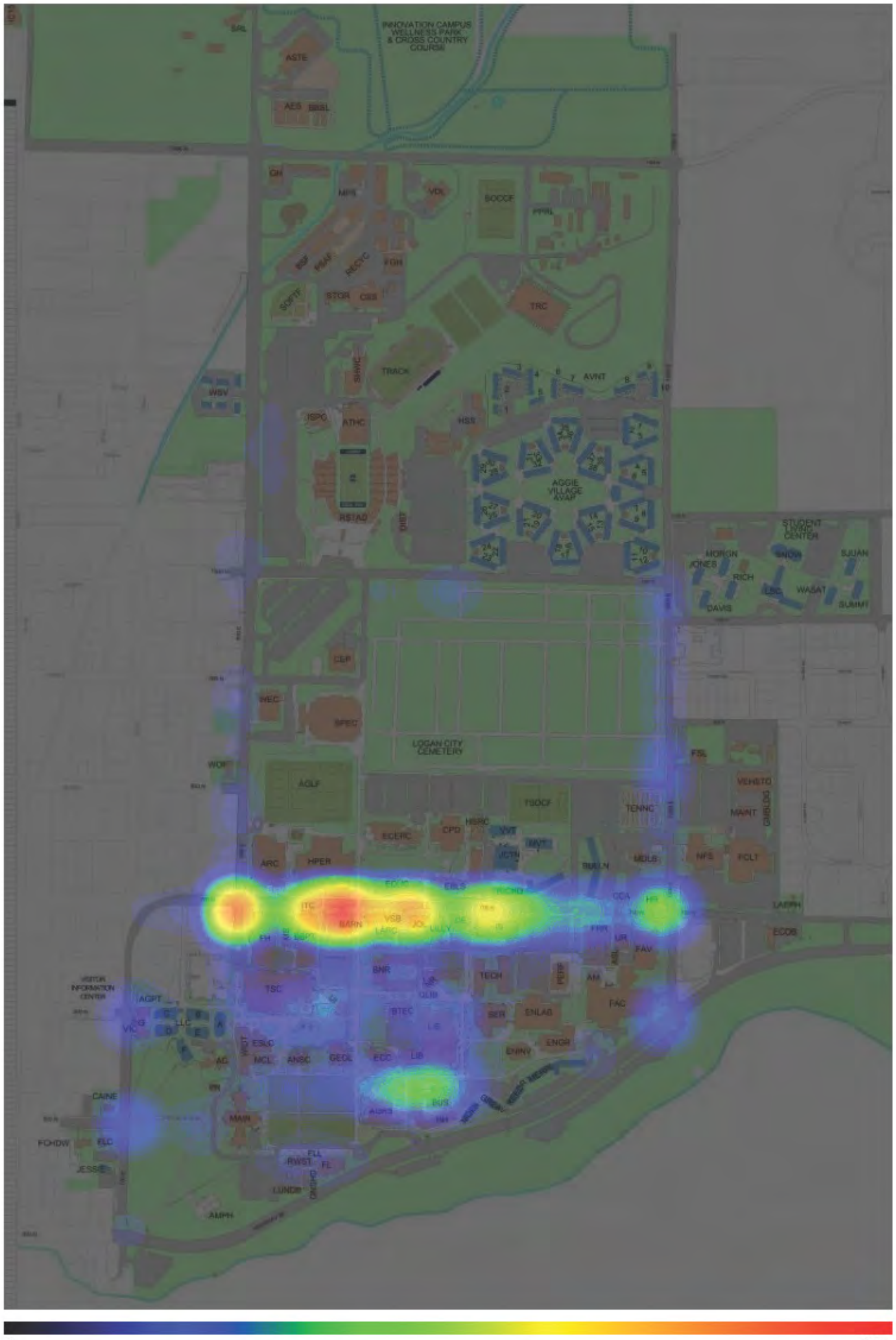
Those who felt unsafe give these reasons:

- Bicyclists (50)
- Skateboards (42)
- Drivers not stopping for pedestrians and/or speeding (26)
- Lighting (20)
- Intersection/crosswalk issues (3)
- Sexual harassment (4 – Pike fraternity was mentioned by name)
- The intersection is horrible. The cross walk signal meter near the fraternities does not work. Students speed past there, as do busses. I do not feel safe there at all. People go slow throughout campus and then speed up here when they're coming up the hill or going down the hill. I have almost gotten hit twice. I am blind in one of my eyes and have a service dog and even then it is soo dangerous for us to walk through there. I live behind the sig ep house so there is no other way I can walk. I wish there would be a stop signal at the bottom of the hill near old main before cars cross up the hill. They come speeding up and can't see students at night. I also wish there was a pedestrian right of way there similar to in front of the hyper building. Students are so busy and run across there because they're trying to get to campus and I feel like it should be a four way stop not a cross walk. Please take this seriously. I hear of friends getting almost hit by cars there all the time.
- I don't know sketchy people
- There's always people staring at me walking
- Too many people selling/proselyting.
- People that are hired to work for USU drive their trucks on the sidewalk that is meant for people to WALK on. There has been several times where people pull up and expect you to walk on the grass while they drive across campus. Why are people driving on the sidewalks? Is it that hard to go get on a road and drive around? I guess driving an extra 1/4 mile is too hard for most people.

99. Please mark on the map below where you do not feel safe while walking on campus.

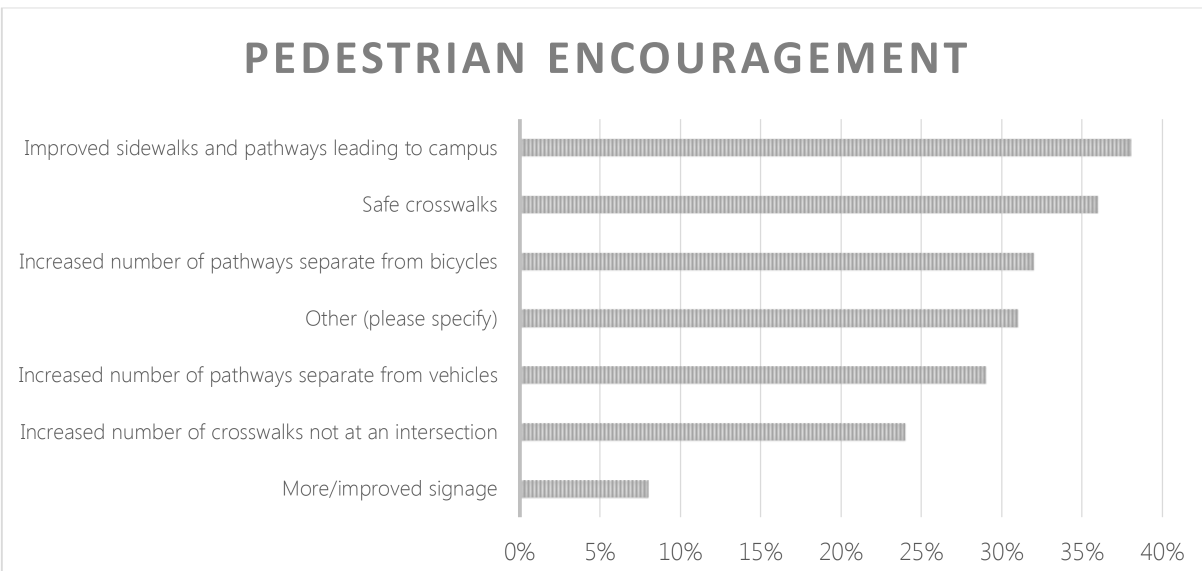


102. Please mark on the map below where pedestrian improvements are needed on campus.



People would be encouraged to walk to campus with improved sidewalks to campus, safer crossers, and separated facilities from bicycles. Specified in the survey responses were:

- Living closer to campus (32)
- Less USU vehicles driving on sidewalks on campus (4)
- More time
- Tunnels (2)
- More bridges
- Bridge over 700 North or lights
- Close 700 North to vehicles
- Better snow and ice removal (2)
- Separate facilities from skate/long boarders (3)
- More street lights (5)
- Better paths from the island to campus. They exist, but they haven't been maintained in years and could be way nicer.
- Better maintained sidewalks
- Nothing needs improvement (2)
- More trees and nature –preserve mature trees (2)
- A crosswalk along 1200 East in front of the cemetery
- A ski-lift style pulley system to haul wheezing students up Old Main Hill
- Additional crosswalk on 1000 N between SW corner of Aggie Village and Logan City Cemetery/Sidewalk by Spectrum
- Sync the traffic signals with the pedestrian signals



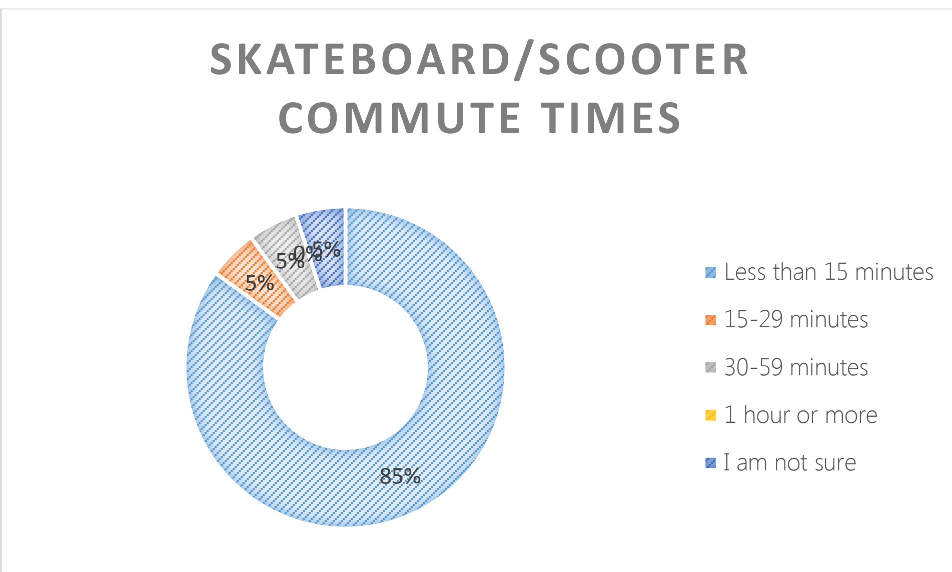
The following are specific barriers people face walking on campus:

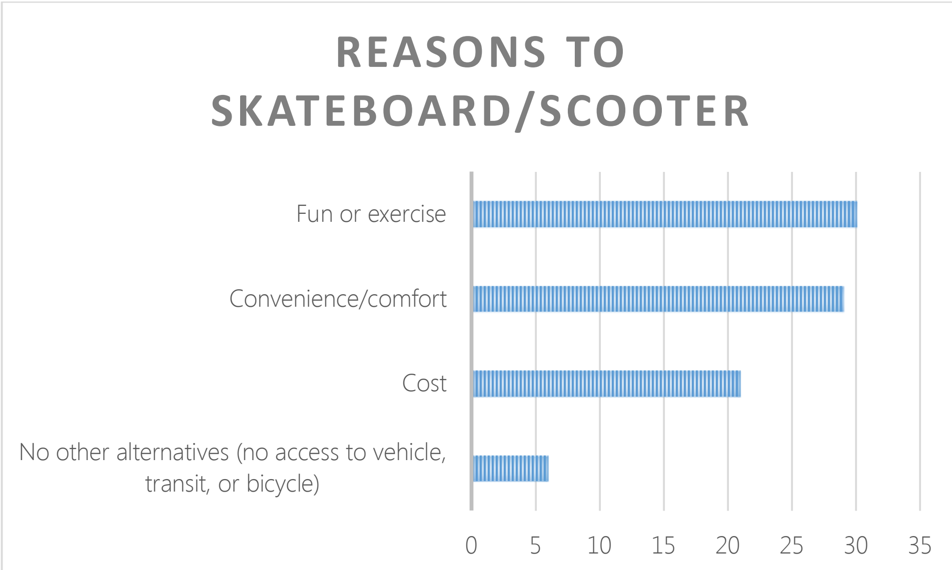
- None (20)
- Bicyclists (12)
- Skateboarders/scooters (10)
- Narrow sidewalks (around bus stops and in general) (3)
- Vehicles not stopping at crosswalks (10)
- Not enough crosswalks (5)
- Traffic intersections
- Traffic lights (2)

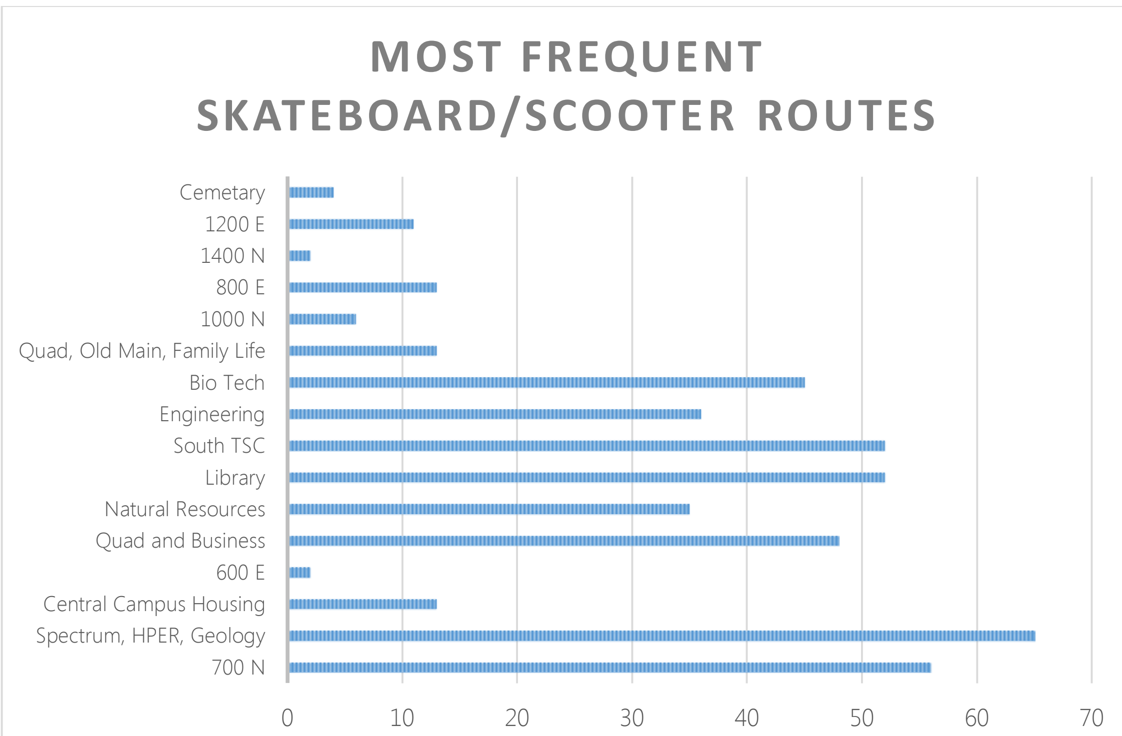
- Non-direct routes (3)
- There are fences that you have to walk around in front of the family life and Ray B West building but it would be easier to just be able to walk straight through
- Most direct route is through parking lot
- The 4-way stop on the block below Old Main is always really busy and hard to cross at times.
- Vehicles on walkways (3)
- Parking areas too far from class buildings
- The northwest corner of the graveyard. Bikes come zooming around the sidewalk due to the hill and there isn't much room on that sidewalk due to the bushes on the side as well as it's pretty well traveled. I think it needs to be widened.
- Crossing the road from Aggie Village to the Cemetery (or the path next to the cemetery) can be quite dangerous because it is on a slight hill (decreasing car visibility) and because the speed limit is 35 mph.
- Crosswalk at the intersection next to the new women's basketball center
- Sidewalk maintenance (5)
- Stairs closed for winter that everyone walks up anyway
- Library entrances (3)
- Hills (7)
- Sprinkler system
- The cemetery
- Construction (5)

Skateboard/Scooter Use

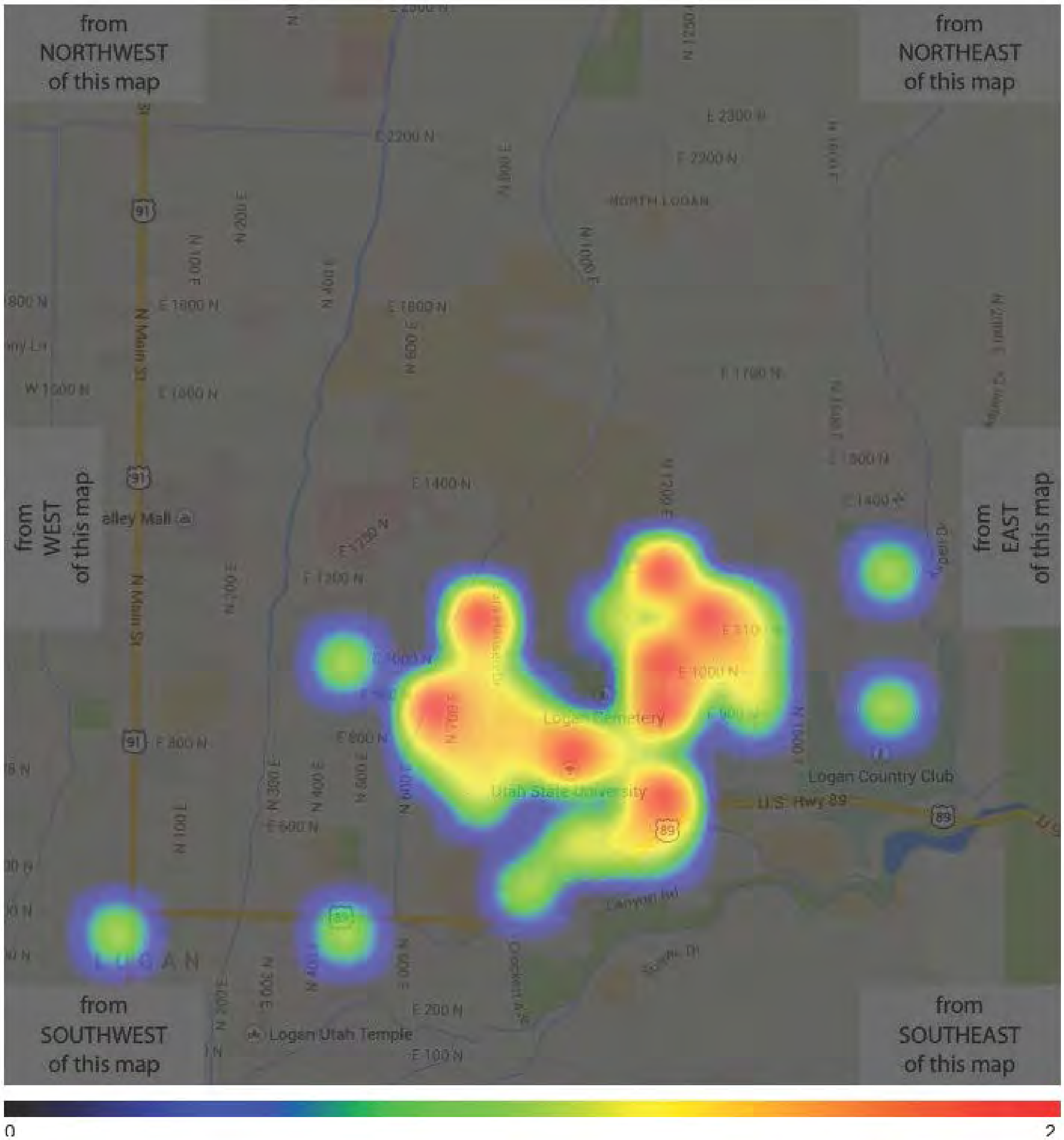
Almost everyone using a skateboard or a scooter to get to campus has a commute of 15 minutes or less.



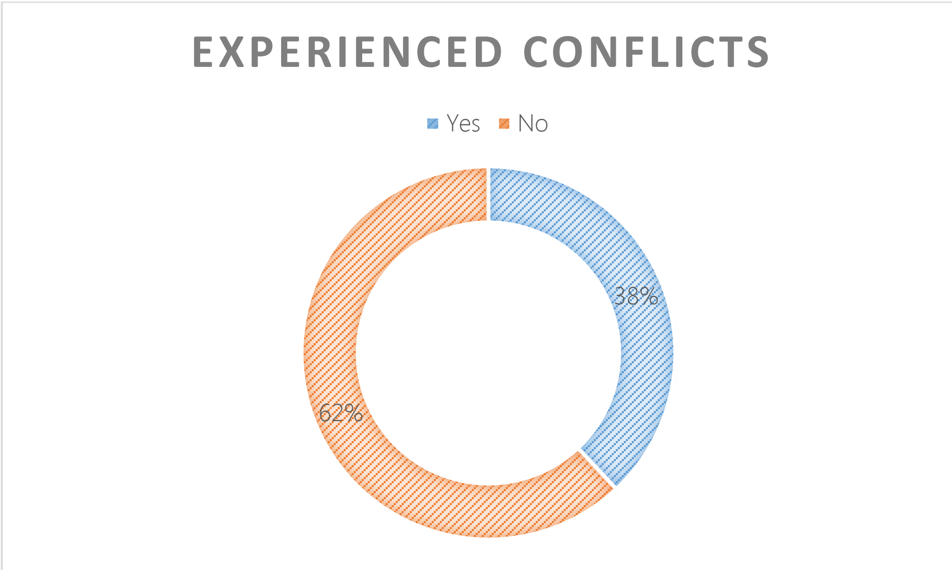

REASONS TO SKATEBOARD/SCOOTER
Fun or exercise
Convenience/comfort
Cost
No other alternatives (no access to vehicle, transit, or bicycle)
0
5
10
15
20
25
30
35


MOST FREQUENT SKATEBOARD/SCOOTER ROUTES
Cemetary
1200 E
1400 N
800 E
1000 N
Quad, Old Main, Family Life
Bio Tech
Engineering
South TSC
Library
Natural Resources
Quad and Business
600 E
Central Campus Housing
Spectrum, HPER, Geology
700 N
0
10
20
30
40
50
60
70

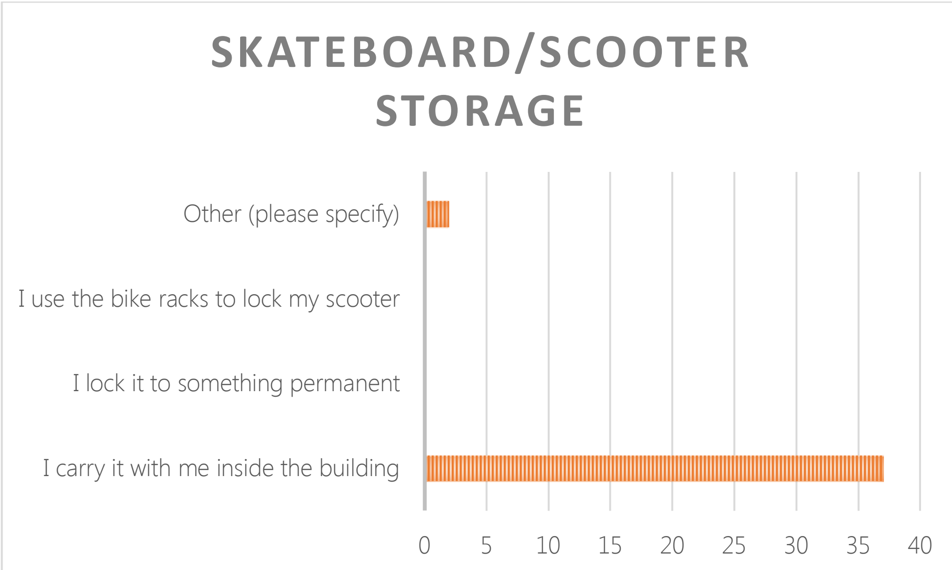
48. Please mark on the map below your starting point when skateboarding or riding a scooter to campus.

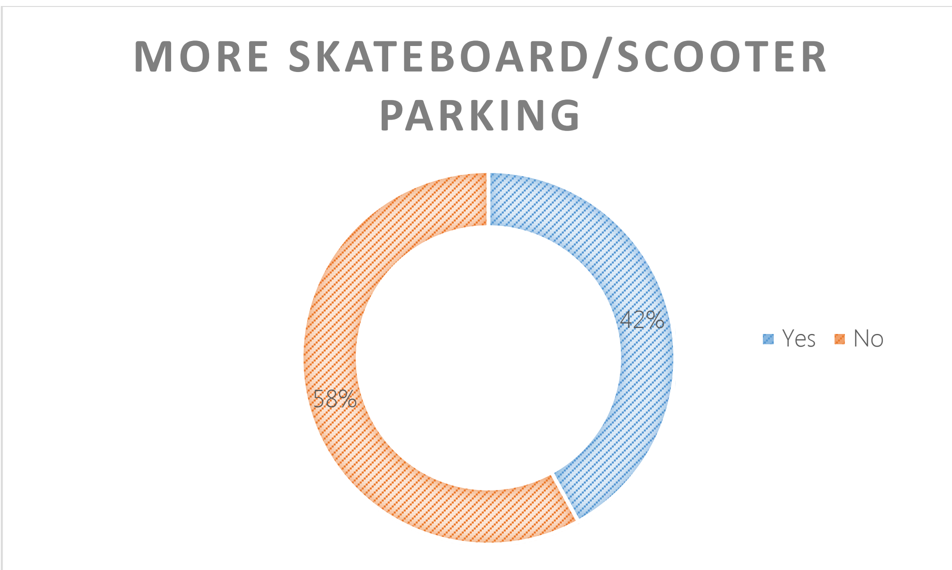


49. Please mark on the map below your ending point when skateboarding or riding a scooter to campus. (If this varies day to day, please select multiple destinations.)


