



**TRANSPORTATION
AND CIRCULATION**

5 TRANSPORTATION AND CIRCULATION

UC Riverside faculty, staff, students and visitors travel to and within campus using a variety of modes. Through the priorities resulting from the Physical Master Plan Study, the University will improve the mobility of all people traveling to and around the campus. The proposed strategic priorities will create a framework to guide the University's future decisions regarding transportation policies and circulation infrastructure. These priorities include creating a campus Mobility Hub and increasing emphasis on active transportation modes, parking management, and pedestrian access and design, thereby promoting environmental stewardship and travel options that are safe and accessible for pedestrians, bicycle riders, transit riders and auto users, alike.

Glossary of Terms

GHG - greenhouse gas emissions

VMT - vehicle miles of travel

RTA - Riverside Transit Agency

AVR - average vehicle ridership. The average number of occupants in a vehicle

TDM - transportation demand management

Mobility Hub - a multi-modal transportation center, including transit service and pick-up and drop-off areas

UPASS - system that allows faculty, staff and students to ride RTA busses for free

TAPS - Transportation & Parking Services

STRATEGIC PRIORITIES

- Promote an integrated circulation framework that engenders safe passage for pedestrians and bicycle riders and accommodates automobiles efficiently.
- Recognize the increasing relevance of bicycles as a choice mode of travel and integrate desired routes with the city and campus's circulation framework.
- Promote transit as a convenient and preferred mode of commuting to campus and connecting to community destinations by integrating it into the campus setting.
- Provide additional on-campus student housing as enrollment grows, to reduce parking demand and minimize the roadway infrastructure improvements that would be required for commuter trips.

5.1 Improving Mobility Options

Every day, thousands of faculty, staff, and students drive to campus in personal vehicles. These cars require parking in lots or structures, interspersed along the campus perimeter and among the campus buildings. For many persons traveling to UC Riverside, their first sight of the campus is of roadways and parking lots instead of key campus landmarks.¹

The University’s projected growth provides an opportunity to create an integrated transportation and parking system that promotes the use of transit, walking, and biking. This effort extends long-standing UC Riverside policies and programs that have reduced dependence on personal automobiles since the early 2000s. With the implementation of the Master Plan Study, integrated transportation strategies will reduce greenhouse gas (GHG) emissions and vehicle miles of travel (VMT), and further UC Riverside’s goals related to environmental stewardship. Mobility strategies will also improve safety by reducing conflicts between vehicles, bicycle riders, and pedestrians.

EXISTING CONDITIONS

Trends in travel modes

UC Riverside has made significant efforts to encourage the use of non-automotive travel. The University has partnered with the local transit provider, Riverside Transit Agency (RTA), to subsidize bus use for faculty, staff and students through the UPASS program. Transit ridership has increased five-fold since the UPASS program began in 2007, from 100,000 riders in the first year to approximately 500,000 riders during the 2013-2014 academic year. Due to the lack of transit infrastructure on campus, RTA has limited capacity to expand its transit service to campus. UC Riverside also provides incentives to employees to use shared ride strategies such as carpooling and vanpooling.

Due to the investments by UC Riverside to encourage non-automobile travel, average vehicle ridership (AVR) has increased from approximately 1.36 to 1.57 occupants per vehicle over the last 15 years, as

illustrated in Fig. 5.1. Forty-five percent of UC Riverside affiliates travel to campus by modes other than single occupant vehicles, as illustrated in Fig. 5.2.

As shown in Fig. 5.3, a majority of UC Riverside affiliates reside in the areas surrounding the campus. This population cluster is an important component and beneficiary of UC Riverside’s efforts to promote alternative transportation. Trips that originate close to the campus are much more likely to be made by alternative modes of transportation than trips originating further away. Proximity to campus makes alternative transportation much more attractive, and helps to achieve the University’s overall goal to reduce single-occupant vehicle trips. In addition, students residing in on-campus housing or close by can travel exclusively by walking and biking, whether going to class, or to social and recreational activities on campus.

Bicycle and pedestrian circulation

Currently, bicycle riders can reach campus from the surrounding areas using the on-street bike lanes along University Avenue, Big Springs Road, and Canyon Crest Drive. The City of Riverside is currently evaluating additional bicycle lanes along Watkins Drive and Martin Luther King Boulevard that will provide additional connectivity to the campus. However, once bicycle riders reach campus there are significant gaps in the bicycle network. In many instances, bicycle riders are forced to share the road with automobiles, buses, and service vehicles.

The pedestrian environment at UC Riverside, as described in Chapter 4, is generally conducive to walking to and within the campus. The pedestrian malls, building arcades, shade trees, and other elements contribute to an environment which promotes pedestrian travel in the Core Campus. However, the pedestrian network has not kept pace with changes in campus development patterns and gaps occur along some of the major campus roadways, such as Canyon Crest Drive.

Pick-up and drop-off trips

Currently, UC Riverside has limited opportunities for the pick-up and drop-off of passengers in designated areas. One formal pick-up and drop-off location is near Parking Lot 1 at the west end of the Carillon Mall. Due to the lack of available options, parking lots are commonly used as pick-up and drop-off areas. There is also a significant amount of informal curb-side pick-ups and drop-offs occurring at locations such as Aberdeen Drive, near its intersection with North Campus Drive.

