
IOWA STATE UNIVERSITY

# Bicycle Planning Services

## Phase 1: Needs Assessment | July 2018

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# Contents

# Introduction

This effort is the first part of a multi-phase initiative to identify needs, develop strategies, and set priorities for bicycle access and mobility on the Iowa State University campus. The focus of Phase 1 is to initiate the bicycle planning initiative by identifying needs for infrastructure enhancements across campus. This phase included the following tasks:

- **Bike Advisory Group Establishment** – Staff, faculty, and student members were recruited to form a Bike Advisory Group (BAG) to provide input on the development of this needs assessment and future bike-related issues and efforts.
- **Online Survey** – An initial online survey was administered to identify preferences and priorities for biking on campus, as well as key issues.
- **Crowdsource Mapping** – An online interactive mapping platform was launched to collect user-identified barriers, challenges, and desired connections.
- **Multi-Day Workshop** – A week-long workshop involving ISU staff, consultant staff, and the BAG was held to identify priorities, perform observations of key locations, and collect site photography.
- **Policy and Program Focus Areas** – Identification of key programmatic, behavioral, policy, and enforcement issues that affect the safety and appeal of bicycling on and off campus.
- **Infrastructure Focus Areas** – Identification and analysis of major infrastructure-related issues and opportunities on campus.
- **Prioritization Framework** – A method for prioritizing bicycle infrastructure projects.
- **Bike Advisory Group Framework** – Guidance for adjusting the composition and function of the BAG based on the findings of Phase 1.

## Online Survey

An online survey was developed to ask students, faculty, and staff about their current bicycling habits in and around ISU. The survey was available from April 11 to May 20, 2018 and was advertised via email, multiple newsletters, and social media outlets. The survey received 678 total responses—562 fully completed surveys and 116 partially completed surveys.

### Overview of Input

Most people who participated in the survey were either staff or undergraduate students—37% and 34% respectively. Most survey respondents live on campus or in Ames. Only 16% of respondents live outside of Ames. Respondents identified numerous opportunities, challenges, and potential solutions. Results from the survey indicate the need to:

- Address the conflict between bicyclists and pedestrians
- Provide general education about the rules of the road and etiquette
- Provide encouragement and education for riding in unpredictable weather
- Coordinate with the City of Ames to increase the availability of safe routes off campus
- Identify and publicize good routes on campus
- Increase the convenience and supply of bicycle parking
- Improve maintenance of streets
- Increase the flexibility of parking passes to encourage biking
- Provide discounted gym memberships and access to showers

- Provide free bike bells
- Develop Park & Walk locations for aggregating bicycle parking and end-of-trip facilities to key locations

## Online Interactive Map

The project team developed an online interactive map (WikiMap) as a tool to gather public input on biking infrastructure on campus at ISU. Respondents identified biking destinations, biking problem spots, places that need more bike parking, good biking routes, and biking routes that need improvement. There were 143 respondents that provided a total of 322 comments on the WikiMap. The map below displays all 322 routes or points that were identified, and the subsequent pages display comments for each individual category separately.

### Overview of Input

ISU staff comprised 50% of the interactive map participants—the single largest participant group. Undergraduate students made up the second largest group with 24% of participants. In an introductory survey where respondents could only choose one option, 41% said they strongly prefer a bicycle facility such as a bike lane, while 39% said they are not comfortable with much traffic and prefer paths or trails.

Participants were asked to identify on the map places they typically bike to, problem spots for biking, locations where bike parking is needed, routes that are currently good for biking, and routes for biking that need improvements. Map input was well-distributed across campus, with most of the destinations and parking needs identified in the western half of campus. Multiple participants identified the desire to have more direct, connected north-to-south and west-to-east routes that go through central campus, particularly off-street paths or trails.

## Summary of Phase 1: Needs

The purpose of Phase 1 was to identify, record, and analyze key needs on campus. This was achieved through the online survey, crowdsource mapping, input from a stakeholder group representing various university departments and student groups, and consultant observations.

While several issues were identified on campus (see page 5), the primary needs identified during Phase 1 revolve around pedestrian-bicyclist conflict, which is a clear challenge to bicycle transportation on campus. This issue was raised by the BAG during this needs assessment process, and even though it was not included as an option on the multiple-choice online survey question regarding barriers to bicycling, it appeared as the second most-cited barrier on the survey through write-in answers. People who already ride bikes were more likely to cite pedestrian conflicts as a reason for not bicycling on campus, but non-bicyclists also cited this barrier frequently.

