Parking and Transportation Demand Management Plan

University of Montana, Missoula

November 2016

NELSON
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Table of Contents

Table of Figures

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EXECUTIVE SUMMARY

The University of Montana, Missoula (UM) campus is the destination for thousands of student, faculty, staff, and visitor trips in the region. In the context of increasing costs and declining resources, the University has sought to evaluate how it can invest in cost-effective strategies for improving the typical campus user's travel experience, reducing vehicle trips, lowering greenhouse gas (GHG) emissions, managing parking demand, and increasing the use of transit, bicycling, and walking at UM.

This report is the culmination of a series of tasks including an in-depth transportation and parking existing conditions analysis, the development of a financial and parking demand model, a screening process for potential transportation demand management (TDM) strategies, and the development of a multi-phase implementation plan. Ultimately, this TDM Program seeks to assist and guide UM in its efforts to create a better managed transportation system, maximize its transportation resources, and provide specific strategies to enable the University to invest in a transportation system that supports all modes of travel.

PROGRAM BACKGROUND

Founded in 1893, the University of Montana, Missoula has grown into the second largest and flagship University of Montana's collegiate system. Providing resources to over 11,000 students, and employing nearly 3,000 individuals, UM is not only an important piece of the education system, but also a regional center for economic and social activities.

Additionally, UM is associated with Missoula College, an institution that provides two-year Associates degrees through technical and occupational education programs. Missoula College serves over 1,800 students, and will be located directly across the Clark Fork River from the larger Mountain campus, providing an opportunity to easily share resources.

These two connected campuses must meet the challenge of increasing demands for education observed nationwide. This increase in demand for education promises to bring challenges in meeting accessibility and transportation needs in a cost-effective way. Most evidently, investments in parking and transportation demand management (TDM) strategies must be balanced. Considering that the campus is bordered by neighborhoods to the west and south, a river to the north, and elevated terrain to the east, land is constrained and construction of additional parking facilities can come at a high cost.

UM acknowledges these coming challenges, and has identified the need to shift its approach to managing transportation access to the campus. Simply providing large amounts of additional parking as the primary solution is unsustainable in the long-term. The transition to thinking about TDM strategies to taper the demand and cost to accommodate vehicles by providing a multi-modal environment with the roll out of TDM strategies will prepare UM for the future.

PROPOSED TDM STRATEGIES

In collaboration with UM staff, the TDM Program identified in this plan contains 21 strategies. These strategies are organized into a two phased timelines, a short-term (1-2 years), and long-term (~10 years) phase. While short-term strategies could be introduced within the next one to two years, long-term strategies may require significantly more consideration given their financial impacts. Figure ES-1 below provides a summary of strategies recommended for implementation, organized by phasing timelines and offers a qualitative range of priorities and costs for each to help guide implementation.

Figure ES-1 Proposed TDM Strategies

Short-Term Strategies				
#	**Strategy**	**Description/Reasoning**	**Priority**	**Cost**
1	Improve parking management and price incentives	Implement several changes to better manage the parking system: 1. Introduce "value" priced parking to better utilize certain lots. 2. Price Missoula College parking once the new facilities open 3. Convert most reserved parking to a "by lot" basis 4. Convert some hourly parking spaces to general decal spaces 5. Consider adjusting summer parking prices 6. Restrict overnight parking on campus streets	High	Low
2	Promote ridesharing through priority rideshare parking locations and the City's rideamigos program	Carpooling and vanpooling reduces the amount of total parking demand on campus. Offering prime carpool parking locations and utilizing the City's new ridematching rideamigos program provide additional incentives to establish ridesharing groups.	High	Low
3	Expand and improve (cost-efficient) bike parking	Bicycling is already an important part of UM trip patterns. Making parking available in desirable, easy to access locations, will provide the tools to make it a more reasonable option for more.	Medium	Medium
4	Improve campus bikesharing service	Build upon the university's yellow bike program to establish a bikesharing system that covers all parts of campus to create easy-to-use, fast access across campus.	Low	Medium
5	Expand multimodal wayfinding	Creating easily visible wayfinding increases awareness for all road users, and serves as a reminder to drivers to be aware are careful.	Low	Low
6	Fund regular maintenance of transportation facilities	Maintaining transportation facilities ensures that alternative modes of transportation run effectively and enhance the user experience.	Medium	Medium
7	Vehicle fleet/car sharing	This strategy creates an alternative for students that do not need to use a car daily, but may want to use a vehicle to visit family or accomplish other trips.	High	Low

8	Improve UM app with real-time parking pricing, availability, transit & bike info	By improving the information available to affiliates and guests, UM can reduce the congestion caused by individuals looking for parking, and expose drivers to alternatives.	Low	Low
9	Introduce employee transportation benefits	Employees should receive pre-tax transportation benefits for all available modes – parking, transit, and bicycle use. Employee benefits could also include a wellness program for those who do not drive alone to campus.	Medium	Low
10	Incentivize students living on campus to not bring cars	Use car sharing, bike sharing, and potentially other incentives to induce more resident students to use alternative modes of transportation rather than bringing cars to campus.	High	Medium
11	Facilitate remote parking options for campus residents and Missoula College affiliates.	Identify and lease affordable, off-site remote parking to offer resident students and Missoula College affiliates a cheaper alternative to parking their vehicles on-campus. Remote parking could involve leasing spaces from a nearby lot (e.g. Comfort Inn) or leasing spaces from a private entity providing both security and liability coverage.	High	Medium
12	Communication and education of transportation program	Educate the campus population about how transportation programs and finances actually work both during the plan dissemination process and in the future via the campus website and other media outlets.	High	Low
13	Establish robust monitoring and evaluation	Provides an opportunity to alter strategies in practice as necessary while working towards goals.	Medium	Low
Long-Term Strategies				
#	**Strategy**	**Description/Reasoning**	**Priority**	**Cost**
14	Consolidate parking and multimodal access/TDM services (Access & Transportation Services) and appoint a single transportation manager of the department	Bringing together TDM and Parking services reduces competition between the two efforts for funding, and allows for a comprehensive approach to managing transportation at UM, Missoula. This strategy includes appointing or hiring a transportation manager for the department who can serve as a "champion" for transportation on campus as well as a plan for how to pay for campus security with funds other than those gained from parking revenues. This strategy also includes managing event pricing.	High	Medium
15	New Bike/Pedestrian Bridge to Missoula College	Connect the campuses using funds from both educational institutions, the City, and state/federal grants to improve access to resources for students.	High	High
16	Daily/hourly pricing using LPR technology	Shift from semester/annual permits to daily parking pricing, requiring less of an investment in parking from individuals, providing more flexibility in how to use transportation dollars.	High	Medium
17	Residential Parking Benefit Districts	Work with the neighborhoods surrounding the campus and city to determine if some form of residential PBDs	Low	Low

		are appealing to the community to better utilize existing residential parking supply.		
18	Integrate/Expand UDASH & Mountain Line	Strategy proposes an increase of frequency of purple and green lines to 10-minute service within 5 years, and 10-minute service to all lines within 10 years.	Medium	High
19	Expand network of protected bike lanes	Expand network to segments of E. Broadway, South Avenue West, Arthur Avenue, South 5th and 6th Streets, funded through a 20% "local match" equivalent. Improving this network will attract more individuals to bicycle on infrastructure that creates a safe environment.	Medium	Medium
20	Wayfinding and real-time parking availability at gated Lot R	Limits wasted time and resulting congestion caused by vehicles searching for parking, as vehicles will be directed to the lot when parking is available, and notified of no unoccupied spaces.	Low	Low
21	Adopt policy establishing parking management goals, including availability target; authorizing admin. rate adjustment to meet targets	Establishing policies and goals will provide the campus with a clear plan for the future, will ensure the campus transportation system continues to improve to better serve campus affiliates.	Medium	Low

EXISTING CONDITIONS ANALYSIS

The complete Existing Conditions Report is available in Appendix A. The analysis examined various elements of the existing transportation system at UM including:

- Transit Service
- Bicycle and Pedestrian Infrastructure and Safety
- Vehicular Circulation
- Ridesharing and Vanpooling
- Travel Trends
- Parking System

The following is a review of key findings from the report with a particular focus on parking.

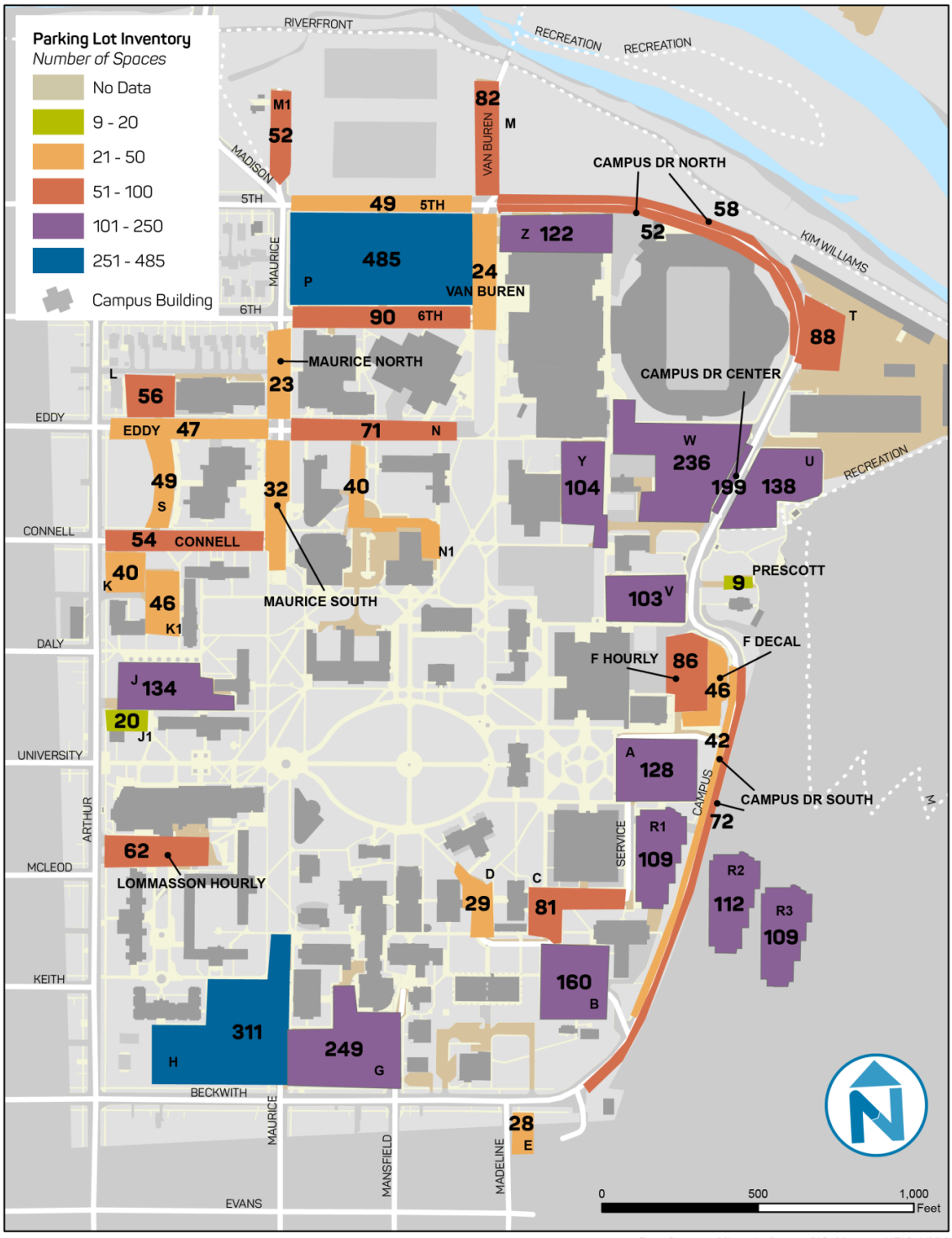
Parking System

Figure ES-2 shows the On-Campus parking supply as of 2015. However, as of the 2015/2016 academic year, the following changes to the map are expected:

- The East Broadway Park and Ride, which included 239 spots, immediately across the Clark Fork River from the Mountain Campus, has been closed for construction of the new Missoula College on that site. As of Fall 2015, there are no plans to replace those parking spaces.
- The construction of the Gilke Executive Education building will compromise 49 spaces for the duration of the 2015 calendar year.
- Lot W, which has 236 spaces, will be closed from May 2016 through July 2017 while it serves as a staging area for construction of the new Athletic Academic Center.

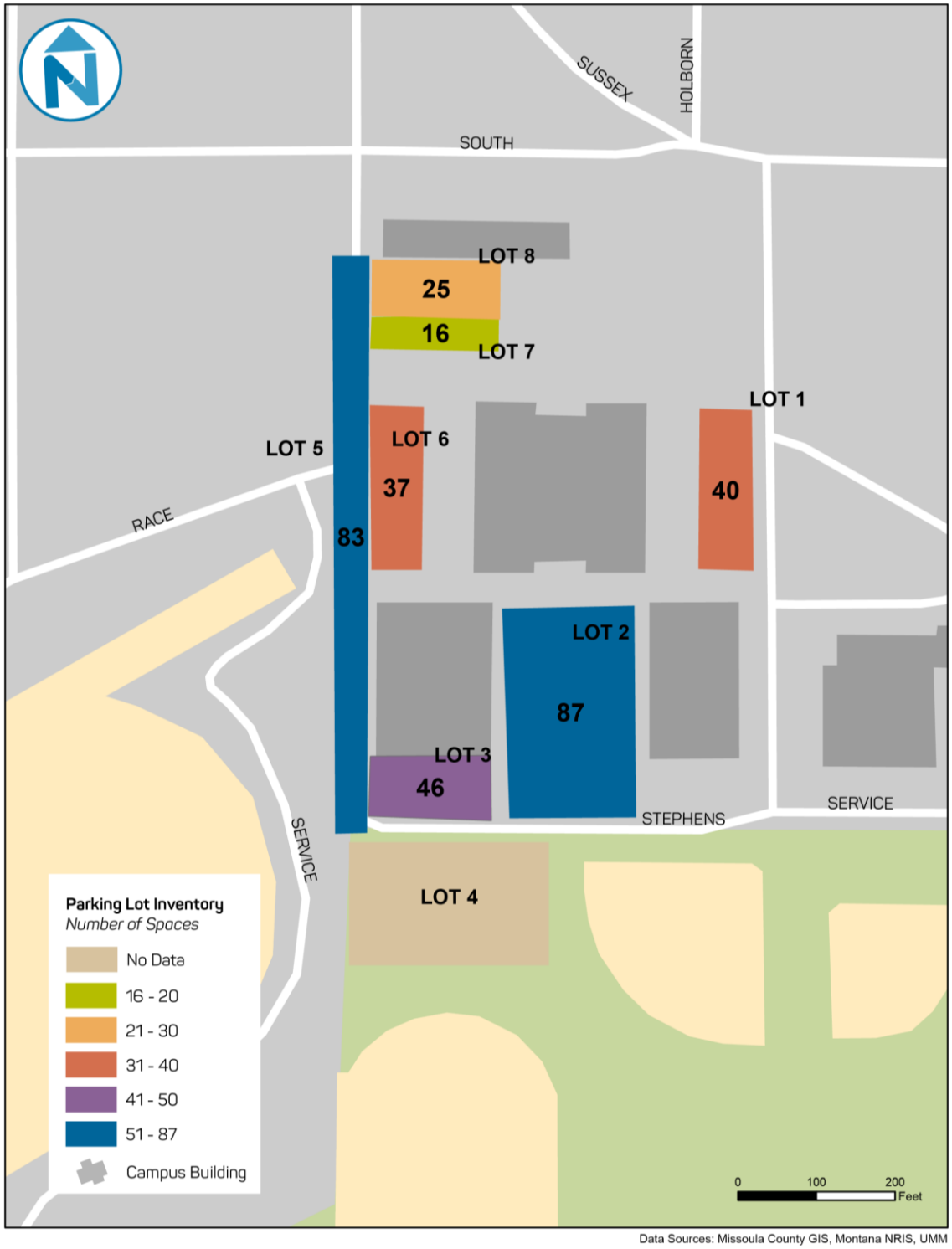
Figure ES-3 shows the parking supply at Missoula College as of 2015.

Figure ES-2 On-Campus Parking Supply, University of Montana, Main Mountain Campus



Data Sources: Missoula County GIS, Montana NRIS, UMM

Figure ES-3 On-Campus Parking Supply, Missoula College Campus, 2015



Parking Utilization

In order to gain a better understanding of how the supply of 5,000 parking spaces is used at the UM campus and Missoula College, ASUM staff, students, and volunteers counted the number of vehicles parked in each lot every two hours, between the hours of 10:00 AM and 4:00 PM on Wednesday, October 14th and Thursday, October 15th 2015, noting how many of each type of permit were used in each lot. Data were also collected for the same periods at selected campus facilities on Tuesday, October 16th, which served as a test of the data collection methods and procedures.

Figures ES-4 shows the total amount of occupied parking spaces on the UM campus on all data collection dates, showing that Wednesday's are busier than Thursday's during a typical week. During both days of data collection, the peak parking utilization occurred between 10:00 a.m. and 12:00 p.m. A maximum utilization rate of 82% (3,379 spaces) was observed.

Figure ES-5 illustrates the rate of utilization on Wednesday, October 15th. This chart highlights that the peak occupancy rate of 82% occurs in the late morning, and declines as the day continues.

Figures ES-6 and ES-7 visualize parking occupancy rates during peak periods.