Figure 5.1 AVERAGE VEHICLE RIDERSHIP

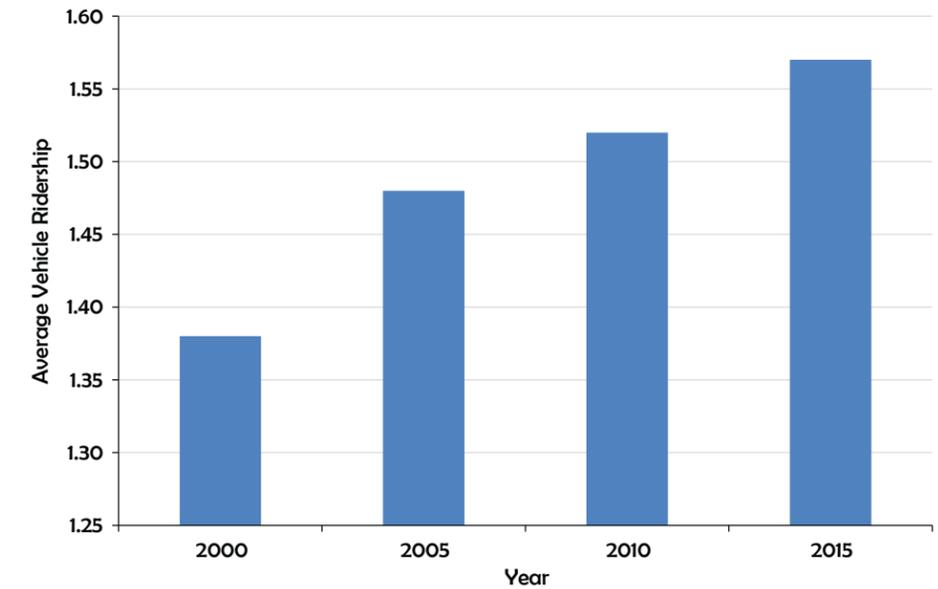
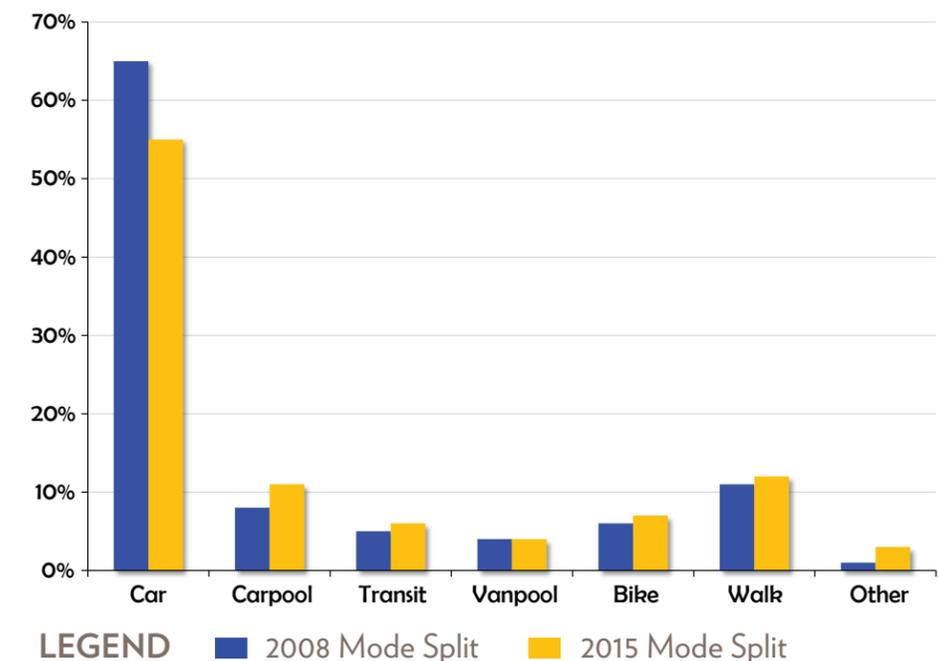


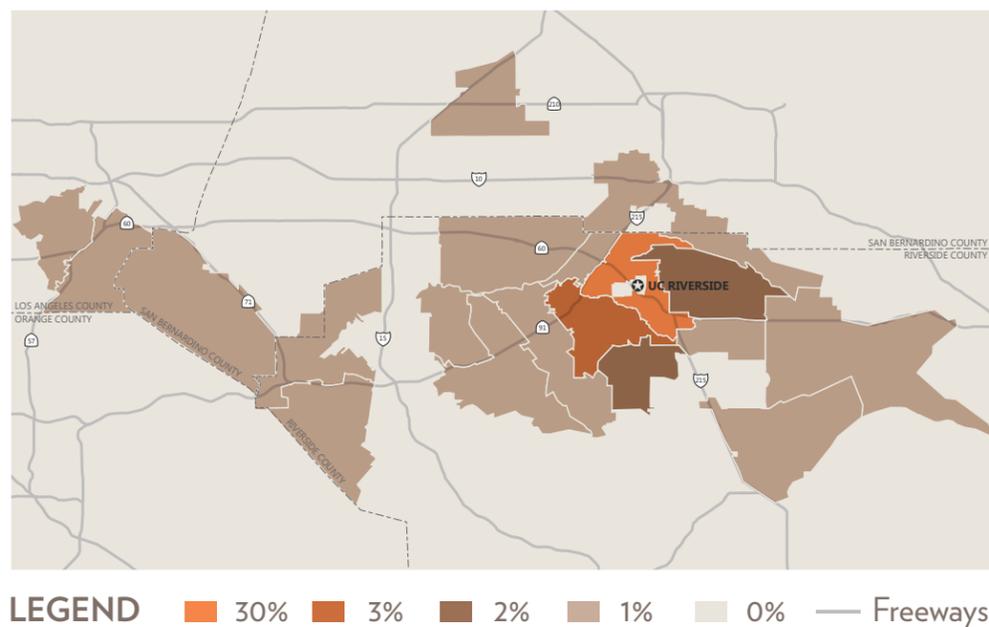
Figure 5.2 MODE SPLIT



The goal of Alternative Transportation is to reduce the total number of single occupant vehicle trips made to campus by faculty, staff and students. This goal supports California clean-air mandates and reduces campus and community congestion.

¹ Additional information is provided in the Appendix: *Transportation Demand Management for UC Riverside Physical Master Plan Study.*