Survey respondents cited infrastructure causes (narrow pathways, lack of on-street bicycle facilities leading to sidewalk riding, directness of pathways versus streets) and non-infrastructure causes (distracted pedestrians, poor etiquette by bicyclists and pedestrians). This problem is especially acute during class change periods when students must traverse campus in a limited amount of time. Field observations by the consultant team also identified pathway intersections as a particularly frequent site of pedestrian-bicyclist conflict. Survey respondents' first choice of campus projects or programs that would encourage them to ride was also related to pedestrian-bicyclist conflict: bike-only paths separate from pedestrians on campus. This response was the clear top choice across users of all modes.

Addressing these challenges requires policy, program, and infrastructure solutions. Top-priority solutions are described in the Policy and Program Focus Areas and Infrastructure Focus Areas sections of this report. They include:

- Exploring a policy addressing bicycling on campus paths, walks, and sidewalks
- Launching a bicycling education campaign
- Developing solutions for five infrastructure focus areas, including:
    - Union Drive (Sheldon Avenue to Bissell Road)
    - Osborn Drive
    - Beach Road (Lincoln Way to Wallace Road)
    - Stange Road / Pammel Drive / N. University Boulevard intersection
    - Wallace Road (University Boulevard to Beach Road)

# Inventory of Issues

Through the survey, online interactive map, BAG meetings, and consultant observations, several issues that affect people's ability to bicycle on campus were identified. The relative importance, priority, and solvability of these issues vary—with pedestrian/bicyclist conflicts being the top issue—but each issue should be considered when making changes to the built environment for bicycling

### Conflicts with pedestrians on campus

The most significant issue observed on campus was the conflict between bicyclists and pedestrians, particularly at street crossings or path intersections. Conflicts between bicyclists and pedestrians also often occur along sidewalks on campus, as walks are generally too narrow to accommodate mixed pedestrian and bicycle traffic during peak periods in between classes.

### Unpredictable weather

Weather patterns in Ames can be unpredictable; inclement weather and seasonal changes in weather patterns can deter some people from bicycling.

### Gateways to campus feel unsafe

Survey respondents reported that gateways to the main academic core of campus (e.g., street crossings and busy intersections) feel unsafe.

### Routes to campus feel unsafe (traffic-related)

Many streets that lead to the ISU campus lack dedicated bicycle facilities, and those roads often feel unsafe to people bicycling.

### People bicycle on sidewalks

Many people choose to bicycle on the sidewalk, even in cases where a low-traffic street and sidewalk parallel each other. This habit is assumed to be due to the discomfort of bicycling on busier streets and the lack of dedicated on-street bike facilities.

### People do not know the best bicycling routes

Several people in the online survey and interactive map mentioned that they are interested in biking, but do not know where the best biking route are located on campus.

### Overcrowded or inconvenient bike parking

Some bike parking locations on campus are inconvenient and others do not have the capacity to meet parking demand, which may result in bicyclists locking their bikes to trees or other fixed objects.

# Policy and Program Focus Areas

Based on the needs and issues identified through input from the BAG, online survey, and consultant observations, there are two general focus areas that require policy and programmatic approaches to resolve.

## Biking on Campus Paths

Most of the sidewalk system on campus was designed for pedestrians only and was not designed for biking. However, bicyclists often use the walks due to their convenience and the lack of dedicated bicycle facilities in some parts of campus. The width of many of the walks are insufficient for pedestrian volumes during peak periods before or after class sessions, and adding bicyclists to the paths makes them even more crowded. Mixing bicyclists and pedestrians on the sidewalk system often leads to conflicts between the two modes.

ISU does not have an official policy regarding the appropriateness of biking on paths on campus. There is a need for further discussion about bicycling on the sidewalk system, and consideration of developing a University policy with supporting actions for biking on campus. The policy should be rooted in ISU's unwritten philosophy that pedestrians have priority on campus.

Potential outcomes of a policy could include:

- Creation of an on-campus path designation system indicating via pavement markings and signs the intended use for each path, which may include:
  - Walking-only sidewalks
  - Shared walking and biking paths
  - Bicycling-only paths
- Designation of pedestrian-only zones, dismount zones, or slow-speed zones
- Development of a university-wide community outreach program aimed at educating bicyclists and pedestrians on the new policy/approach that is implemented by ISU


*Figure 1: The bike route signs on campus are aging, and the only bike-only path on campus does not have any pavement markings to indicate that it is intended for bicycle use only.*

Lastly, ISU should continue exploring the possibility of a cross-campus, east to west bicycle path. Results from the online interactive map show a desire for a cross campus path and a better bicycling connection between Beach Road and the west side of campus. The planning and design of the cross-campus path could happen in conjunction with a new ISU policy on bicycling on campus.