Figure ES-4 Parking Spaces Occupied on Main Mountain Campus (Weds.-Thurs., October 14-15, 2015)

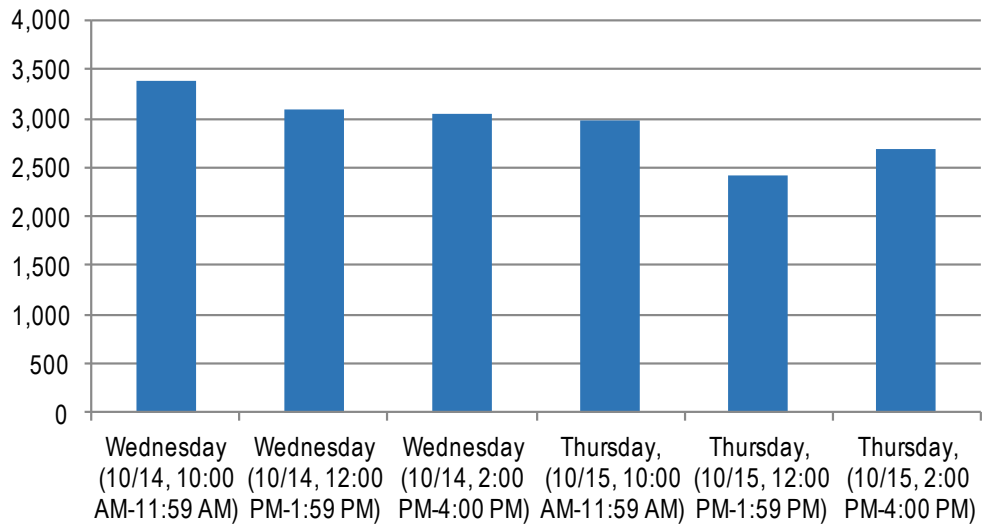


Figure ES-5 Share of Available On Campus Parking Spaces Occupied by Period, University of Montana, Mountain Campus, Wednesday, October 14, 2015

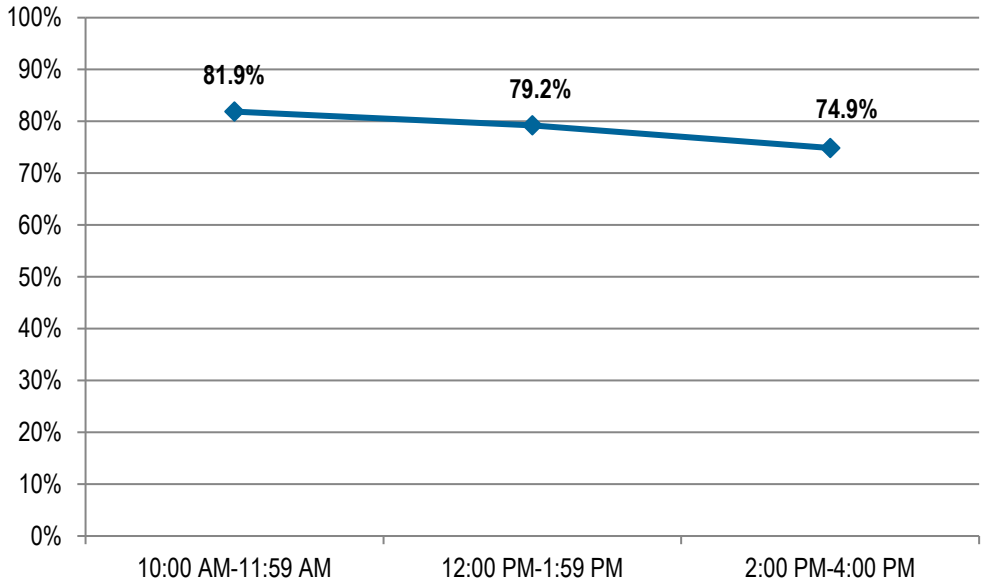
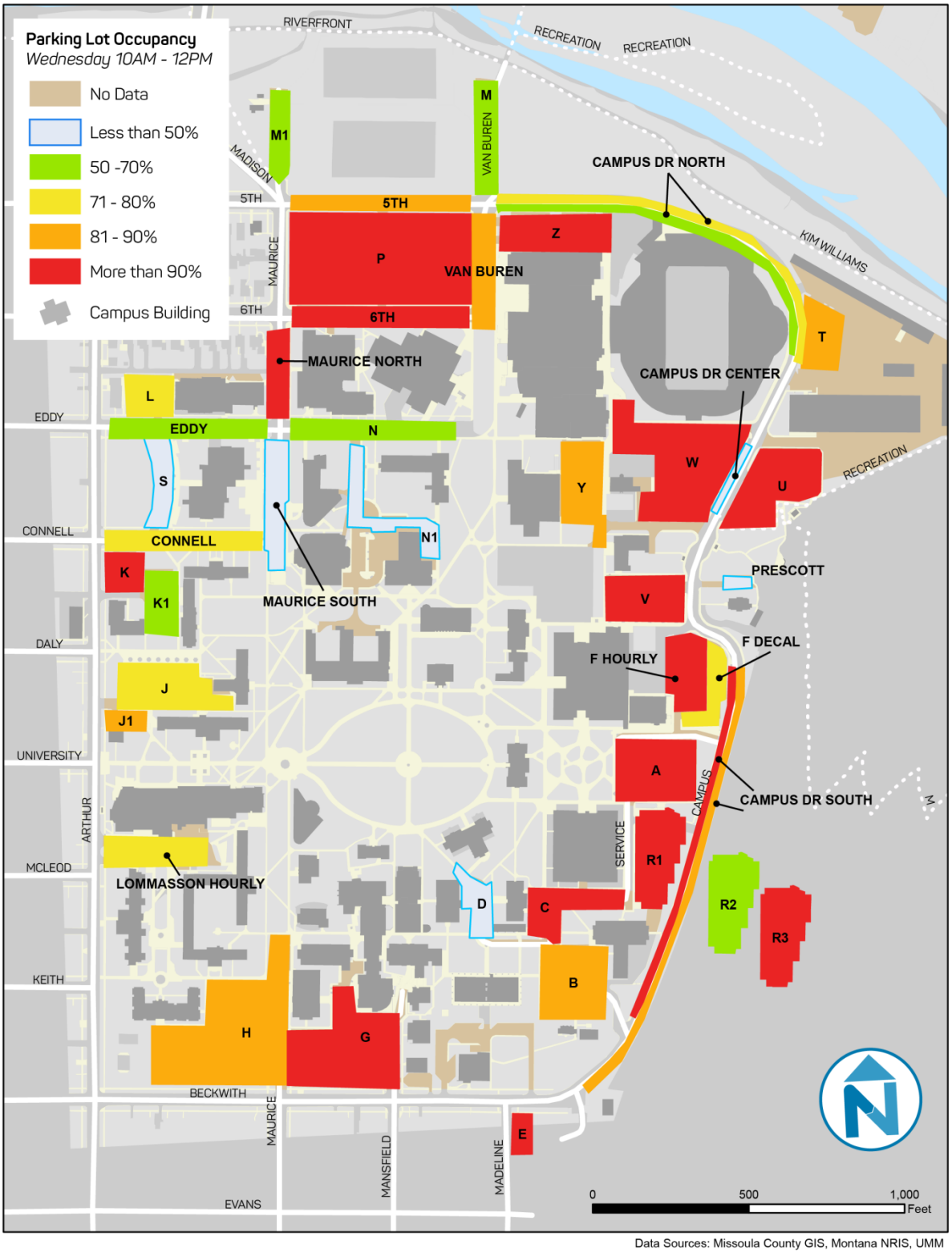
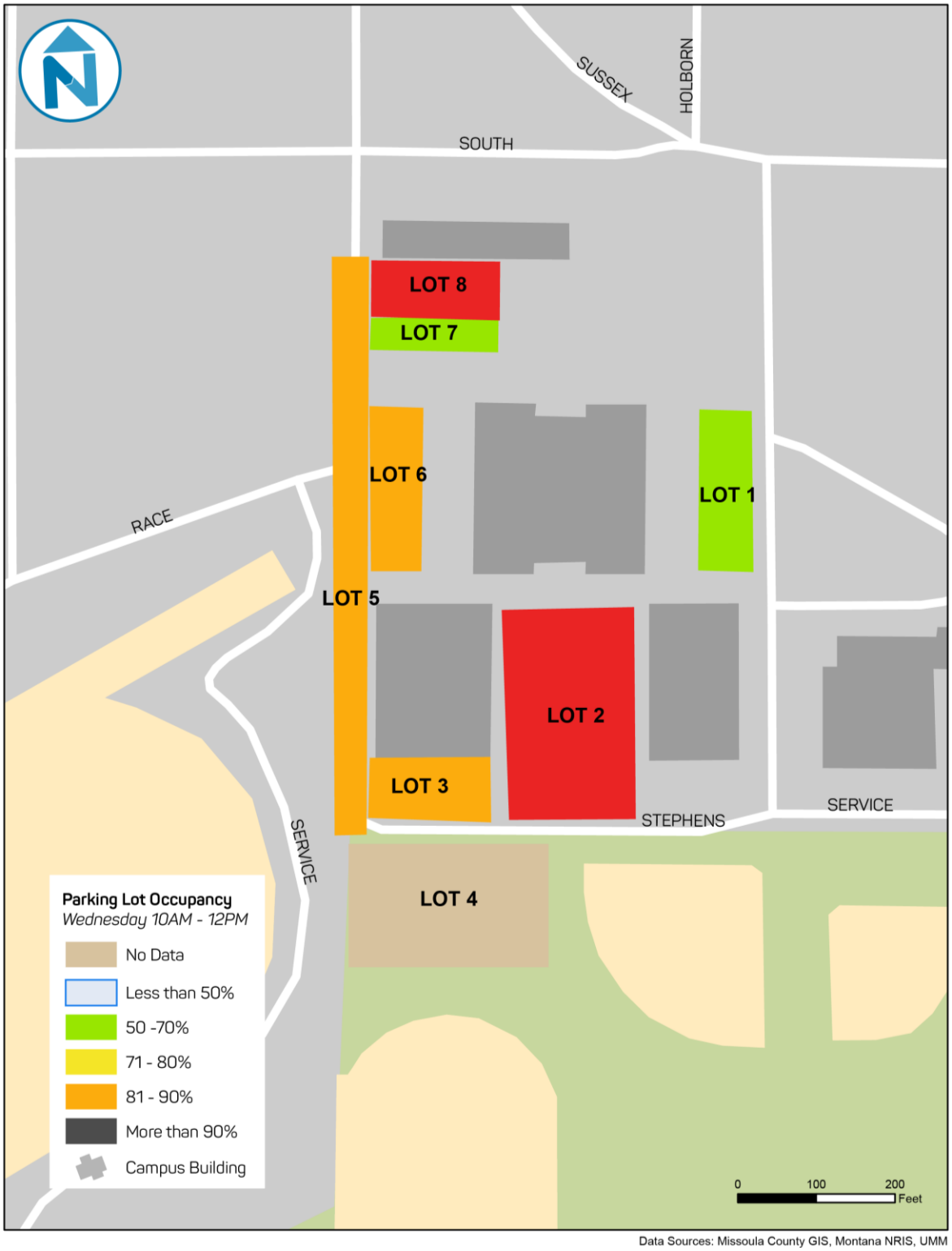


Figure ES-6 Peak Period Parking Occupancy (10AM-12 PM, Weds, Oct. 14, 2015), UM Mountain Campus



Data Sources: Missoula County GIS, Montana NRIS, UMM

Figure ES-7 Peak Period Parking Occupancy (10AM-12 PM, Weds, Oct. 14, 2015), Missoula College Campus



Transit Service

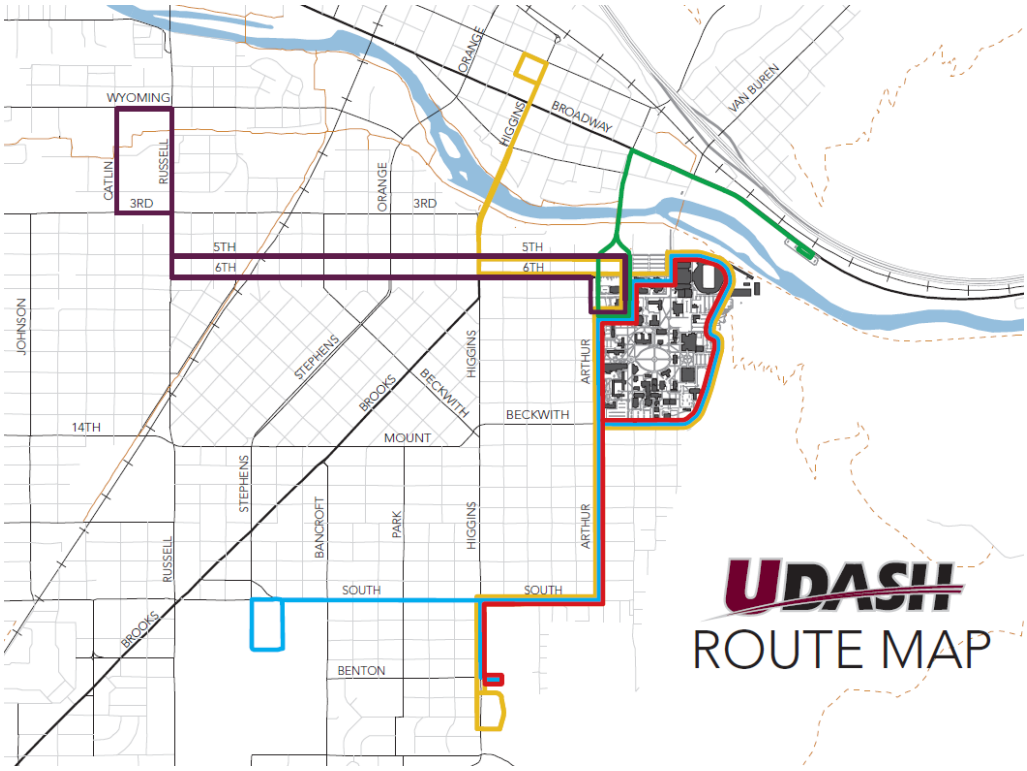
Transit access to the UM campus is provided by University-operated UDASH routes, as well as several Mountain Line public bus service routes operated by the Missoula Urban Transportation District (MUTD).

The five UDASH routes serving UM and Missoula College are described below:

- Red Line from the Mountain Campus to the Lewis and Clark Transfer Center, serving University Villages.
- Blue Line from the Mountain Campus to the current location of the Missoula College Campus.
- Purple Line connecting 5th Street, 6th Street, and Russell Streets to the Music Building on the Mountain Campus.
- Gold Line, which provides late night service and direct connections between downtown Missoula, the Mountain Campus, and South Campus housing and parking.
- Green Line, connecting main campus to the East Broadway park-and-ride lot on the north side of the Clark Fork River (Note that service on the Green Line has been suspended for the 2015-2016 academic year, as work proceeds on construction of the new Missoula College building on East Broadway. Service will be restored when the new Missoula College building opens in 2016).

Additionally, UDASH operates shuttle services during football games and commencement services.

Figure ES-8 UDASH Route Map



Source: Associated Students of the University of Montana

Mountain Line, which operates fixed-route and paratransit service throughout the Missoula region, serves the campus with three routes described below:

- Route 1, serving the Downtown Transfer Center, Missoula College, and Southgate Mall.
- Route 8, serving 5th and 6th Streets, Community Hospital, and Southgate Mall.
- Route 12, serving the Downtown Transfer Center, the Lewis and Clark Transfer Center, and South Hills.

As of January 2015, Mountain Line services are free to use for passengers, a "zero-fare model" operating in a three-year demonstration project to increase annual ridership to 400,000 transit trips.

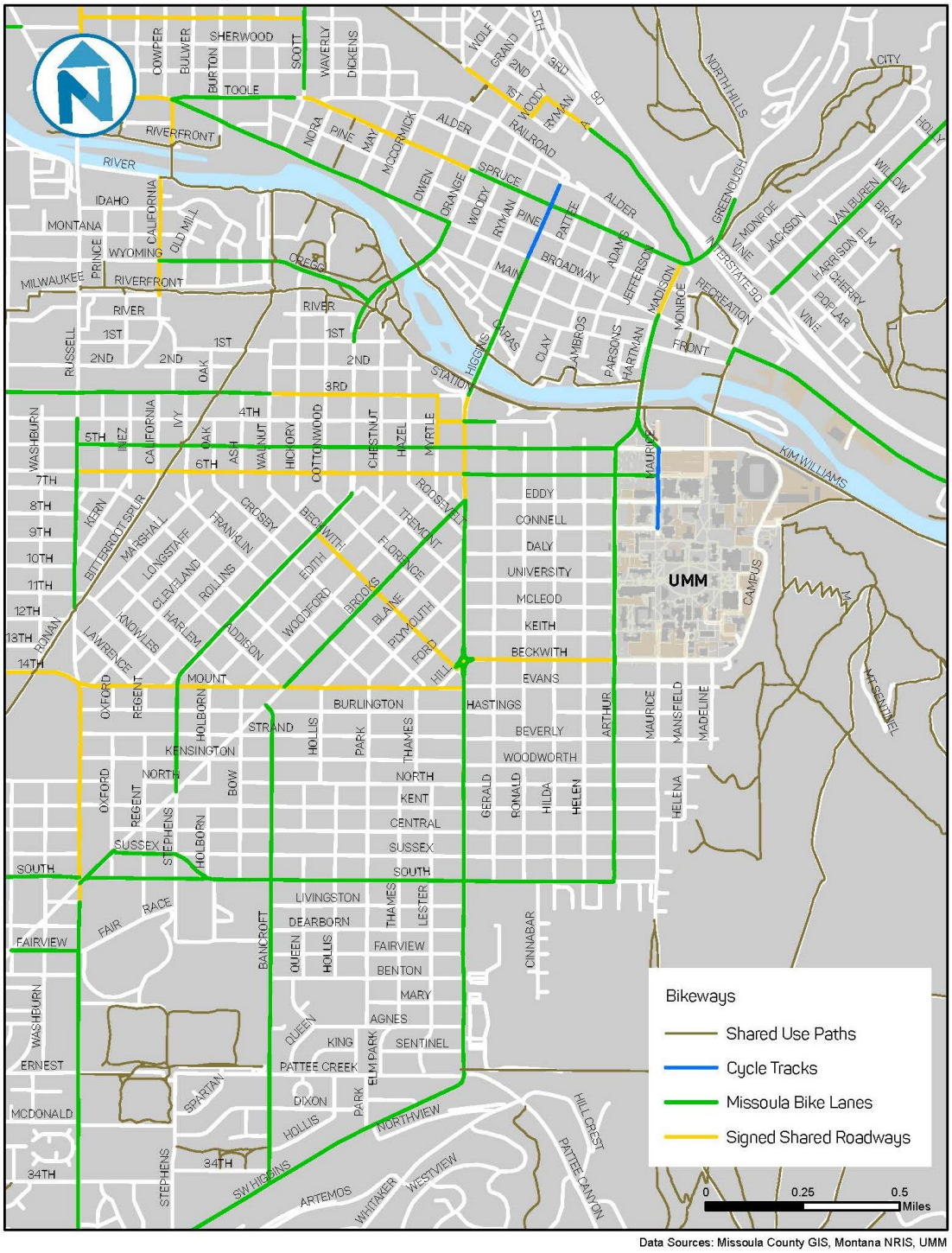
Bicycle and Pedestrian Infrastructure and Safety

As noted in the identified travel trends, bicycling is a significant component of transportation options at UM as it is one of the easiest and fastest ways to get to and around the UM campus. Several initiatives are in place to make bicycling a more viable options for affiliates. These initiatives include:

- A Yellow UBike bikeshare program that allows affiliates to check out bicycles for up to 48 hours using their identification cards. Bicycles are available 5 days a week for checkout
- Bicycle rental services provide students a bicycle for personal use at the rate of $60 per semester, which covers the cost of maintenance, lights, a lock, helmet, and basket.
- Bicycle loan program is available through the Missoula Federal Credit Union. These loans can be for as much as $1,000 and are zero interest for 18 months.
- Awareness programs and campaigns including the Walk & Roll Week and #30daysofbiking challenge, annual events used by ASUM to promote active modes of transportation

As seen in Figure ES-9, bicycling to the UM campus is made easy by a robust bicycling network in Missoula with bicycle lanes, and cycle tracks providing direct access into the campus. Furthermore, a robust supply of bicycle parking locations providing a space to secure a bicycle at most campus buildings make bicycling a convenient option for affiliates.