Figure 5.3 RESIDENTIAL DISTRIBUTION OF UC RIVERSIDE AFFILIATES



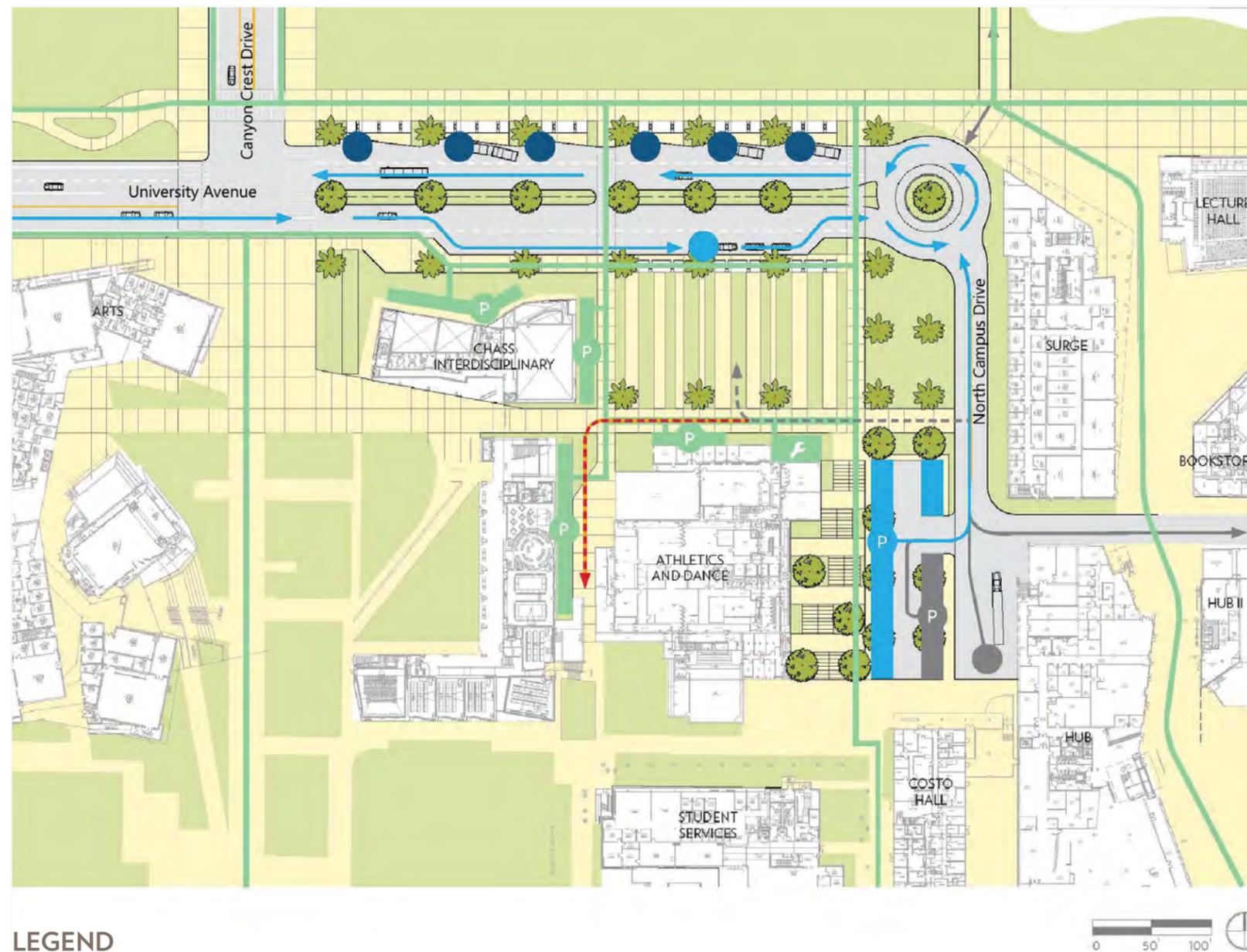
FUTURE INITIATIVES

Mobility Hub

Transit riders can arrive at campus on one of ten routes operated by RTA. Bus stops are located mostly along University Avenue, Iowa Avenue, Blaine Street, Watkins Drive, Canyon Crest Drive, and West Campus Drive. Some stops are located directly on the street, such as the stops on Canyon Crest Drive. UC Riverside currently lacks a dedicated transit station, where transit lines converge and infrastructure such as shelters, electronic signage, and maps are provided.

The proposed Mobility Hub will provide a centralized transit stop on campus, improving transit access. It will also provide the opportunity to enhance bicycle and pedestrian accessibility within the Core Campus by improving bicycle and pedestrian infrastructure in the surrounding areas. As the campus grows, the Mobility Hub will provide additional benefits as a key element of campus place-making. With the implementation of the Master Plan Study, it will be a key multi-modal transportation feature and activity center, enhancing the overall campus environment. Transit facilities and circulation within the proposed Mobility Hub are illustrated in Fig. 5.4.

Figure 5.4 PROPOSED MOBILITY HUB CONFIGURATION



LEGEND

- Visitor Vehicular Route
- Service Route
- Bicycle Path
- Emergency Access
- P Visitor/ADA Parking
- Bus Stops
- Service Loading Dock
- Service Parking
- Visitor Drop-Off
- Bicycle Repair Shop
- Bicycle Parking



Bicycle circulation

Figure 5.5 illustrates the proposed UC Riverside bicycle network. Specific bicycle improvements identified in the Physical Master Plan Study are:

- Bicycle lanes on South Campus Drive
- Bicycle lanes on Aberdeen Drive
- Additional bicycle parking in central locations, including the Mobility Hub
- Bicycle path on the south side of Watkins Drive with current on-street bicycle lanes remaining in place

The Planning Team recommends that UC Riverside proceed with a Bicycle Master Plan Study. This study will provide a framework to make bicycle riding more convenient and appealing on campus. Through the expansion of bicycle and pedestrian networks on campus, travelers will have greater access to campus facilities, become better connected with the surrounding community, and feel safer riding their bicycles and/or walking. This study should integrate the existing and planned bicycle facilities in the City of Riverside with the campus network.

Class I Bike or Shared Use Paths provide a completely separate right-of-way and are designated for the exclusive use of bicycles and pedestrians.

Class II Bike Lanes provide a striped lane for one-way bike travel on a roadway adjacent to vehicle travel lanes and/or on-street parking.

Class III Bike Routes are designated by signs and/or shared lane pavement markings, known as sharrows, for shared use with vehicles.