## Bicycling Education Campaign

Education and awareness of bicycling rules and behavior are an integral component of improving the safety of bicyclists, pedestrians, transit users, and motorists alike. Without proper knowledge and skills regarding how to interact with pedestrians and motorists, people riding bikes may behave in ways that put themselves or others at unnecessary risk (e.g. bicycling the wrong way against motor vehicle traffic, failing to look for pedestrians when turning at an intersection, etc.). The Facilities Planning and Management communications group is currently developing resources and an outreach webpage for biking on campus. Additional initiatives should be deployed to help improve bicycling education for all users, particularly around the topic of bicyclist and pedestrian interactions.

One of the components of a bicycling education campaign could be to incorporate bicycling into communications to students through the Division of Student Affairs. Guides and other information such as bicycling behavior, bicycle maps, bicycle registration forms, and Iowa and Ames law/ordinance cards may be distributed to incoming freshmen through programs targeted to new students .

ISU could also develop informational materials when a new bicycle facility is developed to help educate students, staff, and faculty about how to use new bikeway facilities. When a new type of bicycle facility is implemented, it is important for representatives from the Facilities Planning and Management and Public Safety Departments to coordinate on the content and messaging of associated education materials. It may take time for people to familiarize themselves with a new type of path or bikeway on campus, so a clear message from university officials will help with the transition period.