Figure ES-9 Missoula Bicycle Facilities

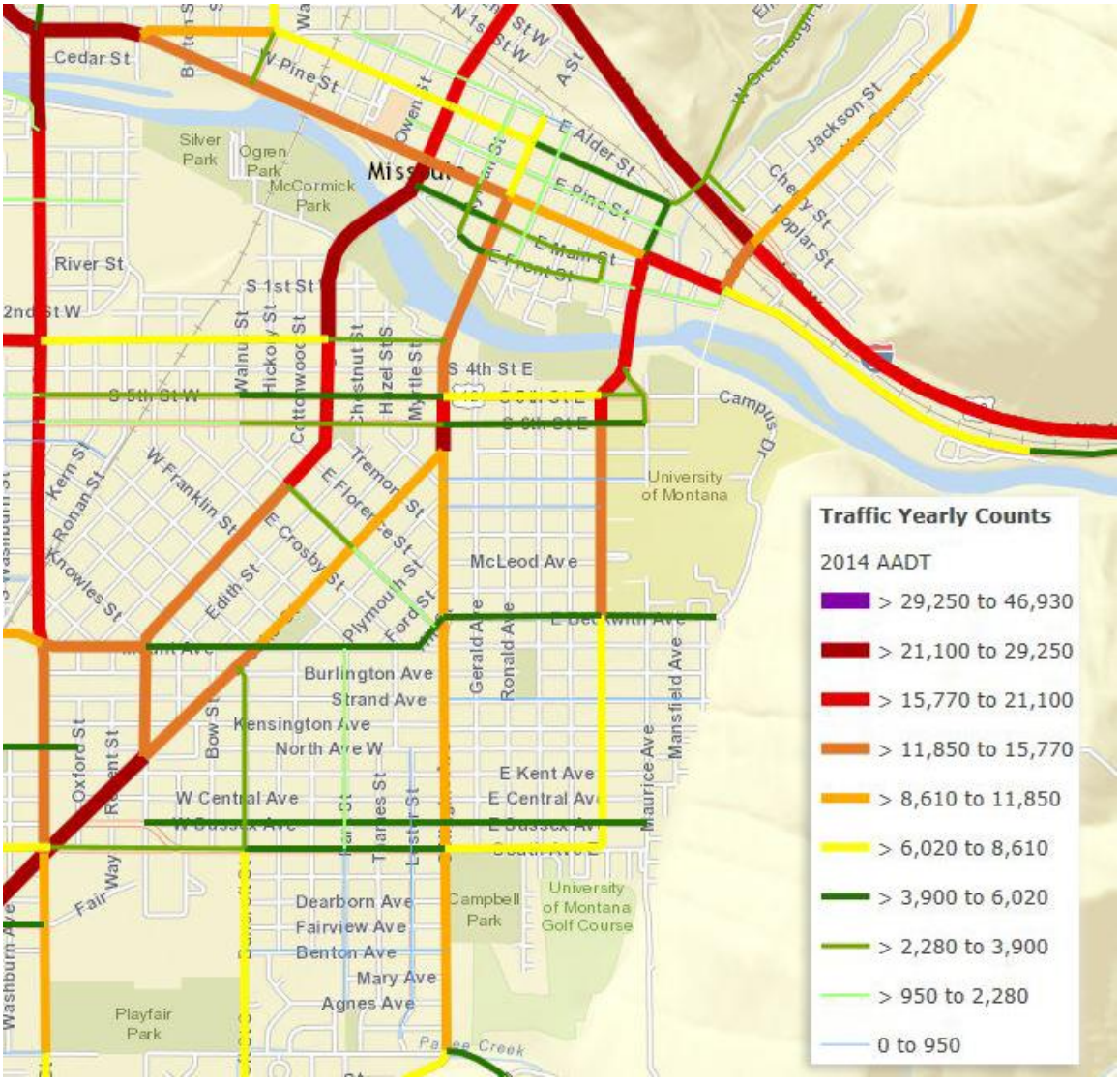


Vehicular Circulation

UM is a major trip generator in Missoula and, as such, is surrounded by busy corridors serving individuals going to and from the campus. As seen in Figure ES-10, the busiest corridors surrounding main campus are the north-south arterials that cross the Clark Fork River to downtown Missoula and Interstate-90.

The busiest segments are Arthur Avenue from 5th St to 6th St, serving an average of 16,090 vehicles daily, and Arthur Avenue from 6th St to Eddy, serving 11,880 vehicles.

Figure ES-10 Annual Average Daily Traffic



Source: Montana Department of Transportation

Ridesharing and Vanpooling

The Missoula Ravalli Transportation Management Association, MRTMA, operates the local "iRide" vanpool service. This service has a fleet of 24 vehicles, providing service along 20 routes to, from, and within Missoula County. Of these, 7 routes deliver commuters to the UM campus.

To join the vanpool service, any member of the public simply has to complete an online registration with MRTMA. Fares range from $105 to $140 per month. However, two of the seven UM vanpool routes currently operate fare free as a result of a subsidy provided by the University of Montana Foundation.

In 2014, the iRide service provided over 31,600 rides to 155 regular commuters to a total of 75 work sites throughout western Montana.

Travel Trends (Based on Travel Survey)

Travel surveys were used to collect information from UM campus affiliates in 2014 and 2015. A total of 833 individuals responded to the 2014 employee survey and 429 responded to the 2015 student survey. Major findings in travel trends include:

- Less than half of employees (48%) and only 37% of students drive alone to campus.
- Bicycling accounts for 18% of employee commute trips to UM and 20% of student trips, reinforcing the importance of bicycling in the UM community.
- About 41% of respondents travel to their permanent address five times or less, suggesting that many students may have vehicles that are parked a majority of the time, resulting in underutilized parking spaces.
- Nearly 70% of students commute three miles or less from home to campus, and only 10% must travel more than 10 miles, making alternative modes of transportation competitive options.

IMPLEMENTATION AND MONITORING

Implementation

Chapter 4 provides a recommended roll-out plan for the implementation of TDM measures. It provides a brief summary of proposed TDM strategies identified in Chapter 1 and identifies an implementation timeline of these TDM strategies. The following principles should guide implementation of the recommended TDM strategies:

1. TDM strategies should be implemented in two phases to improve existing management strategies and introduce new tools to improve access and mobility to the UM campus.
    a. **Short-term** strategies will focus on improving the user's travel experience, better managing parking, and introducing cost-effective incentives and information to guide transportation decisions.
    b. **Long-term** strategies introduce new technologies and expanded infrastructure initiatives to more aggressively manage TDM.
2. The cost of TDM strategies should be balanced with parking revenues. When determining which strategies to employ, parking pricing should be set to cover TDM costs.

3. Establishment of an active monitoring program to track performance and inform effectiveness of strategies in meeting transportation goals, and guide changes as necessary to maximize effectiveness.

Program Monitoring

It is critical to establish a system to monitor the performance of TDM strategies. By observing how travel behavior changes over time, UM will have the tools to determine the proper time to implement TDM measures, gauge their effectiveness, and distribute quantifiable data that will allow a prioritization of the campus's financial and personnel resources, as well as guide any changes to the way strategies are implemented. Program monitoring should consist of conducting annual transportation surveys among employees and students, and observing and recording parking utilization.

Elements of establishing a transportation survey and monitoring parking utilization are contained in Chapter 4.

1 TDM STRATEGIES

This chapter outlines the TDM strategies that are recommended for the University of Montana, Missoula (UM) to meet the transportation needs of students, faculty, staff and campus visitors by providing efficient and diverse transportation options. For each recommended strategy, a general description summarizing the desired outcomes and reasoning for the application of the strategy will be provided.

Strategies are listed in Figure 1-1 below, and are further categorized by their anticipated phasing. This plan assumes a near-term (1-2 years) and long-term (~10 years) phase for implementation. Near-term recommendations are seen as recommendations that could be approved and implemented as soon as the plan is adopted with minimal challenges. Long-term recommendations are provided to assist UM in accommodating future transportation needs that meet the demand of a growing campus.

Figure 1-1 Proposed TDM Strategies

Short-Term Strategies	
#	**Strategy**
1	Improve parking management and price incentives
2	Promote ridesharing through priority rideshare parking locations and the City's rideamigos program
3	Expand and improve (cost-efficient) bike parking
4	Improve campus bikesharing service
5	Expand multimodal wayfinding
6	Fund regular maintenance of transportation facilities
7	Vehicle fleet/car sharing
8	Improve UM app with real-time parking pricing, availability, transit & bike info
9	Introduce employee transportation benefits
10	Incentivize students living on campus to not bring cars
11	Facilitate remote parking options for campus residents and Missoula College affiliates.
12	Communication and education of transportation program
13	Establish robust monitoring and evaluation
Long-Term Strategies	
#	**Strategy**
14	Consolidate parking and multimodal access/TDM services (Access & Transportation Services) and appoint a single transportation manager of the department

15	New Bike/Pedestrian Bridge to Missoula College
16	Daily/hourly pricing using LPR technology
17	Residential Parking Benefit Districts
18	Integrate/Expand UDASH & Mountain Line
19	Expand network of protected bike lanes
20	Wayfinding and real-time parking availability at gated Lot R
21	Adopt policy establishing parking management goals, including availability targets

SHORT-TERM TDM PACKAGE

1. Improve Parking Management & Price Incentives

Overview

Effective parking management can take several forms from simply the allocation and permitting of certain spaces to the pricing (at varying levels) of spaces. In terms of allocating and permitting spaces, the simple rule of thumb is that spaces accessible to a larger number of users experience better efficiency (i.e. are occupied more frequently). As such, to the degree possible, effective parking management encourages spaces to be open to as many users as possible. Similarly, if a space type (e.g. hourly parking) is not being used effectively, it may be prudent to convert that space to a different type that is in higher demand.

In terms of parking pricing, the goal is to charge more for more desirable (in demand) locations in order to make it easier to find a parking space. By monitoring occupancy trends and adjusting pricing to meet parking behaviors, the demand for parking can be managed in a way that encourages affiliates to consider the costs of parking closer to their destination, or walking longer to save money. Ideally under this strategy, parking in or near the center of campus would be more expensive than parking along the periphery.

For off-street facilities where motorists turn over infrequently, target occupancy rates should be high, at approximately 95%, to ensure that supply is optimally utilized. These rates provide enough vacancies that motorists can easily find a spot near their destination when they first arrive. Therefore, for a given off-street facility, the “right price” is the price that will achieve this goal. This means that pricing should not be “uniform,” as the most desirable spaces necessitate higher prices, while less convenient lots should be less expensive. Furthermore, prices should change to respond to differences in demand based on time of year, long-term population growth, or development impacts.

While the primary goal of demand-based parking is improving user convenience, pricing of parking has also been shown to be one of the most effective ways to reduce vehicle trips, cruising for parking, emissions, and the demand for parking. Because motorists are sensitive to pricing changes, parking fees often have the greatest impact on travel behavior because they are a direct and conspicuous user fee. Numerous studies have been conducted analyzing the effects of parking pricing on demand. For the purposes of this study, a parking elasticity of -.3 is assumed. In other words, a 10% increase in parking fees results in a 3% decline in parking demand.

Implementation

One of the key findings from the existing conditions analysis was that while overall parking demand at UM peaked at 82% at 10 AM, there was variation in utilization rates among the facilities throughout campus, particularly in spaces on the northern edge of campus and in reserved and hourly spaces. Therefore, perceptions of a parking shortage on campus is instead an issue of parking management. In fact, during the peak hour, there were more than 540 available spaces at 95% of supply.

Given these findings, it is recommended that a two-tier pricing structure is adopted, setting prices for parking at the core of campus at one rate, and parking along the periphery at a lower rate (Missoula College would be priced at the "core" rate to not dissuade UM affiliates from using it as discount parking). In addition, this strategy will also require reserved parking spaces to be priced and managed, summer parking pricing to be adjusted, and overnight street parking issues to be addressed. Specific phased details of the parking strategy include:

2017

A. Charge all Missoula College affiliates for parking at the same rates as UM affiliates when the new facility opens.

B. Convert most reserved spaces from a per-space to a per-lot basis so that the University can better utilize spaces and create a small oversell permit ratio to boost revenues. The University may wish to preserve some individual reserved spaces for high level executives (e.g. President).

C. Convert half of the hourly spaces in Lot S to decal spaces to increase utilization.

D. Consider lowering summer parking prices if monitoring demonstrates high availability.

E. Reintroduce on-street overnight parking restrictions to allow equal usage of parking during early-morning work hours.

2018

F. Modestly increase parking prices to finance short-term strategy improvements and keep pace with inflation.

G. Create a two-tiered parking pricing system that includes "value" lots. Lots M, M1, and Campus Drive North experience lower utilization and would be priced lower than all other lots. With proposed price increases, value lots would be $227 per year and all other lots would be $243 per year.

It is possible that the initial pricing structure established will not achieve the desired occupancy rates. Therefore, prices should not be static, but periodically adjusted to respond to changes in demand. The proposed structure is an initial framework that may need to be adjusted up or down depending on how parking demand reacts to the pricing changes. To ensure that parking shortages do not occur in the "value" lots, an annual cap should be placed on the number of "value" permits sold. If too many "value" permits are sold in the first year of implementation and parking occupancy exceeds targets in the "value" lots or the cap is reached, the price of "value" permits should be increased the next year to reduce demand and ensure parking availability.

Cost Estimate

The creation of a two-tiered parking system will create a negligible revenue impact as lower parking revenue in value lots are offset by "backfill" in regular lots. Better utilization of reserved and hourly spaces may increase revenues, but for modeling purposes, this analysis assumes a net zero revenue effect.

2. Promote Ridesharing

Overview

Ridesharing is a proven and effective means of reducing the number of commute trips. Ridesharing is attractive to commuters because it can save both time and money due to shared travel costs. Numerous employers also offer additional benefits to rideshare vehicles including preferential parking, pre-tax benefits, and reduced parking costs as a means to incentivize this mode of travel.

Figure 1-2 Rideshare Vehicle and Preferential Signage Used at a Business Campus

Implementation

At UM, this strategy recommends a program to promote ridesharing by establishing priority rideshare parking locations on campus (exact locations to be decided by staff) to encourage people to carpool and/or vanpool, thus reducing the total parking demand on campus. In addition, it encourages the use of the City's RideAmigos transportation management program, which connects users to information that make it easy to join a carpool/vanpool.

By offering prime parking locations to carpools/vanpools, and making affiliates aware of the City's RideAmigos program, UM can incentivize affiliates to establish ridesharing groups.

Cost Estimate

Given the limited number of carpools currently on campus, the immediate cost impact is expected to be minimal (vanpools currently park for free). If the popularity of ridesharing dramatically increases in the future, parking permit revenue would likewise decline. However, it is still

anticipated that any loss of revenue from the reduced prices or additional enforcement costs would be limited.

3. Expand and Improve Bike Parking

Overview

As identified in the travel preference survey findings discussed in Chapter 3, bicycling is an important option for UM Affiliates. Ensuring that sufficient bicycle parking is made available in desirable, visible, and easily accessible locations, makes bicycling a more attractive option for commuters.

Implementation

In order to improve bicycle usage, it is recommended that annual utilization counts are conducted to ensure that there is an adequate supply of bicycle parking, and install additional bicycle parking as necessary. When parking capacity is insufficient, additional bicycle parking should be installed. In addition, because some students prefer to store their bicycles on campus, long-term storage should be an option.

Cost Estimate

The cost of bicycle racks varies widely based on a variety of factors, including size, design, and order quantity. A typical cost is about $25 per bike, not including installation. Bicycle storage lockers are significantly more expensive and can cost as much as $540 per bike.

For modeling purposes, this analysis assumes the installation of 200 secure, covered bike lockers at an annual cost of roughly $10,000 (inclusive of debt service).

4. Improve Campus Bikesharing Service

Overview

The UM yellow bike program provides affiliates the opportunity to check out a bicycle for up to two days at no cost. Currently, a GrizCard is used to check out a bike from the Mansfield Library, in order to access the bicycle at a nearby parking garage.

This system can be expanded upon to create a broader bikeshare system, that allows students to access and dock bicycles at various locations across campus. Expanding to a true bike share system will create a convenient and easy to use way to get across campus quickly.

Bike sharing is an increasingly popular travel program that has been very successful in improving mobility and access in urban centers, commercial districts, and college campuses. Much like car sharing, bike sharing offers users a dispersed pool of bicycles for short-term use. Users rent bicycles on an as-needed basis and can return the bicycle to any number of docking stations. In the university setting, bicycle sharing is particularly attractive because it offers a flexible and inexpensive option for short-distance trips around campus. It can improve accessibility between periphery facilities (such as a parking lot or transit stop) and the campus core. Locations just outside a reasonable walking distance from campus can also now be reached within a 5-10 minute bicycle ride and no longer require a vehicle trip.

Figure 1-3 Bikeshare Kiosk in Denver, CO

Implementation

Given the relatively compact nature of the UM campus, a bike share service does not need to be expansive, particularly since the City has not expressed interest in participating in the program. Bicycle kiosks should be established at key accessible locations on campus that provide direct access to campus destinations as well as to bicycle infrastructure.

Cost Estimate

Assuming the bikeshare system is contracted to a private provider, it is possible for providers to cover a significant portion of costs through sponsorship and membership fees. In order to be conservative, for modeling purposes this strategy assumes 100 bikes on campus with an annual cost of approximately $9,000 to the University (inclusive of debt service).

5. Expand Multimodal Wayfinding

Overview

Wayfinding is a simple solution to improving awareness and safety for all road users. It reminds drivers and bicyclists to be respectful and aware of one another, and helps all reach their destination as directly as possible, reducing the congestion impacts of individuals unable to find their way.

For students, faculty, and staff who do not currently walk, bicycle, or take transit to campus, lack of information about these options makes them less appealing. When someone considers taking the bus, lack of knowledge about the location of pick-up and drop-off points serves as a disincentive. This is especially true for people who currently drive to campus, because they will be

familiar with the location of the parking garage and its relation to where they need to go, but will be less aware of other travel options.

Wayfinding signage also serves as a marketing tool. Signs serve as well-placed advertising for the variety of travel options available on campus. In addition to displaying directions, they can also include the time to walk or bike to destinations. Wayfinding guidance can also be incorporated into the UM mobile app.

Figure 1-4 Multi-modal Signage in Oakland, CA

Implementation

Wayfinding options should be placed in visible locations at the intersection of pedestrian paths or other high pedestrian volume locations. They should indicate the location of bus stops, bicycle parking, bicycle maintenance stations, City of Missoula bicycle facilities and other locations relevant to non-auto travel.

Cost Estimate

Cost of wayfinding improvements will vary based on signage detail and quantity, but for the purposes of this analysis, it assumes an annual budget of $5,000.

6. Fund Regular Maintenance of Transportation Facilities

Overview

Capital investments are only useful to the extent that they are maintained. Keeping track of aging infrastructure on campus and reporting deficiencies can help ensure that facilities are kept in proper working order. In some cases, it may be prudent for UM to contribute to the maintenance of adjacent City-maintained facilities.

Implementation

A targeted list of on-campus facilities (e.g. sidewalks, parking lots, etc.) in need of maintenance should be developed. All relevant City-maintained facilities, including streets, sidewalks, bus stops, and bike lanes should be inventoried and evaluated on a recurring basis. Deficient facilities should be reported to the City of Missoula for appropriate improvements.

Cost Estimate

Additional funds available for maintenance as part of this strategy equal roughly $20,000 annually.

7. Vehicle Fleet/Car Sharing

Overview

Car sharing programs allow people to have on-demand access to a shared fleet of vehicles on an as-needed basis at an hourly or mileage rate. Car sharing has become very popular on college campuses. For example, Zipcar operates on more than 100 campuses. Through car sharing, individuals gain the benefits of private vehicle use without the costs and responsibilities of ownership. In addition, research has shown that car sharing reduces vehicle ownership and vehicle trips. A UC Berkeley study of San Francisco's City CarShare found that members drive nearly 50% less after joining.