EXPERIENCED CONFLICTS
Yes
No
38%
62%

53. Please mark on the map below where these conflicts occur.

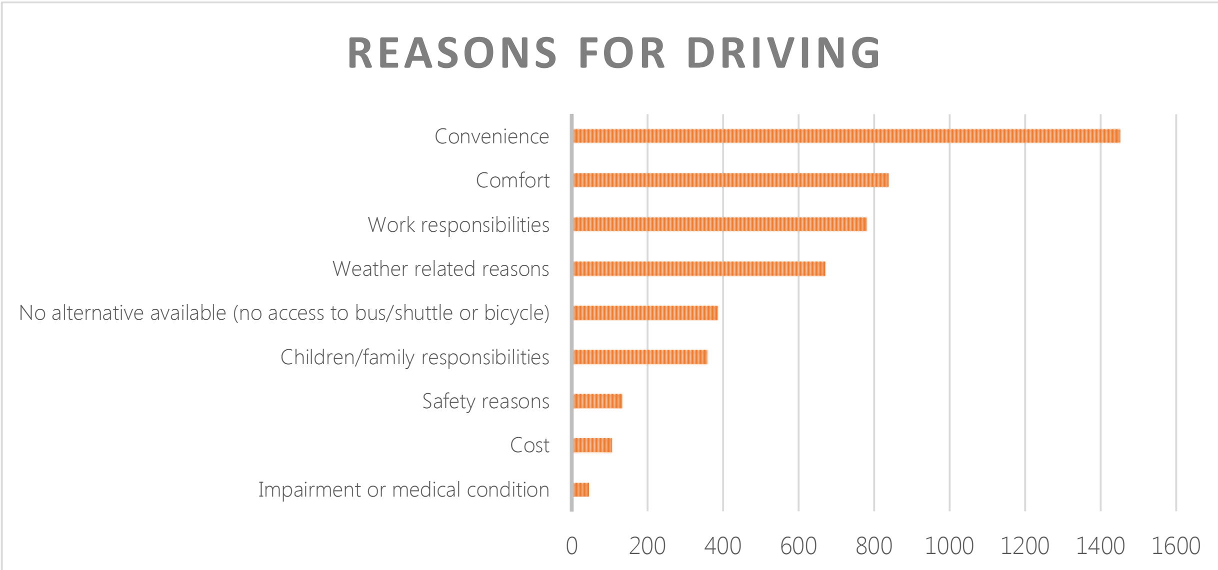

SKATEBOARD/SCOOTER STORAGE
Other (please specify)
I use the bike racks to lock my scooter
I lock it to something permanent
I carry it with me inside the building
0
5
10
15
20
25
30
35
40

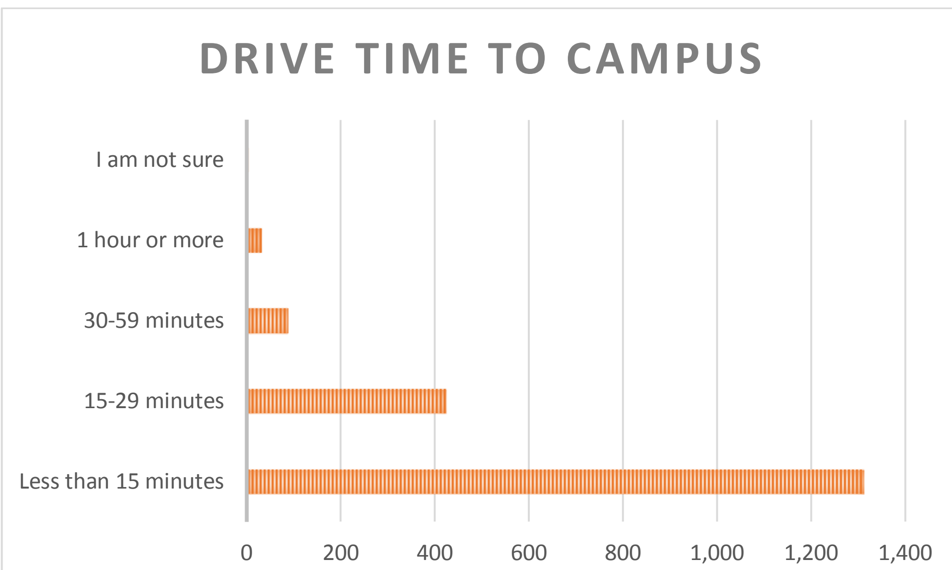

MORE SKATEBOARD/SCOOTER PARKING
42%
58%
Yes
No

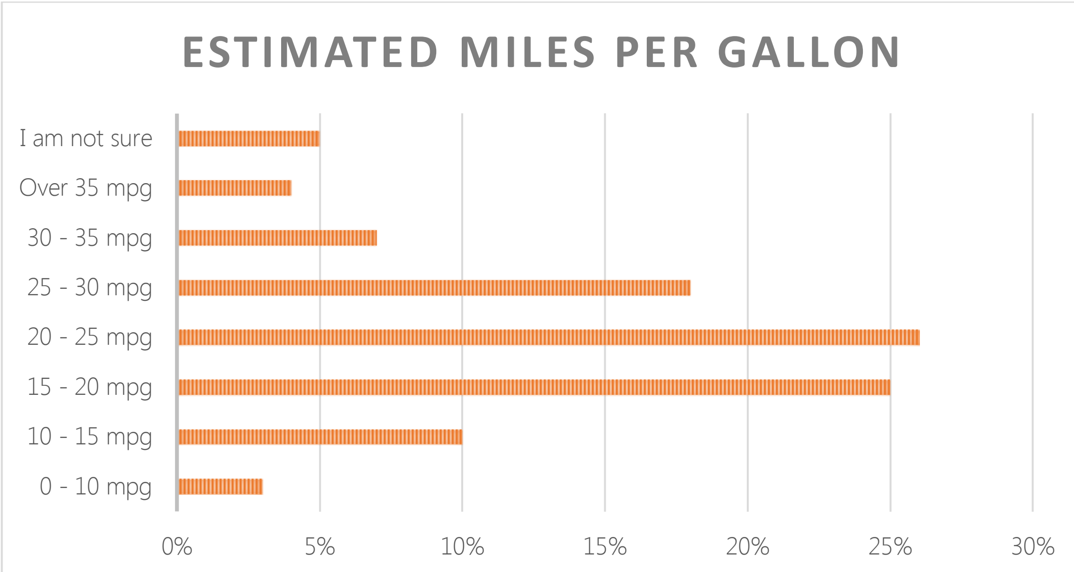
56. Please mark on the map below where you would like to see more parking and locking storage for skateboards and scooters.

Driving

The top three reasons for driving to campus were convenience, comfort, and work responsibilities.

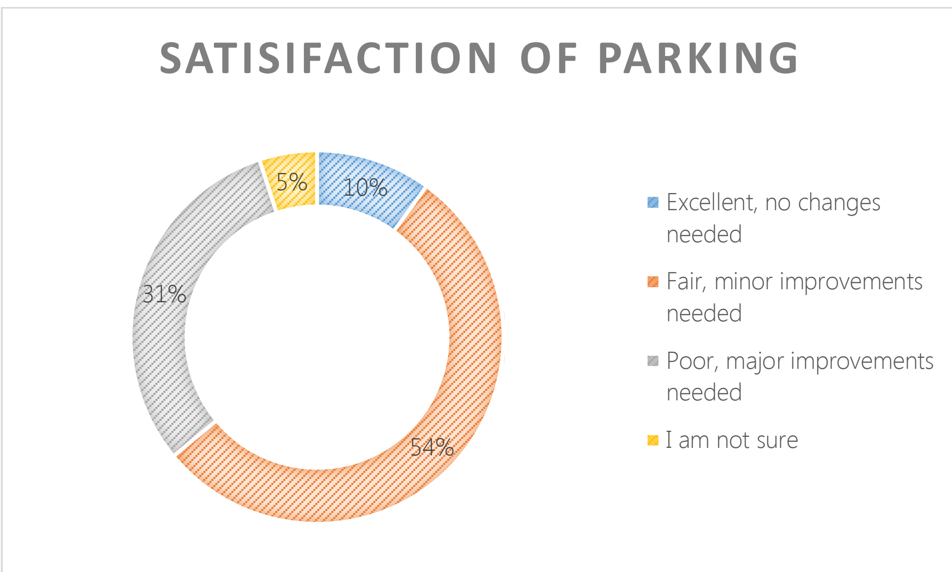






Parking

Over half the people surveyed thought the parking on campus was fair and needed minor improvements, while almost a third thought that parking was poor and needed major improvements.

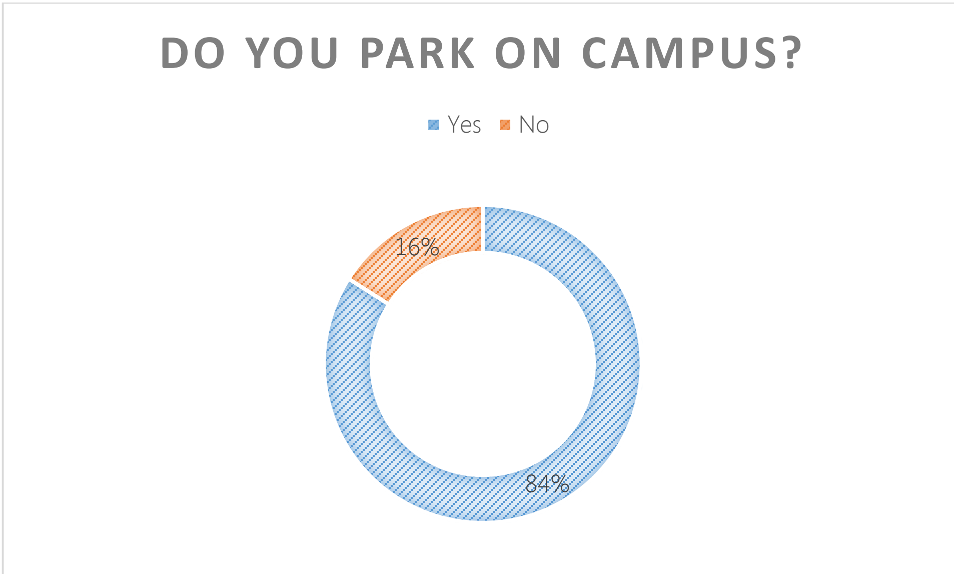


Most people park on campus. Those that park off-campus site price as the most common reason for doing so. Besides parking permits being too expensive, other reasons for parking off campus are:

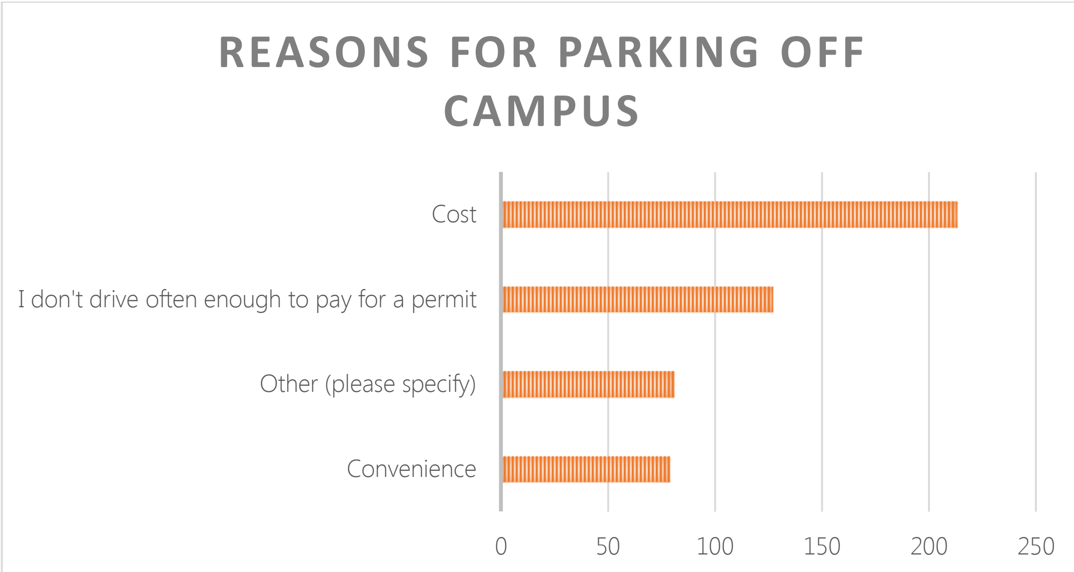
- My motorcycle is easy to find a spot for, in the rare cases that I drive to campus. Motorcycle permits are too expensive for the amount of space they take up.
- Not enough reliable parking
- I don't have a pass and there are no spots available
- Too hard to get a permit that is for parking anywhere close to classes.
- Always open spots in early morning
- I don't want to have to wait for a parking spot when there are too many cars that are being

driven by students.

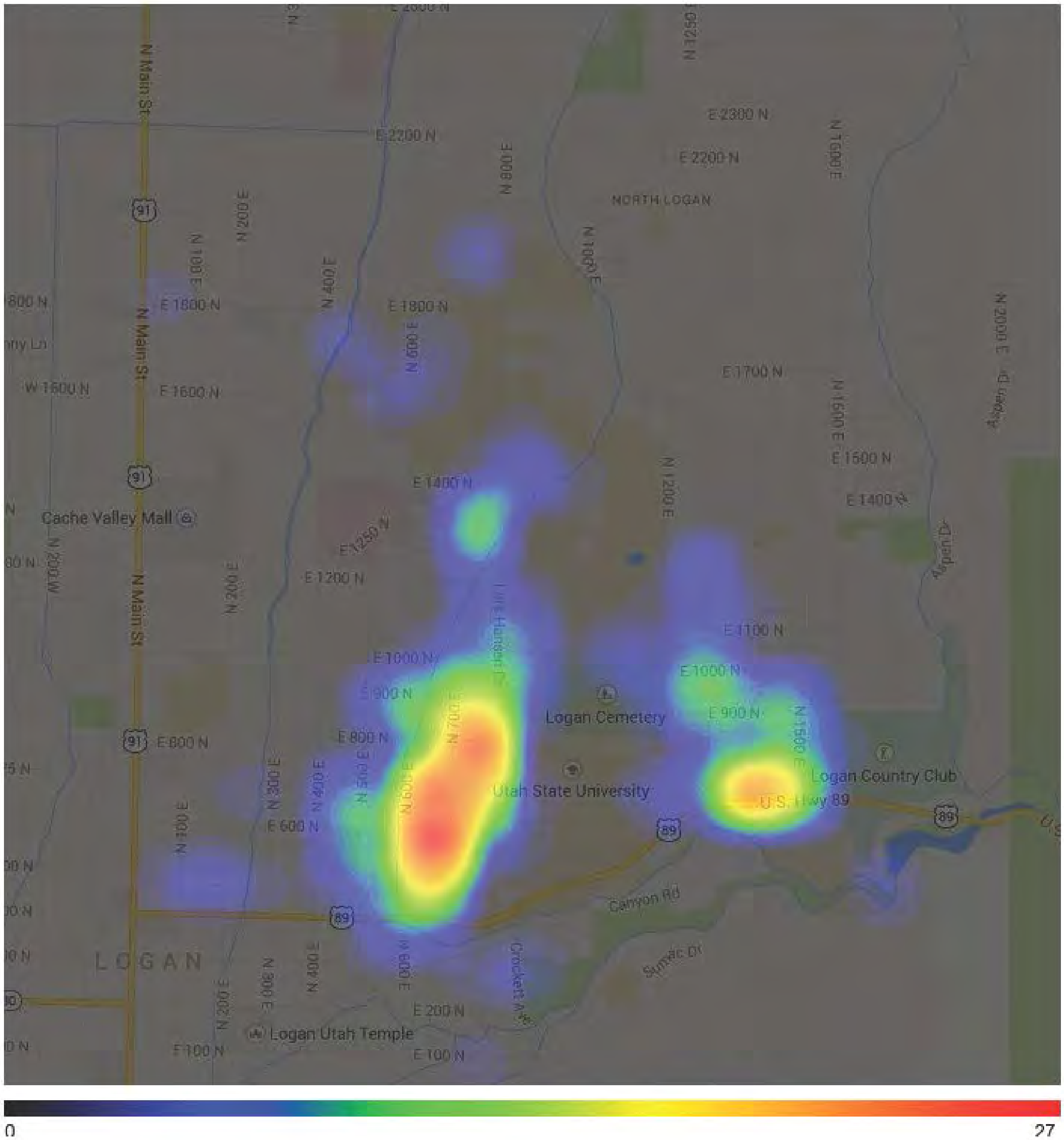
- No convenient parking spots left annoyed
- less crowded farther away
- Parking passes were sold out, which is stupid. There should be parking passes for all who want one, and it should be a first come-first serve basis on parking. It's unfair to not have public parking on campus, and have to force students to buy a pass, if you don't even sell enough passes to accommodate your students. Having more passes available would make your university more money
- Never enough spaces available
- There are no parking passes for spaces close to my classes and work on campus. It takes too long to walk or take the bus from the stadium
- USTAR bldg is off campus.
- Currently taking an online class and some through Weber State, so I have to take tests at the Distance Ed testing center. It is easier to park and take the bus when I need to.
- Parking on campus is a joke...not enough parking, and yes, too expensive.
- have not gotten around to an emissions test to get a permit
- I do not have permission
- USU didn't have enough parking passes
- As stated before passes don't guarantee anything so why pay the price when you oversell the permits?
- I have a free parking pass at sigma chi
- There are no suitable options for parking on campus even if I had a permit. I have classes that are over 3 hours, so parking in a two hour area is not reasonable. All the other parking areas for students either cost too much or are not worth the money because they are so far from my classes.
- its just as close as the free spaces in the yellow and blue lots
- No parking on campus
- Multiple recreational activities preceding/following work require canyon access
- Forces me to exercise
- I am on the waiting list to purchase a parking pass for the terrace and for the parking by the building I work in.
- Employee parking should be a benefit! Any cost is ridiculous and prohibitive at our salary rate.
- Trying to find parking on campus is a zoo and not worth the pain.


DO YOU PARK ON CAMPUS?
Yes
No
16%
84%

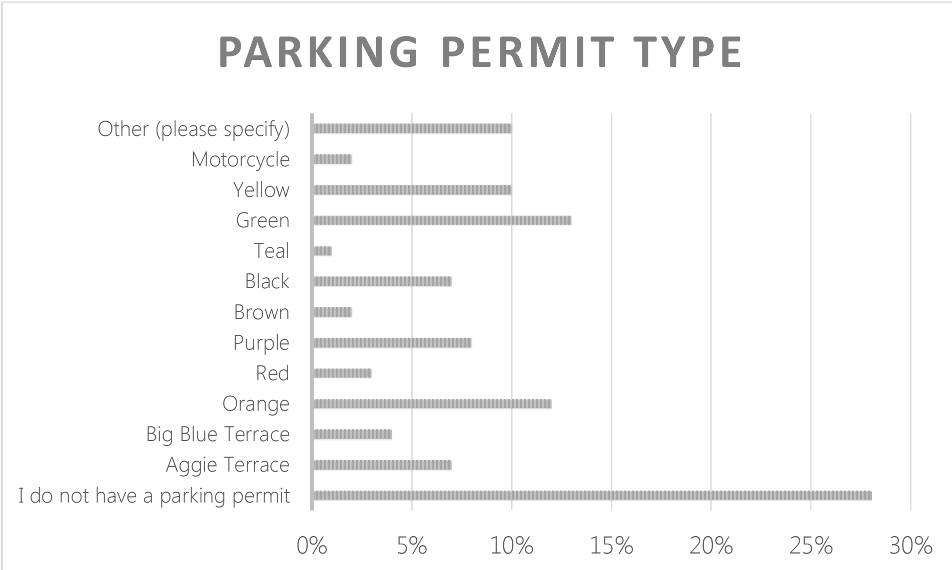
63. Please mark on the map below where you normally park.


REASONS FOR PARKING OFF CAMPUS
Cost
I don't drive often enough to pay for a permit
Other (please specify)
Convenience
0
50
100
150
200
250

64. Please mark on the map below where you park off campus.

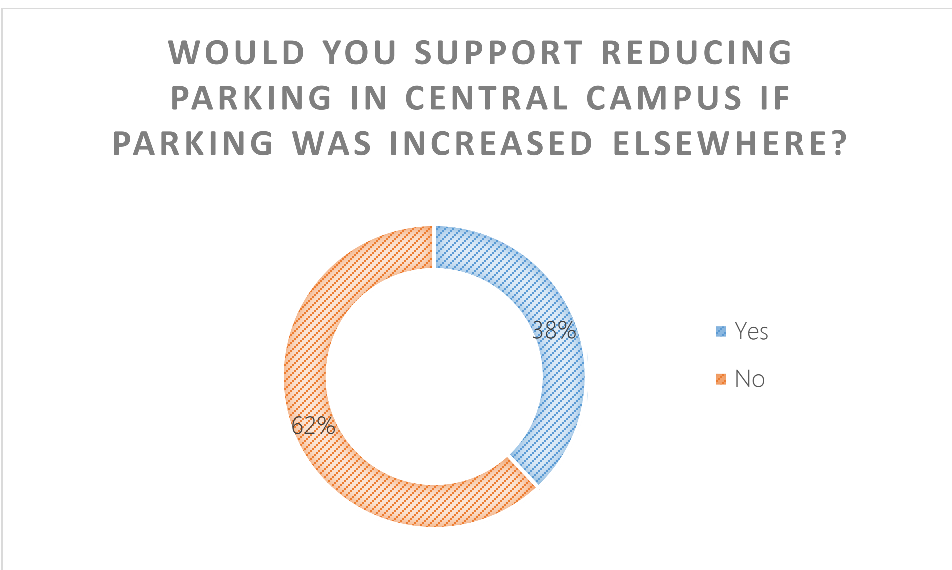


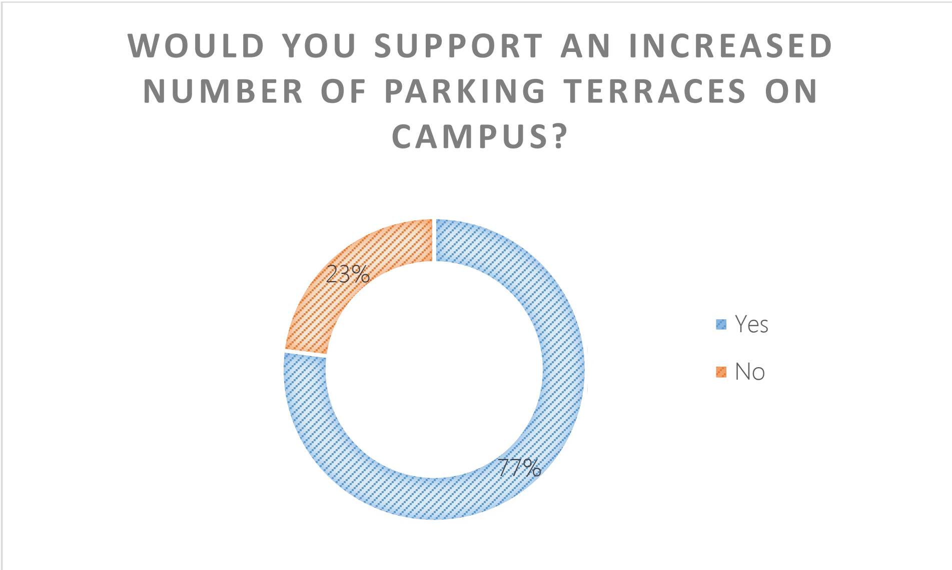
66. Please mark on the map below your ideal parking spot on campus.

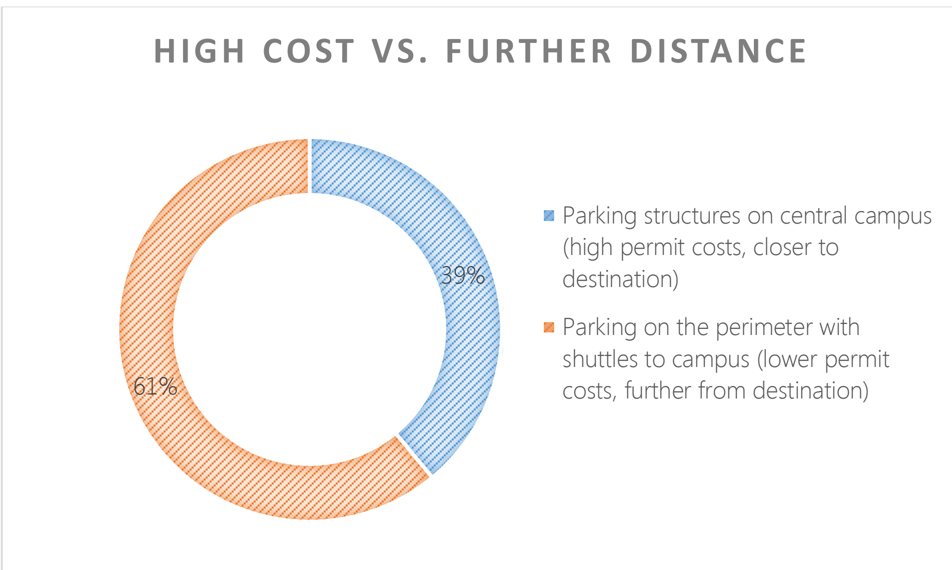


Most people would not support relocating parking from central campus even with an increase in parking. Over 75% of people would support an increase in parking terraces on campus.