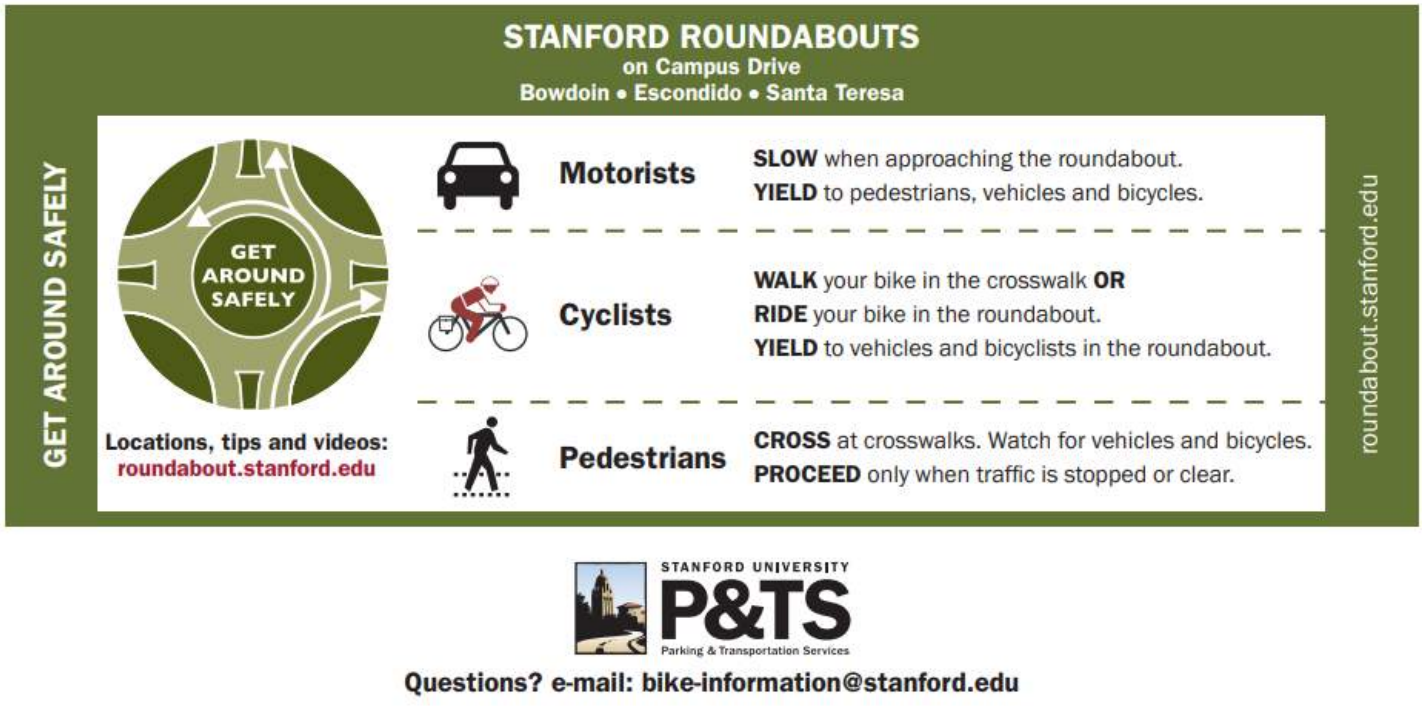



*Figure 2: An example bicycle education graphic from Stanford University.*

## Infrastructure Focus Areas

The project team identified five locations/corridors on the ISU campus that have the greatest need for improvements to bicycling infrastructure and bicycle network connectivity. The locations were chosen based on input received from the bicycle advisory group, public input received from the online interactive map and the online survey, and from project team members field observations on campus. Each of the five locations is described in detail on the following pages, including the issues observed at each location and potential opportunities for improvement. Figure 3 identifies the locations of the five focus areas.

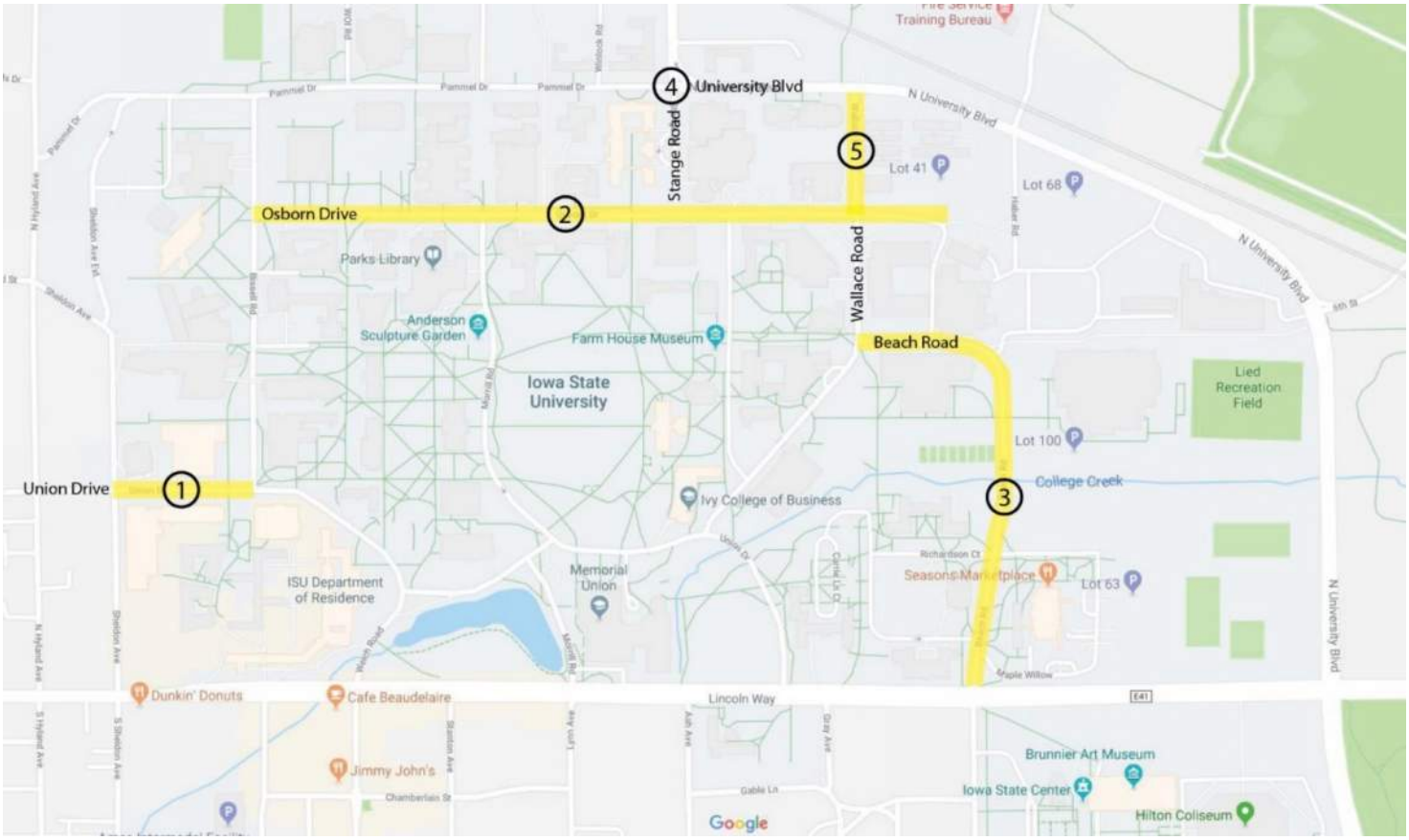



*Figure 3: Map locations of the five infrastructure focus areas on the ISU campus.*