Figure 1-5 Zipcar Designated Spaces and Vehicles

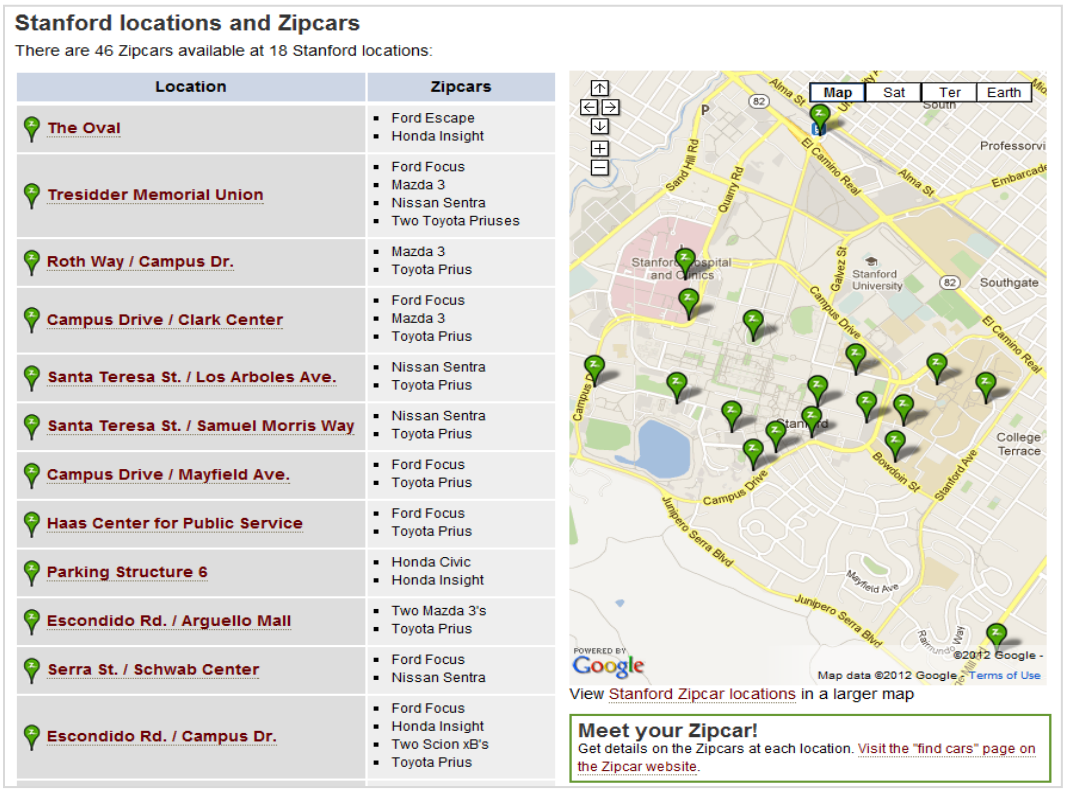
Implementation

Car sharing companies such as Zip Car create opportunities for individuals that do not need a car daily to access a vehicle. Developing a fleet for car sharing, by partnering with car share companies or developing a UM specific program, provides an alternative for students that do not need to use a car daily, but may want access in order to visit family or run errands. This reduces parking demand, as resident students that would otherwise have a car parked most of the time can utilize alternatives.

Once establishing a car share program, UM could also consider various car sharing incentive programs, such as a greater enrollment discount than what is already offered, or associated additional discounts for those who join commute clubs. For example, at Stanford University, students, faculty, and staff who are also part of the Commute Club receive car sharing discounts ($96 per year in driving credit) in addition to those provided to all campus members ($10 off membership fees; $35 in driving credit). Members also received $50 in referral credits when referring a new member.

Campus websites can also help to make car sharing an easy transportation alternative. As shown in Figure 1-6, Stanford University's website lists and maps all on-campus Zipcar pod locations and has easy links for vehicle reservation services. This page is directly accessible from the Parking & Transportation Services homepage.

Figure 1-6 Map of Zipcar Pods on Stanford Campus



Stanford locations and Zipcars

There are 46 Zipcars available at 18 Stanford locations:

Location	Zipcars
The Oval	▪ Ford Escape ▪ Honda Insight
Tresidder Memorial Union	▪ Ford Focus ▪ Mazda 3 ▪ Nissan Sentra ▪ Two Toyota Priuses
Roth Way / Campus Dr.	▪ Mazda 3 ▪ Toyota Prius
Campus Drive / Clark Center	▪ Ford Focus ▪ Mazda 3 ▪ Toyota Prius
Santa Teresa St. / Los Arboles Ave.	▪ Nissan Sentra ▪ Toyota Prius
Santa Teresa St. / Samuel Morris Way	▪ Nissan Sentra ▪ Toyota Prius
Campus Drive / Mayfield Ave.	▪ Ford Focus ▪ Toyota Prius
Haas Center for Public Service	▪ Ford Focus ▪ Toyota Prius
Parking Structure 6	▪ Honda Civic ▪ Honda Insight
Escondido Rd. / Arguello Mall	▪ Two Mazda 3's ▪ Toyota Prius
Serra St. / Schwab Center	▪ Ford Focus ▪ Nissan Sentra
Escondido Rd. / Campus Dr.	▪ Ford Focus ▪ Honda Insight ▪ Two Scion xB's ▪ Toyota Prius

View Stanford Zipcar locations in a larger map

Meet your Zipcar!
Get details on the Zipcars at each location. Visit the "find cars" page on the Zipcar website.

Source: Zipcar

UM could easily implement car sharing services as a part of a broader TDM program. Implementation would depend largely on the timeline of the private car sharing vendor and their determination of the viability of the UM market for additional car sharing vehicles.

Finally, UM should also explore working with peer-to-peer car sharing companies to expand and diversify the types of car sharing services provided at UM. Peer-to-peer car sharing services are similar to traditional car sharing services like Zipcar, except individuals rent out their own vehicles, instead of car sharing companies owning a dedicated fleet. Car share services screen drivers, manage insurance, and coordinate the rental process, while car owners post their vehicles on the service's website and determine when they are available to rent and whom they will rent to. All liability is handled by the third party intermediary.

For example, Wheelz is a peer-to-peer car sharing service that has launched at several California college campuses within the past five years, such as Stanford, UC Berkeley, and UCLA. On the Stanford campus, about 15 cars are available to rent, earning their owners an average of $200 per month, and thousands of students are currently registered on campus to use the service as drivers. Car owners can choose to only rent their cars to fellow students, and are paid per rental. The University could work with companies such as Wheelz to encourage expansion of their service on and near campus.

Cost Estimate

None to minimal. The costs for implementation would be the responsibility of the private car sharing company.

8. Improve UM App

Overview

A single integrated smart phone and tablet app that includes all travel options on campus would be a highly effective source for disseminating transportation information. The ubiquity of smart phones and tablets and the ability of simple software to provide key pieces of information, both static and dynamic, make apps an excellent option for informing students, faculty/staff, and visitors about mobility options.

An upgraded UM App would provide information such as real-time parking pricing, parking availability, transit, and bicycling information in a consolidated, easy-to-use platform, bringing a wealth of information to the fingertips of affiliates. Providing access to this information can help direct guests and affiliates to an open parking space, limiting congestion caused by individuals looking for parking. In addition, it could expose drivers to alternatives to driving by providing all transportation related information in one place.

Cost Estimate

The cost of these improvements may be covered by the existing contract with the app developer or coded through coordination with staff from a University department. The estimated annual budget allotted to app development is $4,000.

9. Introduce Employee Transportation Benefits

Employees should receive pre-tax funds to be allocated for transportation benefits for all available modes, including parking, transit, and bicycle use. This allows employees to allocate pre-tax income dollars to fund their transportation choices, and may inspire use of an alternative mode.

Overview

Pre-tax commuter benefits allow employees to reduce their commute costs and employers to reduce payroll taxes. By deducting the cost of commuting from pre-tax income, employees use tax-free dollars (subject to certain monthly limits set by the IRS each year) to pay for their commuting expenses. The 2016 maximum monthly pre-tax commuter benefit is $255 for parking fees or $255 for transit costs. The bicycle commuter benefit is $20/month. Commuter Check Direct estimates that employees can reduce their commute costs by up to 40% with this program.[1] The benefit to employers is a tax deduction which can decrease payroll taxes by 7.65% or more.[2]

Implementation

It is recommended that UM extend the benefits of this program to all employees. Additionally, by extending the program to employees who regularly commute by bicycle, UM could spur additional mode shift away from driving. In the long-term, this strategy can be expanded to include "wellness" subsidies to employees would do not drive alone to campus, but this would come at considerable cost.

Cost Estimate

Low to minimal administrative costs.

10. Incentivize Students Living on Campus to Not Bring Cars

Overview

As noted with strategy 7, many on-campus students bring a car to campus and keep it parked for a majority of the time, using it only occasionally. UM should encourage students to rely on car sharing, bike sharing, and other alternatives by providing incentives to leave their cars at home.

More than 65 universities across the country have utilized vehicle restrictions as a means to manage limited parking supply and encourage the use of alternative travel modes[3]. In the case of UM, it is recommended that students be offered incentives, rather than restrictions, to induce them to not bring cars to campus. This can be accomplished through car sharing subsidies, off-site parking subsidies, or other mechanisms.

Implementation

As noted above, this strategy is tailored to incentivize alternative modes and not adversely impact enrollment through restrictions. As such, this strategy envisions limited carshare and bikeshare

[1] www.commuterchecks.com

[2] National Center for Transit Research, http://www.nctr.usf.edu/programs/clearinghouse/commutebenefits/

[3] Comprehensive list of schools with car restrictions: http://www.aashe.org/resources/campus-car-bans

subsidies to resident students as well as a subsidy for students to park their vehicles in remote lots (see Strategy 11).

Cost Estimate

Low to minimal. If implemented, it is assumed that any loss in resident student permit revenue would be mostly offset by permit purchases from other students or faculty/staff wishing to purchase permits. The model assumes an annual cost of $12,000 for resident student subsidies, primarily to pay for remote parking fees.

11. Facilitate Remote Parking Options for Campus Residents and Missoula College Affiliates

Overview

As noted, many on-campus students bring a car to campus where it remains parked for long periods of time, reducing the utility of parking spaces. Though incentives to encourage students to leave their vehicles at home should be prioritized, some students will be hesitant to do so, or may require consistent access to a vehicle. In order to accommodate these needs while minimizing impacts on the on-campus parking supply, UM should engage with local partners to identify remote parking options.

Implementation

UM should identify and lease affordable and off-site remote parking to offer on-campus residents and Missoula College affiliates a cheaper alternative to parking on-campus. Remote parking could involve leasing spaces from nearby lots, such as the comfort Inn, or leasing spaces from a different private entity that provides both security and liability coverage. Other opportunities for off-site parking options include large commercial or employment centers that have excess parking supply.

Cost Estimate

Because UM will not be managing spaces directly, it is anticipated that this will be a minimal cost effort to identify potential locations for remote parking. It is anticipated that the cost of remote parking permits would be split between UM and the user (resulting in the subsidy described in strategy 10). The model assumes an annual cost of $12,000 for remote parking.

12. Communication and Education of Transportation Program

Overview

An effective outreach and marketing program is a key component of any successful TDM program. If the target audience is unaware that alternative travel options or financial incentives are available, it will be difficult to achieve trip reduction and mode shift goals. Universities that have had the most tangible success with their TDM efforts have invested substantial time and money in promoting and marketing their TDM programs. Key components of these efforts include a transportation and TDM website, the use of social media, and targeted outreach activities at campus events.

Implementation

To fully benefit from the resources made available to affiliates, the University should take an active role in disseminating information to students, faculty/staff, and visitors. Campus outreach will both provide information directly to intended recipients and help to increase Twitter followers, Facebook friends, and website visitors.

UM should also develop a suite of new or updated outreach and marketing materials to distribute to campus affiliates. Materials should be consistently branded and they should reinforce other marketing strategies. These materials could include:

- Parking, transit, and bike maps
- Informational flyers on TDM programs and social media
- Discount or promotional materials
- "How To" or "FAQ" brochures

These materials should be distributed to campus affiliates in a variety of ways, including:

- Orientation materials for new students and newly hired faculty/staff (already being conducted)
- At booths or tables at all major campus events
- Dormitories, residence halls, and on-campus housing
- Major bus stops and transit centers
- All on-campus and nearby retail businesses

Cost Estimate

It is estimated that the cost of this additional outreach could be accomplished with a budget of $5,000.

13. Establish Robust Monitoring and Evaluation

Overview

A robust monitoring and evaluation program is a crucial component to an effective TDM program. Consistent evaluation of TDM strategies enables objective assessments of program performance and allows administrators to quantify the efficacy of individual TDM strategies. Reliable performance monitoring and evaluation can be used to channel investments into the most effective strategies at UM. Publishing and disseminating performance data of TDM programs in annual reports also fosters greater transparency, accountability, and public trust.

The key components to a well-designed monitoring and evaluation program are:

- Identifying metrics that measure different dimensions of TDM program objectives including:
  - Trip generation
  - Mode of travel
  - Parking demand and adequacy of capacity
  - Transit ridership
  - Customer satisfaction

- Using data collection techniques that fit with and support operations
- Collecting performance information at regular intervals
- Comparing data over time
- Using reports to document performance, identify obstacles and opportunities, and discuss potential adjustments

Implementation

One of the objectives of the TDM program is to help manage impacts of campus-generated traffic on surrounding communities by providing students and employees with choices and incentives that make not driving to campus more attractive. To meet this objective, it is crucial that UM enhance its existing monitoring program to better gauge the effects of ongoing TDM efforts. The recommended monitoring and evaluation actions include:

- **Conduct an annual student and faculty/staff travel demand survey.** It is recommended that UM establish a simple travel demand survey instrument for distribution to student, staff, and faculty.

  The survey should measure travel mode and time of travel, estimated trip distance, transit route choice, parking preferences, existing barriers to bicycling, walking, and taking transit to campus, as well as levels of awareness of and satisfaction with transportation and TDM programs. Employees and students should be asked how satisfied they are with available travel choices, the travel choices they use, the interest/practicality of modes that are not used, and other attitudinal characteristics. The intent of gathering and assessing this information is to help refine facilities and services available to the campus population.

  UM should offer incentives to encourage participation and provide a convenient and user-friendly online survey to generate a higher response rate.
- **Conduct and analyze parking occupancy annually for vehicles and bicycles.** Parking occupancy counts for vehicles should be conducted on two or three weekdays (Tuesday, Wednesday, and/or Thursday) at certain hour intervals. Counts should take place during the middle of the Fall semester. Data collection methods should be consistent to allow for easy comparisons across years. Bicycle occupancy counts should be conducted at all UM bicycle parking facilities during the peak period of one weekday during the Fall semester.
- **Conduct annual bicycle counts.** Bicycle counts should be done at major access points during specific and consistent times in order to ensure the ability to measure change in the future. Counts should be volume-based segment counts and capture information about directionality, location in the right-of-way, and gender.
- **Gather transit ridership data from Mountain Line and ASUM service providers.** Tracking transit ridership will help UM evaluate transit use to and from campus and evaluate the effectiveness of any existing or future transit incentives.
- **Monitor traffic collisions near UM campus.** UM should work with local police enforcement to collect collision data regarding bicycle, pedestrian, and vehicle collisions on roads that serve the UM campus.
- **Prepare an annual report describing travel demand, survey results, occupancy data, and safety trends.** Reports summarizing data and offering observations about performance should be prepared no less than once a year. Year-to-

year comparisons should be made along with identification of milestones or events that may have occurred. A version of the report that is suitable for external distribution should be prepared and posted online.

Cost Estimate

Monitoring and evaluation costs are estimated to be approximately $5,000 per year based on the following assumptions:

- Employee and student survey: minimal, if an online survey instrument is utilized
- Vehicle and bicycle parking utilization: low if counts collected by students using data collection tools and supervised by Parking Services staff
- Transit ridership: minimal costs for collecting data from Mountain Line and the ASUM services

LONG-TERM TDM PACKAGE

14. Consolidate Parking and Multimodal Access/TDM Services

Overview

An enhanced TDM program at UM will require additional staff time to coordinate the development, implementation, and evaluation of the specific strategies described in this plan. It is important that TDM programs are properly staffed so that the various strategies operate as efficiently as possible.

TDM coordinators are professionals whose role is to promote and administer TDM programs. TDM coordinators can bring a diverse level of expertise in TDM program management and direct experience in implementing complex TDM strategies at large institutions with diverse transportation needs.

Implementation

This strategy requires two key steps. First, TDM services managed by ASUM, Parking services, and all parking activities currently managed by Athletics and the Adams Center should be consolidated under one department in order to ensure a comprehensive approach to managing transportation at UM and effective coordination of resources. Second, the appointment or hiring of a dedicated transportation manager to lead the department and champion for diverse transportation option on campus is necessary in order to develop a plan for how to pay for campus security with funds other than those gained from parking revenues. Key responsibilities of this transportation manager would include:

- Monitor the parking permit program and evaluate the efficacy of pricing structures to achieve desired occupancy targets
- Coordinate with ASUM and Mountain Line regarding all local transportation programs
- Coordinate with the City of Missoula to implement key bicycle and pedestrian facility improvements
- Manage all transportation marketing and outreach efforts

- Coordinate with car sharing companies to expand and diversify car sharing services
- Coordinate with the City of Missoula to secure short-term and long-term funding for TDM programs
- Oversee all data collection and program evaluation efforts, including annual TDM reporting
- Manage event pricing strategies

Cost Estimate

The cost for this position is assumed to be covered by an existing position among staff as these functions are largely being carried out at present by various persons.

15. New Bike/Pedestrian Bridge to Missoula College

Overview

With the relocation of Missoula College across the river from the Mountain campus, a bridge facilitating pedestrian and bicyclist movements between the two institutions would make it easier for affiliates to access resources at each location.

Figure 1-7 Example of a Bicycle and Pedestrian Bridge and Signage

Implementation

This strategy will require collaboration between the two educational institutions and the City in order to fund the development of a direct connection between the two campuses.

Cost

The total cost of the bridge can vary considerably based on its specifications, but for modeling purposes, it is assumed that UM would contribute roughly $150,000 annually over the period of a 15-year loan (with other funds from the City and state/federal grants).

16. Daily/Hourly Pricing Using LPR Technology

License Plate Recognition (LPR) technology can facilitate the shift from semester/annual parking permits to daily parking pricing, improve the efficiency of enforcement, and improve the user's parking experience.

Overview

The use of monthly, semester, or annual permits does not yield the most efficient use of campus parking resources. Once a student or employee purchases a pass, that individual ceases to consider the marginal cost of parking each day because the permit has become a sunk cost. Long-term permits actually create an incentive to drive to campus as frequently as possible in order to take advantage of the investment. In many ways, selling annual and monthly permits is similar to offering an "all-you-can-eat" buffet at a restaurant. Just as all-you-can-eat buffets typically encourage diners to return for additional helpings, long-term permits encourage commuters to drive even when it may be convenient to use an alternative mode, in order to "get their money's worth."