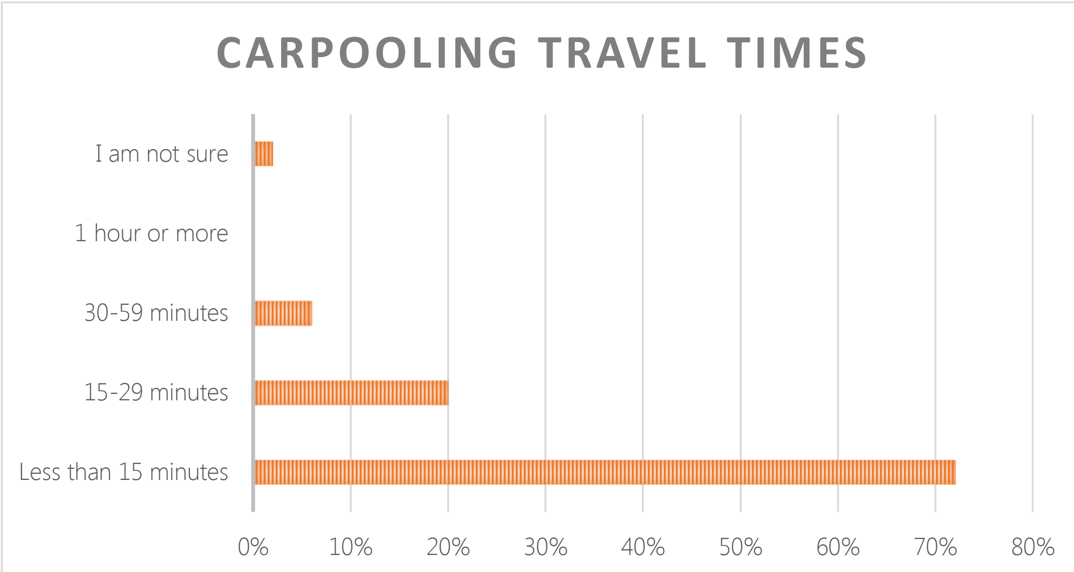
60% of people would support perimeter parking with shuttles (lower cost permits but further from destination) to parking structures on central campus (high cost permits but closer to destination).




WOULD YOU SUPPORT AN INCREASED NUMBER OF PARKING TERRACES ON CAMPUS?
23%
77%
Yes
No


HIGH COST VS. FURTHER DISTANCE
39%
61%
Parking structures on central campus (high permit costs, closer to destination)
Parking on the perimeter with shuttles to campus (lower permit costs, further from destination)

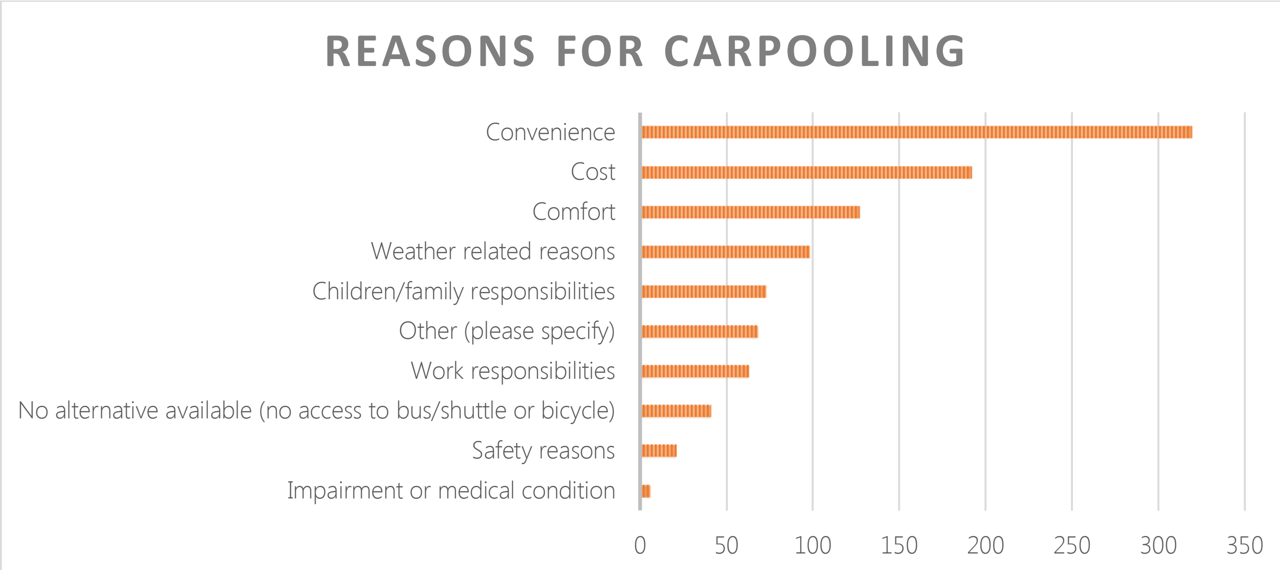
Carpooling



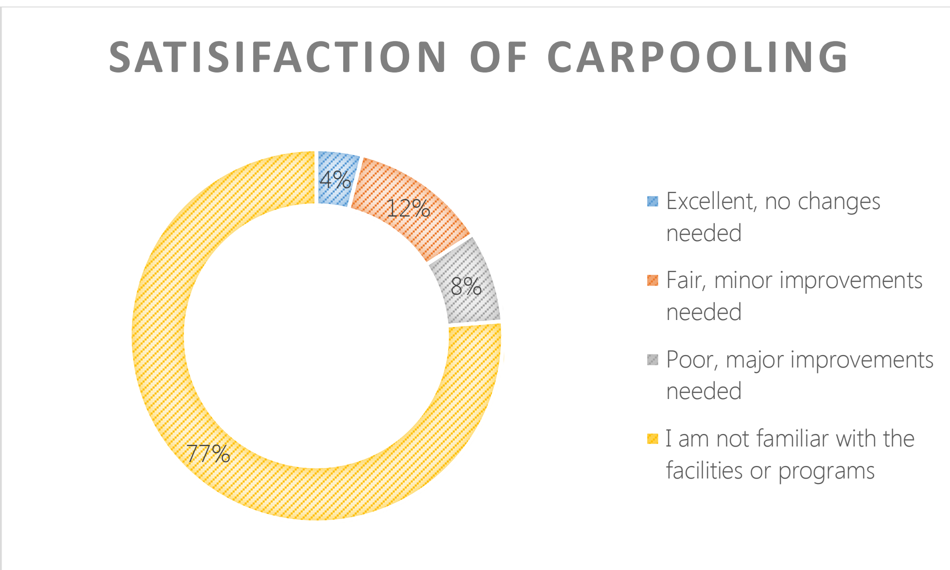
The top three reasons people gave for carpooling were convenience, cost, and comfort. Other reasons not listed in the question were:

- Environmental:
- Helping the Environment - and being with good carpool friends.
- Environmental benefits...how did that not make this list?
- better for the environment
- green option
- reduce driving
- reduced environmental impact
- Environmental reasons, specifically air pollution
- Family-related:
- My boyfriend brought his car down and needs to take it back up (he lives on campus)
- one car family and the wife needs the car
- My Wife and I both work on campus and to take two cars is not necessary.
- spouse and I both have classes, drive together
- marriage
- I carpool with my wife
- Because my wife works here also
- Husband goes to school on campus. so we drive together
- To spend time with my husband
- Spouse and I both work on campus.
- kids attend Edith Bowen
- My wife also works on campus
- Dual career family
- Wife attends class while I teach
- commuting with family member
- My wife works here too, if our schedules align, then we carpool
- Wife and I both work on campus. Why would we bring 2 cars?
- Wife needs the car for the day

- I carpool with my husband so we carpool together because we live together and it is most convenient.
- ride with spouse who also works for USU
- Husband and I only have one car
- Spouse also works at USU
- Come with spouse
- Daughter is student and she rides with me to class in morning.
- Friends-related:
- My roommate likes rides sometimes.
- Driving friends who don't have cars
- Being nice to friends
- With Friends
- I am the driver and I do it for a friend so he doesn’t have to ride the bus
- To help out a friend
- It's only after school to go to my studio
- To be on campus at times when the buses do not operate.
- Only from work to campus, I bring co-workers with me from time to time
- Don't want to buy parking pass
- Attend USU basketball games.
- Missed the bus near my house.
- Because someone is driving up when I need to go up
- I was asked to.
- I give others rides when it's too cold and early for them to walk
- Speed
- We all went halfsies on a parking pass because we know there isn't parking available.
- Using the bus takes me about a 30 to 45 minutes
- No car
- I have to come anyway. It doesn't take that much to pick people up along the way
- I broke my foot 5 days ago and have a hard time walking. Normally I drive myself to work and do not carpool even though my husband and I both work on campus in the same building.
- Bus takes too long
- No personal car, and the weather is bad
- only carpool when out of a vehicle and weather not good for bike
- Because I live next door to a colleague and we can share a ride easily.
- I am the driver in my apartment. If roommates want to ride with me, that's great! but otherwise I am driving to campus anyway.

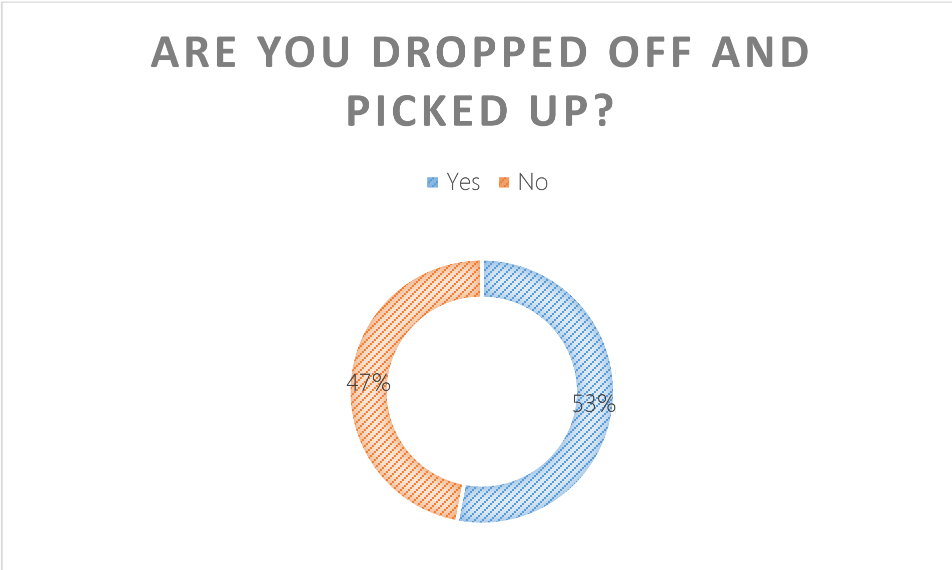


It is interesting to note that over three-quarters of people on campus are not familiar with carpool facilities or programs.

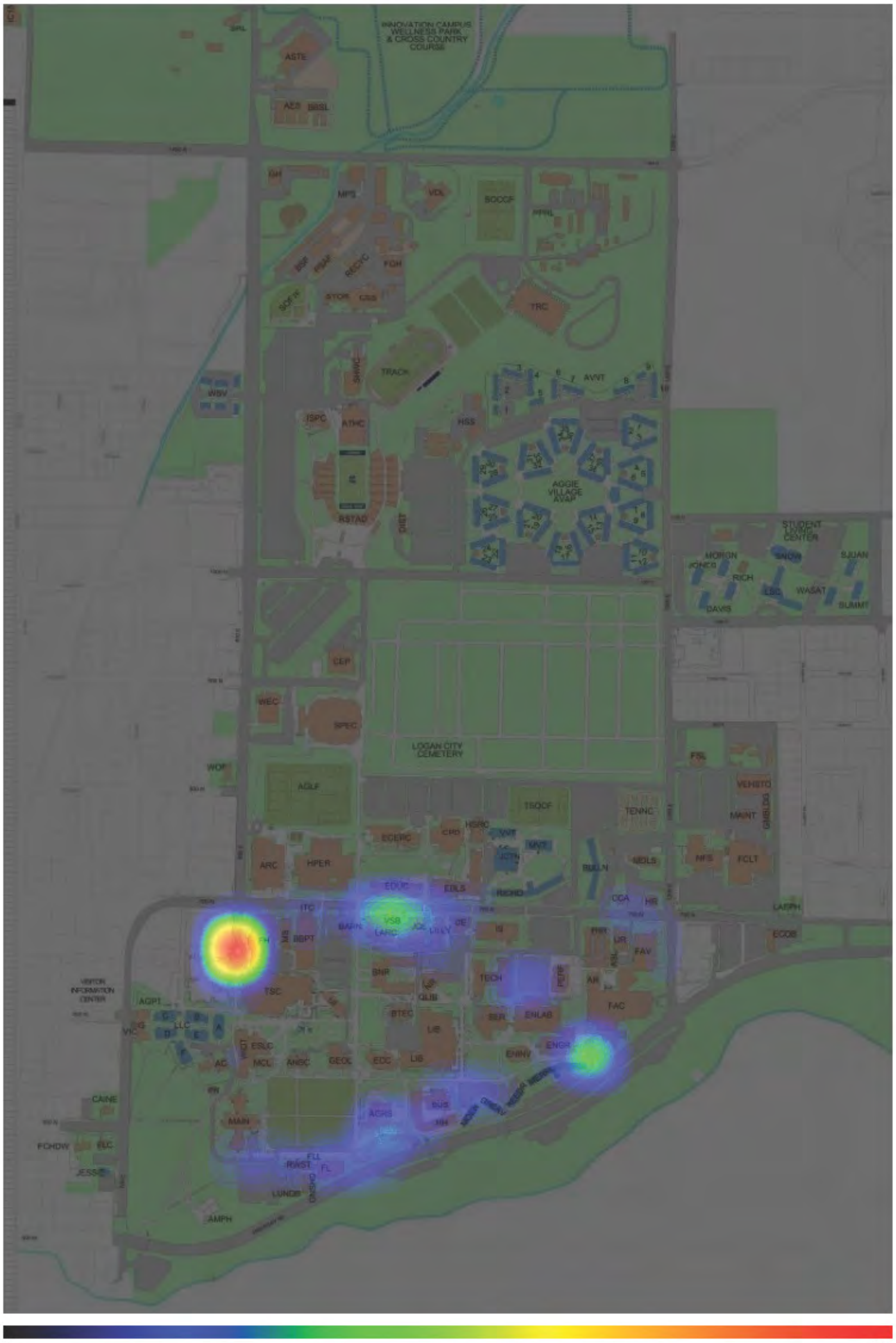


Pick-up/Drop-off

Only have the people that are pick-up from campus are also dropped-off.

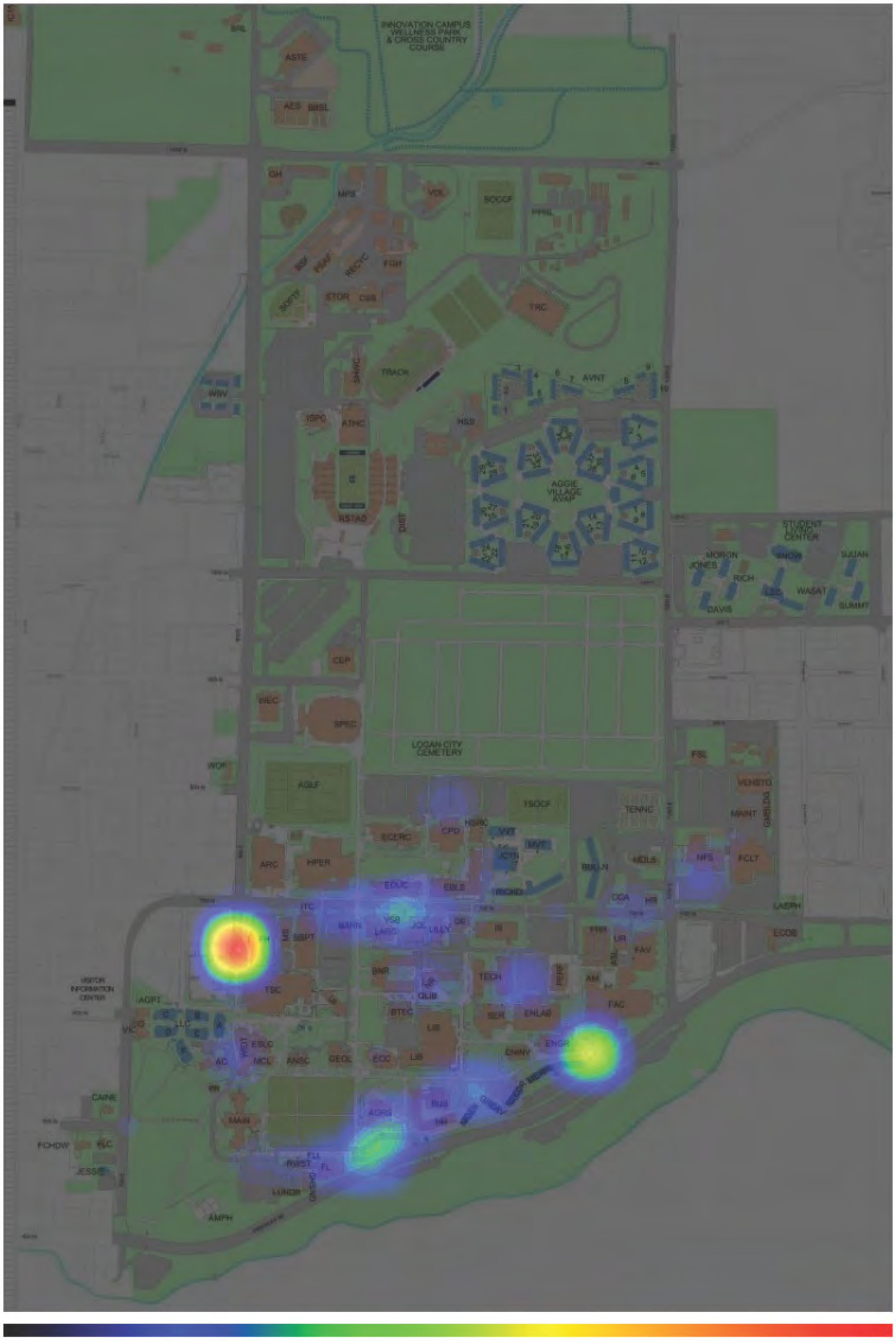

ARE YOU DROPPED OFF AND PICKED UP?
Yes
No
47%
53%

76. Please mark on the map below where you were dropped off on campus.



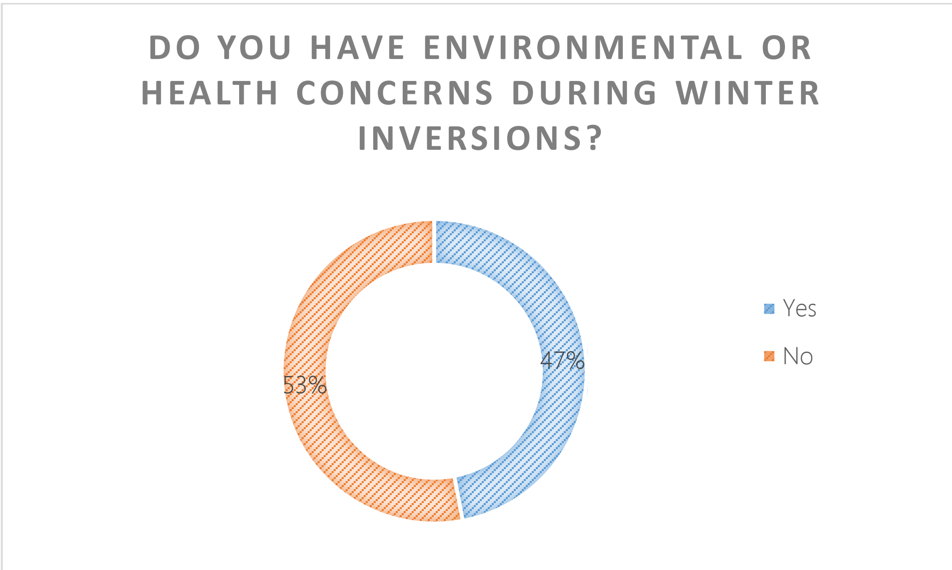
77. Please mark on the map below your first destination after being dropped off on campus.

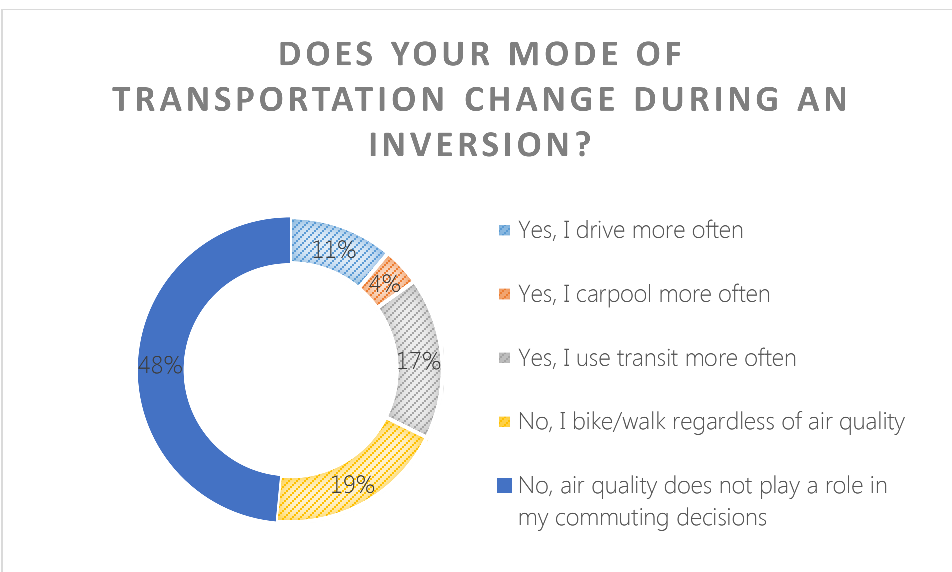
79. Please mark on the map below where you were picked up on campus.



Inversions

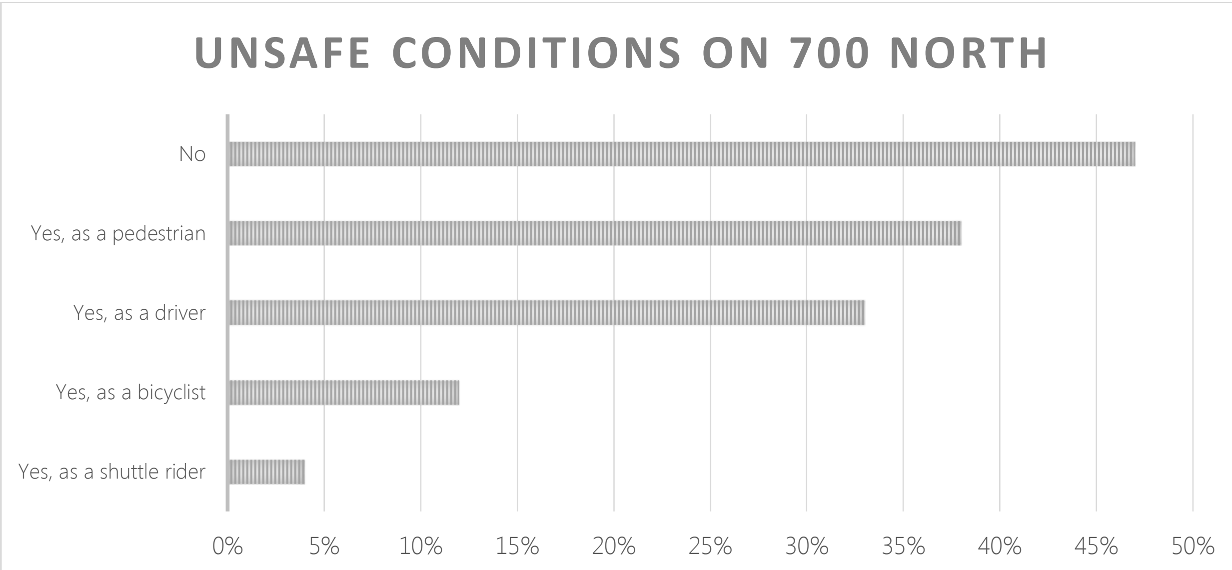
Slightly less than half the survey respondents have environmental or personal health concerns during inversions. Also, slightly less than half of survey respondents say that air quality does not play a role in their commute decisions. About 20% will continue to walk and bike to USU and another 20% will use a more sustainable method like carpooling or transit when an inversion is present.