Figure 5.5 PROPOSED BICYCLE NETWORK

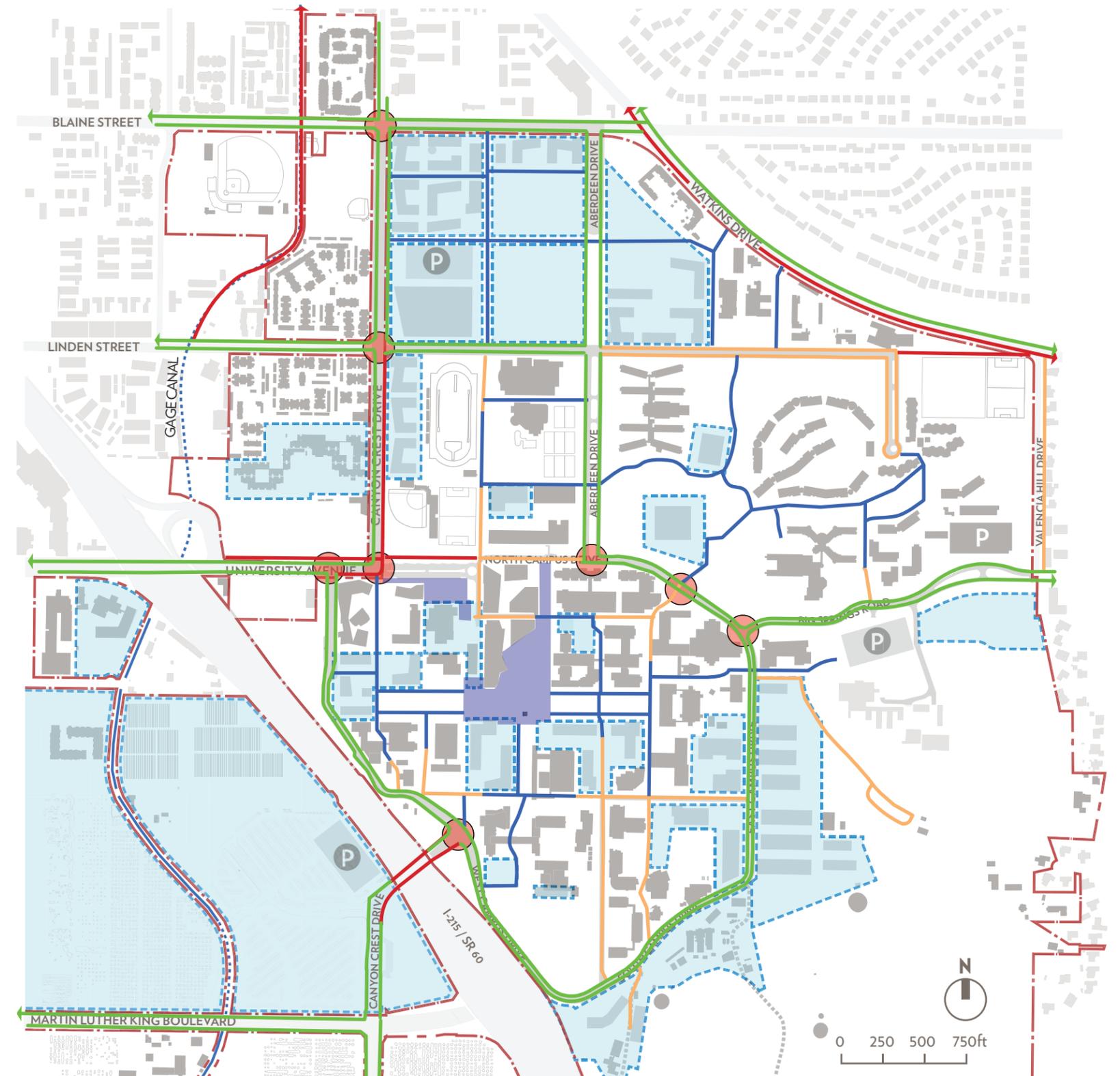
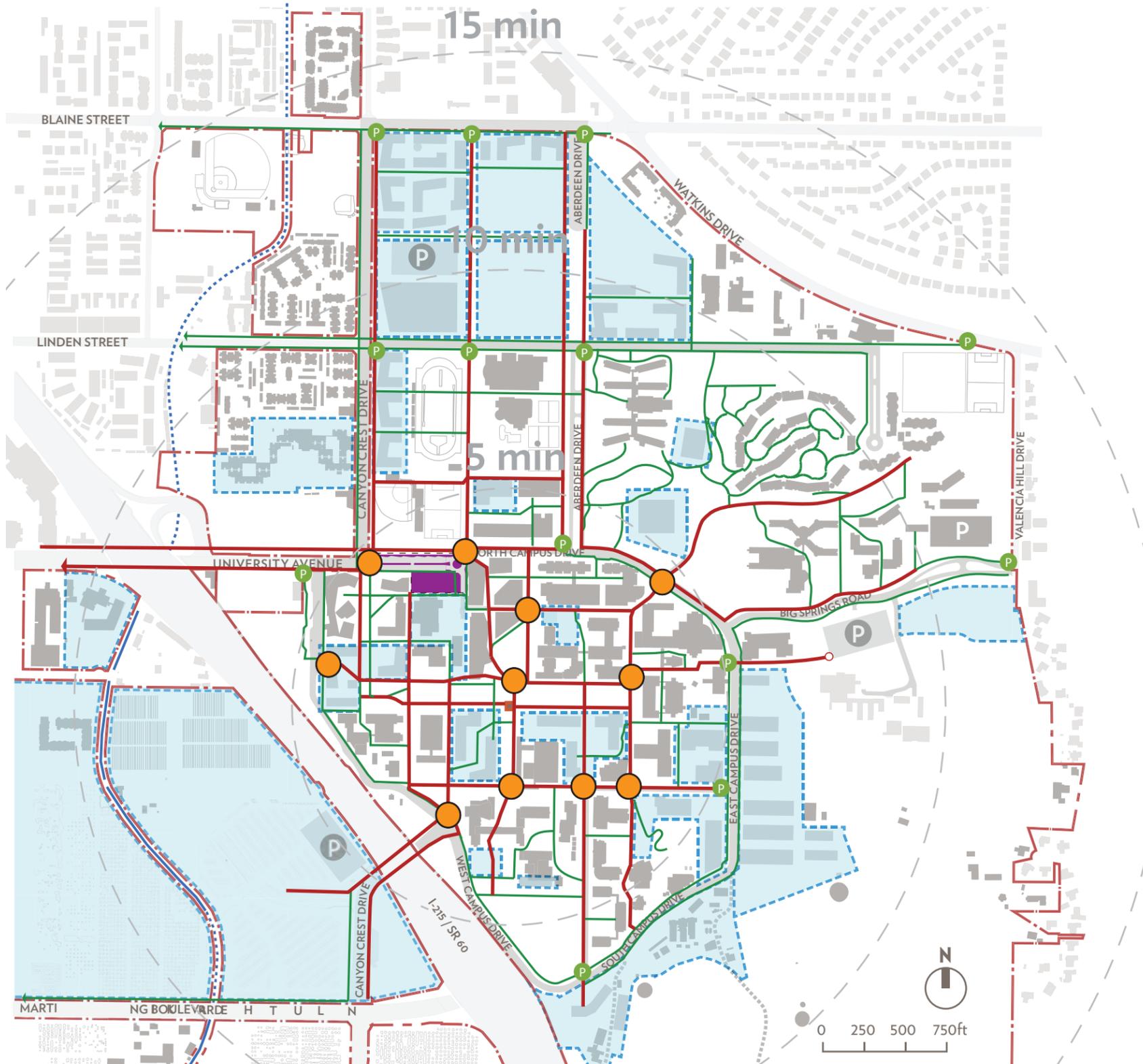


Figure 5.6 PROPOSED PEDESTRIAN NETWORK



LEGEND

- Primary Pedestrian Route
- Secondary Pedestrian Route
- P Pedestrian Entry
- Pedestrian Node
- Opportunity Site
- UC Riverside Property Line
- Walk Radii from Belltower