Furthermore, long-term permit prices are often set to incentivize even occasional drivers to purchase a monthly permit as the price of passes are commonly equivalent to the cost of less than a month's worth of daily passes. Thus, a student or employee who drives only a few days per month is often financially incentivized to purchase a monthly pass.

Under a daily fee system, the student or employee will make a conscious decision each day about whether it is worth it to pay the daily parking fee or whether a non-driving alternative might be a better option. In short, switching to daily fees allows commuters to save money every time they use an alternative to parking in campus facilities. This will help to reduce driving alone among those for whom shared or non-auto modes are a reasonable alternative.

Implementation

It is recommended that staff proceed with a License Plate Recognition (LPR) system for parking. Each affiliate wanting to park on-campus would register their license plate online with the University and each time an enforcement vehicle logs the vehicle, a parking fee is deducted from that person's account. License plate information will facilitate enforcement as LPR's can drastically reduce the amount of time necessary to monitor vehicles.

Due to the complexity of implementing new parking access technology and a new payment system, it is recommended that this strategy be implemented in two phases. First, the campus should upgrade its software and hardware to an LPR based payment system, while maintaining the current pricing structure for permits. Second, once this infrastructure has been successfully

installed and drivers have adjusted to using electronic permits, the university should transition to daily pricing using this technology.

Cost Estimate

Costs would depend on the selected technology and level of deployment. It is estimated that it would cost approximately $73,000 per year (inclusive of debt service).

17. Residential Parking Benefit Districts

Overview

Campus adjacent neighborhoods may be concerned with use of residential parking by UM affiliates impacting availability for residents. A parking benefit district may be a solution. This strategy typically involves the establishment of a parking management system that directs revenues for the improvement of the district.

Implementation

UM should engage with neighboring communities and the City to better understand community concerns and determine if a residential Parking Benefit District appeals to the community as a potential way to manage parking in communities adjacent to the community. UM, community members, and the City would work together to establish a management system that works best. For example, the district may be one in which a certain number of permits can be sold to UM affiliates and those revenues returned to the neighborhood association.

Cost

Such a program would require City staff time to administer and manage the program. The program would cost the City about $10,000 to establish, and about ¼ the time of a full time employee to manage the program annually. Much of the staff costs would likely be consumed in management and enforcement already conducted by the City for the existing permit district.

18. Integrate/Expand UDASH & Mountain Line

Overview

Increasing the frequency of transit service increases the quality of service available to affiliates. It reduces wait times in case someone misses their bus, and makes it a more competitive alternative to driving.

Implementation

This long-term strategy envisions an increase in the frequency of the purple and green UDASH lines to 10-minute service. Other improvements could be included within this strategy (e.g. establishing 10-minute service for all UDASH routes), but given the high cost of providing transit service, any improvement should be weighed carefully.

Cost

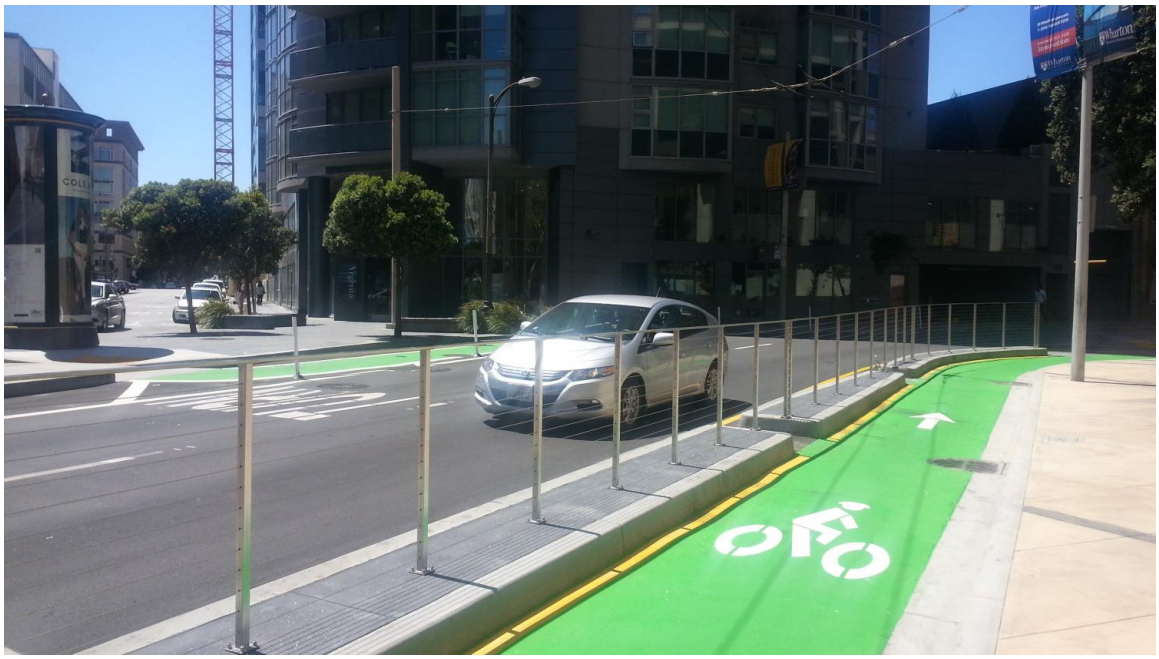
The cost of increasing service for the purple and green lines would be approximately $340,000 annually.

19. Expanded Network of Protected Bike Lanes

Overview

As noted, bicycling is a significant piece of the transportation puzzle at UM. Expanding the network of protected bicycle lanes will make bicycling a safe and inviting alternative to driving for a broader group of people. In order to accomplish this strategy, UM will need to collaborate with the City of Missoula to facilitate the installation of such infrastructure.

Figure 1-8 Protected Bicycle Lane in San Francisco, CA



Implementation

Specific corridors recommended for the expanded network of bicycle lanes are:

- E. Broadway
- South Avenue West
- Arthur Avenue
- South 5th Street
- South 6th Street

Cost Estimate

For modeling purposes, it is assumed that UM would contribute a portion of the overall costs of bicycle network improvements as they are utilized by the city as a whole. As such, the cost to the University is assumed to be $102,000 annually.

20. Wayfinding and Real-Time Parking Availability at Lot R

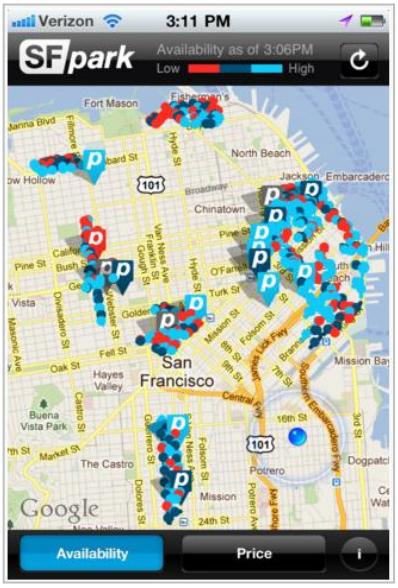
Overview

Parking wayfinding signage and real-time availability information on campus can help orient visitors, students, and faculty/staff alike, pointing them to parking facilities with unoccupied spaces. A wayfinding program can be tailored to specific groups depending on desired outcomes. Directional signage is most relevant and important for those unfamiliar with an area, helping to inform people of the best way to access an area once they arrive on campus. Parking wayfinding signs can also display real-time availability data, pointing motorists to facilities with available spaces, which may be more useful to students, faculty and staff who park on campus regularly.

Parking signs can direct motorists to underutilized parking facilities, freeing up the most convenient spaces closer to the center of campus, and maximizing the efficiency of a parking system. Improved wayfinding in the form of new signs can help maximize the use of parking facilities on the periphery of campus, representing another way to help eliminate traffic caused by cars circling and queuing for parking in overused lots. Wayfinding helps dispel perceived (but not actual) shortages in parking.

Wayfinding is most effective when it is consistent; all signage should be produced in a similar style. Regardless of the particular signage installation utilized, good design that is consistent with and supports the character of the campus is critical for all signage elements.

Figure 1-9 SFpark Signage and Real-Time Info Interface



Implementation

UM should develop a system of simple, easy-to-read signage to direct newcomers to campus to appropriate parking facilities, using clear, legible signs with general parking wayfinding information posted at all entry points to campus, and additional signs to guide motorists along each step of the way to their destination.

To aid students, faculty, and staff who park regularly on campus, UM should also consider implementing variable display signs that indicate the amount of parking available in real-time at Lot R. This information could also be made available on UM's website and with an integrated smart phone app to further assist motorists in planning where to park.

Many cities have used improved wayfinding and real-time parking information to better manage parking supply. For example, the SFpark program is a coordinated citywide parking management and wayfinding program to direct motorists in San Francisco to both on-street and off-street facilities with available spaces. Various wayfinding signs throughout the city's pilot areas direct motorists to parking facilities, and contain real-time availability information. The program has a significant online presence as well, enabling motorists to find garages and blocks with available spaces before circling multiple blocks in search of parking. The website and smart phone application also report the most recent pricing information, as rates are adjusted based upon demand.

The City of Santa Monica offers another example where the City created an integrated wayfinding and real-time data program for its downtown district. Wayfinding signage was installed throughout the downtown, directing visitors and residents to various amenities, and motorists to various parking garages. Each garage now has real-time availability posted both online and on signs throughout the downtown district. The program included a beautification effort which gave each off-street facility a distinct, attractive character, adding to neighborhood vitality.

Cost Estimate

Static wayfinding signage would incur a one-time cost to develop and install, but is a relatively low-cost improvement. Providing real-time parking data on variable display signs and online would require additional costs, including upgrading parking facilities with automatic vehicle counters. For modeling purposes, a combined annual cost of $5,000 is assumed.

21. Adopt Policy Establishing Parking Management Goals, Including Availability Target

Overview

A TDM program must establish goals in order to measure the effectiveness of adopted strategies. Goals may include a certain level of parking occupancy, travel mode split, or reduction of vehicular congestion. These goals must be established by UM in order to ensure the TDM program is operating in a fashion that is consistent with broader campus initiatives.

Implementation

A policy and goal setting process should be undertaken by UM admin and appropriate affiliate representatives. This process should identify a clear vision for the future of the campus transportation system and how it should continue to better serve campus affiliates. Specific targets should be set for various goals, and UM administration should be authorized to make changes to transportation strategies, such as parking rate changes, in order to ensure targets, set by adopted policies and goals are met.

Cost

Minimal costs would be incurred by UM during its goal setting process. Monitoring and management of TDM program performance would be the responsibility of the program director.

2 PARKING ASSESSMENT

OVERVIEW

In order to estimate the future parking demand financial implications of new TDM strategies at UM, a multi-stage model was developed as outlined below. The steps in developing the model included:

1. Reviewing current parking supply and demand and current population, by user group (commuter students, resident students, and faculty/staff). These data were obtained via the occupancy study conducted in October 2015, and presented in Appendix A.[4]
2. Estimating future population of each user group.
3. Estimating resulting future parking demand for each user group based on existing parking demand ratios (observed parked vehicles per person).
4. Projected parking supply changes based on proposed loss or addition of parking facilities.
5. Measuring the revenue and expenditure impacts of both new TDM strategies and the effects of those measures on parking permit sales.

The following inputs were the major components of the financial model. Many of these inputs were documented and assessed in Appendix A.

- Campus population of commuter students, resident students, and faculty/staff from 2017
- Number of parking spaces on campus
- Parking utilization rates, based on the peak demand in the October 2015 study
- Future plans for campus parking supply
- Current and projected revenues and expenditures, including proposed TDM measures and parking permit sales

MODEL ASSUMPTIONS

As with any modeling exercise where information is limited for key inputs, a number of assumptions were made for the financial modeling of the proposed TDM program. In general, a best estimate was used based on existing campus programs and revenues, experience with other cities, and professional judgment. This model used the assumptions listed below:

[4] Resident student parking demand was estimated as a percentage of the whole given that the data collection did not distinguish between student vehicles.

- Increases in campus population by user group were estimated based on consultation with UM staff. It was assumed that the campus population would remain steady through the horizon year of 2026 (except for the modeling exercise in Scenario 3 below).
- Price elasticity of demand for parking was assumed to be -0.3 (i.e. a 10% increase in parking price reduces parking demand by approximately 3%). This number represents a "midpoint" in values found in the national transportation research literature on parking demand elasticity with respect to price, which range from -.01 to -0.6, with -0.3 being the most frequently cited value.[5]
- Annual inflation rate was assumed to be 2% given historic inflation rates since 2010.
- For all parking spaces, this study uses an "effective parking supply factor" of 95%. Effective supply is defined as the total number of parking spaces in a lot, less the percentage of spaces that the parking operator wishes to have vacant even at the typical peak hour. Choosing an effective parking supply factor of 95% means that the operator wishes to have 5% of the parking supply vacant at peak hour. For the purposes of this analysis, the effective supply calculation combines commuter student, resident student, and faculty/staff spaces.
- Revenue projections from 2017 to 2026 were based on existing parking financial information and projected revenues from a tiered parking pricing structure and parking fee increases described in Strategy 1. These price changes were recommended to achieve the following goals:
  - Maintain campus-wide parking utilization rate of approximately 90% to improve user-experience in finding available parking spaces
  - Incentivize parking in less convenient parking facilities to improve the productivity of existing parking resources, spread parking demand, reduce congestion, and improve user convenience
  - Sustain financial solvency of the transportation program
  - Achieve broader parking reduction goals

Expenditures were based on existing parking and TDM program expenses extended into 2026 using an annual inflation rate of 2%. Added to existing program expenses were the implementation costs of the immediate and long-term TDM strategy recommendations, as discussed in Chapter 2 of this report.

SCENARIO 1 – BASELINE SCENARIO

Future Parking Supply and Demand

If both student enrollment and the number of faculty/staff remain steady, overall parking supply will be able to accommodate parking needs, but supply will continue to feel constrained. The Baseline Scenario examines parking demand over time accounting for inflationary effects by incorporating a parking price elasticity of -0.3. Figures 2-1, 2-2, and 2-3 illustrate the effect of a -0.3 parking price elasticity on the demand of spaces per commuter student, spaces per resident student, and space per faculty/staff member. In brief, the figures demonstrate the fundamental principle of demand: as prices increase, demand declines.

[5] Litman, Todd (2012). *Understanding Transport Demands and Elasticities: How Prices and Other Factors Affect Travel Behavior*. VTPI. http://www.vtpi.org/elasticities.pdf

Figure 2-1 Commuter Student Elasticity Curve

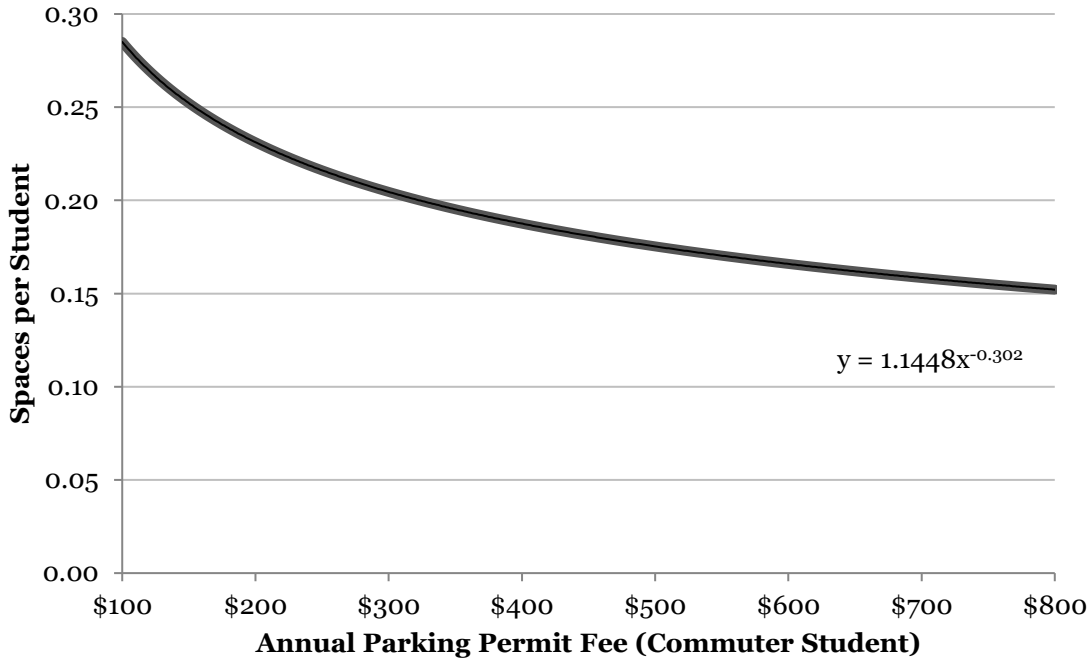


Figure 2-2 Resident Student Elasticity Curve

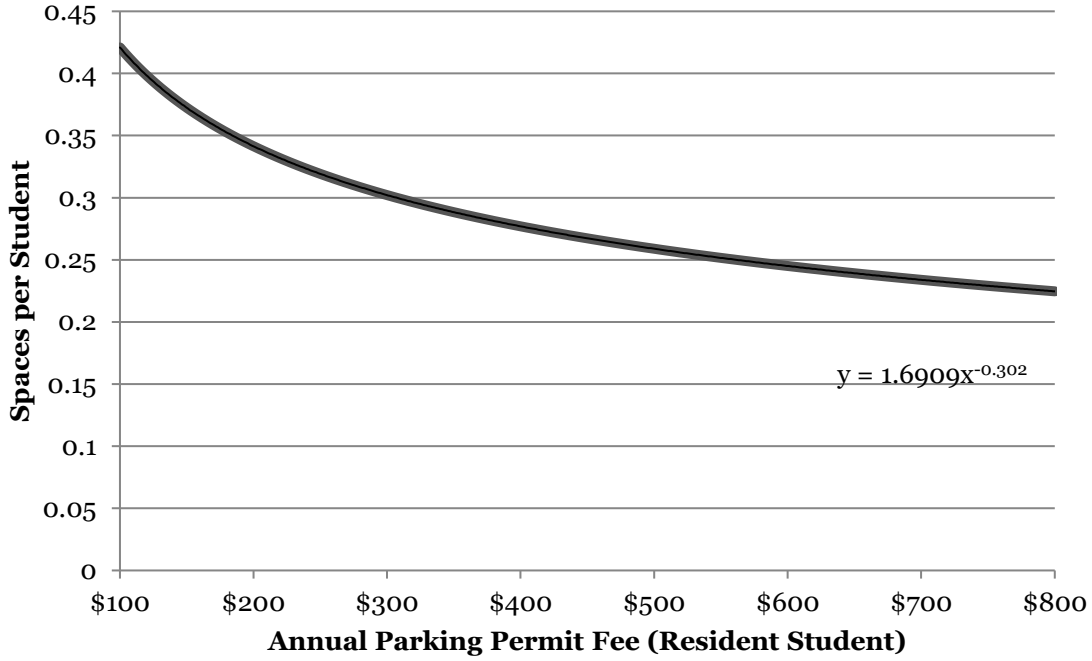
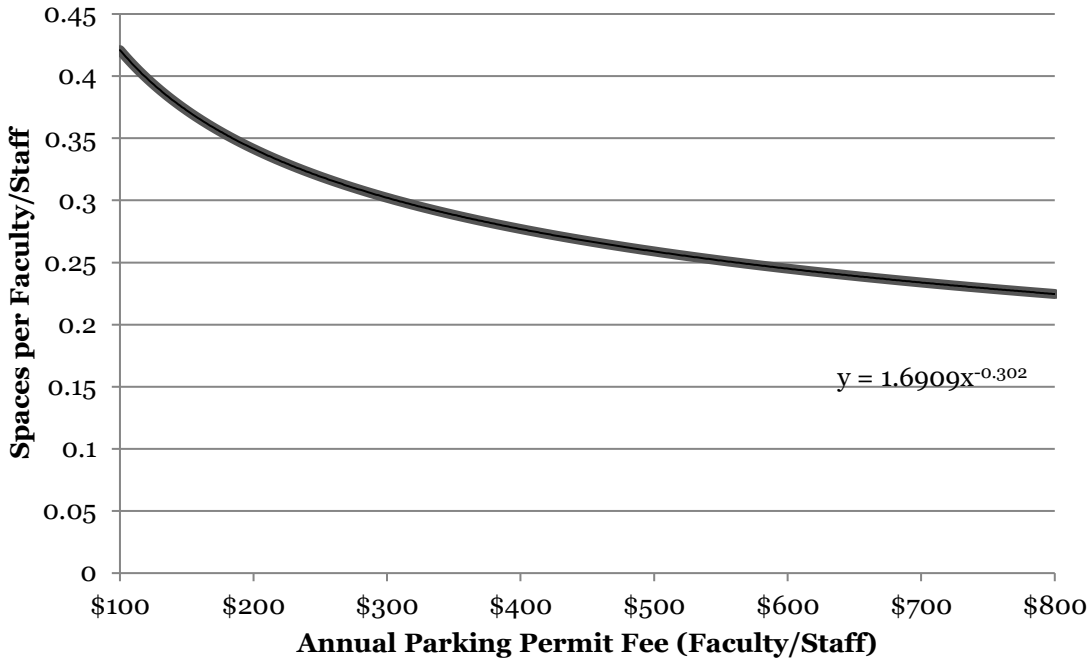


Figure 2-3 Faculty/Staff Elasticity Curve



Given the stable enrollment projection for UM and the assumed price elasticities, the Baseline Scenario continues to result in an effective parking surplus through 2026, but shows the parking supply becoming more constrained. This estimate assumes no parking price increases.