# 1. Union Drive: Sheldon Avenue to Bissell Road

## Overview

Union Drive from Sheldon Avenue to Bissell Road is one of the primary entrances to the ISU campus when approaching from the west. Results from the online survey indicate that about 22% of students enter campus coming from the west near Sheldon Avenue and Hyland Avenue. During peak periods, the area has very high pedestrian and bicycle volumes, including pedestrians that are alighting CyRide buses at the southwest corner of Union Drive and Sheldon Avenue. Union Drive has shared lane markings for bicyclists.


## Observations

- Heavy pedestrian crossings at Union Drive and Sheldon Avenue
- Low motor vehicles traffic volumes
- Lack of dedicated bicycle facility on Union Drive
- Some bicyclists riding on sidewalks, posing conflicts with pedestrians

## Opportunities

Union Drive is a wide street with two lanes in each direction. Traffic volumes on the street are relatively low, and may not warrant the existing four lane configuration. There is an opportunity to reconfigure the roadway and provide an on-street bike facility, which could be a standard bike lane, a buffered bike lane, or a protected bike lane.

*Figure 4: A buffered bicycle lane provides additional space between motor vehicles and bicyclists.*

## 2. Osborn Drive

### Overview

Osborn Drive is a busy east-west street on the north side of campus, connecting Bissell Road in the west to Wallace Road in the east. The road has very heavy bus volumes, high pedestrian volumes, and moderately high bicycle volumes. The current roadway width is approximately 36 feet from curb to curb, and daytime parking was recently removed along the entire corridor. The road has shared lane markings for bicyclists, although the markings are wearing off and bicyclists often ride in the center of the road.

*Figure 5: Osborn Drive is a busy street for buses, pedestrians, and bicyclists.*

### Observations

- High bus volumes and many busy stops
- No personal vehicles allowed
- Lack of dedicated bicycle facility on Osborn Drive (existing road has a shared-lane marking)
- Bicyclists riding on sidewalks, posing conflicts with pedestrians

### Opportunities

Osborn Drive is a 36-foot wide street that presents an opportunity for a roadway reconfiguration to incorporate an on-street bikeway. The bikeway could be a standard bike lane, a buffered bike lane, or a protected bike lane. The heavy bus volumes need to be carefully considered in the configuration of the street, particularly looking at existing bus stops locations. Despite the heavy bus volumes and concentration of bus stops, the roadway still provides a great opportunity to incorporate a dedicated bicycle facility due to the width of the street.

*Figure 6: Osborn Drive could have a dedicated bike lane while still accommodating buses, similar to the roadway configurations on 6th Street in Ames shown above.*

## 3. Beach Road: Lincoln Way to Wallace Road

### Overview

Beach Road is a curvilinear road that stretches from Lincoln Way in the south, north through campus, then turns west until terminating at Wallace Road. ISU's only on-campus dedicated bike path is located directly west of the intersection of Beach Road and Wallace Road, although the connection requires bicyclists to mix with pedestrians and share a narrow curb ramp.


*Figure 7: Beach Road, approaching the intersection with Wallace Road. The connection from Beach Road to the bike path across the road requires mixing with pedestrians on a narrow sidewalk and curb ramp.*

### Observations

- Under-utilized roadway width on Beach Road – a significant portion of road is striped shoulders or striped medians
- Connection to bike trail between Wallace Road and Farm House Lane requires mixing with pedestrians on a narrow sidewalk and curb ramp
- Dual turn lanes at Wallace Road and Beach Road are unnecessary due to low traffic volumes
- Provides access to popular recreation destinations such as Lied Recreation Athletic Center, recreation field, and tennis courts

### Opportunities

Beach Road provides a prime opportunity to extend the dedicated bike path between Wallace Road and Farm House Lane all the way south to Lincoln Way. Beach Road has a significant portion of roadway that is underutilized, including striped shoulders, striped medians, and underutilized motor vehicle turn lanes. Results from the online interactive map show bicycling problem spots on Beach Road and a desire for an improved bicycle connection on Beach Road between Wallace Road and the Lied Recreation Athletic Center. There is an opportunity to reconfigure the roadway and provide a two-way protected bike lane on the east/north side of Beach Road, extending from Lincoln Way to Wallace Road. This connection would provide a comfortable, safe, and dedicated bike facility into campus from Lincoln Way. It would also connect to popular recreation destinations, such as the Lied Recreation Athletic Center, Lied Recreation Field, and the campus tennis courts.