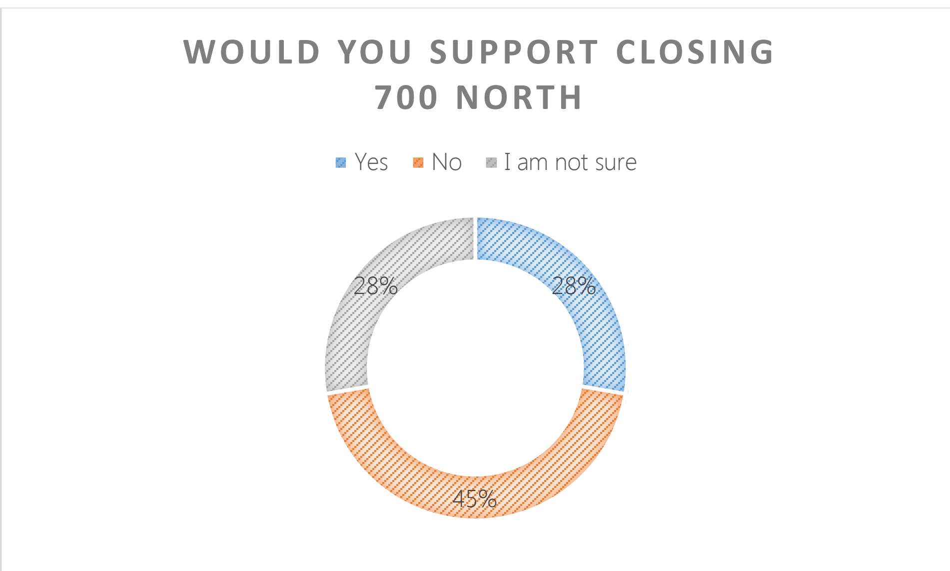




700 North

Just over half of survey respondents experienced unsafe conditions on 700 North either as a driver, pedestrian, bicyclist, or shuttle rider. Close to 40% of people experienced unsafe conditions as a pedestrian. However, 45% said they did not support closing 700 North, while 28% each either supported the closure or were unsure.





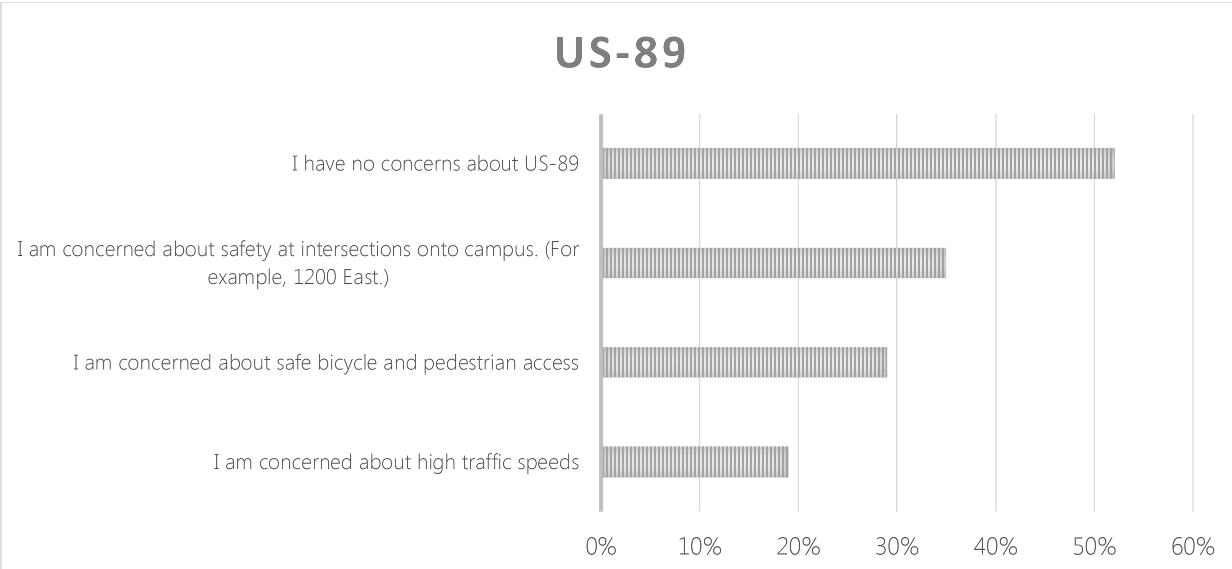
The concerns that people have with closing 700 North are:

- Access to parking (29)
- Displacing congestion to other corridors (10)
- Getting to campus (5)
- Increased travel times (11)
- Inconvenient (12)
- Pick-up/drop-off along 700 North (7)
- Decrease visitation to campus

- I'm not sure (2)
- None (18)

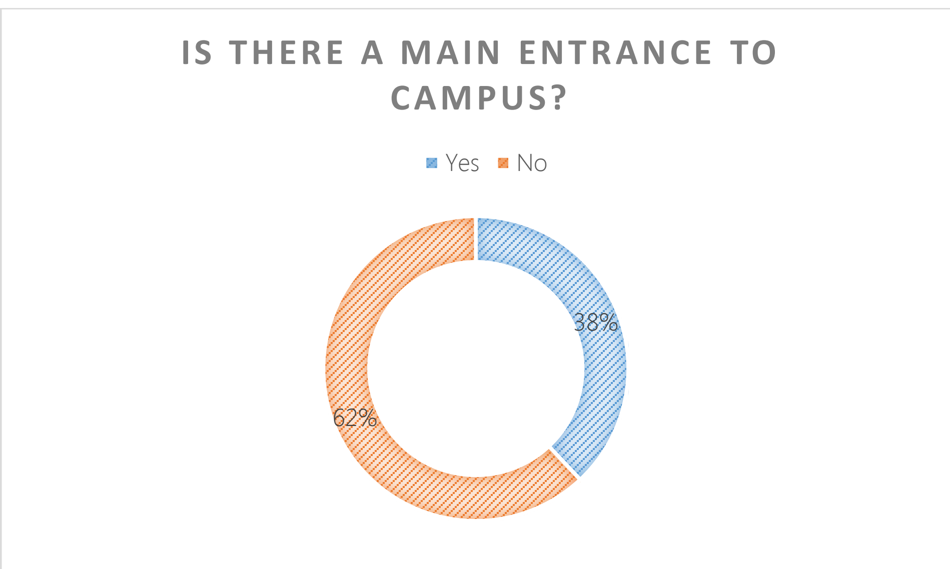
US-89

Over half of survey respondents have no concerns with US-89, while over 30% thought that the intersection were unsafe. Just under 30% of users thought it was unsafe for pedestrians and bicyclists.

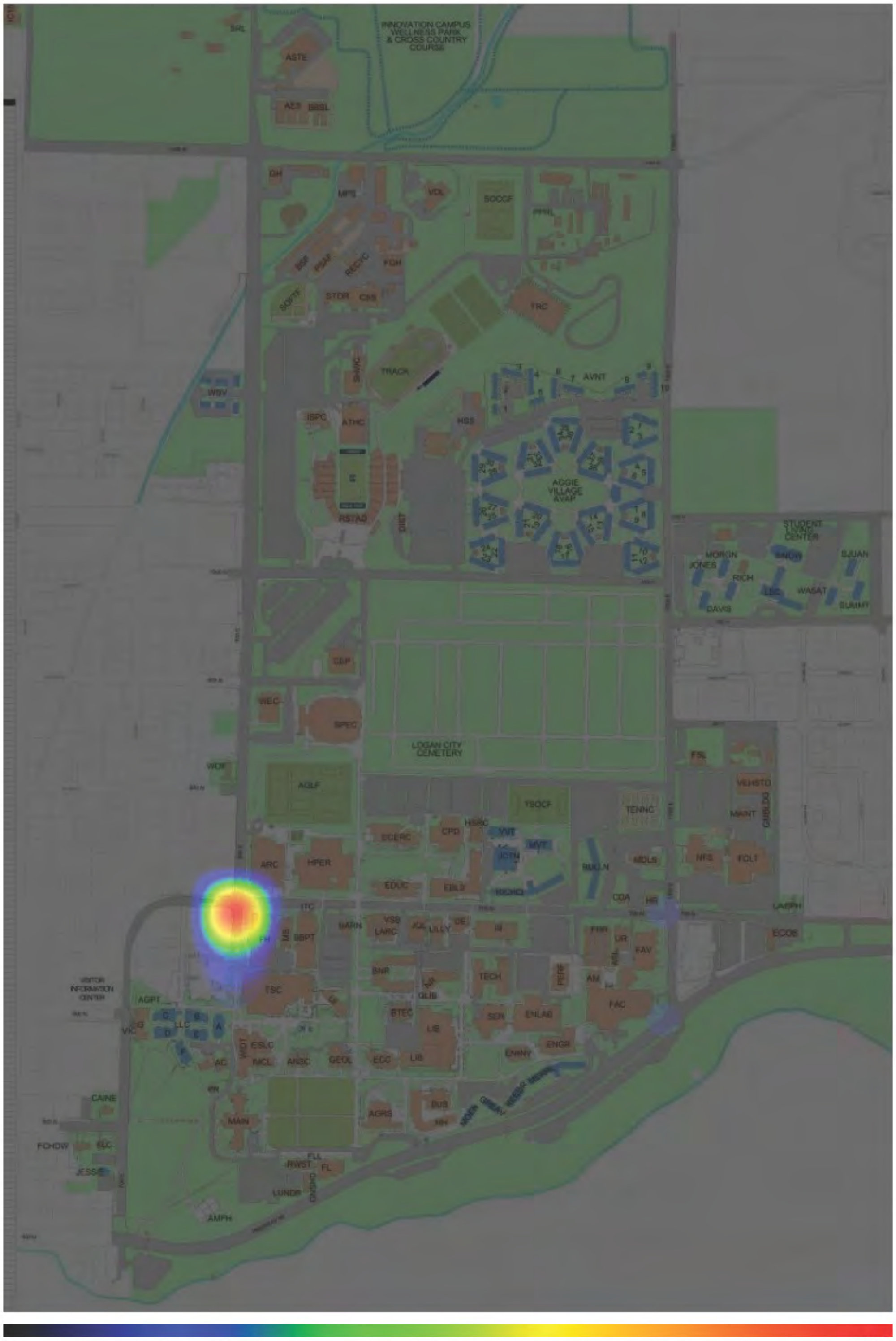


Main Entrance

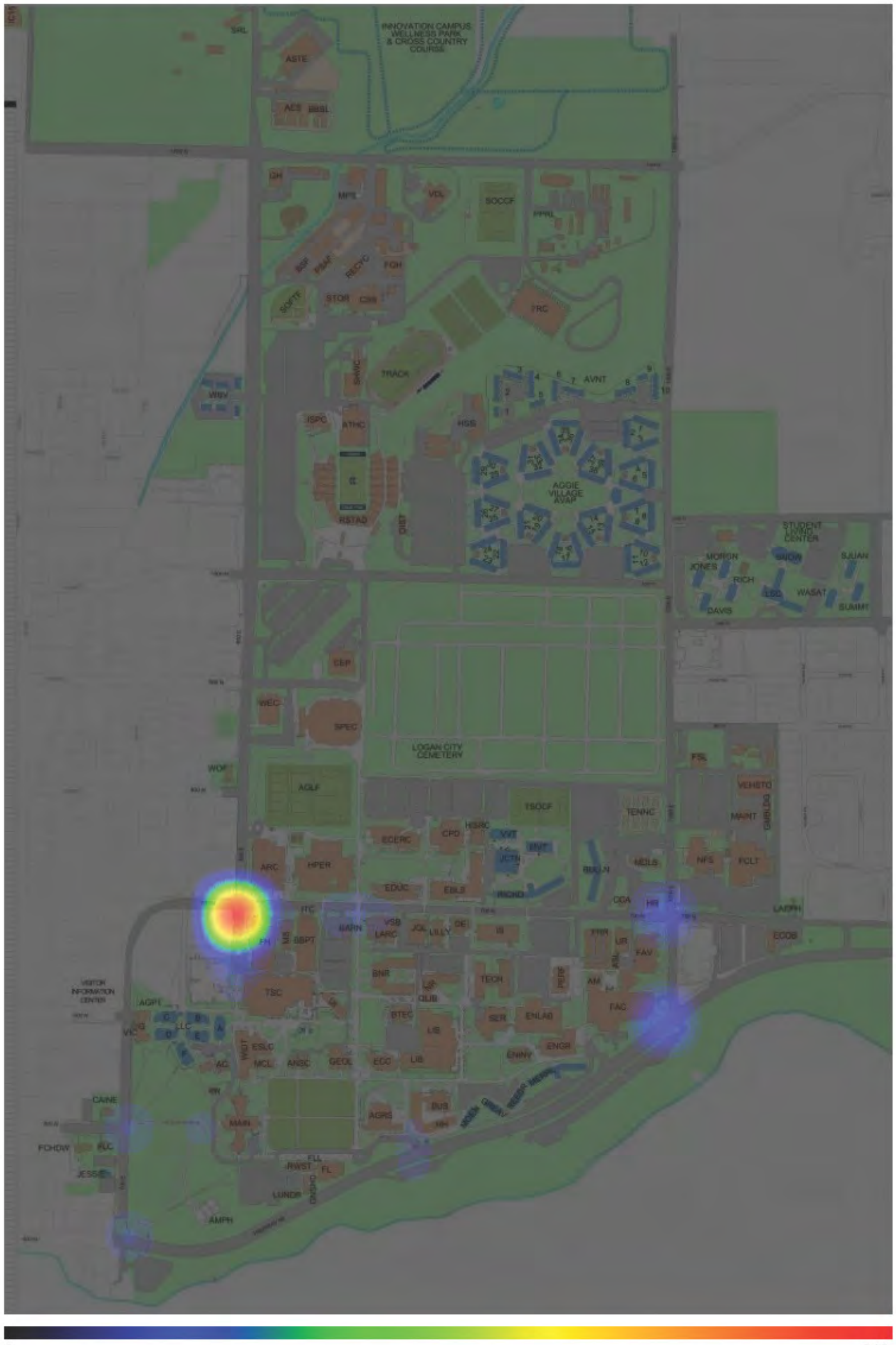
Over 60% of people thought there was no main entrance to campus.



113. In your opinion, mark on the map below the location of the main entrance into campus.

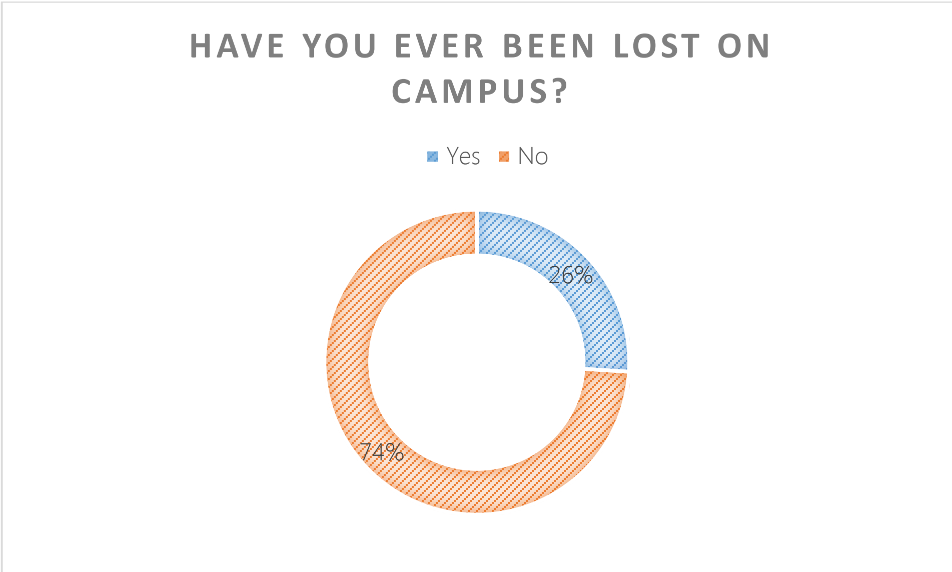


114. Please mark on the map below where you would like the main entrance of campus to be.



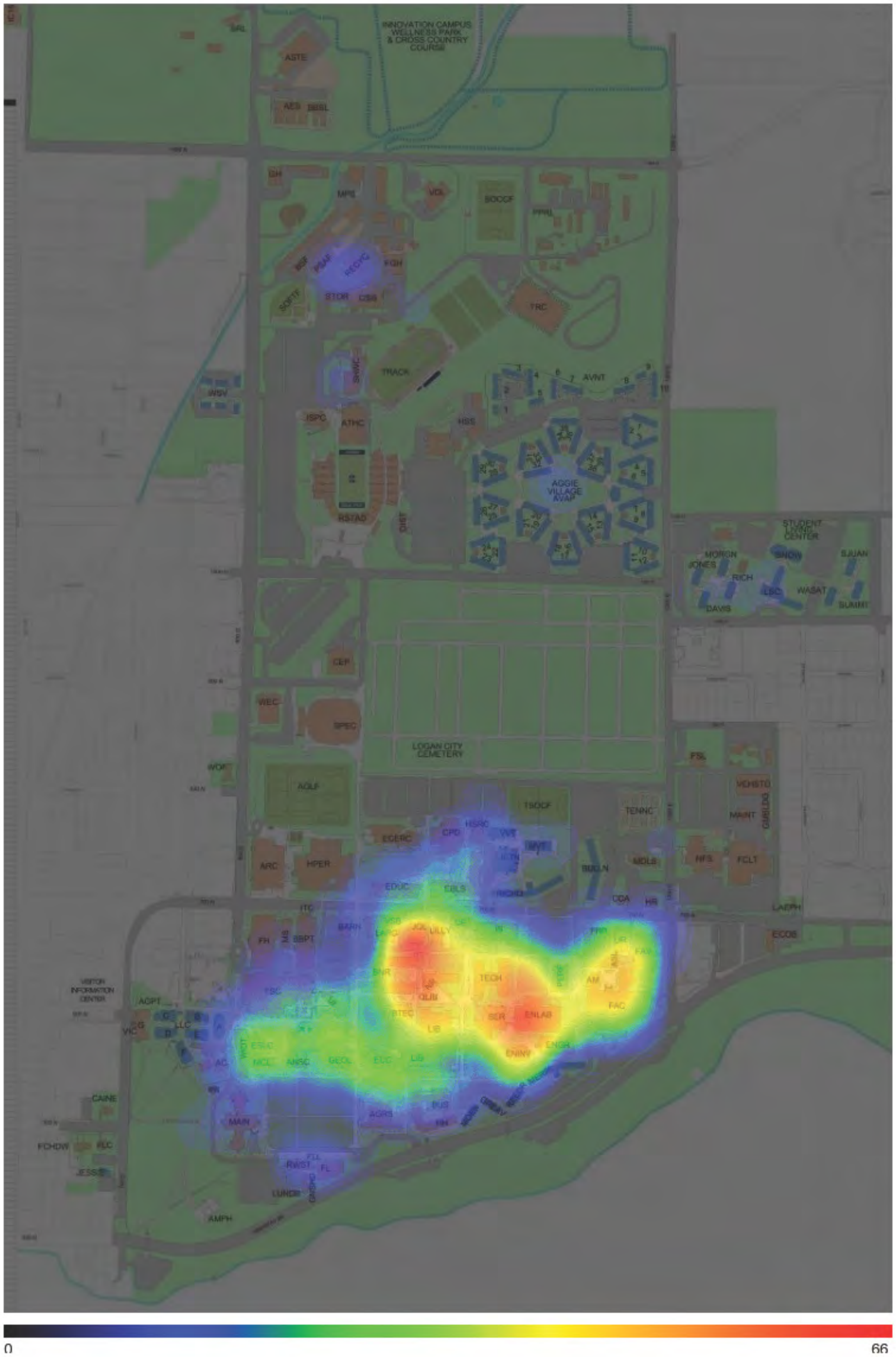
Wayfinding

The majority of people (76%) have not been lost on campus.



HAVE YOU EVER BEEN LOST ON CAMPUS?
Yes
No
26%
74%

116. Please mark on the map below where you were lost on campus.



117. Please mark on the map below where your destination was when you were lost.

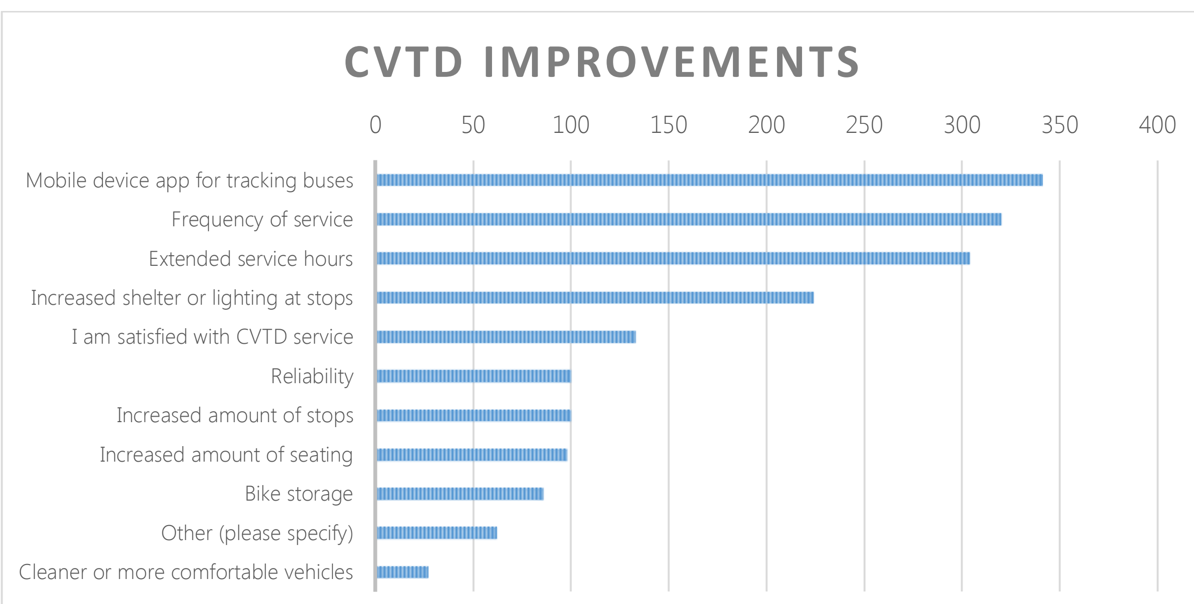
Improvements

Transit Improvements

The top 3 improvements noted for CVTD are a mobile tracking device, increased frequency of service, and extended service hours. Additional comments from the survey include:

- Routes to campus:
- More routes around campus
- Have more routes to campus for students living somewhat close to campus
- If the routes to campus arranged to be at campus near times class gets out
- More information located around campus
- Particularly that it is easier to get back to where I living. Getting to campus is easy, but getting home with CVTD is difficult.
- Direct routes to campus to avoid transfers and bottlenecks at the transit center.
- Bus clearance during class changes; students will NOT stop at the crosswalk to allow buses through on 700 N
- Location of stops on campus
- Bus stop improvements:
- It is a little confusing when trying to figure out where stops are in relation to where you're at/going. It would be nice to have something that clearly marked the stops (map, stop locator app, etc.)
- Schedules posted at the stops
- Have shelters at most stops due to the weather
- Driver improvements ("Nicer drivers," "More polite drivers," and "Better drivers.")
- Wait for people running to get on the bus.
- A bus stop before the cross walks, or some way of making the cross walks not interfere as much with traffic
- Extended service, especially on Sundays ("Earlier service," "evening runs on the CVS," "Weekend service," "Sunday Hours!!!," "Operate on Sundays," "Sunday service," "Service until 10 pm on weekdays and extend the hours on Saturday to match weekdays (even if fewer options are offered)," and "Extended service hours on Saturday.")
- The CVS express is frequently late after 4:00 PM
- Better connectivity with Aggie Shuttle
- More reliable tripper bus service.
- A tripper is sent every morning; however, sometimes a nearly empty bus passes us and then the tripper is beyond full, and we have to cram even more people on it, because the other bus didn't stop.
- Lower admin salaries to provide additional services
- Odor issues – "Less stink on the buses" and "Smell! I wish I didn't have to use CVTD because smokers get on the bus and then it reeks of marijuana, cigarettes, or both. Sometimes the stench is so suffocating I feel sick."
- Specific location improvements:
- Shuttle directly to Legacy Village apartments by innovation campus at night.
- Bus stop on 800 N............ the 4 drives right past yet there is no stop until the gas station. I live in between there.
- A 10th North bus from 200 East to 1200 East to 400 North
- A stop at the bottom of Old Main Hill (at about 600 North and 700 East)
- A more direct route to River Heights

- Stops along the south edge of campus on 400 N (near Champ Dr, etc.)
- A stop by FCHD West; especially during the summer when the Aggie shuttle does not run.
- Service to Wellsville Park and Ride
- More direct route from the Island (Wilson neighborhood) to campus
- Need a connection from the transit center that would get me to campus by 8
- More routes to cover more of the valley
- Different times on the Franklin County bus
- Drivers shouldn't drive before all passengers are seated!!!!!!!!!!!!!!!!!!!!!!
- Clarification on above checked boxes The CVN route uses different drivers nearly every day, Each driver seems to arrive and leave my stop on his own schedule so either I am pushing it to not miss it or have to wait a long time for them. Also with winter, it would be nice for the heaters to ALWAYS be on. Some days I ride #1 up the hill, some drivers will leave students standing outside instead of letting them ride saying they are full when in fact there will be room for another 12 students easy. I've seen gaps in the isle of 3 or 4 feet in the back and the driver says they are full and won't even stop.
- Some sort of short delay system (i.e. flashing light signal) at crosswalks on Aggie Blvd. for pedestrians.
- When buses get rerouted due to road closures or bad weather often really hard to find out details in a timely manner. Also the website is rarely updated.
- Indication of the next stop (even request stops) that the bus is approaching by screen or voice
- The bathrooms at the center are just TERRIBLE!
- Less high school students on bus.
- Quick stop from transit center to TSC roundabout and back and forth
- Speed to Campus.
- Change the way the routes are run. I don't like the need for connecting at a single transit center. It takes more time I think.
- Any improvements would be great, but not at the cost of adding a fare. For a free fare bus system, it is perfect.