Pedestrian circulation

Several pedestrian enhancements are part of the Master Plan Study. Fig. 5.6 illustrates the proposed UC Riverside pedestrian network. Pedestrian improvements are as follows (see Chapter 4 for details):

- Identifying bicycle dismount zones, including one at the Mobility Hub, to reduce conflicts between bicycle riders and pedestrians
- Improving pathways such as Science Walk, Barn Walk, Arts Mall, and Eucalyptus Walk
- Providing an upgraded pedestrian environment on major streets such as University Avenue, Canyon Crest Drive, and Aberdeen Drive

Pick-up and drop-off zones

UC Riverside will improve pick-up and drop-off zones through two efforts. First, the proposed Mobility Hub will contain a formal pick-up and drop-off area at the main entryway of the campus. Second, new pick-up and drop-off zones will be incorporated into the Master Plan Opportunity Sites. For example, the North Campus Opportunity Sites can provide a pick-up and drop-off zone for those entering through the Canyon Crest North Gateway. In addition, pick-up and drop-off zones will be evaluated in conjunction with the design of future parking structures on campus.

5.2 Manage Parking Supply and Demand

EXISTING CONDITIONS

Parking supply

Over the past ten years, UC Riverside has accommodated significant growth in faculty, staff, and students with minimal increases to the number of parking spaces on campus.

Overall campus population doubled from 2005 to 2015 while the University added only 1,500 parking spaces.

As of 2016, UC Riverside has approximately 10,000 parking spaces to serve a campus population of 27,000 (faculty, staff, graduate students, undergraduate commuter students, on-campus residents), as well as service and delivery vehicles and campus visitors. The majority of these spaces are allocated for use by faculty, staff and graduate students (31 percent), followed by commuter students (29 percent), and on-campus residents (27 percent), leaving the remaining parking supply for visitors and department and service vehicles (13 percent.)

Most of the campus parking facilities are surface parking lots, with one parking structure reserved for use by on-campus residents. UC Riverside actively manages parking demand through a tiered parking permit system in which users purchase permits to access various parking facilities based on their affiliation with the campus. While this allows the campus to allocate parking based on campus affiliation, parking spaces cannot be easily redistributed as parking demand shifts throughout the day or academic year. Fig. 5.7 illustrates the existing parking lots and parking supply.

Figure 5.7 EXISTING PARKING LOTS AND PARKING SUPPLY

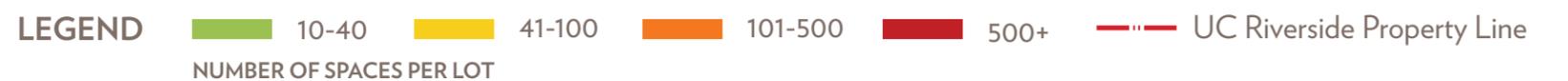
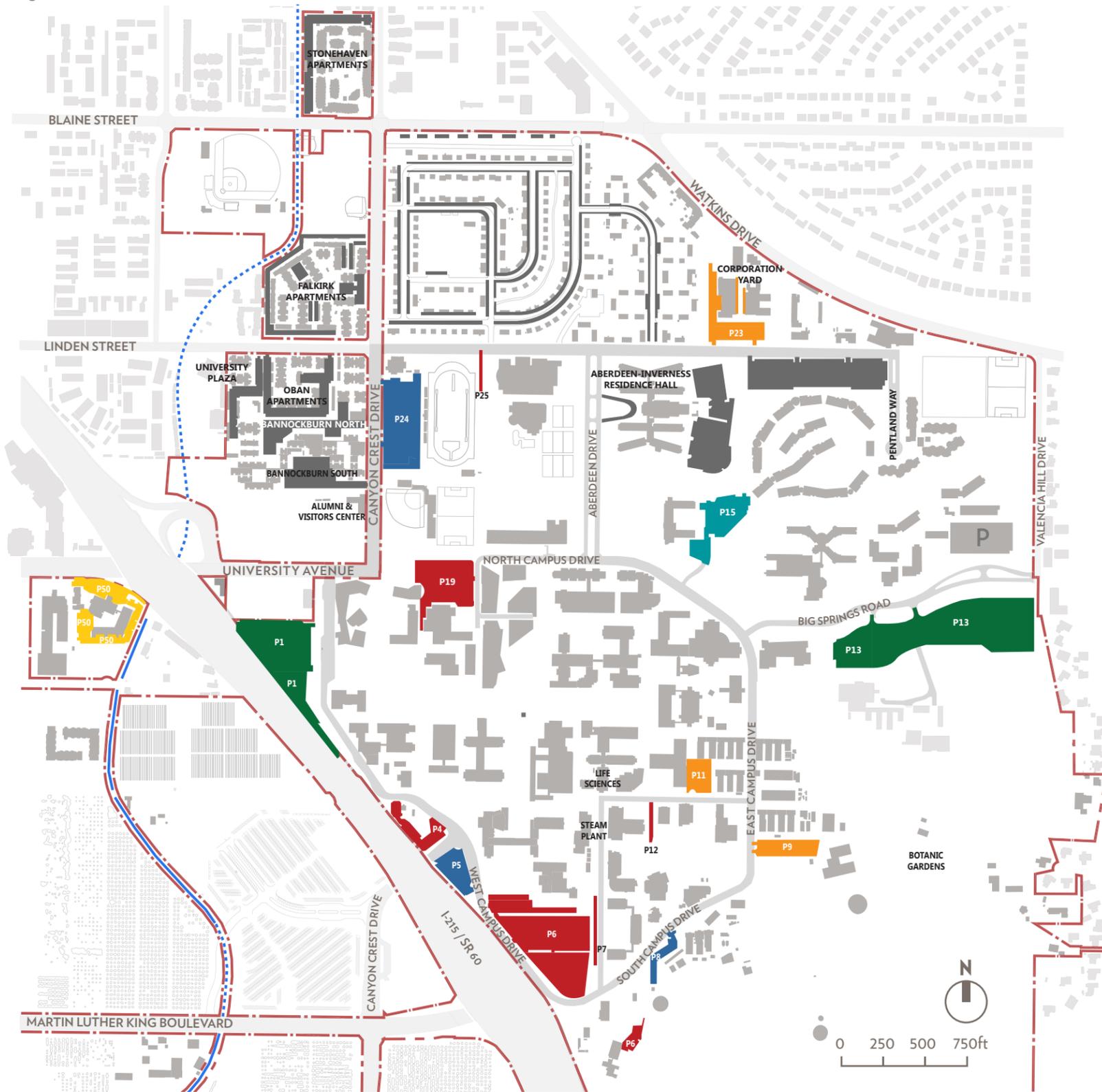


Figure 5.8 UTILIZATION OF PARKING ON CAMPUS



LEGEND ■ < 50% ■ 51-60% ■ 61-70% ■ 71-75% ■ 76-80% ■ 81-85% ■ > 85%

■ Residential Lots - - - UC Riverside Property Line

PERCENTAGE OCCUPANCY OF PARKING SPACES DURING PEAK PERIODS BY LOT

Note: Occupancy shown based on available TAPS data. Does not include residential lots.