Figure 2-4 Projected Parking Demand, Baseline Scenario

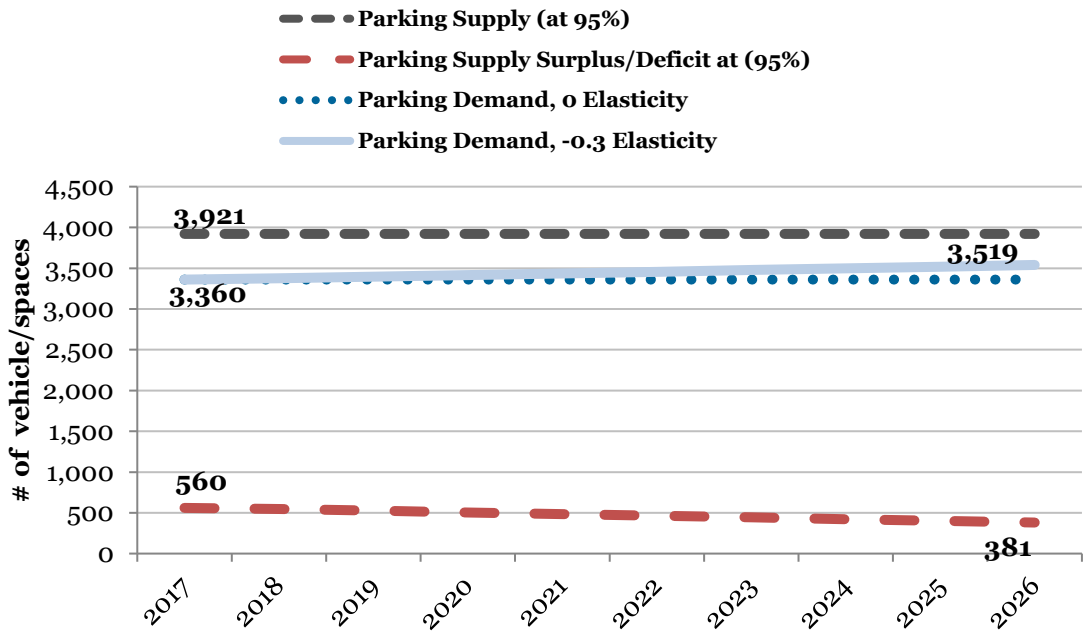


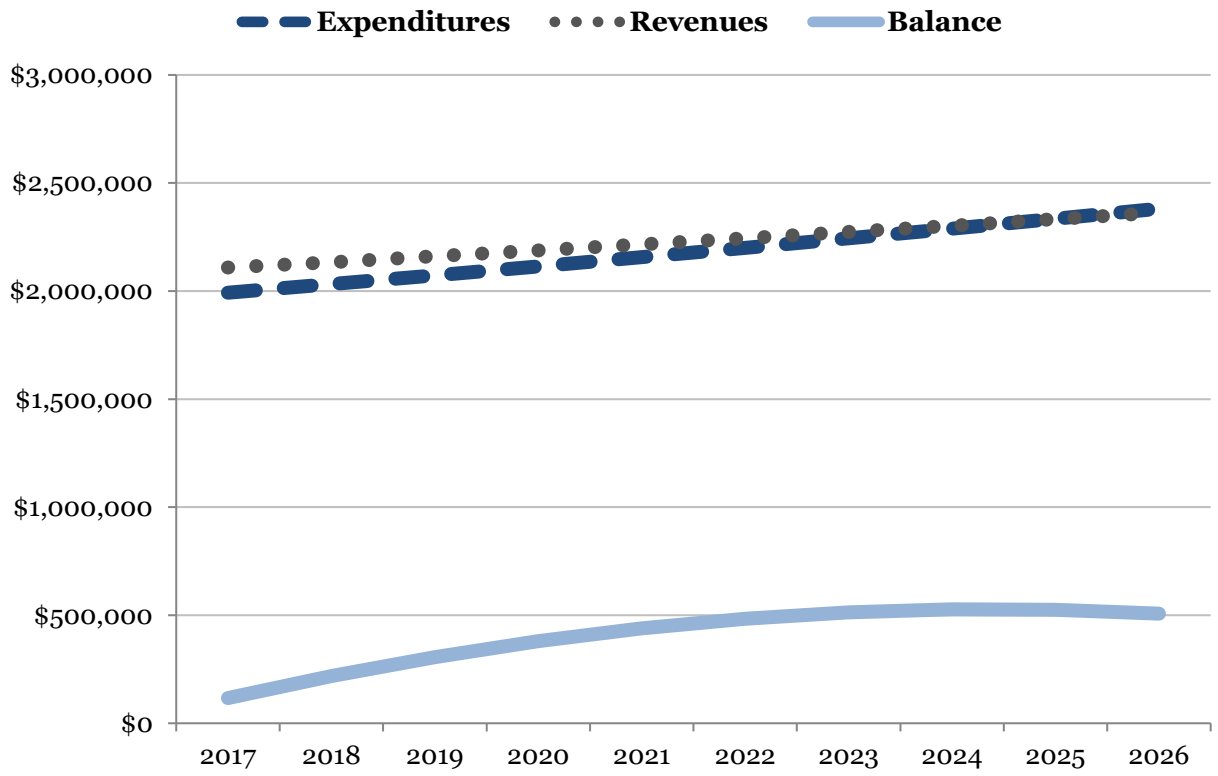
Figure 2-5 Summary of Projected Parking Demand, "Baseline" Scenario

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Commuter Students & Visitors	7,835	7,835	7,835	7,835	7,835	7,835	7,835	7,835	7,835	7,835
Resident Students	2,504	2,504	2,504	2,504	2,504	2,504	2,504	2,504	2,504	2,504
Faculty/Staff	2,374	2,374	2,374	2,374	2,374	2,374	2,374	2,374	2,374	2,374
Total School Population	12,713	12,713	12,713	12,713	12,713	12,713	12,713	12,713	12,713	12,713
Projected Commuter Student Parking Demand, Assuming an Elasticity of "0"	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751
Projected Resident Student Parking Demand, Assuming an Elasticity of "0"	826	826	826	826	826	826	826	826	826	826
Projected Faculty/Staff Parking Demand, Assuming an Elasticity of "0"	783	783	783	783	783	783	783	783	783	783
Projected Total Parking Demand, Assuming an Elasticity of "0"	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360
Price Index Assuming 2% Inflation	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20
Commuter Student Price Increase Projected	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Commuter Student Price, in Current Year Dollars	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225
Commuter Student Price in Real Dollars	$ 225	$ 221	$ 216	$ 212	$ 208	$ 204	$ 200	$ 196	$ 192	$ 188
% Reduction in Commuter Student Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	-0.4%	-1.0%	-1.6%	-2.2%	-2.9%	-3.5%	-4.1%	-4.7%	-5.3%
Resident Student Price Increase Projected	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Resident Student Price, in Current Year Dollars	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225
Resident Student Price in Real Dollars	$ 225	$ 221	$ 216	$ 212	$ 208	$ 204	$ 200	$ 196	$ 192	$ 188
% Reduction in ResidentStudent Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	-0.4%	-1.0%	-1.6%	-2.2%	-2.9%	-3.5%	-4.1%	-4.7%	-5.3%
Faculty/Staff Price Increase Projected	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Faculty/Staff Price, in Current Year Dollars	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225
Faculty/Staff Price in Real Dollars	$ 225	$ 221	$ 216	$ 212	$ 208	$ 204	$ 200	$ 196	$ 192	$ 188
% Reduction in Faculty/Staff Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	-0.4%	-1.0%	-1.6%	-2.2%	-2.9%	-3.5%	-4.1%	-4.7%	-5.3%
Adjusted Commuter Student Parking Demand (After Adjusting for Elasticity)	1,751	1,758	1,768	1,779	1,790	1,801	1,811	1,822	1,833	1,844
Adjusted Resident Student Parking Demand (After Adjusting for Elasticity)	826	830	835	840	845	850	855	860	865	870
Adjusted Faculty/Staff Parking Demand (After Adjusting for Elasticity)	783	787	791	796	801	806	811	815	820	825
Adjusted Total Parking Demand (After Adjusting for Elasticity)	3,360	3,375	3,395	3,415	3,436	3,456	3,477	3,498	3,519	3,540
Projected Supply	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127
Projected Effective Supply (95%)	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921
Projected Total Campus Surplus/Deficit	767	752	732	712	691	671	650	629	608	587
Projected Total Campus Effective Supply Surplus/Deficit (95%)	**560**	**546**	**526**	**506**	**485**	**464**	**444**	**423**	**402**	**381**

Parking System Revenue and Expense Review

UM staff supplied data on current parking expenses and revenues including operations and maintenance costs. Using these figures, Nelson\Nygaard projected system revenue and expenditures, assuming increases in expenses and other parking revenues tied to inflation. Student permit fees were not assumed to increase during this time. The result is a marginally revenue-positive outcome, primarily due to the permit revenue increases that are caused by a decline in the real price of permits. Figure 2-6 shows the expenses, revenues, and resulting balances in this scenario.

Figure 2-6 Projected Parking Revenues and Expenses, Baseline Scenario



SCENARIO 2 – PREFERRED TDM SCENARIO

The Baseline Scenario described above assumes that there is no change from the current parking and TDM program utilized by UM. In contrast, the Preferred Scenario projects the parking demand and financial impacts of instituting or expanding measures in a phased manner, while still weighing the effects of parking price elasticity.

In the Preferred Scenario, the costs of implementing the recommended TDM strategies are balanced by increased parking revenue in each phase, allowing the program to remain revenue positive until the long-term strategies are implemented. At that point, costs would increase substantially and would warrant a more detailed funding strategy as increases in parking prices alone would need to roughly double in order to finance potential programs. The Preferred Scenario recommends periodic parking fee increases of 8% in 2018 and 6% in 2021 to both meet inflationary needs and finance new measures. The dramatic change in parking demand in 2026 is due to implementation of new TDM measures. Figure 2-7 illustrates the impact on projected parking demand of an assumed parking price elasticity of -0.3 in conjunction with TDM Plan implementation and parking price increases.

Figure 2-7 Projected Parking Demand, Preferred Scenario

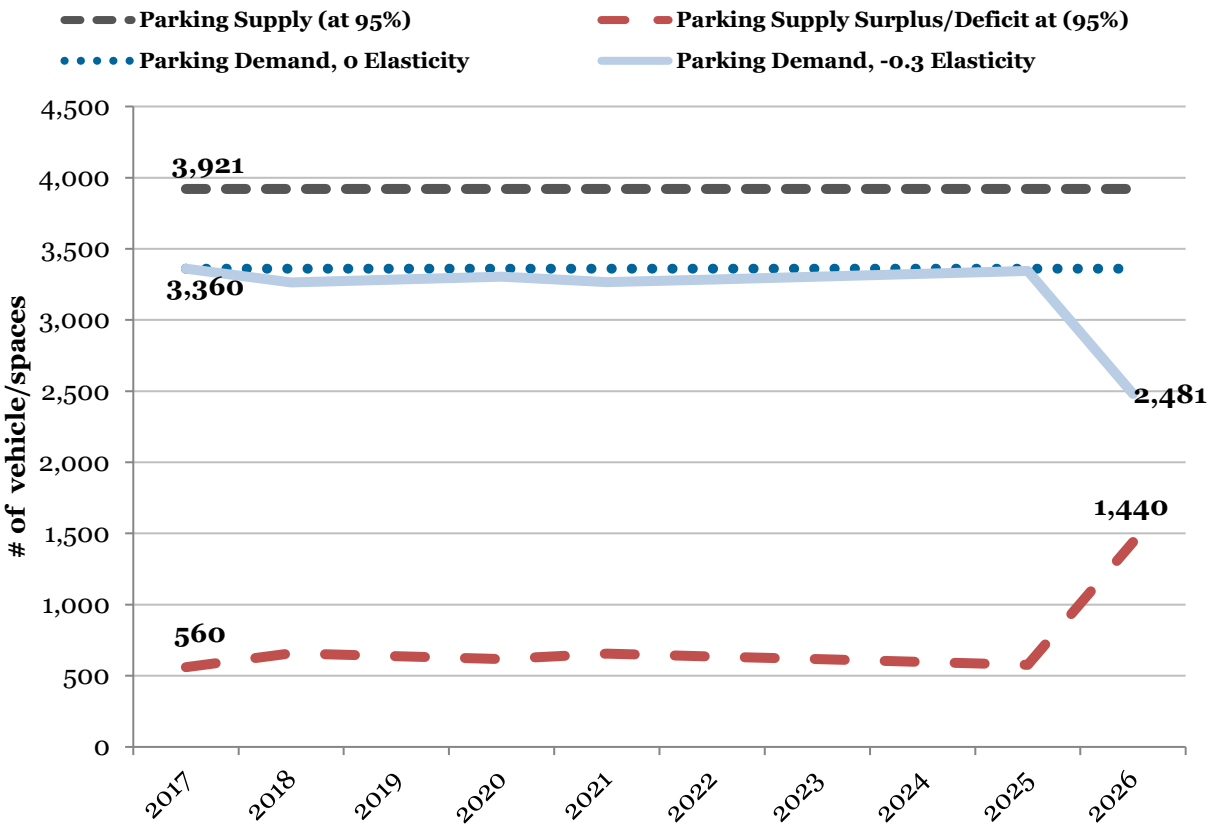


Figure 2-8 shows commuter student, resident student, and faculty/staff parking demand over time when accounting for elasticity and inflation. The table includes permit price increases taking effect at certain points to manage parking demand and guarantee an adequate revenue stream to fund the proposed TDM programs.

It should be noted that immediately after the implementation of parking fee increases in each phase, parking demand drops as drivers respond to the fee increase and the number of vacant parking spaces temporarily rises. While this surplus will give the University greater flexibility in closing lots in the future to accommodate growth, some in the campus community may question why the University is increasing prices when empty spaces are present. Ultimately, parking pricing is one of the most effective tools in promoting sustainability and although more parking spaces may sit empty due to higher prices, the University will be receiving the benefits of less traffic congestion, lower GHG emissions, and greater ease for motorists searching for available parking spaces.

Figure 2-8 Summary of Projected Parking Demand, "Preferred" Scenario

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Commuter Students & Visitors	7,835	7,835	7,835	7,835	7,835	7,835	7,835	7,835	7,835	7,835
Resident Students	2,504	2,504	2,504	2,504	2,504	2,504	2,504	2,504	2,504	2,504
Faculty/Staff	2,374	2,374	2,374	2,374	2,374	2,374	2,374	2,374	2,374	2,374
Total School Population	12,713	12,713	12,713	12,713	12,713	12,713	12,713	12,713	12,713	12,713
Projected Commuter Student Parking Demand, Assuming an Elasticity of "0"	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751
Projected Resident Student Parking Demand, Assuming an Elasticity of "0"	826	826	826	826	826	826	826	826	826	826
Projected Faculty/Staff Parking Demand, Assuming an Elasticity of "0"	783	783	783	783	783	783	783	783	783	783
Projected Total Parking Demand, Assuming an Elasticity of "0"	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360
Price Index Assuming 3% Inflation	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20
Commuter Student Price Increase Projected	0%	8%	0%	0%	6%	0%	0%	0%	0%	100%
Commuter Student Price, in Current Year Dollars	$ 225	$ 243	$ 243	$ 243	$ 258	$ 258	$ 258	$ 258	$ 258	$ 515
Commuter Student Price in Real Dollars	$ 225	$ 238	$ 234	$ 229	$ 238	$ 233	$ 229	$ 224	$ 220	$ 431
% Reduction in Commuter Student Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	2.9%	2.3%	1.7%	2.8%	2.3%	1.7%	1.1%	0.5%	26.2%
Resident Student Price Increase Projected	0%	8%	0%	0%	6%	0%	0%	0%	0%	100%
Resident Student Price, in Current Year Dollars	$ 225	$ 243	$ 243	$ 243	$ 258	$ 258	$ 258	$ 258	$ 258	$ 515
Resident Student Price in Real Dollars	$ 225	$ 238	$ 234	$ 229	$ 238	$ 233	$ 229	$ 224	$ 220	$ 431
% Reduction in ResidentStudent Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	2.9%	2.3%	1.7%	2.8%	2.2%	1.7%	1.1%	0.5%	26.2%
Faculty/Staff Price Increase Projected	0%	8%	0%	0%	6%	0%	0%	0%	0%	100%
Faculty/Staff Price, in Current Year Dollars	$ 225	$ 243	$ 243	$ 243	$ 258	$ 258	$ 258	$ 258	$ 258	$ 515
Faculty/Staff Price in Real Dollars	$ 225	$ 238	$ 234	$ 229	$ 238	$ 233	$ 229	$ 224	$ 220	$ 431
% Reduction in Faculty/Staff Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	2.9%	2.3%	1.7%	2.8%	2.2%	1.7%	1.1%	0.5%	26.2%
Adjusted Commuter Student Parking Demand (After Adjusting for Elasticity)	1,751	1,700	1,711	1,721	1,701	1,711	1,721	1,732	1,742	1,292
Adjusted Resident Student Parking Demand (After Adjusting for Elasticity)	826	803	807	812	803	808	813	817	822	610
Adjusted Faculty/Staff Parking Demand (After Adjusting for Elasticity)	783	761	766	770	761	766	770	775	780	578
Adjusted Total Parking Demand (After Adjusting for Elasticity)	3,360	3,264	3,284	3,303	3,265	3,285	3,304	3,324	3,344	2,481
Projected Supply	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127
Projected Effective Supply (95%)	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921
Projected Total Campus Surplus/Deficit	767	863	843	824	862	842	823	803	783	1,646
Projected Total Campus Effective Supply Surplus/Deficit (95%)	**560**	**657**	**637**	**617**	**655**	**636**	**616**	**596**	**576**	**1,440**