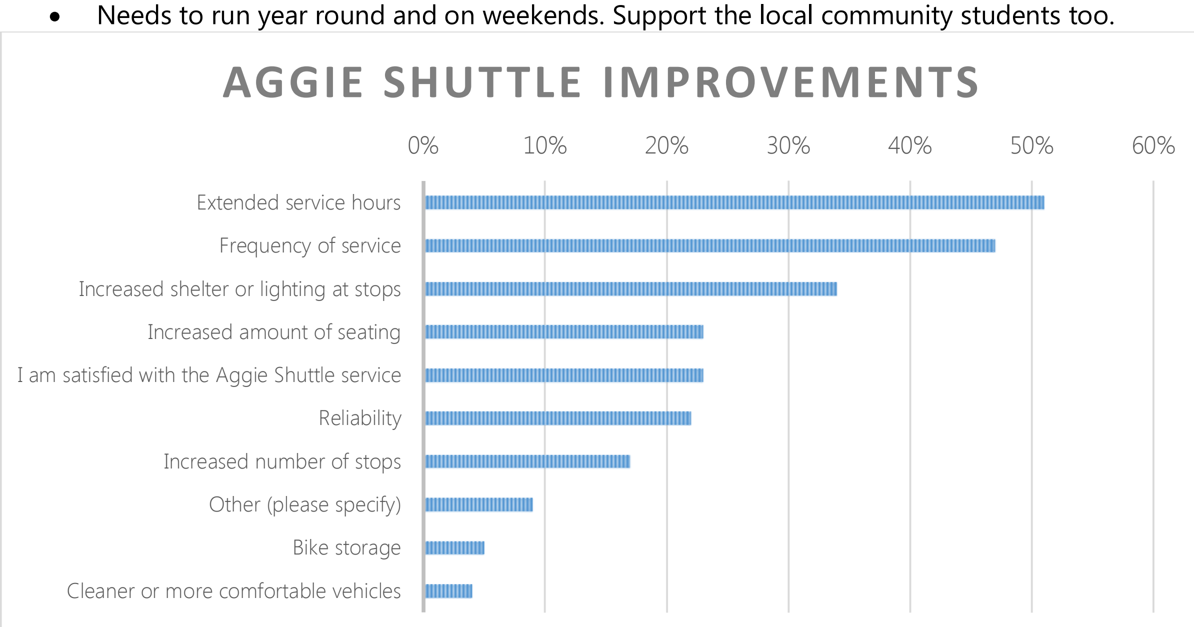
The top 3 improvements noted for Aggie Shuttle are extended service hours, increased frequency of service, and increase shelter/lighting at stops. Additional comments from the survey include:

- Texting/Tracking system:
- The text messaging is inconsistent and unreliable.
- More reliable texting service
- update the tracking system
- text reliability
- the remote tracker sucks! it never reflects the actual waiting minutes it says
- When you text the bus, it is very rarely accurate. Usually off by 3 to 7 minutes.
- More accurate App system
- The app something give you false time.
- It would be great if the text-to-shuttle system had a number to text with an area code, since my phone won't text partial numbers such as 41411.
- Crowds:
- There are way too many people at "rush hour" times.
- Certain times of the day it is way too crowded and unsafe.
- In peak times you guys really, really need to up the amount of busses running. Often I have to wait for two to three buses on the campus loop to get on.
- More students on the bus! If this is what my tuition is paying for, I want the benefits to be maximized.
- more busses during heavy hours ie around 8 am
- More buses when it is busy - 8:30 class
- South Campus:
- I feel like there are A LOT more Aggie Shuttle Campus Loop shuttles than there are South Campus shuttles. There needs to be a nice balance between the two.
- More buses on south campus so it comes around more than every 20 minutes
- south campus needs to be more frequent
- More South Campus Buses.
- South Campus needs to run more
- Schedule:
- Stops at the same time each day, e.g. will be at Stop 9 at 8:13, 8:26, 8:39, etc.
- The bus should follow a schedule. I often wait 5-10 minutes for the bus to leave the stop before mine. It's inefficient.
- Schedules
- Arrive at stops at more consistent times
- a regular schedule so that I can plan
- Scheduled stop times
- Posting scheduling information for new riders at bus stops would be tremendously more convenient than having to text some number and waiting for a response.
- consistency in morning start time AND start at 6:45 for 7:00 work/meetings
- Needs to run on a schedule
- More consistent schedule so it's easier to know when to show up on the bus. Also, this year I really appreciated the 8th East Express running half an hour later than last year. This makes it a lot easier to get off of campus to one of my jobs. If anything I'd like to see it run later considering that parking on campus in the evenings is still a nightmare. I have an on campus job and even coming in at 9:00pm on a weekday night can mean I still have absolutely no where to park. If the 8th East express ran later, like ro 7:00 that would make it much easier

for me to get to campus in the evenings.

- Night Buses:
- If there is something going on at the university, you should have a shuttle running. Especially as it gets darker earlier and gets colder.
- I would love to see more shuttles go to innovation campus at night.
- Night bus more stops, it's scary walking home alone
- I would like it to run a little later into the night
- Extend the evening express route (make it like last year)
- Bus runs later in the evening
- I wish to have a night route to innovation campus. (8th east). It is cold and unforgiving outside, walking at night is hard, especially when there is snow and ice.
- longer hours especially at night, route of service out to the farm
- Long wait at night-time
- Drivers:
- Trained drivers. Some driver accelerate and brake too hard for comfort
- Less Crazy drivers (weird braking, sometimes quick accelerations)
- Driver waits until you sit down to start driving
- More gentle drivers, after all we are their customers.
- Better/more driver training
- Better drivers
- Better/more driver training.
- I would appreciate the bus drivers waiting when they see someone coming. Some of them do this, but recently less of them have, I find that frustrating when I am so used to them being so kind in the past.
- The drivers are way too patient and won't leave slow people running to the bus. Also they wait a long time to get down Aggie Boulevard because the drivers are too nice and stop for every person crossing the street
- Wi-Fi:
- Free Wi-Fi on the bus
- Wi-Fi
- Stops:
- benches at aggie 20 and aggies 15 would be nice.
- Benches
- the same stops available on both sides of the street
- no shelters available. extended hours on the south route
- Needs to be easier to get to from my apartment and drop me off close to classes
- Summer routes
- Work in the weekend (Saturday)
- More overlapping routes
- Quicker arrival to campus
- Not waiting so long at the TSC
- Summer bus route to innovation campus.
- A stop closer to my place 2165 North 700 East would be good. I don't like walking 20 minutes to get to a bus stop, and as far as I know there's no free parking at innovation campus (the bus stop I would normally go to if I didn't have a yellow pass).
- A route that goes from the pick up on 6th north along Aggie Bull-evard
- Decent maps that show stops

- Faster transport between stops. It takes a while once you get on the bus to get to your destination because there are so many stops.
- wider entrance so it is easier to get on and off
- Temperature inside of bus is extremely hot
- More extensive routes
- Run extra buses at the beginning of the semester and during finals week
- It would be nice if the brakes didn't sound like a dying witch.
- don't mind standing but need better poles or railings to hold onto
- better routes
- Earlier start times, I have a hard time getting to my 7:30 class
- Faster/shorter routes
- Don't wait around for people at the round about on campus. Just pick people up then leave.
- Campus loop that takes less time than walking
- Color labeling of on buses to distinguish routes
- Clearer communication of service hours, esp. end of service
- Summer hours
- Earlier start times for the shuttle
- Extended range; many stops are within walking distance to campus
- Please include the Water Lab on one of the routes. This could be done at 8:00 am, during the lunch hour and at 5:00 pm since the previous shuttle was deemed less cost-effective probably due to too many runs to and from the main campus.
- Move the Bus Stop onto 5th east in between those apartments and the houses. There is one on 6th east and 5th north that are pretty close. If you just go one block lower to 5th east, it makes it more convenient for a lot of us, and the 6th east people still only have to walk a little.
- fewer stops
- Needs to run year round and on weekends. Support the local community students too.

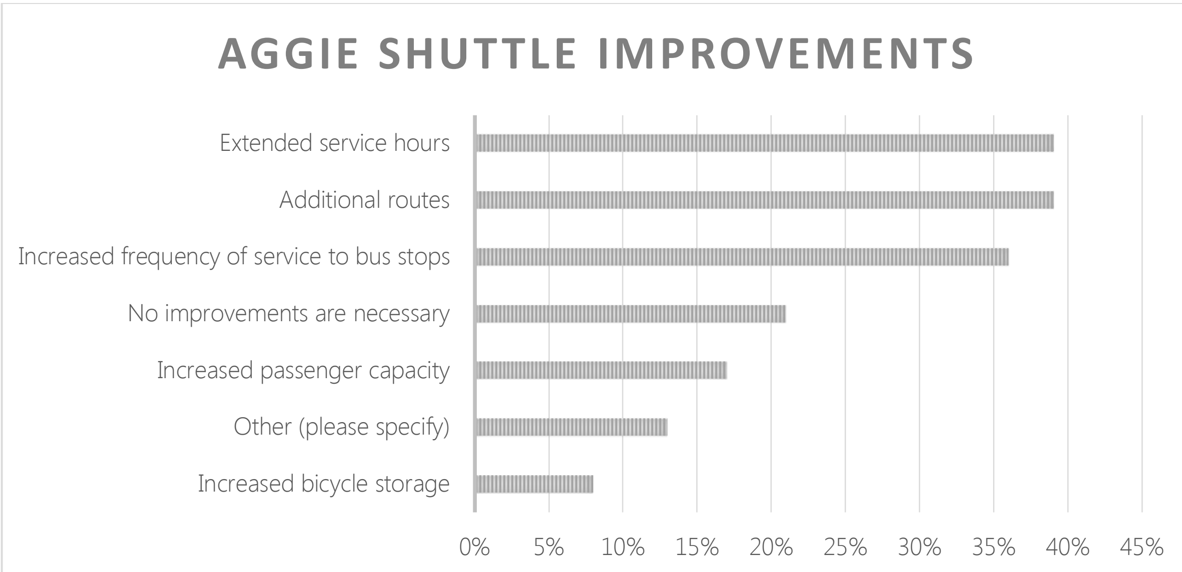


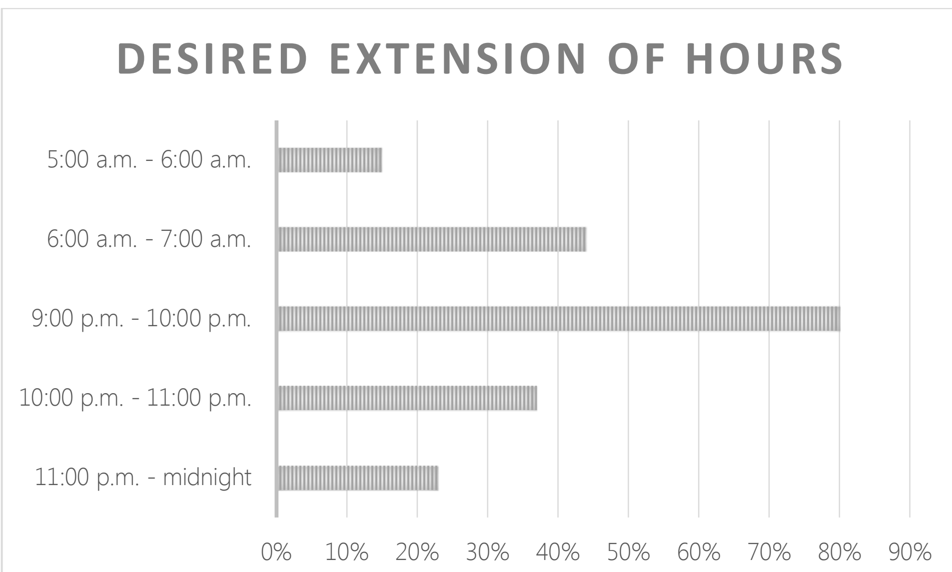
When this same question was asked to the general population and not just shuttle users, the top three improvements were extended service hours, additional routes, and increased frequency of service. Other reasons people mentioned in the comments were:

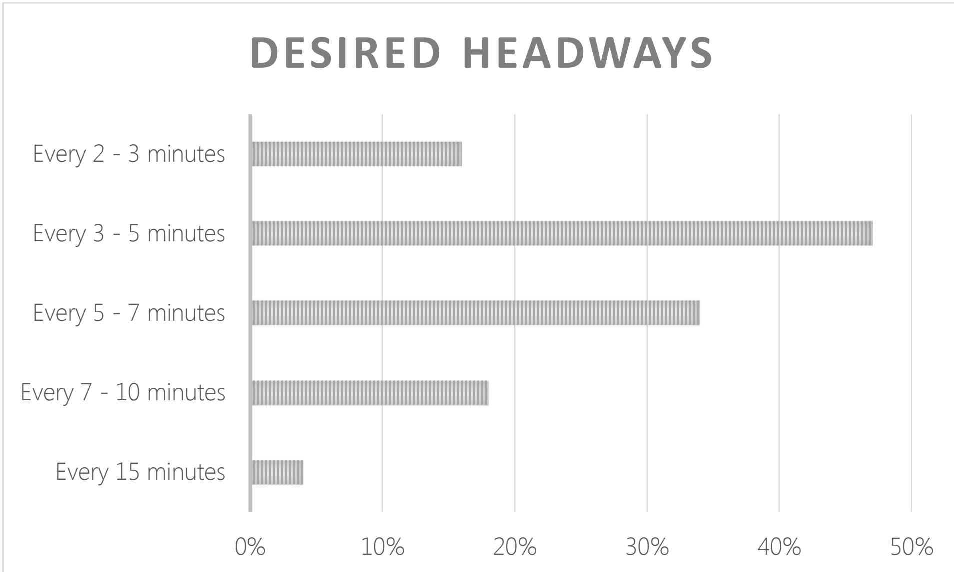
- Better Information:
    - Reliability on time between stops
    - More information needs to be provided about when and how the bus system works
    - Precision in text alert system, clarity on route schedules
    - Seriously, where is it?
    - Clearer route labeling so you know where that shuttle is going
    - One bus work in Saturday, GPS system some time not give data or correct data
    - Tell me when they arrive at each stop
    - Education of usage of the shuttle.
    - improve the tracking app. its tells you the bus will come in 10 min but actually it comes in 3 min!!!
    - Better advertised routes
    - have no idea when the stop times are, need those listed on signs at each stop
    - clarification of route stops-somewhat confusing
    - Better (more predictable) time schedule
    - I don't really know where the Aggie Shuttle goes or when
    - I don't use it due to lack of knowledge
    - Better way to know where the bus is going.
    - Clearer route explanation
    - I would like it to be less confusing
    - information on systems more understandable
- Reliability:
    - More dependability
    - Summer routes, reliable departure / arrival times.
    - Reliability
    - More consistent timing of routes similar to CVTD
    - Consistent schedule
    - reliability, it would be nice if you could expect consistent times
- Travel Time:
    - Faster service (bus drivers take forever), better vehicles (allowing faster passenger exchange -> more doors, remove arbitrary limitation of entering the bus with front doors)
    - I love to ride the shuttle but the problem that I always encounter is that it takes far too long to wait for the shuttle and then to get to campus it takes twice as long as necessary.
    - Less Stops. Takes longer than just walking.
    - It's so slow, or the buses don't come frequently enough and it's quicker to walk anywhere.
- Environmental:
    - None gas/diesel buses
    - Environmentally friendly vehicles, if possible (hybrids)
    - Red Air day quick shuttles
- Drivers:
    - Better drivers they always cut me off and they think they own the road

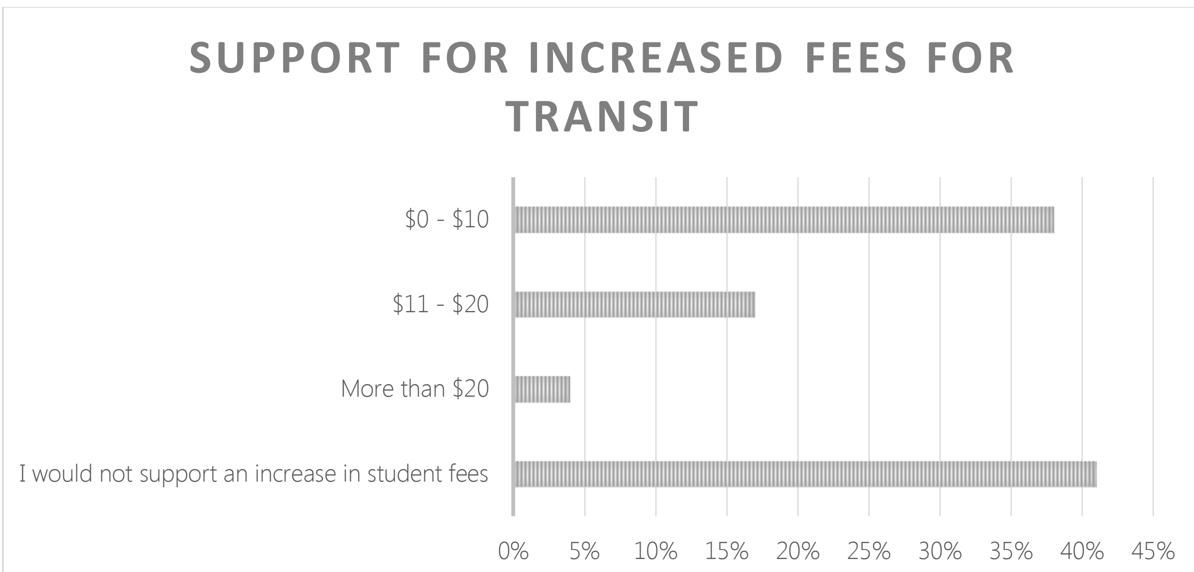
    - Driver waits until you are seated to start driving. The green lines stops at the roundabout too.
- Vehicles:
    - Difficult to get up stairs; I have a service dog.
    - As newer busses, ones that don't have steep steps
- Specific Locations:
    - More stops in stadium (by the softball field and wellness center)
    - More routes THROUGH campus. Unfortunately, there is only one Aggie Shuttle that goes through the middle of campus. And what's why is there no shuttle access to the library??? That would help out our (increasingly) overcrowded, free-after-5 parking lot close to the library.
    - A route from turnabout to next intersection eastbound & back...just looping during bad weather.
    - Routes outside of campus
    - Increased stops beyond campus. (West of Main)
    - South campus route needs to be more frequent
    - Transport to the water lab
    - dont wait at tsc on stadium express route.
    - a route that goes closer to the transit station
    - Designated bus lane on 700 North
    - Shuttle to Main street/ Walmart
- During Snowy days increase number of busses
- Weekend hours
- Both directions on a route
- Wi-Fi would be sweet.
- A bench at all stops.
- Better bus stops please
- More stops
- Start earlier, like 6:30 instead of 7:00
- I don't use the bus, but if you made changes it would suck for the wheelchair people.
- some summer service
- lighting/cover/texting/tracking the bus doesn't always work
- I think people should pay themselves to use the bus. I don't think it should be a part of our fees.
- keep brakes serviced. The noise hurts
- I don't ride it anymore. It doesn't go by my house
- add a bus going the opposite direction
- Specific pick-up/drop off times on some routes.
- Buses going opposite directions on the same route.
- Don't wait for stragglers- be like the city bus
- Extended hours for more routes that the Evening Express
- Express service.
- more busses in the morning
- *increased passenger capacity during peak ride times
- Dedicated tram/trolley/shuttle from parking lot/garage at edge of campus to CENTER of campus. As it is the the shuttles only service the outside edges of campus.

- more stops

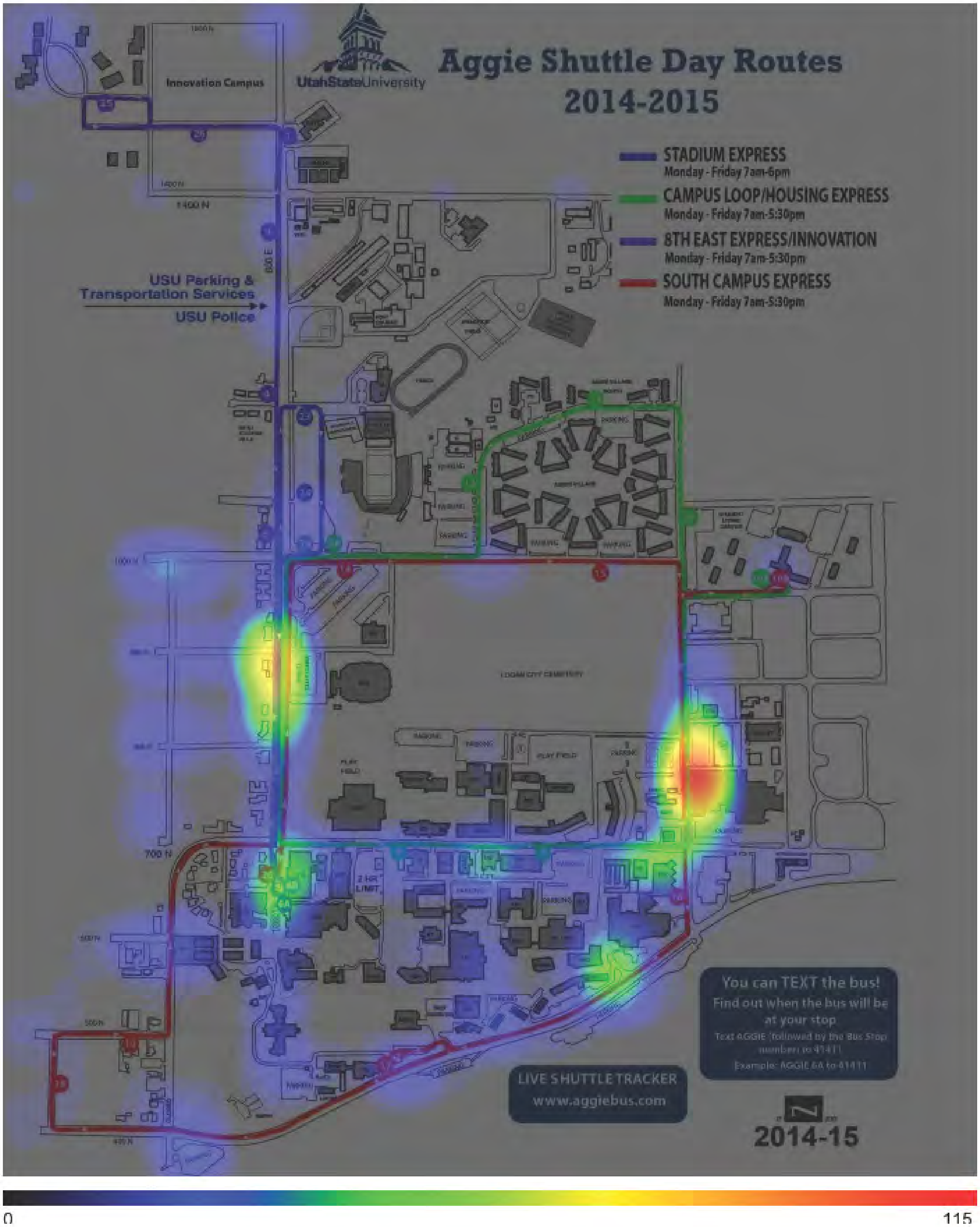

AGGIE SHUTTLE IMPROVEMENTS
Extended service hours
Additional routes
Increased frequency of service to bus stops
No improvements are necessary
Increased passenger capacity
Other (please specify)
Increased bicycle storage
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%


DESIRED EXTENSION OF HOURS
5:00 a.m. - 6:00 a.m.
6:00 a.m. - 7:00 a.m.
9:00 p.m. - 10:00 p.m.
10:00 p.m. - 11:00 p.m.
11:00 p.m. - midnight
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%


DESIRED HEADWAYS
Every 2 - 3 minutes
Every 3 - 5 minutes
Every 5 - 7 minutes
Every 7 - 10 minutes
Every 15 minutes
0%
10%
20%
30%
40%
50%


SUPPORT FOR INCREASED FEES FOR TRANSIT
$0 - $10
$11 - $20
More than $20
I would not support an increase in student fees
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%

85. Please mark on the map below where you would like to see additional Aggie Shuttle stops. (If you do not see a need for more shuttle stops please move onto the next question.)



Bicycles

Specific barriers to bicycling are:

- Crowded paths on campus
- Traffic
- Topography – especially Old Main Hill
- Lack of bicycle lanes on campus
- Lack of bicycle lanes in Logan
- Inattentive drivers
- Winter/air quality
- Bike racks:
- Crowding
- More sheltered bike parking
- More mounted bike racks around the towers that allow for people to lock their front wheel and frame to the bike rack using a U lock. It is not possible to lock a bike in this way when using the standard bike rack that keeps the front wheel steady
- More bicycle racks by the business building
- The bike racks are terrible. Racks vary from being too close to each other to really fit two bikes side by side, some are located next to sprinklers, some buildings don't have any near an entrance, and many racks fail to effectively support a bike....
- Bike parking and access to pump stations
- Some areas don't have bike racks, so I lock my bike by another building. Not the worst, but it is slightly inconvenient.
- Sometimes it is hard to find a bike rack with available slots on certain parts of campus, so often times I will leave my bike by the ENGR or MAIN and then walk to other parts of campus where it is harder to find somewhere to store my bike.
- Not enough places to lock up in main areas of campus. Especially near the ESLC. There are a lot of spots there, but they are always filled. Add more please
- Too many bikes per rack. Bad design of racks.
- Lack of parking space (Fieldhouse, Business Bldg)
- There are some parking issues at major buildings with a lot of classes. Engineering, BNR, sometimes library on north side.
- There are not enough places to lock up your bike near the FAV because they removed a bunch of the bike racks. Also, there are not enough places to lock you bike up where they won't get rained or snowed on if it happens to rain or snow in the 8 hours or so I am on campus.
- Specific locations:
- The four way stop at 6th E and 10th N is difficult to bike through. People will not recognize you as easily. I also hate biking up the hill but life's unfair like that.
- Hit by a car leaving Aggie Village parking lot. He tried passing me on the left while I was (signaling and) moving left. Snow may be considered a barrier. 1200 E is not very bike friendly near 1000 N (potholes/rough). Perhaps all of 1200E could be smoother.
- The intersection of 400 N and 500 E feels very dangerous for a bicycle.
- The traffic light on 500 north and main, and the fleet of white vehicles that roam the campus sidewalks at all times of day.
- I would love if Aggie BLVD was just closed down to car traffic. It's dangerous to bike or walk there, and is not necessary. Walking and biking is good for your health and students and faculty will get used to not being so lazy.