Parking demand

The University currently oversells parking permits (more permits than spaces) to maintain optimal usage levels of existing parking facilities.

Despite the overselling of parking permits, the campus still has available parking supply on a typical weekday. On average, 67 percent of parking spaces are occupied on campus.

Fig. 5.8 illustrates the utilization of parking on campus. Several lots have a high occupancy rate (over 85 percent), while other parking lots further from the Core Campus have less than a 60 percent occupancy rate during peak periods. These utilization rates indicate a higher demand for parking in the Core Campus area. While parking capacity is available on campus, it may not be provided in the areas most convenient for faculty, staff, students and visitors.

Student resident parking

Campus residents have access to 2,670 parking spaces, which comprises 27 percent of the overall supply of parking on campus. One out of every four undergraduate residents (25 percent) purchases a parking permit in comparison to one out of every two and one-half undergraduate commuter students (40 percent).

Residential parking lots currently have an occupancy of approximately 56 percent, leaving nearly 1,200 parking spaces available each day.

Freshman are allowed to purchase parking permits when residing on campus, which sets UC Riverside apart from several other universities.

Transportation Demand Management (TDM) Program

One of the key components of managing the demand for parking at UC Riverside is the TDM program. TDM strategies are aimed at reducing reliance on driving to campus through effectively providing alternative travel options. To reduce the demand for parking and vehicle trips on campus, UC Riverside operates several programs to encourage the use of transit, ridesharing, and active transportation modes, such as walking and bicycling.

FUTURE INITIATIVES

Parking management plan

As the campus grows, both in terms of population and physical space, the existing parking system will change due to two factors:

- Parking demand, including parking needs by user type, will be affected by the growth in faculty, students, and staff, and by an increase in student housing.
- Some surface lots will be replaced by new buildings.

UC Riverside can respond to this change in supply and demand by strategically managing parking. Providing the optimal amount of parking will require the development of a Parking Management Plan, given that there are significant downsides to providing too much or too little parking on campus. Excess parking can result in the following:

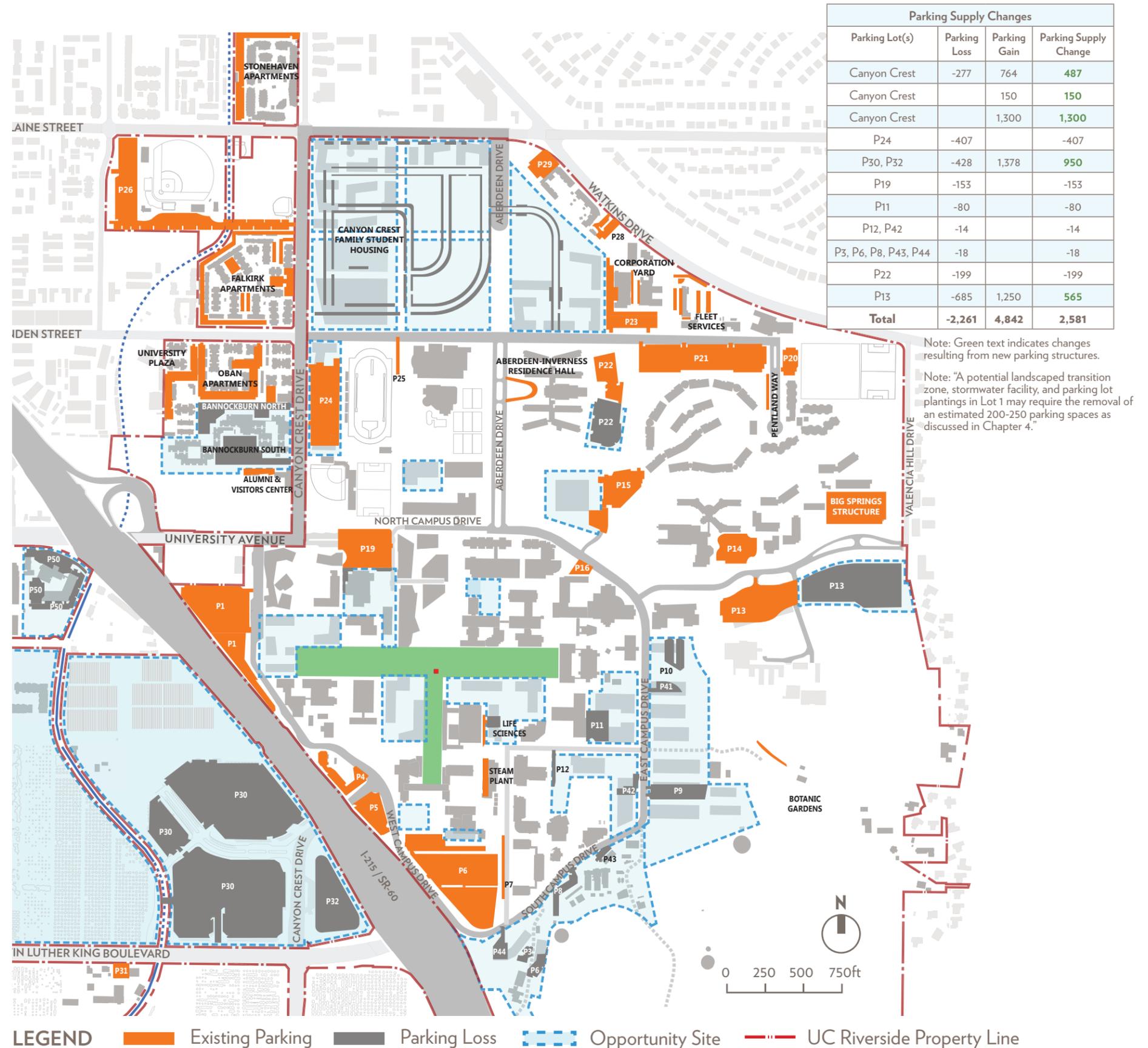
- Parking areas consume land and funding that could otherwise be used for academic buildings and open space.
- Additional impervious surface creates greater challenges for stormwater management and treatment.