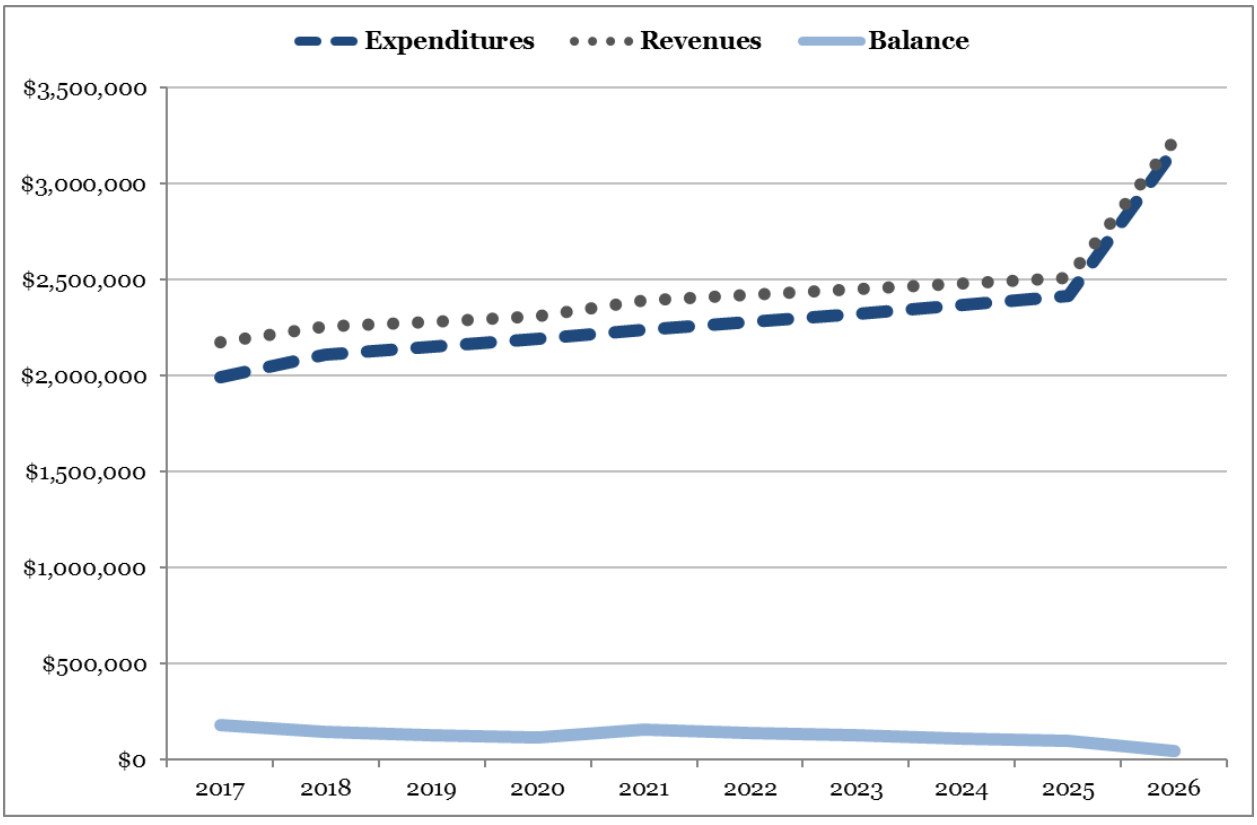
Parking System Revenue and Expense Review

In the Preferred Scenario, the tiered parking pricing structure of $227 per year for "Value" facilities (Lots M, M1, and Campus Drive North) and maintaining a price of $243 per year for all other parking spaces was calibrated to maximize use of under-utilized parking facilities, allow a certain number of vehicles to "backfill" spaces left vacant, and maintain revenue neutrality for "short-term" phase measures. In 2021, prices would be increased to keep pace with inflation, keeping real prices the same, but increasing nominal prices to $240 per year for "Value" facilities and $258 per year for all others. For modeling purposes in the "long-term" phase, the price of annual permits in "Value" facilities increase to $480, and in all other facilities, annual parking permits cost $515.

During the "short-term" phase, program expenses are estimated to increase roughly $80,000 annually while all "long-term" phase measures could result in costs upwards of $800,000. The estimates for program expenses include adjustments for inflation, changes to parking supply, and implementation of the TDM measures as described in Chapter 2.

Figure 2-9 shows the expenses, revenues, and resulting annual balances from instituting the three phases of the Preferred UM TDM Program. It is projected that the program will have a surplus of revenue neutral effect.

Figure 2-9 Projected Parking Revenues and Expenses, Preferred Scenario



SCENARIO 3 – CAMPUS GROWTH + SHORT-TERM TDM SCENARIO

Although enrollment growth is not currently anticipated in the immediate future, it is important to gauge at what point growth would cause a potentially insupportable transportation environment. This analysis

examines at what point the size of the total school population (i.e. students and employees) acts as a "trigger" point to necessitate more robust TDM measures to manage parking demand. As such, the analysis is based on total school population levels, rather than calendar years.

As in the Preferred Scenario, the costs of implementing the recommended short-term TDM strategies are balanced by increased parking revenue, allowing the program to remain revenue positive.[6] However, despite these programs, a steady increase in total school population will eventually result in a parking deficit. Figure 2-10 illustrates the impact of increased population on projected parking demand. It shows that shortly after reaching 14,000 affiliates (up from a current 12,713 affiliates), there will be a critical need for greater transportation management.

Figure 2-10 Projected Parking Demand, Growth Scenario

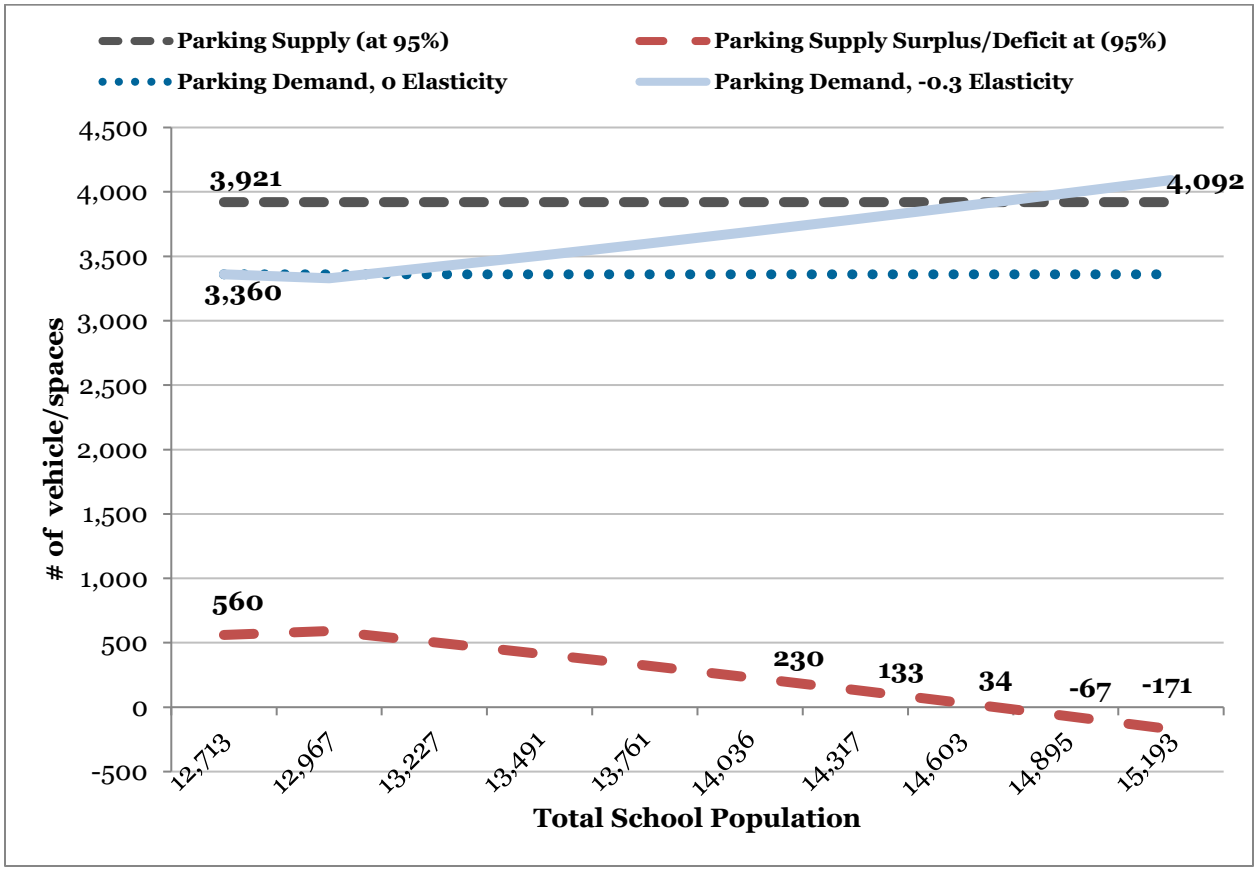


Figure 2-11 shows commuter student, resident student, and faculty/staff parking demand over time when accounting for elasticity and inflation. The table includes permit price increases taking effect for the short-term strategies, but does not assume implementation of long-term strategies.

[6] Because this scenario is intended to demonstrate at what point parking deficits occur, it does not include long-term strategies and as such, there is no accompanying fiscal analysis.

Figure 2-11 Summary of Projected Parking Demand, "Growth" Scenario

Commuter Students & Visitors	7,835	7,992	8,152	8,315	8,481	8,650	8,823	9,000	9,180	9,364
Resident Students	2,504	2,554	2,605	2,657	2,710	2,765	2,820	2,876	2,934	2,993
Faculty/Staff	2,374	2,421	2,470	2,519	2,570	2,621	2,674	2,727	2,782	2,837
Total School Population	12,713	12,967	13,227	13,491	13,761	14,036	14,317	14,603	14,895	15,193
Projected Commuter Student Parking Demand, Assuming an Elasticity of "0"	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751	1,751
Projected Resident Student Parking Demand, Assuming an Elasticity of "0"	826	826	826	826	826	826	826	826	826	826
Projected Faculty/Staff Parking Demand, Assuming an Elasticity of "0"	783	783	783	783	783	783	783	783	783	783
Projected Total Parking Demand, Assuming an Elasticity of "0"	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360
Price Index Assuming 3% Inflation	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20
Commuter Student Price Increase Projected	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%
Commuter Student Price, in Current Year Dollars	$ 225	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243
Commuter Student Price in Real Dollars	$ 225	$ 238	$ 234	$ 229	$ 224	$ 220	$ 216	$ 212	$ 207	$ 203
% Reduction in Commuter Student Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	0.9%	-1.7%	-4.3%	-7.0%	-9.8%	-12.7%	-15.6%	-18.7%	-21.8%
Resident Student Price Increase Projected	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%
Resident Student Price, in Current Year Dollars	$ 225	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243
Resident Student Price in Real Dollars	$ 225	$ 238	$ 234	$ 229	$ 224	$ 220	$ 216	$ 212	$ 207	$ 203
% Reduction in ResidentStudent Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	0.9%	-1.7%	-4.3%	-7.0%	-9.8%	-12.7%	-15.7%	-18.7%	-21.8%
Faculty/Staff Price Increase Projected	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%
Faculty/Staff Price, in Current Year Dollars	$ 225	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243	$ 243
Faculty/Staff Price in Real Dollars	$ 225	$ 238	$ 234	$ 229	$ 224	$ 220	$ 216	$ 212	$ 207	$ 203
% Reduction in Faculty/Staff Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	0.9%	-1.7%	-4.3%	-7.0%	-9.8%	-12.7%	-15.7%	-18.7%	-21.8%
Adjusted Commuter Student Parking Demand (After Adjusting for Elasticity)	1,751	1,734	1,780	1,826	1,874	1,923	1,973	2,025	2,077	2,132
Adjusted Resident Student Parking Demand (After Adjusting for Elasticity)	826	819	840	862	885	908	931	956	981	1,006
Adjusted Faculty/Staff Parking Demand (After Adjusting for Elasticity)	783	776	796	817	839	861	883	906	930	954
Adjusted Total Parking Demand (After Adjusting for Elasticity)	3,360	3,329	3,416	3,505	3,597	3,691	3,787	3,886	3,988	4,092
Projected Supply	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127	4,127
Projected Effective Supply (95%)	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921
Projected Total Campus Surplus/Deficit	767	798	711	622	530	436	340	241	139	35
Projected Total Campus Effective Supply Surplus/Deficit (95%)	**560**	**591**	**504**	**415**	**324**	**230**	**133**	**34**	**-67**	**-171**

3 TRAVEL PREFERENCES SURVEY

In order to better understand how affiliates of UM travel to, from, and within campus, as well as to gauge the interest in various transportation strategies, the Associated Students of the University of Montana (ASUM) included a series of transportation related questions to online surveys for campus affiliates in 2014 and 2015. The 2014 survey was sent to all students, staff, and faculty at the UM Mountain Campus, and Missoula College, while the 2015 survey was limited student affiliates.

The 2015 survey also asked respondents to identify their affiliation with UM, in which many indicated that their primary affiliation with the University is as an employee, a common instance as many employees take classes during their employment tenure. However, the sample of faculty and staff was not broad enough to draw conclusions about employee travel patterns and preferences for the 2015 calendar year. As such, employee responses from the 2014 travel survey, and student responses from the 2015 travel survey are discussed in this chapter.

More detailed information can be found in the "Travel Demand Analysis," section of the Existing Conditions Report, attached as an appendix to this document.

RESPONSES RECEIVED

A total of 833 individuals responded to the 2014 travel survey, and 429 individuals responded to the 2015 travel survey. Figure 3-1 and Figure 3-2 below breakdown the total responses by affiliation. A majority of employee respondents indicated working at the UM Mountain campus full-time as staff (58%(or faculty (27%). Additionally, more than three-quarters of student respondents were either juniors or seniors, notable because upperclassmen exhibit a higher propensity to live off-campus than first or second-year students. It should be noted that only four Missoula College students responded to the 2015 survey, and as such, responses from Missoula College affiliates were not analyzed separately.

Figure 3-1 "Primary Affiliation" of 2014 Employee Travel Survey Respondents

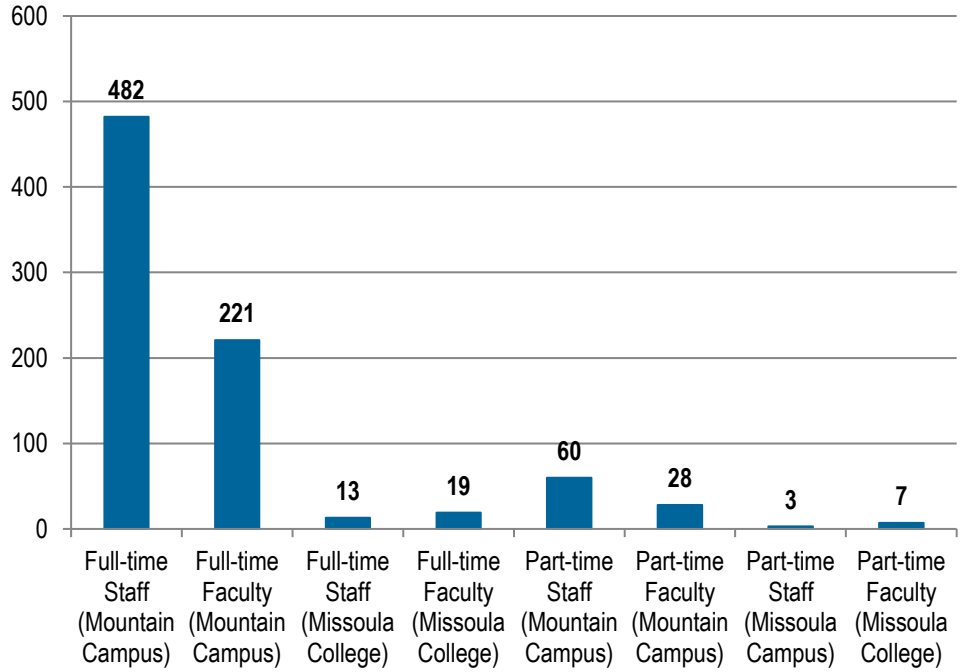
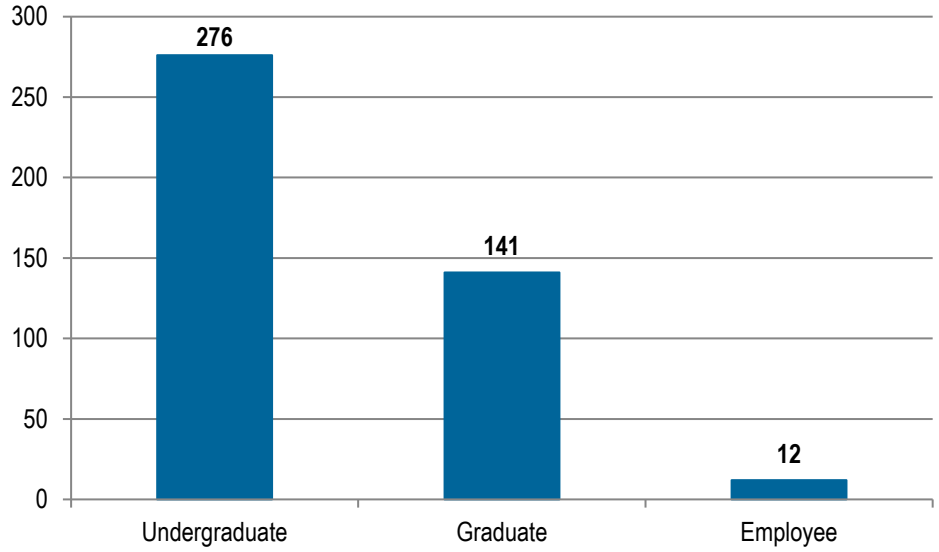


Figure 3-2 "Primary Affiliation" of 2015 Student Travel Survey Respondents



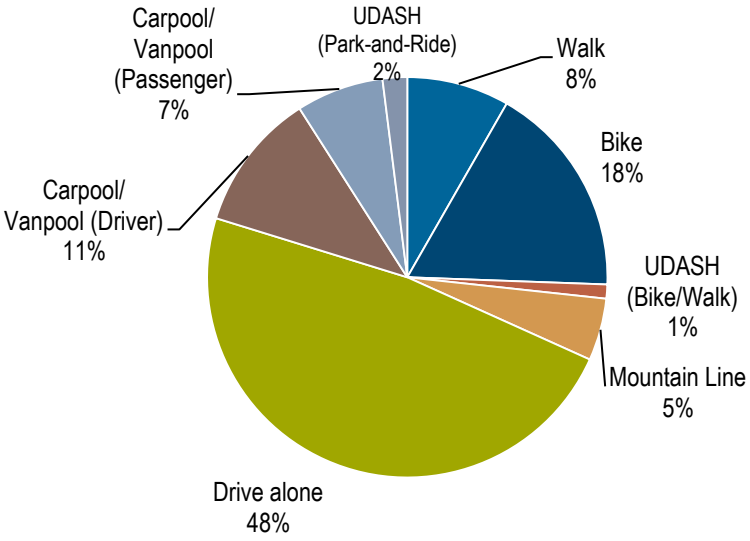
MODE OF TRAVEL

Home to Campus

Figures 3-3 and 3-4 show the prevalence of different transportation modes in trips to campus for employees and students respectively. Less than half (48%) of employees noted that they drive

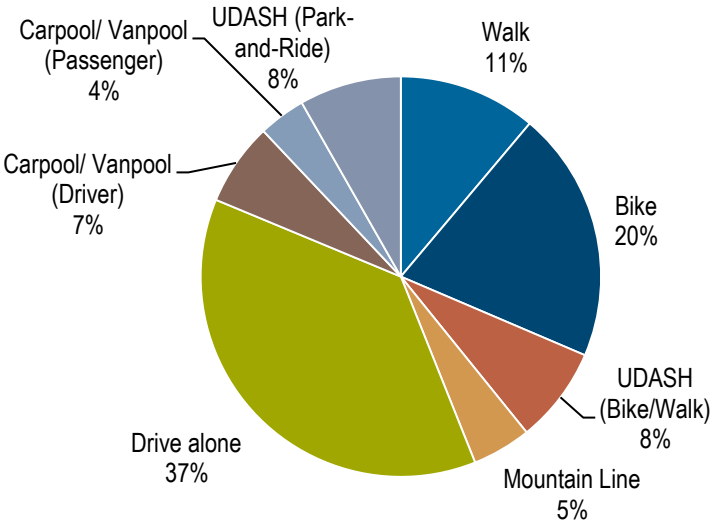
alone to campus. The second most popular mode of transportation amongst employees was bicycling, accounting for 18% of trips, showing the importance of active transportation at UM.