34. Please mark on the map below where you would like to see more bike parking on campus.

Skateboard/Scooter

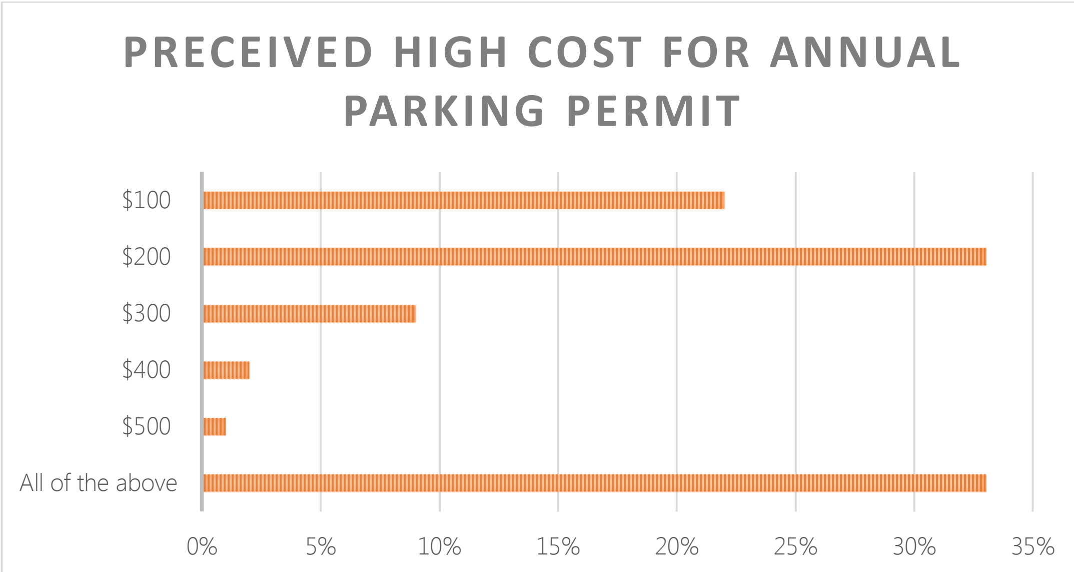
- Bike Lanes:
- Bike/boarding lane, traffic direction limited to right side of sidewalk
- Bike lanes
- Sidewalk Cracks/Smoother Sidewalks:
- Cracks in and between sidewalk sections can be very wide and awkward to ride over.
- Possibly a skateboard/longboard lane. Sidewalks with smaller cracks would be great.
- Paved lanes without sidewalk cracks. I'm happy to share with bikes/scooters/anything. But the size and depth of those joints are atrocious and completely kill my momentum.
- Smoother sidewalks, smaller cracks, maybe a riding path
- The sidewalk on the East side of the cemetery is coming apart and difficult to ride on.
- None needed, other than attention and maintenance regarding cracks in the concrete walkways and sidewalks on campus.
- Only small cracks in the side walk.
- Smoother ground, fix bad cracks, pedestrians stay to the side
- Replace the sidewalk along the cemetery. It is extremely torn up and the cement is cracking making it an uncomfortable scooter trip.
- Smoother walkways.
- Smoother sidewalks maybe lights at crosswalks
- smoother sidewalks
- Fix sidewalk cracks
- Sidewalks where the stress relief is 45 degrees to the direction of travel is easier on the small wheels. Such as in front of the TSC. The sidewalks by old main have the stress relief cut at 90 degrees to the direction of travel and scooters and skateboards go bump bump bump on each one. If there is a height difference then it can stop the wheels and you will fall.
- Better sidewalks
- Smoother sidewalks, less of a gap between slabs, less abrupt changes in sidewalks, i.e. one part of the sidewalk is two inches above the piece next to it.
- Level out Pavement. way too many places where it has tripped me up
- When riding from Old Main to the business building there are huge separations in the sidewalk that make riding very uncomfortable.
- The cracks in the sidewalk are too big
- Fixed large cracks or bumps. These can be dangerous and cause scooters and skateboards to catch thus making the rider fall or nearly fall.
- smoother sidewalks
- Smoother sidewalks. The cracks are pretty jarring in some areas.
- The sidewalks need to have smaller separating cracks, makes it difficult to ride. I prefer to ride on asphalt for its continuous smooth surface.
- Smoother sidewalks
- Smoother sidewalks?
- Smaller (not as wide) cracks in the sidewalk. by cracks i mean the premade ones. not the actual cracks made by nature. Filling in the little pot holes would be nice as well.
- Less gaps between the sidewalk tile-squares. On the walkway from Merrill Hall to Old Main the gaps are too wide, causing my knees to jar, I usually avoid that walkway because of the gaps.
- Less uneven sidewalks
- Sidewalks with smaller cracks between them

- Wider Paths:
- Wider sidewalks would help be able to navigate better and maybe specified lanes or areas so that pedestrians will not cut us off.
- Wide paths or more options, basically preventing large crowds or sharp turns.
- Wider sidewalks in the areas I mentioned I was having conflicts with. ENFORCEMENT OF BICYCLE LAW. Bicycles should be ridden on the roads, not the sidewalks. I think educating people about how to properly ride a bicycle on the roads would be nice too. A lot of people probably don't know that they should be riding in the road and not the sidewalks
- Sidewalks could be wider or have a "wheels lane" to avoid people using scooters, longboards, etc from running into people
- Slightly larger sidewalk between the business building and the library.
- Skateboard lanes:
- Skateboard only lanes where pedestrians don't walk, more stop signs in parking lots to prevent cars from turning corners without looking
- Their own lane on the edge of the sidewalk
- Maybe a designated sidewalk for walking and another for [skateboarding]
- I would love a longboard lane. Also more side walk space.
- A skateboarding/scooter lane, or better paved sidewalks that make skateboarding/scootering safer for the rider and pedestrians. Having a designated skateboarding/scooter road on aggie boulevard
- Pathways separate for us.
- I would love to see a bike/skateboard lane
- Anyway that helps students not get ran over, if that is "splitting the sidewalk" or making a scooter/skateboarding lane on both sides.
- The only thing I can think of at the moment would be to have a separate lane for people who skateboard, cycle, or ride scooters. The reason for this is because the areas where I've indicated I've had conflicts are areas where there is a large amount of people on the sidewalk which makes it very difficult and even impossible at times to commute via skateboard, bike or scooter.
- I know there is some negative feelings towards long boarders... But as far as logistics go, I don't think it would be necessary to provide a lane for them. Educating both pedestrians and boarders the proper way to interact with each other would be great.
- Maybe an area where only skateboarders and cyclists can go and no walkers/pedestrians.
- Have a separate lane for skaters in the TSC patio area, because that is the only area of conflict because it is downhill, and in my opinion the most congested area of students coming and going
- Lanes or alternate routes for longboarders
- A no walking lane on sidewalk where only bikers/skateboarders can ride.
- Small 2ft cruising lanes on the sidewalks, so pedestrians know there could be longbarders and bikers coming in those lanes, so they know its a at risk path. There should be signs that say keep walking straight if a boarder or biker are coming from behind. I've had pedestrians accidentally move into my path because they tried to predict what way I was coming from behind.
- Storage:
- Places for quick and easy storage outside of buildings. Sometimes it's a hassle to find a place for my scooter with 5 or 10 other skateboards and scooters lining the walls of the classroom.
- A place to securely leave your skateboard while in class

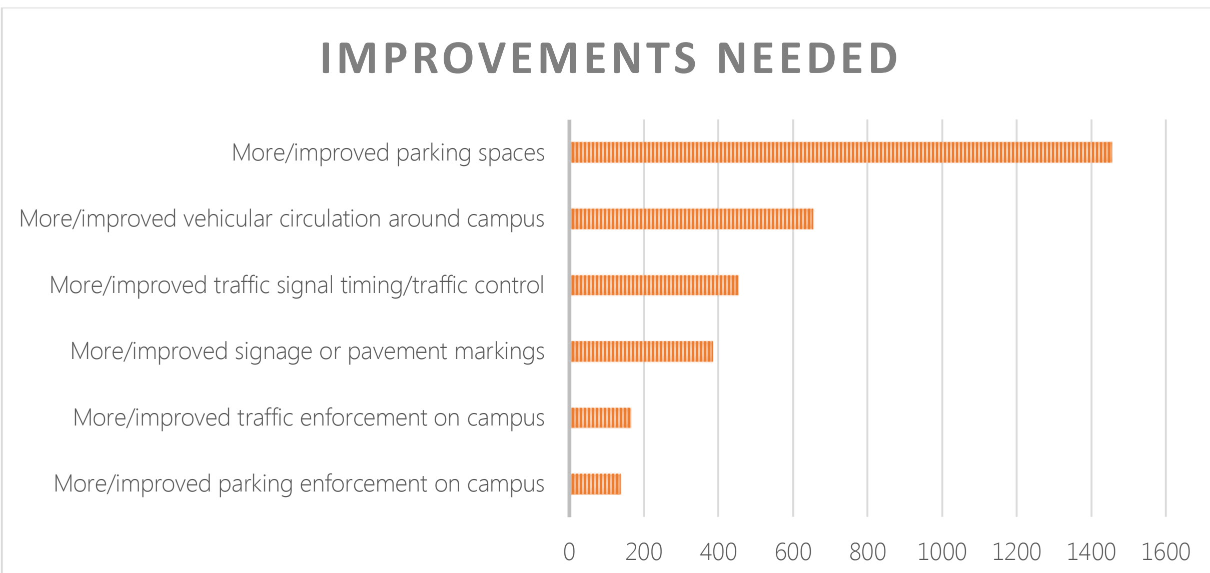
- More skateboard storage across campus, especially in dining services
- Just waterproof places to store them during class
- Long board 'lockers' or storage places would be nice. I've seen at Cal State Northridge and I really liked them
- Hangers or shelves where we could accommodate scooters. The hangers would be outside while the shelves would be inside the buildings (like those on the Marketplace).
- I like the idea of locked storage but even easier would be to remove the ban on skateboards in buildings. There is no need to ban them inside only the riding of them inside. If you were allowed to carry them in the building it would mean there would be no need to create storage spaces for them. I don't need to lock my skateboard up if I can carry it with me.
- Also more skateboard parking, like those available in the Marketplace, in classrooms often scheduled for Gen Ed courses. In the Auditorium classrooms such as in old main or the ESLC.
- Love the board racks in the Marketplace; would love to see them in other cafeterias.
- Mirrors where cars have to cross sidewalks to enter the road, signs reminded drivers to look before blocking the sidewalk while waiting for opportunity to enter the roadway and not pull forward quickly. Also, Darwin and Aggie Bullevard is a very dangerous intersection. It is a 3-way, and I have seen lots of people almost have accidents, and my friend got hit, but didn't report it. (She is too timid.) But there should be speed bumbs at the top of the hill heading east before you reach this intersection. The average car speed around the corner is 30-33 mph. And there should be a crosswalk. And there needs to be some red paint applied to the curb in front of Morty's because with the 1-2 cars that park close to the corner, they take up road space, not giving traffic enough space to get on and off of Darwin Ave. I have seen a couple people almost have accidents, and was almost hit myself.
- Trees to be trimmed a little higher, often have to crouch between the Library and NR

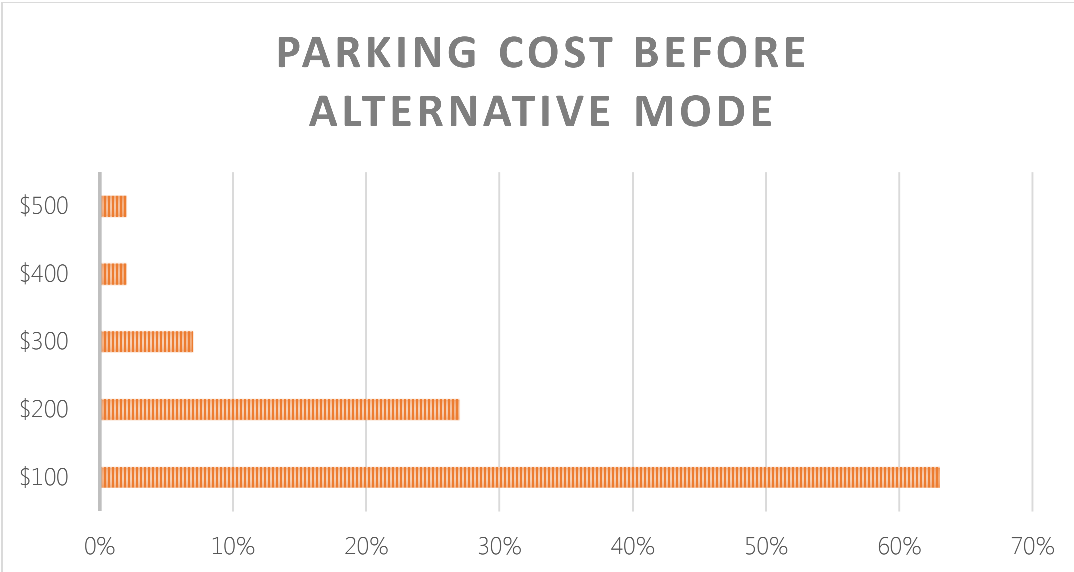
Driving/Parking

When asked how much was too much for an annual parking permit, over half the people thought $100 was too much for a parking permit and almost 90% of people thought $200 was too much. At a parking permit of $100 per year, over 60% of people said they would switch to an alternative mode.



The number one improvement needed was identified as more parking. Enforcement of parking and traffic were the least needed improvements.



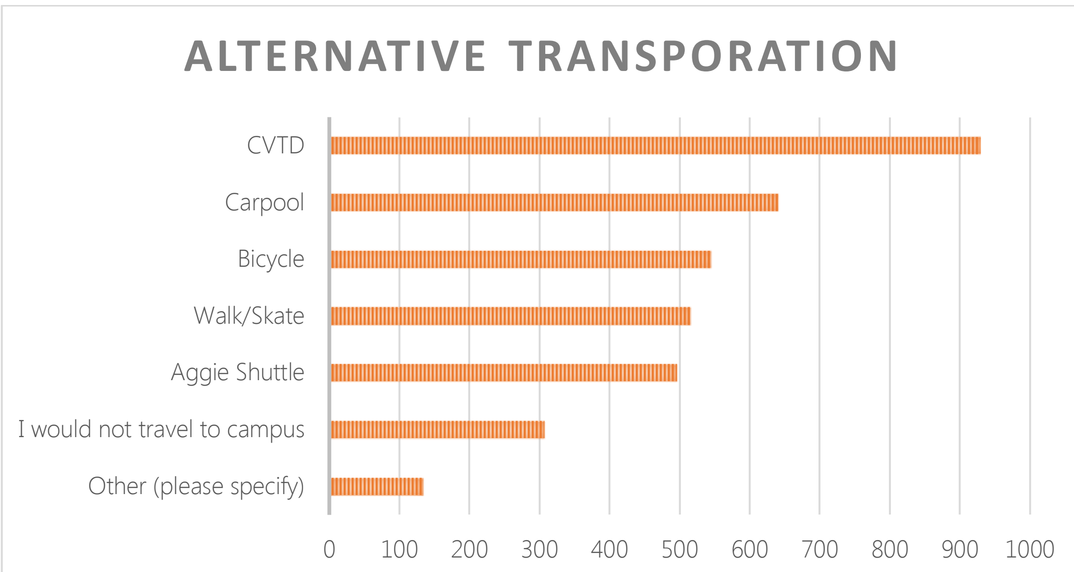


The top three alternative modes of transportation if one could not drive are CVTD, carpool, and bicycling. Other modes than those below that were identified as potential options are:

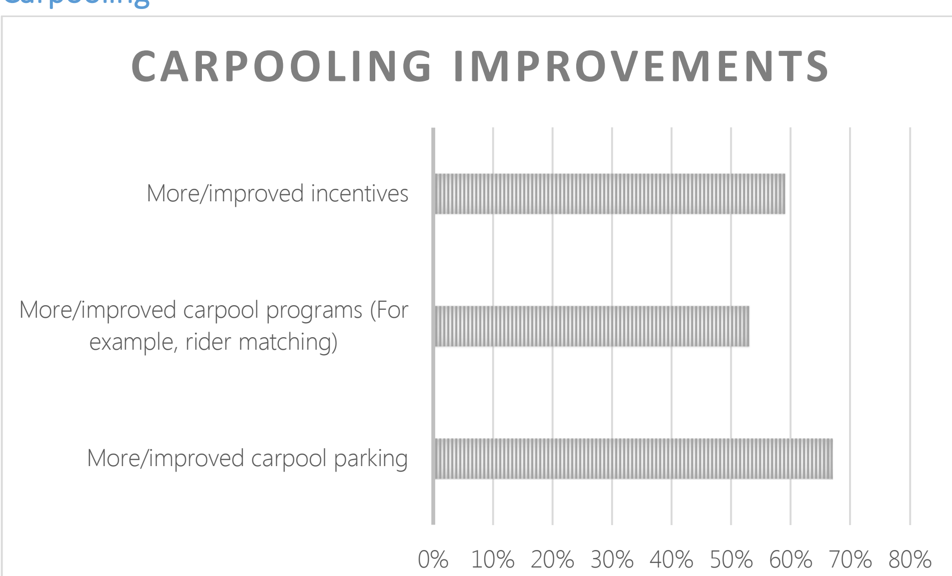
- Motorcycle/Scooter:
- Motorcycles - They are under-represented, in usage, parking reduction benefit, and access.
- Motorcycle
- Scooter/Motorcycle
- Scooter in warmer weather
- Motorcycle, borrow a car from a friend
- motorcycle
- Drop-off:
- My spouse would drop me off
- Have a spouse drop me off on campus.
- Family
- get someone else to drive me
- Get dropped off
- Spouse drop me off
- have my spouse drop me off
- My spouse would drive me
- have family member drop me off
- Have someone drop me off
- I would have to be dropped off by my wife as we live too far away to make other travel realistic
- get a ride
- I would have my wife drop me off.
- drop off
- Have my spouse give me a ride
- Get a ride from a spouse or friend but this would mean inconvenience on the timing. My husband starts work at 7:15am
- Someone drop me off
- Drop off
- Spouse drop off

- drop off by spouse
- Have someone drop me off
- I'd probably have to be dropped off - the bus stop is a bit far from my house.
- Get a ride from someone
- Spouse or Family Member to drop me off
- Husband drop me off
- Have my husband drop me off. I work here so I should be able to park close to my job
- Someone would drop me off and pick me up
- Have someone drop me off and pick me up
- Get a family member to drive me to drop me off and pick me up so it would double the travel.
- No feasible alternative:
- There is no conceivable reason that I would be "unable to drive to campus"
- I have no other options due to schedules and medical issues
- It would be difficult on many days to walk across campus from a shuttle stop as I have significant arthritis in my feet.
- Driving is the only option from Ogden
- Until I move, the bus is the only viable option, but it doesn't run during my work commute. I would be in jeopardy of losing my job without my car.
- No public transport near my home, cannot walk that far (permanent damage to ankles)
- My commute is 50 miles. Not much of an alternative.
- I live in Wellsville where there is no other option
- I don't have a choice as I am also transporting a child from South Cache to InTech each day!
- None, because no other option is available.
- Nothing else because I get motion sick.
- I have no other choice because of daycare/school for my kids.
- Crossing "Sardine Canyon" is not possible without a car
- I would be unable to arrive timely to perform my job
- I live in Ogden and work on campus. I have no other alternatives, and I haven't been able to find a carpool.
- There is no other viable alternative for me.
- I must have access to campus with my vehicle to effectively do my job . . . this question should not even be a consideration.
- I don't have any other option
- I could not work I have to drive
- Would be unwilling to use other means:
- Honestly, I would probably wait until I DID have my own transportation.
- I will ONLY drive to campus
- It’s hard to say because any of those options are unreasonable and unacceptable.
- Because I live in Brigham City, I would have to most likely use the Salt Lake Express.
- I would be forced to walk to the stadium shuttle.
- would stay in Logan during the week and then go home on weekends
- I would look into online classes or satellite campuses. But this is the only semester I plan on living this far away.
- taxi?
- Brutal honesty, I think too many people drive to campus. Make parking permits more expensive!
- would take the bus or shuttle if any started near my house, currently closest bus stop is about same distance from my house as campus

- But there isn't a shuttle to Brigham.
- I live too far away and arrive too early in the morning for a car pool or bus
- It would be difficult as a come to campus very early.
- I would retire
- I would LIKE to carpool but don't know where to find it
- I would use the CVTD if it came by my house, especially in winter.
- I do not have anyone that I could carpool with; I am 1/2 ways to campus before hitting CVTD options
- I would take CVTD if it stopped closer to my neighborhood.



Carpooling



Alternative Modes

When asked what changes to campus transportation would need to occur before they would switch to carpooling, biking, or riding transit, survey takers responded:

- Transit improvements:
- Better more efficient routes
- Having areas away from campus that shuttle to campus. The current aggie shuttle isn't convenient for anyone, except for people who don't walk up the hill.
- More reliable bus service. Sometimes it takes 45 minutes to get to campus even on a short route because there are so many people riding that they have to pass you by.
- There would need to be a bus stop near my home, there is no point to drive to a bus stop and then get on the bus. It would double my time
- More frequent busses
- shorter bus routes
- Later shuttle hours and weekend hours
- I take the shuttle the majority of the time, but frequency or larger capacities improvements are needed. Some mornings I am passed by 3 shuttles too full to stop for me- endangering my punctuality to class that day.
- More frequent bus stops and also more CVTD stops around campus other that the vet science and education buildings. Like one at the bottom of old main would be very nice since routes 1 and CVN pass by there anyway.
- Frequency and locations
- More direct/shorter CVTD route to campus - current route takes 45 min from home to campus
- Shuttle service clear out in Wellsville.
- City bus would need to arrive before class arrives-- not 5 minutes after or 25 minutes before. 10 to 15 minutes prior, would work. Also, more parking at the transit center, and a city bus stop at the top of 7th North.
- The hours that the bus stops by my house make it almost as quick to walk, even though walk takes about an hour. Probably a change to the scheduling of the bus would help out.
- The bus is too crowded and there isn't enough seats. I'm short and have a hard time reaching the bar to hold on to.
- need more buses that come more frequently
- Better availability of the bus/shuttle system to where I live. Currently, I can walk faster than the time it would take for me to use the bus.
- closer/more reliable shuttle stops near my apartment
- More bus routes, more buses, and buses that run 24/7
- Closer bus stop to house. It would be nice to have it take me straight to campus. Instead, I'd have to walk a few blocks to the bus stop, get off at the Depot, wait for a bus to campus. That takes an hour, when I can just drive there instead in 5 minutes.
- Have the shuttle run on a more regular schedule. It's hard to know when it will arrive and it is never the same
- Get a CVTD bus from 2nd west to campus.
- A bus out to the south farm. I live on campus and have to drive out to Wellsville for my riding class three times a week.
- More stops, extended hours. Better access to more areas of campus.
- Closer bus stops to where I live.
- More stops

- If there were regular aggie shuttles to and from Brigham City, I would be more inclined to use them.
- I unfortunately would need not a change in campus transportation but in the CVTD/city transportation.
- CVTD would need to have a stop at the UWRL, and campus would need to continue the shuttle service to the UWRL so I could get from to work and from the UWRL to campus for class or meetings.
- The shuttle could run down to the island, where a lot of students park. it already goes down around fourth, so it wouldn't be too much further. As it is, riding the cvtd makes the journey take 45 minutes, while walking is about half an hour. A route straight from the island to campus would be great
- more frequent bus shuttles that run later in the evening
- Bus coming more often and having more routes for people that live on the west side. I'm the first stop so I have to go to all others before transit center and it take an hour!!!
- A direct bus route to campus so I don't have to stop at the terminal and wait for a second bus
- Better CVTD scheduling, need a bike with beefy snow tires
- More direct route of the CVTD to campus. Actor shuttle that picks people further away from campus.
- If the bus near my apartment would go directly to the top of campus (nutrition building)
- I Used To Use The Shuttle Until I Had To Get Straight To Work. So FaSter Service I Guess
- Faster buses
- More frequent buses
- Campus would have to be at the bottom of the hill rather than the top. the shuttle would have to be more effective at getting me to my buildings, and by effective, I mean faster and less crowded.
- There would need to be more timely stops and there should be something smaller than a bus available. A shuttle van perhaps.
- The bus would have to arrive at or near my house and early enough for me to get to school on time.
- Pedestrian/Bicycle Improvements:
- A bicycle lift like this one from Norway would be great, and perhaps justifiable given our worst air in the nation: https://www.youtube.com/watch?v=7j1PgmMbug8
  Also, in the winter pedestrians get no respect in the approach to campus, like along 4th north - it is a total ice surface because residents don't clear the sidewalk.
- Improve highway 30 so that it has a bike lane or a lot larger shoulder to the road
- Parking changes:
- No more parking to be found within a mile radius
- Higher prices
- If parking passes cost too much
- Incentives:
- Incentives to bike/carpool/shuttle to campus.
- Probably some sort of incentive for a carpooling system, (preferably cheaper passes). It would need to warm up a lot for me to want to walk to campus.
- They would not change:
- Not going to happen. Not practical. USU needs more parking, and it needs to be cheaper.
- A personal limousine picking me up at my front door and at a moment's notice and dropping me off at the campus location of my choosing.