Parking supply

If the current parking demand rate was applied to Master Plan Study growth projections, parking utilization on campus would be 100 percent in comparison to today's utilization of 67 percent. When planning for new parking facilities it is common to aim for a parking utilization of 90 percent. This allows for parking turnover to occur throughout the day with a buffer for peak periods. For use in the UC Riverside Master Plan Study, two parking demand factors were considered to capture a range of future parking needs (a low of 80 percent and high of 90 percent utilization).

If the current parking supply rates were to continue to be implemented to accommodate campus growth, the parking supply on campus would be underutilized and the campus would likely invest in more parking infrastructure than actually needed. Therefore, the Planning Team developed a more realistic parking forecast based on the number of vehicles actually parked on campus on a typical weekday in relation to the current population.

Figure 5.9 PROJECTED PARKING CAPACITY CHANGE



On the lower end of the range, minimal new parking will be needed to accommodate growth (fewer than 300), whereas at the higher end of the range, nearly 2,200 new parking spaces may be needed.

Parking expansion opportunities

The parking opportunities in the Master Plan Study consider the following:

- Implement Strategic Priorities to reduce the need for faculty, staff and students to drive to campus.
- Identify TDM strategies in support of the Strategic Priorities to further reduce the need for new parking on campus.
- Identify opportunities for new parking on campus to accommodate future needs if demand management strategies are not as effective as desired or other demographic and economic trends result in changes to parking demand (e.g., gas prices continue to decline, the next generation of students likes driving more than millennials do, etc.)
- Consider the geographic distribution of parking on campus, need for convenient parking in the Core Campus, and new facilities that may have unique parking needs, such as the planned Campus Events Center.

Implementation of the Master Plan Study will result in the elimination of several surface parking lots in the Core Campus. To replace the eliminated parking spaces, new parking structures may be constructed. Fig. 5.9 illustrates the parking envisioned in the Master Plan Study. New parking structures may be constructed for the proposed additional student housing and Campus Event Center, along with additional parking on Lot 30. The Master Plan Study estimates the campus could create a net gain of up to 2,580 parking spaces on campus.

Some specific benefits of this parking approach are as follows:

- Providing less parking in the future than currently prescribed by the existing supply ratios will create further incentives towards the use of alternative travel modes.

- New parking structures will be easier to manage and operate than dispersed parking lots, particularly for faculty and staff parking. As Opportunity Sites are developed, UC Riverside will be able to better manage changing parking demands in the larger, centralized parking structures.

The construction of parking structures will create additional debt for parking operations and increase permit prices.

The parking recommendations are based on current travel behavior and the current parking programs at UC Riverside. Further changes in driving behavior could result in fewer persons driving to campus beyond the reductions seen in the past 10 years.

Resident parking

Underutilized resident parking can be reallocated to other uses, such as faculty, staff, commuter student and visitor parking. This reallocation in

parking supply can help to serve the growth envisioned in the Master Plan Study. In addition, UC Riverside could restrict freshman on-campus residents from bringing their cars to campus, similar to several other UC campuses, such as UC Davis and UC Santa Barbara. Since freshman on-campus residents consume most of the current residential parking supply, not allowing freshman on-campus residents to purchase campus parking permits will help to further increase parking supply for other campus users.

Transportation Demand Management

Additional TDM strategies will be utilized by UC Riverside to support the Strategic Priorities of the Master Plan Study. Fig. 5.10 summarizes these strategies. The combination of TDM strategies and the Strategic Priorities listed will help to promote a multi-modal environment at UC Riverside, decrease personal automobile use, and improve safety on campus.

Figure 5.10 TDM STRATEGIES IN SUPPORT OF STRATEGIC PRIORITIES

#	Strategy	Summary
1	On- and Near-Campus Housing and Amenities	Prioritize investments in on-campus housing and amenities to eliminate the need for students to drive to campus
2	Parking Management	Create a parking management program to monitor demand and reallocate supply as growth occurs
3	Metrolink Service	Create a rebate program for commuters using Metrolink and promote the extension of the 91/Perris Valley Line
4	Car Sharing	Expand and diversify on-campus car sharing, especially for campus residents
5	Emergency Ride Home Program	Expand current program to include graduate students
6	Active Transportation	Provide amenities to encourage more trips by biking and walking to campus, such as bike share, bike centers, and bike repair stations
7	Annual Monitoring and Evaluation	Implement annual monitoring and evaluation program to determine effectiveness of TDM strategies and need for new facilities
8	Resident Parking	Restrict permits available for residents living on campus, including restrictions for freshman parking
9	Parking Pricing	Increase permit pricing to fund new parking structures serving the Core Campus

5.3 Improve Service Routes and Loading Areas

Service routes are currently provided throughout the campus. They typically coexist with pedestrian pathways and roadways shared with bicycle riders in the Core Campus.

CURRENT CONDITIONS

There are two primary challenges with the current service vehicle routes at UC Riverside. First, there are several significant conflict areas where service vehicles, bicycle riders, and pedestrians commingle, such as by the HUB and the Bookstore. Secondly, many service and loading locations only serve a single building instead of servicing multiple buildings from a single location. Therefore, service locations proliferate through campus, meaning that service vehicles often have to make multiple trips.