Figure 3-3 Home-to-Campus Mode Share – Employees (2014 Travel Survey)



For student commute trips to campus, 37% of respondents drove alone, while 21% of responding students used transit (UDASH or Mountain Line) to get to campus. Bicycling and walking made up 20% and 11% of trips respectively, again showing the importance of active transportation modes at UM.

Figure 3-4 Home-to-Campus Mode Share – All Students (2015 Student Travel Survey)



Place of Permanent Residence to Campus

Figure 3-5 shows how many trips to a permanent address student respondents take during a year. A large share (42%) of respondents noted that the question was not applicable, suggesting that they originate from the Missoula area and/or may commute to school from their permanent address. Forty-one percent of respondents noted travelling to their permanent address 5 times or less annually.

Interestingly, though a large share of students travels to their permanent address only a few times annually, 60% of students travelling to their permanent address during University breaks drive alone. This is important to note, as many students may perceive the need to bring and keep a car on or near campus, even if they only use it rarely to travel. The availability of alternatives to travel to/from their place of permanent residence, such as ridesharing, car sharing, and/or user-friendly car rental services may make it easier for students to live in Missoula without a vehicle.

Figure 3-5 Trips Home to Permanent Address per Year – All Students (2015 Student Travel Survey)

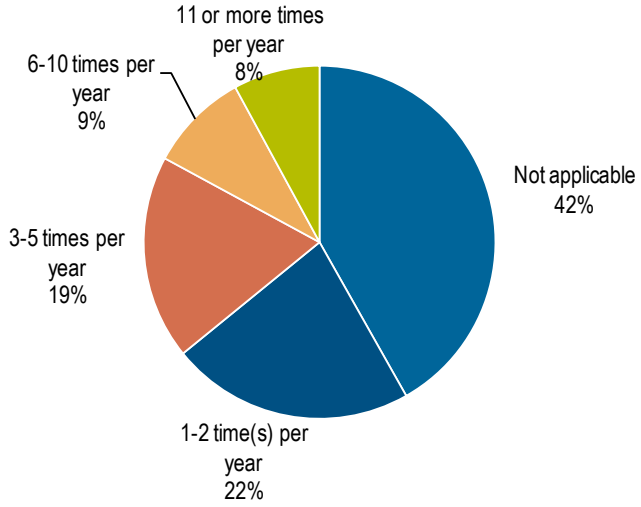
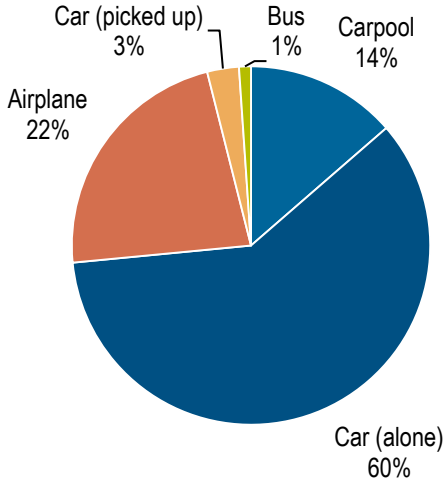


Figure 3-6 Typical Mode of Travel for All Students who Reported Traveling to Permanent Address for University Breaks (2015 Student Travel Survey)



TRIPS TO CAMPUS

Trip Distance

Based on the 2015 student travel survey, nearly 70% of survey respondents commute no more than 3 miles from home to campus, with just under 15% of commuters having a commute distance of under 1 mile. Less than 10% of commuters traveled more than 10 miles from home to campus. These travel distances make alternatives to driving competitive options.

Figure 3-7 Approximate One-Way Commute Distance, 2015 Student Travel Survey Respondents

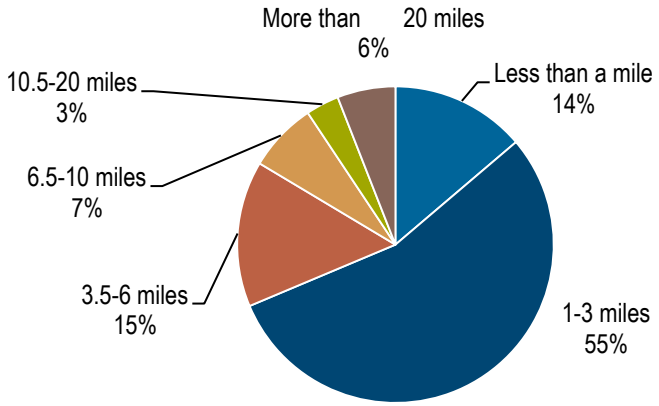


Figure 3-8 Approximate One-Way Commute Distance by Affiliate Status[7]

Distance to Campus	Undergraduates	Graduate Students
Less than one mile	12.9%	9.8%
1-3 miles	55.7%	68.9%
3.5-6 miles	14.5%	10.6%
6.5-10 miles	6.3%	6.8%
10.5-20 miles	4.7%	2.3%
More than 20 miles	5.9%	1.5%

Frequency of Travel to Campus

In addition to understanding how far and how individuals travel to campus, it is important to understand the frequency of travel to the campus, as trip patterns fluctuate much more than at a typical employment center due to the variance in class schedules. These variances in flows of people arriving and departing to campus impact the type of solutions that are recommended.

[7] As no similar question was asked on the 2014 survey, a significant sample of one-way commute distances for employees is unavailable.

According to Figure 3-9, half of all students reported making five or six round trips to the UM Mountain Campus per week. Less than 15% of respondents made less than 5 trips per week, and over a third of student respondents make 7 or more round trips per week.

Figure 3-9 Student Round Trips to Main Campus per Week (2015 Student Travel Survey)

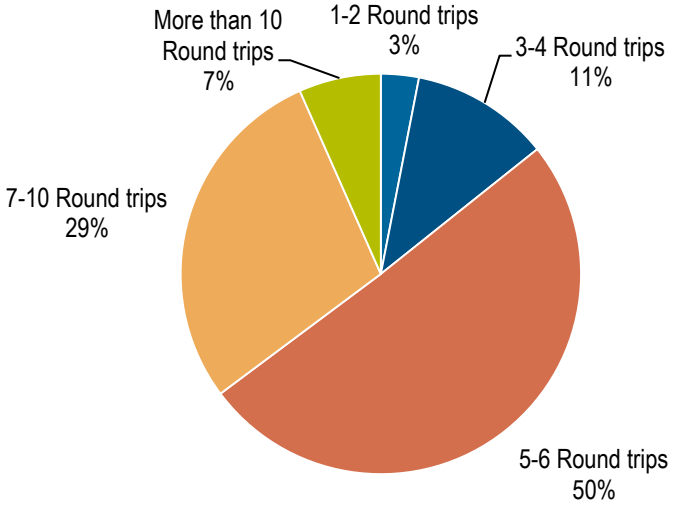


Figure 3-10 and Figure 3-11 show the concentration of home to campus trips by day for employees and students respectively. Weekday travel patterns are nearly identical between students and employees, though the rate of employees travelling to work on weekends was considerably higher - 57% of the average number of weekday trips - when compared to just 34% for students.

Figure 3-10 Employee Home to Campus Trips by Day (2014 Travel Survey)

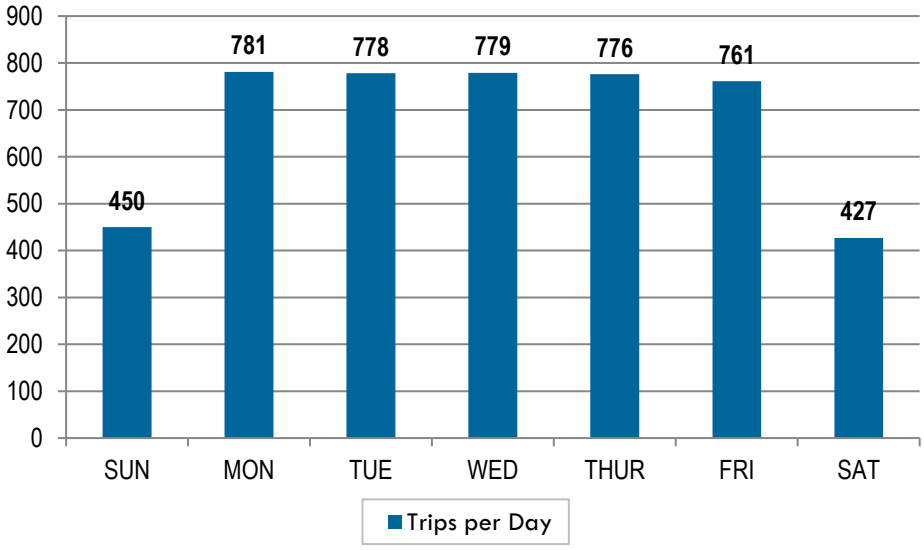
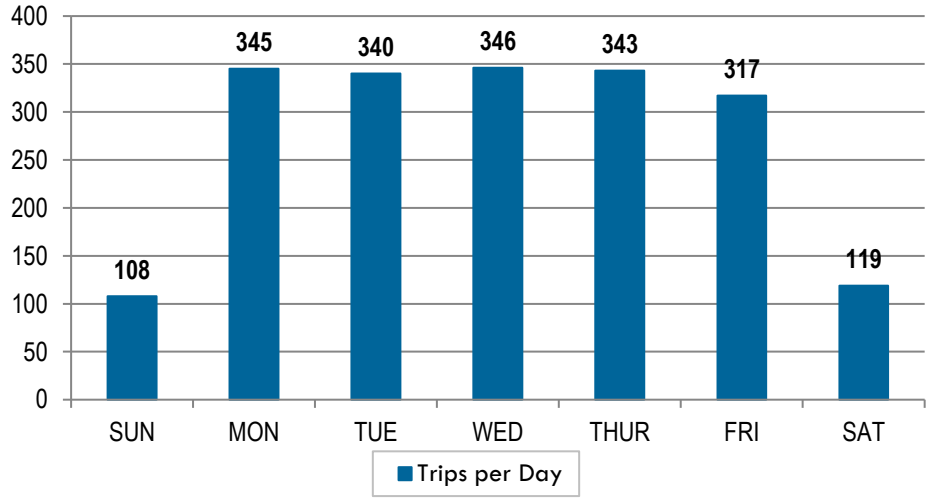


Figure 3-11 Student Home to Campus Trips by Day (2015 Student Travel Survey)



4 TDM IMPLEMENTATION AND MONITORING

This chapter provides a recommended framework for implementing the proposed TDM measures. It provides a brief summary of proposed TDM strategies identified in Chapter 1 and identifies a timeline for implementation of these TDM strategies. Lastly, this chapter proposes a program to monitor the success of the UM TDM program to ensure staff has the tools to evaluate program successes, and make adjustments over time to ensure overarching goals are met.

BACKGROUND

The TDM strategies identified below are recommended to improve upon and maintain multimodal accessibility to the UM Missoula campus as travel demands change over time.

APPROACH

The following principles, developed throughout the Plan development process with UM, should guide implementation of recommended TDM strategies:

1. TDM strategies should be implemented in two phases to improve existing management strategies and introduce new tools to improve access and mobility to the UM campus.
    a. **Short-term** strategies will focus on improving the traveler's user experience, better managing parking, and introducing cost-effective incentives and information to guide transportation decisions.
    b. **Long-term** strategies introduce new technologies and expanded infrastructure initiatives to more aggressively manage TDM.
2. The cost of TDM strategies should be balanced with parking revenues. When determining which strategies to employ, parking pricing should be set to cover TDM costs.
3. Establishment of an active monitoring program to track performance and inform effectiveness of strategies in meeting transportation goals, and guide changes as necessary to maximize effectiveness.

IMPLEMENTATION PHASING

The goal of deploying TDM strategies will be to change how people access the UM campus, reduce congestion near campus, and ensure that parking availability is maintained. However, all strategies outlined in this report cannot be implemented simultaneously due to lack of financial and technical feasibility. As such, a flexible approach that phases in strategies over time is recommended.

Short-term

Purpose

Short-term strategies were specifically identified to be low-cost, effective ways to improve the campus travel experience while promoting equity across all modes. They will not have a substantial impact in shifting mode choice, but represent a quick way to augment and better manage the campus's transportation system.

Measures

- Improved parking management
- Ridesharing through priority rideshare parking locations and the City's rideamigos program
- Expanded and improved bike parking
- Improved campus bikesharing service
- Expanded multimodal wayfinding
- Regular funding maintenance of transportation facilities
- Vehicle fleet/car sharing
- Improved UM app with real-time parking pricing, and availability, transit & bike info
- New pre-tax employee transportation benefits
- Incentivizes for campus residents to not bring cars to campus
- Remote parking options for campus residents and Missoula College affiliates
- Communication and education of transportation program
- Robust program monitoring and evaluation

Cost

It is anticipated that short-term TDM strategies will cost approximately $80,000 per year and will be funded by revenues generated by the recommended parking pricing program.

Long-term

Purpose

Long-term strategies will take considerably more time to vet with campus stakeholders and identify funding sources. These measures can have a significantly greater impact in reducing parking demand and increasing alternative mode use.

Measures

- Consolidated parking and multimodal access/TDM services (Access & Transportation Services) and appoint a single transportation manager of the department
- Bike/Pedestrian Bridge to Missoula College
- Daily/hourly pricing using LPR technology
- Residential Parking Benefit Districts

- Integrated/Expanded UDASH & Mountain Line
- Expanded network of protected bike lanes
- Wayfinding and real-time parking availability at gated Lot R
- Policy establishing parking management goals, including availability target; authorizing admin. rate adjustment to meet targets

Cost

The high cost of this implementation phase ($800,000 annually) currently makes the method of financing these strategies uncertain. This report currently models a necessary parking price increase of 100% in order to pay for all programs and as such, it is recommended that after short-term strategies are adopted, the university explore a blend of financing methods for long-term strategies.

PROGRAM MONITORING

It is critical to establish a system to monitor the performance of TDM strategies. By observing how travel behavior changes over time, UM will have the tools to determine the proper time to implement TDM measures, gauge their effectiveness, and distribute quantifiable data that will allow a prioritization of the campus's financial and personnel resources, as well as guide any changes to the way strategies are implemented. Program monitoring should consist of conducting annual transportation surveys among employees and students, and observing and recording parking utilization. UM should conduct a trial of this monitoring program following the implementation of this plan to test the protocols, refine the procedures, and develop a sound monitoring methodology.

Transportation Survey

A transportation survey, similar to what was used to understand the existing conditions on the UM campus, should be used to understand travel behavior, attitudes towards available travel options, and the propensity to shift to alternative modes of transportation among students, faculty, and staff. The survey will be able to inform the TDM program manager about program effectiveness, proliferation of program information in the campus community, and potential issues and opportunities for improvement.

A transportation survey is a straightforward with necessary considerations for administration including the following:

Survey Instrument

The instrument itself can vary in complexity as determined by UM. Key Questions that should be asked include:

- Primary mode of transportation to campus (i.e. mode used for majority of trip if more than one trip was used)
- For those who carpooled/vanpooled, the number of people in the carpool/vanpool, including the driver
- Affiliation (e.g. faculty, staff, commuter/resident student, undergraduate/graduate student)

- Full or part time
- Home location (on or off-campus, requesting zip code information helps inform where affiliates travel from)
- Distance travelled to campus
- Arrival and departure times
- Frequency of weekly travel to campus
- Interest levels in using alternative transportation programs
- Parking location used most often
- Questions to understand affiliate knowledge of transportation program tools available

Survey Distribution

Surveys may most easily be distributed via email to all affiliates containing a link to the survey. This provides a low impact way to administer the survey, and reduces the need to enter results manually. Free services such as SurveyMonkey and Google Surveys are available to build simple surveys for free. It should be noted that some staff individuals may not have access to email while at work and may require paper surveys. Both of the noted online survey resources provide an option to "print," physical copies if necessary.

To ensure an adequate response rate, a marketing and distribution plan should be developed and implemented. For example, a respondent incentive (free prize or cash) may be necessary to ensure an adequate response rate. Additional distribution considerations are listed below:

- Annual administration of survey to maintain annual tracking of performance
- Administration of survey during the same time of year every year to minimize impacts of factors such as weather; additionally, survey distribution should consider how weather patterns impact commutes
- Surveys should not be administered during the start of the term to allow affiliates the time to normalize their commute patterns

Survey Analysis

The first year of data collection will provide a baseline to which future data should be compared to in order to track the effects of the TDM program.

Parking Utilization

Parking utilization is a critical measure to understand the demand for transportation improvements. Annual parking occupancy counts should be conducted, ideally during a time period that overlaps with the distribution of the transportation survey. Counts should be conducted on peak use weekdays (not Monday or Friday) in order to ensure the highest points of parking demand are accurately reflected in the data. Counts should be collected hourly, though peak demand hours (11 am, 2 pm, 6 pm) could be selected to obtain a representative sample of parking patterns at various times. Like with the transportation survey, counts should be conducted during the same time period (weeks, days, times) each year to ensure annual comparisons can be made. Furthermore, occupancy counts should make note of the type of parking spaces being counted (e.g. faculty/staff, disabled).

APPENDIX A: EXISTING CONDITIONS REPORT