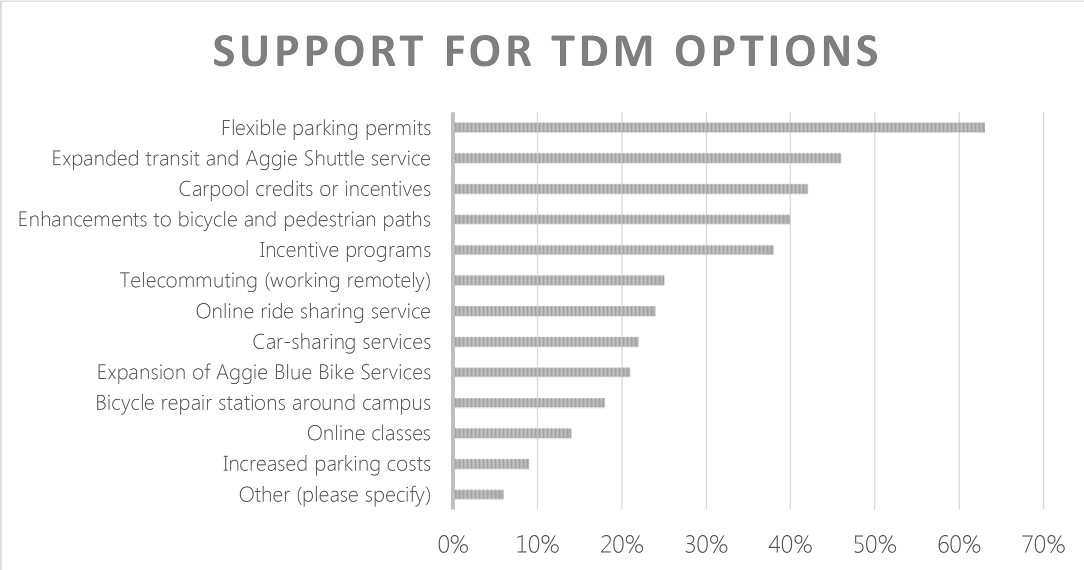
- There would need to be a magic bus that goes only where I want it to go, plays lots of loud music, and that I can rely on it for all my transportation needs. Oh wait, my car does all of that already...
- None, I just don't live close to a convenient stop and I would have to leave way too early.
- A regular, reliable, bus/shuttle to where I live that runs pretty much 24 hours a day. If there is a risk I'm going to get stuck in town and have to call for a ride I will drive. Also 24 hour bus/shuttle transport to other areas so that I can get where I need to during the day.
- I would rather drive.
- It's nothing to do with the transportation I have to get to work by certain times.
- It is nothing you could fix. Students are rude and disrespectful. Plus they are always sick and I do not want to be in an enclosed space with sick people. The bus I can only imagine is a petri dish. It is not the universities fault but students are not very aware of sanitation.
- I have no alternative because of where I live so there are no changes that apply for my situation
- The carpooler and bus would need to arrive and leave exactly when I wanted to and the bike would need to be temperature regulated so I did not sweat or freeze depending on the season.
- Be forced too out of an inability to drive myself.
- I carpool when schedule allows
- Someone would have to pick me up in Kaysville.
- I live too far away I probably never will bike or ride a bus. I carpool sometimes but it is very rare and annoying since everyone has their own schedule
- Campus transportation is not the problem. The problem is the time it takes to catch the CTVD in Smithfield, travel to the downtown hub, change for a campus bus, and get up to campus. It just takes too long and I don't have the time.
- The time required to travel from my home to campus using the bus/shuttle system or biking is prohibitive, and my roommates do not have similar schedules to permit carpooling without a significant disruption to my daily activities.
- Improved traffic circulation. More shuttles at peak hours.
- I would need a bus or something that takes less than half an hour to get to campus. Because I don't want to bike 6 miles uphill to campus everyday or leave to get on the bus basically a full hour before I need to be on campus when I have a million other things to worry about.
- Arranging schedules for carpool and an Aggie route that comes near my house.
- Weather. I ride a bike from March to September.
- Live closer/cost
- I carpool whenever possible, but my work schedule often doesn't match with other student's schedules. I don't think there is anything that the campus transportation could do.
- There's nothing that campus could do to change the way I do things, it would have to come from within myself.
- I would carpool if I had people who stayed and left at the same times as me, riding the bus/shuttle gets too cold during the winter, and I don't know how to ride a bike.
- If there was a bus out where I live I'd take the bus. I think I'd be more about carpooling if there was an incentive. I think there should be a carpool pass available for students. For instance students would be able to park at select parking spaces if there is at least two people in the car. The problem is that it would need to be monitored but I think it would be a great idea. It would cut down on the amount of stalls that are occupied especially in the morning time.

- At this time, my situation in life does not allow for carpooling since I have little children that I need to take to school and daycare.
- Have more graduate students with my schedule. I have to be here all day- no one wants to stay here that long beside me, the nerd.
- The only change that would need to happen is for me to find a person with a similar schedule or move to Logan. Both personal problems. Campus transportation is fine!
- For someone to be willing to carpool with me.

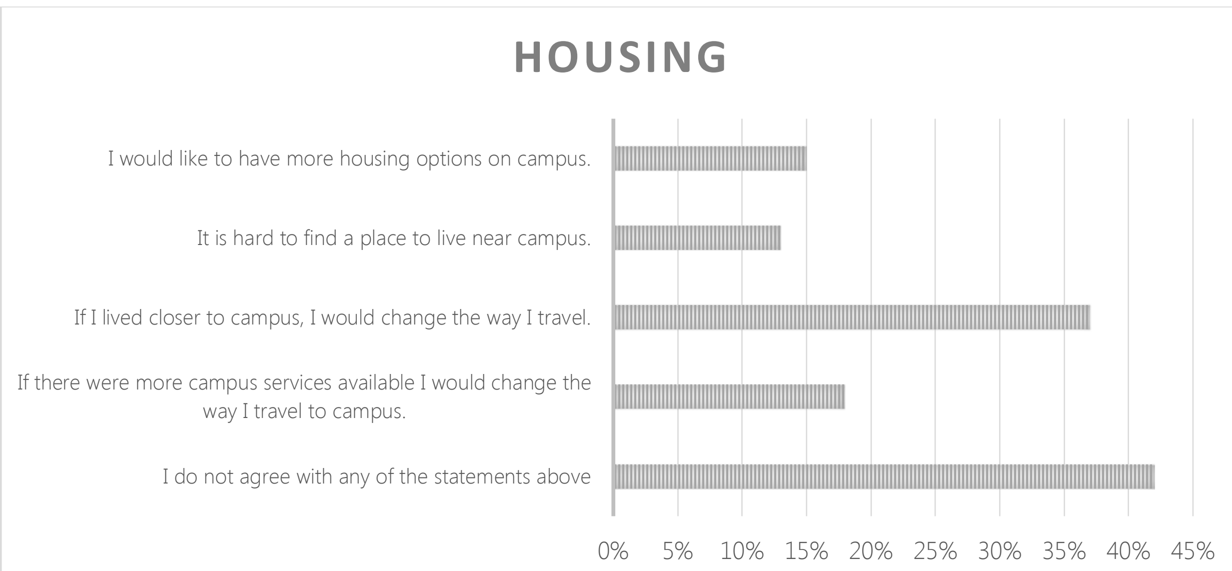
TDM

The most supported TDM option is a flexible parking permit. Expanded transit, carpool incentives, bike and pedestrian enhancements, and other incentive programs are among the top 5 most supported options. Increased parking costs and online classes were the two least popular options. Survey respondents were also encouraged to submit other options. Those that related to TDM are:

- Parking permit offered staggered so seniors can be first, then juniors, etc.
- Expansion of Aggie Blue Bikes – their lines are long and hours don't accommodate my schedule
- Increased walking paths from Island
- Extended bus hours
- Evening express route changed back
- Aggie shuttle service to the transit center every 10 minutes from 8 am to 6 pm
- A class on skateboard/longboarding skills and safety
- Increase parking cost on bad air inversion days
- Double on the Blue Bikes. Triple even.
- Trolley/tram through center of campus
- Limit car access to campus except public transport, and for those with disabilities and emergency vehicles
- Biking incentives
- Crosswalk lights
- More bike racks on public buses
- Improve Aggie Shuttle
- Covered parking in Aggie VLG to protect our bikes
- Longer service hours of the Aggie Shuttle
- I would like to see more coverings on bike parking, especially around the library.
- More covered bicycle parking
- More roofs over the bike parking, like those between NR and DE and the one by technology and engineering
- I would support the shuttle service is there were stops west of main street that would take me to campus from my home and there were enough buses to have a bus come every 15 minutes or so.
- Elevated walkways between buildings to keep out of the weather



Over 35% of people said that if they lived closer to campus, they would change their travel behavior. However, most people did not agree with any of the options regarding housing.



Other

Comments received about what services people would like to see on campus were:

- Animal-friendly housing
- Trans-friendly housing
- Co-ed housing
- More housing (2)
- More affordable housing
- More affordable housing for students with children on campus
- More housing options for graduate students
- More housing options without meal plans
- More housing (kitchen included) variety

- Change Logan City laws to allow living with more than 3 unrelated people
- ZipCar (3)
- A golf cart/shuttle system to take you from east to west campus for a $1 charge
- More places to eat
- A decent supermarket (the QuickStop is too expensive and has very limited options)
- More food shops
- Reduced food costs
- 24/7 library study area
- 24-hour café
- 24/7 recreation area like TSC
- More bike available at Aggie Blue Bikes (2)
- Three-month rentals at Aggie Blue Bike
- Rentable golf carts for students. Not just athletes.
- Extended hours for bike repair courses
- Red air day shuttles
- Shuttle for cyclists from the CVTD station to campus
- Rentals for bikes
- Discounts on buying bikes as students

Additional comments

- There needs to be crosswalks on 1200 east. There are students constantly trying to cross that street in random places because there are virtually no crosswalks. This leaves the pedestrians unprotected, and it makes it harder for cars to predict when they need to slow down for a pedestrian.
- There are a number of USU Vehicles - such as pick up trucks that drive across campus on pedestrian only walkways. They often drive fast and close to students walking.
- More pedestrian crossings
- We need more parking on campus, and parking rates should stay the same or decrease. The only parking available during the day is in the faculty lot, which no students can use.
- Long waitlists for faculty parking near their offices and no faculty exemption in the 2 hour parking. Irresponsible bicyclists and skateboarders
- I want subways and tunnels. They're better for winter conditions and don't mess with traffic. Connecting campus underground would be awesome.
- People trying to cross traffic on 89. I have seen a couple of accidents in this intersection during the morning/ start of the school day.
- I think it would be wise to put a light be the old chapel.
- 500 N 700 E is super dangerous for pedestrians. Around that corner, cars cannot see other cars or pedestrians. It an be downright scary there.
- I mentioned before having better vehicle/pedestrian traffic on 700 North
- Do not close 700. That is just ridiculous
- I'm not comfortable with the obvious bias towards carpooling, biking, and public transportation conveyed in this survey. Oh sure, I might walk or bike to campus if I weren't so concerned about freezing my extremities off 6 months out the year - these months all being during the school season. My fingers and toes reject your liberal agenda. Now if you don't mind, I'm going to go burn some cheap gasoline. Don't fight big oil, you saw what happened to that girl in Quantum of Solace...
- More signs telling people where buildings are, please! Also, bigger signs identifying the buildings, both in their abbreviated form, and full name.
- I think they should install pedestrian lights on 7th north at the crossing in front of the HPER building and

the one just beyond it to allow for more vehicular movement during high times of high pedestrian traffic. Like when classes are changing. This would definitely fix the giant line up of cars that you get on 7th north every hour on the half hour.

- I think it would be beneficial to put stop lights for pedestrians and traffic along 7th north. (See University of Oklahoma for example) Also a crosswalk between Aggie Blue Square and the stadium parking lot would be very beneficial and much safer.
- As a driver, it is difficult to drive on the 'bull-evard' or other roads around campus because of bicyclists and boarders. They usually do not stop or slow down at crosswalks and it can be very difficult to see them. Maybe there could be an enforcement of bikers and boarders having to walk their bikes or boards across the crosswalk so they don't just run out in front of a car without looking.
- I saw a couple of times in this survey the suggestion of more citations or more strict parking enforcement. Or citations to bikers to help them understand new rules. If anything, I think you should be a little more flexible with the citations on campus. Maybe give a warning citation first rather than straight up charging. I've had all kinds of issues trying to find motorcycle parking this year, and the one time I was in a hurry and parked right by a full motorcycle parking area, I got ticketed within the 30 minutes I left my bike there. It really REALLY sucked.
- It would be nice if there were bike paths with less pedestrians, even if the paths were more out of the way.
- I really want the CVTD to add more stops around CV campus, preferably at the bottom of old main
- Closing 700 N. is a very poor idea. Look at other options.
  Peripheral parking is a also a poor idea. It's for sure that school administrators wouldn't be required to park peripherally...so don't make everyone else park forever away.
- It's too cold to use the shuttle services. The purple line drops me off no where any classes so it makes me walk through the freezing cold to the engineering building. And transferring shuttles just isn't worth the time. I would rather have more parking available around the different sides of the school.
- on 400 North, many cyclists illegally cross the street and don't follow the traffic laws there.
- I would like to see more parking available closer to campus, but affordable as well since we have paid our student fees already. I feel like if there were more parking places I would use the facilities the university offers more frequently, such as the library, studying centers, and stuff like that because I would be able to get to campus when I needed and leave when I needed.
- I think that road that comes up the side of old main and comes into aggie blvd is so dangerous and scary as a driver! I think if the road through campus gets closed (which I support) the entrance to campus should be Lars Hansen Drive because that hill should be closed. It's so scary when there are pedestrians or bikers and lately there have been skateboarders cruising down that hill at unsafe speeds and no protection or warning that they are coming. That hill could be used to park at the terrace but should be closed above that.
- Train university drivers better. Especially golf carts that run on the side walk. They have no concern for the pedestrians
- I'd love to see better pedestrian paths from the island to campus. They're there now, but they're poorly maintained and hard to walk on/impossible to bike on. People should also have to park their bikes and walk through high traffic areas. I've had multiple instances where I felt I was in danger of being run over by them.
- The priority that faculty are given over students in terms of parking is pretty aggravating.
- Intense booting services employed around campus that target students and student housing.
- More parking on campus. Preferably terraces. Lower daily fees of terraces. Don't close 700N.
- we just need more parking spots. :) thanks
- Parking lots are managed poorly. Parking permits are highly restrictive, generally not available, and it is often difficult to find a parking place even if you do have a parking permit. Restrictions on parking after hours are ridiculous. Parking lots are usually empty at this time and it is extremely infuriating to get a parking ticket when you are parked in an empty parking lot. The reason for this being that presumably parking passes are meant to ensure that there are spots available for permit holders. As has already been stated this is often not the case during the day. During the evening when the lot is empty a car parked without a permit isn't preventing a car with a permit from parking also.

- I think most of them got addressed. I would like to see better parking enforcement. There are some students that park crazy (e.g., double parked, parked so closely to another vehicle it is impossible to open the car door) especially after hours (i.e., 5PM). I think it would be nice for some service where we can snap a picture of the grave injustices and post them somewhere for parking to address. For example if there is a student that parks too close to me I'd like to take a picture of it that includes our licence plates and hashtag it so the parking can ticket the offending student!
- There already isn't enough parking on campus for everyone who wants to drive. The parking services sells too many permits for too few spots; its a first come first serve basis with the notion that we'd have a place to park if we buy a permit. That is a lie; they sell too many permits for the spots available. Faculty deserve a place to park near their works, but students don't need parking close to class unless they want to pay a premium. There are quite a few other ways to get to campus without needing to park next to class; I personally have never owned a parking permit and have done just fine getting to and from work and class. I've also held two jobs while going to school full time and found it easier to arrange my own transportation than to have someone pick me up on 700 N.
- Keep service/utility vehicles off the sidewalks - it makes it difficult to get around the vehicles and limits visibility
- There needs to be stop signs at all walking path/road areas on campus, not just 700N
- Slow US 89 down. Curbing that is hard for people with disabilities. Water on sidewalks in the summer from sprinklers (lot's of it at FAV).
- Bikers/skateboarders and pedestrians should not mix. It is an accident waiting to happen.
- I rarely drive to campus. when I do drive i am usually frustrated at how unattentive pedestrians are. They need to be more aware of their surroundings...especially talking on phone/texting.
- Student fees are already too high. Cutting extraneous costs in other areas would be better than raising fees.
- If there are improvements being considered, I would be in support. I enjoy the improvements to USU and am glad to know that we are staying abreast current trends and progression.
- THE CROSSWALK DIRECTLY BELOW OLD MAIN HILL!! THE INTERSECTION OF 600 NORTH and 700 EAST! I have almost been ran over multiple times. Cars don't yield.
- It is so dangerous at the intersection near sororities/fraternities. I am fearful for my life walking there, especially at night when cars zip by. The cross walk signals don't work and students driving ignore these. This really needs to be a four way stop with pedestrians having right of way. I also think there should be a stop light at the bottom of old main that correlates with the cross walk signals. So cars are not zipping up the hill and trying to make a yellow light and killing a student running across. I also think there should be more bus stops along 800 east.
- One of the brick paths put in between the TSC, LLC, and ESLC has kind of an odd angle. It probably matches the path worn by students in the winter, but it looks kind of funky for the rest of the year. I think if the path were adjusted to a more natural angle the students would still stick to the path.
- red shuttle route cut in half or more frequent.
- The intersection below Old Main, 600 n 700 e. Limited stop signs makes walking dangerous.
- I would like CVTD to bus earlier and later on Saturday
- I think there should be a shuttle that takes people to the off campus ADVS buildings at the South Farm like the Hillyard Bldg. It is a 20 minute drive. Or there should be encouragement for carpooling.
- We need a traffic light on us 89 coming out of the aggie blue parking. That intersection is deadly.
- I think there should be more shuttles during the colder months of the year. The number of people that ride the bus during those months sky-rockets. Sometimes we don't even get on because the busses have reached their full capacity and we have to walk. That is a HUGE pet-peeve. Send out more shuttles when they are needed. Check the forecast and prepare. We hate the cold.
- The road that comes off of Aggie bullevard and goies under the skybrigse needs some sort of traffic control for pedestrians and cars. The cars wait forever for all of the pedestrians to pass.
- 400 North is a potential problem because of the stupid Multiple-Empire called USU. On most of it, it has tunnels while really help avoiding 400 North. But on 1200 E., there hasn't been incentive to put in a tunnel

next to the Golden Toaster.
Again I remind anybody that the State has a Duty to Commerce, and Commerce requires flow, and flow requires higher access roads and speeds. Get with the program and put in tunnels on the remaining few sections in or along 400 North.
Don't force tens of thousands of Highway users to "slow" down because we have a University that can't get with the program.
Also look at roundabouts. It allows a slowing but not stopping an intersection, which improves the vehicle carbon profile, especially in winter, and nights, and any time when its not entirely necessary to stop. Plus they look pretty.

- Blocking public traffic up to campus during or after a very severe snow storm. Buses only if they have chains. Also, if the buses cannot get up to campus because of snow, then no one should be able or allowed to drive to campus, to eliminate traffic accidents.
- I would like to see increased speed in the shuttle system. I would use the shuttle more often if I could get to class in a timely manner. I will go out to the bus stop by my apartment in Aggie Village 30-35 minutes before class starts and I will still be unable to get to class on time due to the slow nature of the shuttle.
- Bicyclists and longboarders are assholes and think they can do whatever they want.

  Not enough parking close to campus.

  Parking permits are outrageously expensive. I pay the school enough money. I also bust my ass at work everyday for the university for very little pay, no recognition, no benefits, and no chance of advancement.

  I work for you while getting treated like garbage, then you nickel and dime me on everything.
- Bikes go too fast on the pedestrian pathways within campus. Bikes and skateboarders cross the streets too suddenly and with little regard to vehicle traffic on 700 N Aggie Bullevard.
- The biggest issue I experience as a pedestrian is the sprinklers on old main hill (although this is also an issue to a lesser extent on other parts of campus). Some of the sprinklers spend more time watering the sidewalk than the grass, and getting down the steps or the other path is like navigating an obstacle course. If you are walking at certain times, generally 9pm-11pm, it can be ridiculous. These are serious sprinklers and you either need to wait for a minute for them to pass and then dash by or make a big detour on wet, slippery grass.
- Don't fix what isn't broken. It will just result in higher tuition and fees.
- The small information building outside of the Aggie Terrace creates a blind spot for vehicles exiting the terrace into traffic. This becomes even worse during the winter when snow is plowed up against the building forcing cars to go into the lane of traffic just to be able to see if traffic is coming uphill. I have seen cars slide down the hill on ice in the evening as a result. I am extra cautious during the winter and avoid even going into the street until I can tell that there is no traffic in either direction. Pedestrians also cause many problems jaywalking on the south side of the Aggie Terrace. They are not walking the additional 15 feet to use the marked crosswalk. It would also be great to have no bicycle signs on the Aggie Terrace. Pedestrians like to use the elevators to take the bicycles up to campus and ride through the garage when leaving campus. A few times I have nearly hit bicyclists with my car because I didn't see them and they go so fast in the garage it is just an overall danger.
- Reopen the 7th E and 4th N intersection. Stick in a light and have a legitimate entrance to campus.
- Again, an escalator up old main hill would be fantastic!
- My only real issue with transportation on campus is I wish there was more parking around the library. Its a place where people meet up late at night. When its cold (as it usually is in Logan), regardless of where you live, you don't want to walk home. Due to this, many people park in the evenings near the library, and many times there isn't a place to park.
- On 700 North, I wonder about the possibility of having lights put in for the pedestrians and the cars. If we did this and gave pedestrians tickets for crossing at the wrong times/out of the crosswalks, I think that could go a long way towards solving the problem. It's definitely the cheapest option that I have thought of.
- I would appreciate a better/more advertised program to support women walking home alone at night. I

would like to see an increased presence of officers or official personnel of some sort to be quickly and easily available to assist women alone at night on campus. Perhaps there could be some sort of presence at the entrance/exit of the library during the late hours so that they could ask for assistance on their way out.

- It's sort of messy trying to get out of the Gray 3 parking lot (across the highway) onto campus, and I think a lot of people are uncertain about how to handle that situation.
- More yellow parking south
- The feature where I was supposed to mark which pathways I typically walk though campus seemed to not select any option when I clicked on it.
- I hate that I pay for a permit to park in married student housing. I think those should come with rent. Not an increase of rent I don't think it is fair to charge for a permit to my parking lot.
- Parking citations need to be addressed. The University rakes cash in hand over fist so I understand why our parking is terrible. Put a parking terrace behind the new performance hall.
- When driving, I have a huge fear of smacking someone on a bike or board that zooms into the crosswalk without even looking whether there is a car coming or not. I don't speed and I do my best to look for people, but the people who make sudden appearances on bicyclists/boards, especially that make rapid 90 degree turns into a cross walk don't seem to realize I nearly hit them every time. There needs to be a sign, or something, that tells fast-moving people to not assume they are invincible once they dash onto a crosswalk, and can be accidentally squashed if I can't hit the brakes quickly enough.
- I would like to see more street lamps. I walk to campus early in the morning and one of the street lights doesn't work all the time. I would feel safer and more comfortable if it did. More street lights all along would be great!!
- Get rid of bikes and boarders on campus.
- I DO NOT HAVE A CAR SO IRRESPECTIVE OF HOW COLD IT IS I HAVE TO RELY ON BUS

- Separate paths for bikes, to a central bike parking location.
- Overall, transportation to and around campus is pretty good. I have no real complaints.
- Just needs more free/lowcost parking options. If there is a new parking garage, dont sell so many passes we still cant get parking.
- More parking on main campus.
- Crosswalks on aggie bull-evard need a signal to avoid student walking into traffic with the notion that they have the right of way at all times
- Subways and tunnels.
- More vertical bicycle racks with sun protection
- I wish there was a bustop closer to Hillcrest Avenue.
- Heated sidewalks during winter would reduce slipping.
- Closing 700 North would be a good idea as long as you keep the current parking accessed only by 700 North.
- we need more parking spaces for students! Less for faculty.
- I would love to ride the bus if I understood more about how the system worked.
- Parking permit prices are out of control. Also the parking enforcement is a job for the number of parking spaces on campus. There needs to be more parking options and there wouldn't be as many people parking in the wrong places and getting tickets. Although the ladies in the parking office are awesome and super nice considering paying for a parking tickets sucks.
- I think the aggie shuttle is a great way to get on and off of campus.
- I am not representative of much of the USU population as I live in the Ogden area and the nature of my job requires me to be flexible in the times I am able to arrive at and leave campus. Carpooling and other ride sharing options are not feasible for my commute.