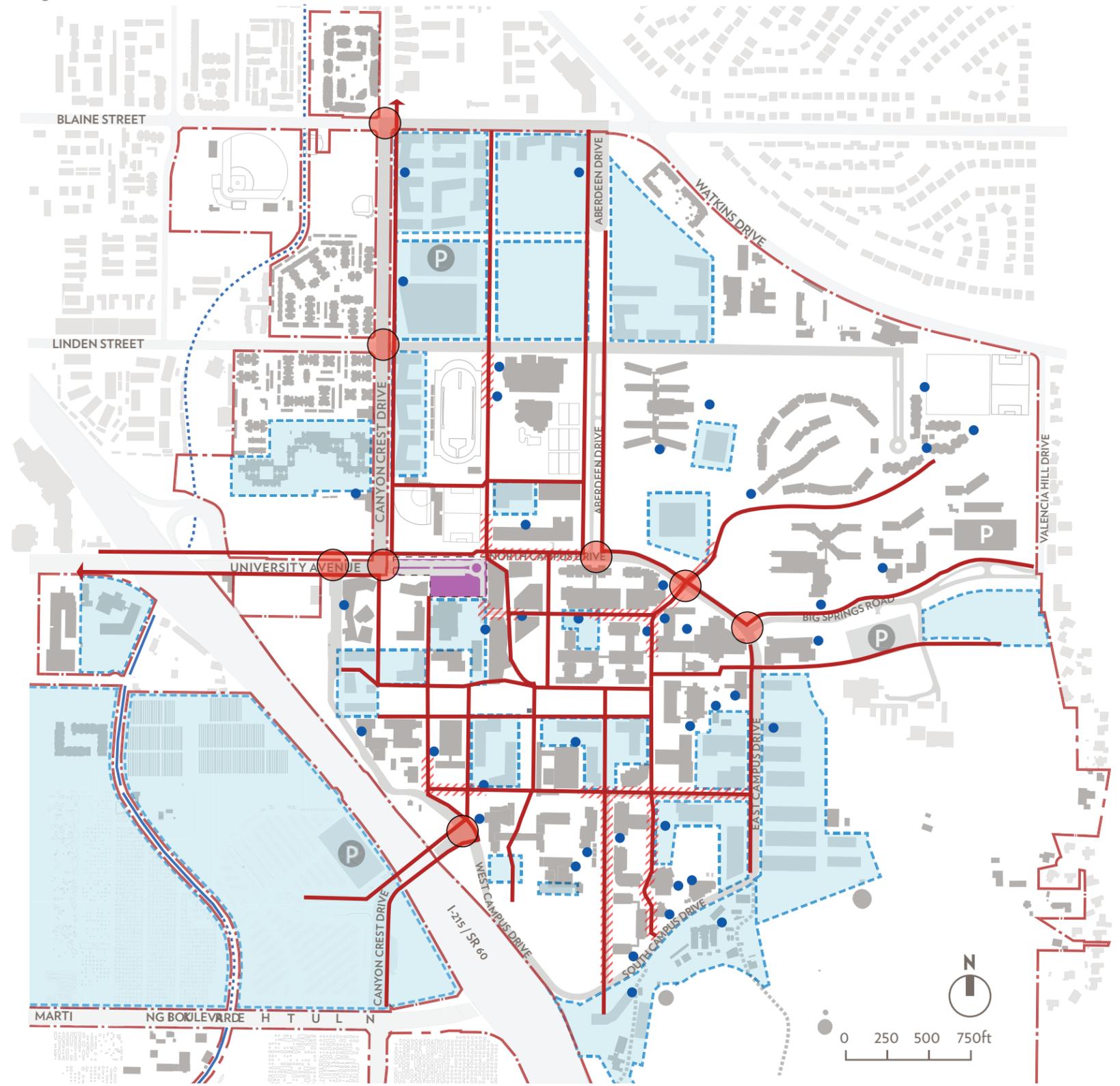
There are also several examples on campus of buildings that have existing service facilities that are no longer necessary. Some examples of this are the Rivera Library, the Bookstore, and the Geology Building. All of these buildings currently have loading docks designed for large truck deliveries, which are no longer utilized due to changes in their delivery needs.

FUTURE INITIATIVES

Reconfigure service routes and loading areas

Fig. 5.11 illustrates the service access proposed in the Master Plan Study. New service areas will be incorporated into the Opportunity Sites as redevelopment occurs.

Figure 5.11 PROPOSED SERVICE ACCESS



Service route improvements around the Mobility Hub, specifically, will include:

- Providing direct access to campus facilities and avoiding circuitous routes for service vehicles.
- Restricting delivery vehicle access through the construction of a gate adjacent to the Bookstore at the end of the current service drive. This gate will allow emergency vehicle access but restrict vehicles from entering the Commons Mall.

The Planning Team recommends that UC Riverside study the potential for service to enter campus adjacent to the Pierce Hall loading area. This would allow vehicles on the Commons Mall to be completely eliminated. The grade of this area would need to be factored into the feasibility of providing service vehicle access.

Service Courtyards

A comprehensive solution is the provision of service courtyards for new buildings or redeveloped existing buildings. Service courtyards will be incorporated into the Master Plan Opportunity Sites. For example, the North District can provide a centralized courtyard to serve multiple buildings. Service vehicle and accessible parking can be provided as well. These service courtyards provide a significant amount of flexibility, allowing the space to be reconfigured as the service and loading needs of buildings change over time. This joint-service approach reduces potential conflicts between bicycles, pedestrians, and service vehicles.

Key mobility benefits of future initiatives

- **Centralized access:** Transit access to the campus will be significantly improved with the Mobility Hub. Currently, most RTA buses load and unload on Canyon Crest Drive at locations remote from the Core Campus. The Mobility Hub is embedded into the fabric of campus, near key destinations such as the Highlander Union Building (HUB).
- **Better bus operations:** RTA buses stopping on Canyon Crest Drive have to extend their routes after dropping off passengers, as they are unable to turn around at the final stop. The Mobility Hub will provide a turn-around, allowing buses to reduce their travel time to and from campus. With a reduction in travel time, the same number of RTA buses can provide higher frequency service.
- **Multi-modal access:** The existing pick-up and drop-off locations provide access to sidewalks but limited connections to other modes. The Mobility Hub will consolidate modes such as bike riding and car sharing, allowing a person to exit the bus and directly connect to these other types of travel.
- **Better connectivity to the Riverside community:** As transit service improves, there will be more opportunities for students, particularly those that live on campus, to use transit to connect to other areas in Riverside. Local destinations such as Downtown Riverside will be more accessible to these on-campus students, providing additional cultural, dining, and recreational opportunities. In addition, bus service can provide access to the future Metrolink station at Hunter Park.
- **VMT/GHG reductions:** As persons traveling to and from UC Riverside use transit with greater frequency, there will be a proportionate reduction in vehicular trips. This reduction will reduce VMT and GHG, consistent with State regulations and UC policy. Diverting personal automobile trips to carpooling, vanpooling, transit, bicycling, and walking will also reduce fossil fuel consumption.
- **Synergy with emerging technologies:** The transportation field is undergoing a transformative change as new technologies and strategies are being developed and deployed. Mobile phone applications that tie transit with car sharing and bicycles are widely available and will continue to be heavily used in the future. Providing a high level of multi-modal connectivity will increase mobility choices. Autonomous vehicles can also be integrated into the University's transportation system as they become more commonplace.
- **Parking management:** Effectively managing existing and future parking resources will reduce the number of new parking spaces required, protecting available land resources for academic buildings and open spaces.
- **Bicycle and pedestrian circulation:** Dedicating facilities for bicycle riders and pedestrians will improve their overall safety by protecting them from vehicular traffic.
- **On- and near-campus housing:** Enabling more students to live on or near campus will help to minimize the amount of new parking required as the campus continues to grow and will allow more students to walk and bike to classes instead of driving.