- A bike shuttle - a vehicle specifically designed to haul bikes and their riders - may effectively encourage increased bicycling by alleviating the need to work one's way up the hill. Basically, get rid of the uphill 'experience' and people may bike more. Going downhill is no problem, of course
- Have a better online center where you can see the busses. Also if a bus is going off route it should say that in the text messages because it's annoying when you are waiting at the bus for 30 mins because you didn't know a bus was going off route
- Trying to drive on 700 North during morning and lunch is a joke.
- Higher frequency of buses please!! Especially in the winter, waiting for the bus is miserable.
- Actual bike lanes, both on the streets and on the sidewalks on campus.
- I think closing 7th north to most traffic isn't a bad idea and would make the campus feel more connected but, as an employee of the parking office, i'm concerned about the effect it would have on the terrace and blue premium lot.
- It is difficult in a vehicle to get through 7th north with so many pedestrians crossing. The traffic jam on that road in the mornings is terrible.
- There should be a cvtd stop at the bottom of old main
- Perhaps talk to more students about closing 700 N and peripheral parking. I don't think that most support those ideas.
- I wonder why so many people longboard?
- It's fine. Let people deal with it who actually have the problem. Don't let them externalize the costs of their actions.
- Build more parking around campus
- Make buses come more frequently during busy times
- I feel that there should be places for skaters and bicyclists to ride safely without pedestrians becoming road blocks, and likewise with pedestrians.
- I love the bus services.
- I truly would bike and walk more if the hill weren't an issue but I know no one can't do any thing about that so it is what it is. Parking is difficult but the bussing systems are great. I wish there was a CVTD stop by the turn around at the TSC and I wish there was a way to track via text the CVTD buses the way you can the aggie shuttle that would be sooooo wonderful!
- I like and use aggie shuttle a lot.
- I just want my Gray 5 pass to be of use in all Gray zones, at least for 24-hour periods. I have friends in Richards Hall but I live in Snow Hall. That is a very long way to walk if I choose to walk home late at night.
- I love the Aggie bus system. Its free and easy to use.
- New buses would be cool. Usu developed that cool electric bus but then it gets sent to U of U, what's up with that? Higher capacity buses would be awesome too, cause during the busy hours, people are turned away because they're too full.
- Improve Aggie Blue Bike services and provide real bikes...
- Close the Aggie bull-evard. There really doesn't need to be cars on there.
- I love CVTD.
- Parking (price, limitations on where you can park and for how long, and the parking enforcement) are terrible.
- For those of us that have parking permits that do not expire - freeze the fee and quit raising every year.
- Difficult to get to the university. You have to drive through neighborhoods. I'm sure there is a creative solution to opening up 700 E on 89 to act as the main entrance to campus. It's natural.

It seems that was the way it was designed. I know traffic is coming down quick from the canyon, but we could figure something out.

- I love the buses and the extended hours. I like the night bus now running on the shorter route. I would like to see better shelter from the wind and snow on the red route by the cemetery. That area really needs something.
- Add another bus stop between the stadium and the TSC
- Aggie shuttle is amazing!
- Maybe put a light in at the bottom of old main hill. That is a TERRIBLE intersection!
- Let buses go before pedestrians as pedestrian crossings...if not most people on the buses are late to classes.
- Overall, I'm very satisfied with the state of transportation on campus.
- All in all, I am satisfied with the transportation system the way it is. I feel safe and it is usually convenient to get to where I need to go. Sure, parking is sometimes limited, but I have bigger problems to worry about.
- I use Aggie Shuttle System and I love it. Its easy to text and know when the bus will come. The stops are in convenient places. I really like the Aggie Shuttle Bus system.
- Overall, no major changes are needed. Don't reinvent the wheel! Increasing parking would be bomb, but its not worth huge increases in fees and closing down other roads.
- I feel hated as a bicyclist, because we have neither the rights of a car nor a place to ride around campus.
- I think there ought to be more roads going through campus. At least one more anyway. I hate that everything (especially the geology building) is so far away from every bus stop.
- See Previous Comments.
  But mainly there needs to be a partnership between Logan and USU to truly succeed.
  Plus another pet peeve is the officers enforcing on campus, need to learn to use their signals. I can't read their minds, and they set a truly bad example to both students and drivers around campus.
- Register bikes used on campus and require a brief instruction on bike safety on campus, like saying "on your left" when coming from behind pedestrians.
- I would love to see the shuttle start at the turnabout, stop at the Animal Vet Science building, Distance Ed Building, and near where the Cain College/Library is at. If a shuttle made a loop from the Turnabout down to where Fredrico's is at and loop back around that would be great during the winter months. Also, there are faculty & staff who would be more apt to park in the lots if the Aggie Shuttle ran during the hours when they arrive & leave work year round. When the weather is bad I often park down at the CVT lot & take the bus up even though I have an Aggie Terrace permit. I don't have to worry about driving the hill on icy nights & the CVT busses run all hours.
- Biking around campus is difficult. I'm sure pedestrians complain about people who bike on campus as well. (especially longboarders/skateboarders) Is making separate designated paths for wheels an option?
- During heavy traffic hours on the main road in campus only, maybe have short "stop" signals for pedestrians, that way traffic can move along too.
- Make usu a walking campus by getting rid of bikes and boards
- I strongly support the expansion of on-campus parking even if the cost of parking permits and student fees increases.
- I refuse to ride a bike up to campus because the hill is so big its easier for me to carry a skateboard or scooter to flat ground and ride that intead

- yes lets try and build bridges
- Parking shouldn't be such a hassle. I come from California where space is a premium and parking is a nightmare. I never expected this in Utah too, especially Logan.
- From the options and wording of this survey it seems clear that you want to force students park off campus and walk or take the shuttle to class. While this may be a more "green" option and look good on paper it would create barriers for students to get to class. You must remember that about all usu is an educational institution and accessing that education needs to be a top priority, even if it results in increased carbon emissions or "waisted" space due to parking facilities in the core of campus. We CANNOT have students missing or being restricted from educational opportunities because they would not be able to easily and quickly physically access them.
- I get really confused driving to campus. I accidentally got stuck in the parking garage today and it really annoyed me. It is not clear at all where all the little roads go to on campus. It always takes me forever to drive to a specific location on campus because I get lost or get stuck in dead end streets. That's probably one of the main reasons I ride my bike so much too.

Appendix E – Detailed Cost Estimates

Civil Solutions Group, Inc.
Leaders in Sustainable Engineering and Planning

Project: **USU Transportation Master Plan**
Name: **Programming Cost Estimating**
Date: **5/27/2015 - FINAL**

PROJECT SUMMARY				
PROJECT TYPE	**PROJECT #**	**PROJECT NAME**	**LENGTH (FT)**	**COST (2015 DOLLARS)**
5 YEAR BIKE & PED PLAN				
Shared Used Path	1	Old Main Hill Shared Use Path (Existing 10' wide concrete path. Project only requires striping & signage)	1,210	$ 12,490
	2	Southside Campus Shared Use Path (Existing 10' wide cocrete path. Project only requires striping & signage)	2,920	$ 30,141
	3	600 N 800 E Shared Use Path (Assumes 600ft of new construction switchbacks through Rock Garden)	1,500	$ 32,268
	4	900 E 850 N Shared Use Path (Existing 20' and 10' wide paths. Would need striping & signage)	3,150	$ 32,515
	5	1050 E Cemetery Shared Use Path (Existing 1000 East cemetery road, 15' Wide. Would need striping & signage)	2,050	$ 21,161
Bike Boulevard (assumes chicanes, lower-cost speed bump prices also available)	6	Champ Drive Bike Boulevard	1,660	$ 46,422
	7	Bullen Hall Bike Boulevard	1,570	$ 43,905
Protected Bike Lane	8	700 North (Aggie Boulevard)	2,690	Cost included in the cross section change along 700 North (see 5-yr vehicle improvement plan)
Shared Roadway	9	800 E from Kiss-n-ride to Aggie Blvd Shared Roadway	350	$ 1,800
	10	850 N & 1100 E Shared Use Path	3,190	$ 32,928
Buffered Bike Lane	11	800 E from Aggie Blvd to 1000 North Buffered Bike Lane	2,060	$ 12,824
Bike Lanes	12	800 East from 1000 North to 1400 North	2,620	$ 11,397
Crosswalk Enhancement	13	800 E 900 N Crosswalk w/ HAWK	N/A	$ 104,237
	14	800 E 1200 N Crosswalk w/ HAWK	N/A	$ 104,237
	15	800 E 1300 N Crosswalk w/ HAWK	N/A	$ 104,237
	16	600 N Crosswalk w/o HAWK, all four legs	N/A	$ 13,625
	17	1400 North Crosswalk		$ 27,251
	18	1000 N 1050 East Crosswalk w/o HAWK	N/A	$ 13,625
	19	1000 N 900 East and 950 East Crosswalk w/o HAWK	N/A	$ 27,200
New Sidewalk	20	1200 E Sidewalk	2,140	$ 80,250
	21	1000 N Cemetary Sidewalk	325	$ 12,188
	22	800 E (Westside) Sidewalk	190	$ 7,125
	23	Stadium Parking Sidewalk (Southside of road only)	390	$ 14,625
	24	800 E (Eastside) Sidewalk	2,380	$ 89,250
	25	North East Campus Sidewalk (Westside from end of existing sidewalk to 850 North)	430	$ 16,125

	56	Sidewalk on the east side of 700 East between 400 North and 600 North.	1,100	$ 41,250
PROJECT SUMMARY				
PROJECT TYPE	**PROJECT #**	**PROJECT NAME**	**LENGTH (FT)**	**COST (2015 DOLLARS)**
10 YEAR BIKE & PED PLAN				
Shared Used Path	26	Hwy 89 1200 E Shared Use Path (1200 E leg already contains some 5' wide sidewalk; full reconstruction assumed)	2,910	$ 30,038
	27	875 N Shared Use Path (Existing 16' wide asphalt road; signing and striping only assumed)	1,870	$ 19,303
	28	Shared Used Path East of Spectrum (Existing 20' Wide sidewalk. Signing and striping only assumed)	380	$ 3,922
Buffered Bike Lane	29	700 E Buffered Bike Lane	1,900	$ 11,828
	30	1000 N Buffered Bike Lane	2,630	$ 16,372
	31	1200 E Buffered Bike Lane	4,680	$ 29,133
Bike Lane	32	900 N & 900 E Bike Lane	1,380	$ 6,003
New Sidewalk	33	1200 East 1000 North New Intersection (From end of 5-year plan sidewalk extension to construction of 950 North and 1200 East re-alignment)	820	$ 30,750
25 YEAR BIKE & PED PLAN				
Shared Used Path	34	1150 East Shared Use Path (Existing 15' Wide Path through Cemetery, would need signing and striping).	1,220	$ 12,593
Bike Lane	35	1400 N Bike Lane	2,620	$ 11,397

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Project: USU Transportation Master Plan
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Date: 5/27/2015 - FINAL

PROJECT SUMMARY			
PROJECT TYPE	**PROJECT #**	**PROJECT NAME**	**COST (2015 DOLLARS)**
FUTURE BUS PLAN			
Bus Shelter & Ammenities for Existing Aggie Shuttle Stop	36	Aggie Shuttle Route (16 Total, 4 assumed to already have shelters)	$ 144,000.00
Bus Shelter & Ammenities for New Aggie Shuttle Stop	37	Aggie Shuttle Bus Shelter (7 Total)	$ 84,000.00
Bus Shelter & Ammenities for New CVTD Stop	38	CVTD Route (2 Total)	$ 24,000.00

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Project: USU Transportation Master Plan
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Date: 5/27/2015 - FINAL

PROJECT SUMMARY			
PROJECT TYPE	**PROJECT #**	**PROJECT NAME**	**COST (2015 DOLLARS)**
FUTURE PARKING PLAN			
New Parking	53	800 E 1400 N Surface Lot	$ 1,940,400.00
	54	Bruce Hall Aggie Boulevard New Parking Garage	(Provided by Fehr & Peers)
	55	Aggie Boulevard 800 East New Parking Garage	(Provided by Fehr & Peers; Mid-range pricing for structured parking comes in around $22K/stall)

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Project: **USU Transportation Master Plan**
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PROJECT SUMMARY				
PROJECT TYPE	**PROJECT #**	**PROJECT NAME**	**LENGTH (FT)**	**COST (2015 DOLLARS)**
5 YEAR VEHICLE PLAN				
Signal	39	1200 East Hwy 89 Signal	N/A	$ 290,000.00
Roundabout	40	1200 E 845 N Roundabout	N/A	$ 450,000.00
All-way Stop	41	500 N 700 E All-way Stop	N/A	$ 750.00
Realigned Roadway	42	North East Quadrant Road	1,200	$ 850,000.00
Cross-section Change	43	Aggie Boulevard (800 E to 1200 E) (Includes all cross-sectional changes for all modes)	2,690	$ 986,333.53
	44	800 E (1000 North to 1400 North) (Only covers re-striping for narrower lanes)	5,290	$ 7,575.00
Movement Ristrictions	45	Champ Drive Hwy 89 Intersection Movement Restriction	N/A	$ 750.00
	46	550 N Hwy 89 Intersection Movement Restriction	N/A	$ 750.00
Sign Relocation	47	Highway Guide Sign Relocation Near 550 N Hwy 89	N/A	$ 1,200.00
Driveway Consolidation	48	Aggie Boulevard Driveway Consolidation	N/A	$ 2,835.00

Vehicle

10 YEAR VEHICLE PLAN					
Signal	49	950 N 1200 East Signal	N/A	$	280,000.00
	50	1400 N 1200 East Signal	N/A	$	280,000.00
Realigned Roadway	51	Re-alignment of 1000 North from 1150 East to 1200 East	N/A		$384,279.82
Cross-section Change	52	1200 E (Hwy 89 to 1400 North) Re-striping to three lanes	N/A	$	10,035.00
25 YEAR VEHICLE PLAN					
- No additional improvements identified beyond those listed in the 10-Year Plan -					

Civil Solutions Group, Inc.
Leaders in Sustainable Engineering and Planning

Project: USU Transportation Master Plan
Name: Programming Cost Estimating
Date: 5/27/2015 - FINAL

	Cost Itemization:	Unit Cost	Unit	Quant	Item Cost	Subtotal	Grand Total*
BIKE / PED IMPROVEMENTS	**New Sidewalk (5' - Wide)**	$ 25.00	lf	1	$ 25	**$ 25**	**$ 38**
	Crosswalk Enhancement (with HAWK and median refuge)						
	Curb Bulb-out, 8x16 with 2:1 tapers (Both sides of road)						
	Asphalt Demolition	$ 0.30	sf	752	$ 226	**$ 69,492**	**$ 104,237**
	Concrete Curb & Gutter	$ 17.00	lf	96	$ 1,632		
	Concrete Flatwork	$ 5.50	sf	512	$ 2,816		
	ADA Ramp (includes detectable warning surface)	$ 1,500.00	ea	2	$ 3,000		
	Median Refuge (12' x 30')						
	Asphalt Demolition	$ 0.30	sf	360	$ 108		
	Median Curb	$ 12.00	lf	60	$ 720		
	Concrete Flatwork	$ 5.50	sf	360	$ 1,980		
	Detectable Warning Surface	$ 450.00	ea	2	$ 900		
	Pedestrian Railing - 4' Wrought Iron Fence	$ 85.00	lf	20	$ 1,700		
	Crosswalk Signing	$ 500.00	ea	1	$ 500		
	Crosswalk Striping	$ 455.00	ea	2	$ 910		
	HAWK Signalization	$ 60,000.00	ea	1	$ 55,000		
	Crosswalk Enhancement (without HAWK or median refuge)						
	Curb Bulb-out, 8x16 with 2:1 tapers (Both sides of road)						
	Asphalt Demolition	$ 0.30	sf	752	$ 226	**$ 9,084**	**$ 13,625**
	Concrete Curb & Gutter	$ 17.00	lf	96	$ 1,632		
	Concrete Flatwork	$ 5.50	sf	512	$ 2,816		
	ADA Ramp (includes detectable warning surface)	$ 1,500.00	ea	2	$ 3,000		
	Crosswalk Signing	$ 500.00	ea	1	$ 500		
	Crosswalk Striping	$ 455.00	ea	2	$ 910		
	Crosswalk Enhancement (4-way intersection)						
	Curb Bulb-out, 8x16 with 2:1 tapers (All four corners)						
	Asphalt Demolition	$ 0.30	sf	1,504	$ 451	**$ 18,167**	**$ 27,251**
	Concrete Curb & Gutter	$ 17.00	lf	192	$ 3,264		
	Concrete Flatwork	$ 5.50	sf	1,024	$ 5,632		
	ADA Ramp (includes detectable warning surface)	$ 1,500.00	ea	4	$ 6,000		
	Crosswalk Signing	$ 500.00	ea	2	$ 1,000		
	Crosswalk Striping	$ 455.00	ea	4	$ 1,820		
	Bike Lane (both sides of road, 500 feet stretch)						
	Bike Lane Signage	$ 500.00	ea	2	$ 1,000	**$ 1,450**	**$ 2,175**
	Bike Lane Striping (8" White Stripe)	$ 50.00	gal	5	$ 250		
	Bike Pavement Marking	$ 100.00	ea	2	$ 200		
	Buffered Bike Lane (both sides of road, 500 feet stretch)						
	Bike Lane Signage	$ 500.00	ea	2	$ 1,000	**$ 2,075**	**$ 3,113**
	Bike Lane Striping (8" White Stripe)	$ 50.00	gal	5	$ 250		
	Bike Pavement Marking	$ 100.00	ea	2	$ 200		
	Buffering Striping (3-ft buffer)	$ 50.00	gal	13	$ 625		
	Bike Boulevard (chicanes at 500-ft spacing)						
	Chicanes, 12x72 (3:1 taper out and back)						
	Asphalt Demolition	$ 0.30	sf	1,152	$ 346	**$ 9,322**	**$ 13,982**
	Median Curb	$ 12.00	lf	288	$ 3,456		
	Landscaping	$ 5.00	sf	864	$ 4,320		
	Sharrow Marking	$ 100.00	ea	2	$ 200		
	Sharrow Signing	$ 500.00	ea	2	$ 1,000		
	Bike Boulevard (speed bumps at 500-ft spacing)						
	Speed Bumps	$ 1,000.00	ea	1	$ 1,000	**$ 2,200**	**$ 3,300**
	Sharrow Marking	$ 100.00	ea	2	$ 200		
	Sharrow Signing	$ 500.00	ea	2	$ 1,000		
	Shared Roadway (signage at 500-ft spacing)						
	Sharrow Marking	$ 100.00	ea	2	$ 200	**$ 1,200**	**$ 1,800**
	Sharrow Signing	$ 500.00	ea	2	$ 1,000		
	10' Shared-Use Path (100-ft stretch)						
	3" Asphalt	$ 1.40	sf	100	$ 140	**$ 688**	**$ 1,032**
	4" Untreated Base Course	$ 0.50	sf	100	$ 50		
	12" Granular Borrow	$ 13.00	cy	4	$ 48		
	Bike Lane Striping (8" White Stripe)	$ 50.00	gal	5	$ 250		
	Bike Pavement Marking	$ 100.00	ea	2	$ 200		
	10' Shared-Use Path (100-ft stretch) w/ Existing Pavement						
	Bike Lane Striping (8" White Stripe)	$ 50.00	gal	5	$ 250	**$ 450**	**$ 675**
	Bike Pavement Marking	$ 100.00	ea	2	$ 200		
Transit Improvem.	**Bus Stop Shelter & Ammenities****						
	Design, Permit, and Oversight	$ 2,000.00	ea	1	$ 2,000	**$ 12,000**	**n/a**
	Concrete Flatwork	$ 5,000.00	ea	1	$ 5,000		
	Shelter, Bench, Trash Can	$ 5,000.00	ea	1	$ 5,000		

SUPPORTING CALCULATIONS							
	Cost Itemization:	Unit Cost	Unit	Quant	Item Cost	**Subtotal**	**Grand Total***
VEHICULAR IMPROVEMENTS	**Driveway Consolidation**						
	Asphalt Demolition (30' x 10')	$ 0.30	sf	300	$ 90		
	Remove Concrete Curb and Gutter	$ 5.00	lf	60	$ 300	**$ 1,890**	**$ 2,835**
	Landscaping	$ 5.00	sf	300	$ 1,500		
	Stop Sign	$ 500.00	ea	1	$ 500	**$ 500**	**$ 750**
	Movement Restriction Sign	$ 500.00	ea	1	$ 500	**$ 500**	**$ 750**
	Sign Relocation	$ 800.00	ea	1	$ 800	**$ 800**	**$ 1,200**
	700 North Cross-Section Change - 800 East to 1200 East (2,700-ft stretch)						
	Protected Bike Lane						
	Median Curb	$ 12.00	lf	5,400	$ 64,800		
	Concrete Flatwork - 5-ft wide	$ 5.50	sf	13,500	$ 74,250		
	Landscaping 5-ft wide	$ 5.00	sf	13,500	$ 67,500		
	Bike Lane Signage	$ 500.00	ea	10	$ 5,000		
	Bike Lane Striping (8" White Stripe)	$ 50.00	gal	27	$ 1,350		
	Bike Pavement Marking	$ 100.00	ea	10	$ 1,000		
	Pedestrian Railing - 4' Wrought Iron Fence	$ 85.00	lf	2,700	$ 229,500		
	Removal of Existing Bulb-Out & Medians						
	Remove Concrete Flatwork	$ 2.25	sf	5,240	$ 11,790		
	Remove Concrete Curb and Gutter	$ 5.00	lf	1,310	$ 6,550	**$ 657,556**	**$ 986,334**
	Remove Median Curbing	$ 5.00	lf	580	$ 2,900		
	3" Asphalt	$ 1.40	sf	16,595	$ 23,233		
	4" Untreated Base Course	$ 0.50	sf	16,595	$ 8,298		
	12" Granular Borrow	$ 13.00	cy	615	$ 7,990		
	Re-Install Crosswalks						
	Crosswalk Signing	$ 500.00	ea	8	$ 4,000		
	Crosswalk Striping	$ 455.00	ea	14	$ 6,370		
	ADA Ramp (includes detectable warning surface)	$ 1,500.00	ea	14	$ 21,000		
	Bus Lane Re-Striping	$ 50.00	gal	41	$ 2,025		
	Bus Gating System	$ 60,000.00	ea	2	$ 120,000		
	800 East Cross-Section Change (1000 North to 1400 North)						
	Re-Striping	$ 50.00	gal	81	$ 4,050	**$ 5,050**	**$ 7,575**
	Pavement Markings	$ 100.00	ea	10	$ 1,000		
	1200 East (700 North to 1400 North)						
	Re-Striping	$ 50.00	gal	106	$ 5,290	**$ 6,690**	**$ 10,035**
	Pavement Markings	$ 100.00	ea	14	$ 1,400		
PARKING	**Parking Lot at 800 East and 1400 North**	$ 2,800.00	stall	693	$ 1,940,400	**$ 1,940,400**	**n/a**

*Includes an additional 5% for design, 5% for construction engineering, 10% for mobilization, 30% construction contingency

**Tabulation includes design and oversight. No additional markups applied. Prices provided by UTA.

Re-Alignment of Offset Intersection at 1000 North & 1200 East in Logan, UT

Concept Estimate

Civil Solutions Group, Inc.
540 W Golf Course Road, Suite B1, Providence, UT 84332 Telephone 435-213-3762
Providence, UT 84332 mtaylor@civilsolutionsgroup.net

Date: May 27, 2015

General Notes: This cost etimate is based upon the Engineer's opinion of the current cost of materials and labor in this area. The quantities shown on this proposal are based upon the Concept Drawing dated Dec. 17, 2014.

	Description	Quantity	Unit	Amount	Total Amount
	General Site Grading				
1	Mobilization and Site Clean Up	1	LS	$10,000.00	$10,000.00
2	Rock Filled Sand Bags for Inlets	6	EA	$300.00	$1,800.00
3	Clear and Grub	62,000	SF	$0.10	$6,200.00
4	Remove Concrete Curb and Gutter	864	LF	$2.00	$1,728.00
5	Remove Sidewalk	3,216	SF	$0.50	$1,608.00
6	Install 6" On-Site Topsoil	396	CY	$22.00	$8,709.96
7	Landscaping	21,379	SF	$3.00	$64,137.00
8	12" Import Granular Borrow Fill under asphalt & Curb (1-ft beyond curb)	1,000	CY	$13.00	$12,997.59
9	4" Untreated Road Base Fill under asphalt and curb (1-ft beyond curb)	28,915	SF	$0.50	$14,457.50
10	3" Asphalt	30,678	SF	$1.40	$42,949.20
11	ADA Ramps	2	EA	$1,200.00	$2,400.00
12	4" Thick Concrete Sidewalk w/ 4" Gravel	4,370	SF	$3.00	$13,110.00
13	30'-Wide Concrete Driveway Approaches (6" concrete, 8" untreated road base)	2,062	SF	$4.50	$9,279.00
14	6" Ribbon Curb	100	LF	$8.00	$800.00
15	30" Concrete Curb and Gutter w/ 4" Gravel Base	1,198	LF	$13.00	$15,574.00
	SUBTOTAL GENERAL SITE GRADING				**$205,750.26**
	Storm Drain				
1	15" RCP Storm Sewer, Class III	1,198	LF	$25.00	$29,950.00
2	Storm Sewer Inlet (2x3 with cast combo grate)	4	EA	$2,200.00	$8,785.33
	SUBTOTAL STORM DRAIN				**$38,735.33**
	Miscellaneous				
1	Materials Testing (Per Contractor)	1	LS	$20,000.00	$20,000.00
2	Relocate Street Lighting	1	LS	$10,000.00	$10,000.00
	SUBTOTAL MISCELLANEOUS				**$30,000.00**
	SUBTOTAL				**$274,485.59**
	CONTINGENCY (40%)*				**$109,794.24**
	GRAND TOTAL				**$384,279.82**

Created by: M. Taylor
*Includes 5% for design, 5% for construction engineering, 10% mobilization, 20% construction