*Figure 8: Beach Road has a significant amount of under-utilized pavement space, including striped shoulders and striped medians.*

## 4. Stange Road / Pammel Drive / N. University Boulevard Intersection

### Overview

The intersection of Stange Road, Pammel Drive, and N. University Boulevard is a critical access point to the ISU campus when coming from the north. Results from the online survey indicate that about 26% of students enter campus from Stange Road coming from the north, which is the most popular campus access point. During peak periods, the intersection is very busy with motor vehicles, pedestrians, bicyclists, and buses.


*Figure 9: The intersection of Stange Road, Pammel Drive, and University Boulevard.*

### Observations

- Heavy motor vehicles volumes on Stange Road during peak periods
- Peak periods have heavy turning vehicles volumes off of Stange Road heading east on University; signal phase inadequate for turning vehicles volumes
- Heavy pedestrian and bicyclist volumes on path on east side of Stange Road
- Short signal timing for pedestrians crossing University
- Shared lane markings for bicyclists on Stange Road

### Opportunities

One of the biggest opportunities to improve this intersection include adjusting the signal timing/phase to better accommodate the volumes of vehicles, bicyclists, and pedestrians crossing University Boulevard, particularly during peak periods. Second, the shared-use path on the east side of Stange Road would ideally be widened to better accommodate the bicyclist and pedestrian volumes during peak periods; however, this is a significant challenge due to the horizontal clearance under the railroad bridge. Consideration could be given to rerouting bicycle and pedestrian traffic to the west side of Stange Road and to the existing path underpass near Wallace Road.

## 5. Wallace Road: University Boulevard to Beach Road

### Overview

Wallace Road is a relatively low-volume street that provides access to several buildings on the east side of ISU's campus. The existing roadway configuration has two lanes in each direction and shared-lane markings for bicyclists, but does not have a dedicated bike facility. Pedestrian volumes are lower on Wallace Road compared to many other streets on campus.

*Figure 10: Wallace Road has shared lane markings for bicyclists, but there is an opportunity to enhance the corridor for biking by providing a dedicated bike facility or widening the existing sidewalk to a 10'-foot wide shared use path.*

### Observations

- Shared-lane bike markings exist on Wallace Road but likely do little to encourage people to bike in the roadway
- Relatively low pedestrian volumes
- Bicyclists frequently crossing University Blvd to access tunnel under railroad north of intersection

### Opportunities

There is an opportunity to more comfortably and safely accommodate bicyclists on Wallace Road than the existing shared-lane markings. The existing roadway configuration is two lanes in each direction, but motor vehicle volumes appear to be relatively low and two lanes in each direction may not be warranted. The road is wide enough to be reconfigured and provide a dedicated bike facility on Wallace Road from University Boulevard south to the intersection with Beach Road. This reconfiguration would connect directly to the on-campus bike trail west of Beach Road/Wallace Road, and it would also connect directly to the potential on-street bikeway on Beach Road (see page 11).

If it is determined that the existing four-lane road configuration should be maintained, there is also an opportunity to widen the existing sidewalk on the east side of Wallace Road to a 10'-wide shared use path that extends from University Boulevard south to Beach Road. The intersection of Wallace Road and University Boulevard could also be studied to provide a safer, more comfortable crossing for bicyclists looking to access the tunnel beneath the railroad tracks north of the intersection.

*Figure 11: Bicyclists crossing University Boulevard on Osborn need to share a narrow sidewalk and curb ramp with pedestrians, and then cross a parking lot to access the tunnel beneath the railroad north of the intersection.*

## Project Prioritization Framework

To determine which bicycle infrastructure projects are most important and should be implemented first, ISU should consider using a project prioritization framework. The project prioritization framework table shown below consists of five factors used for scoring and selecting potential bicycle infrastructure projects – traffic, stakeholder input, cost effectiveness, connectivity, and demand:

| Project Prioritization Framework | | | |
|---|---|---|---|
| Factor | 1 point | 2 points | 3 points |
| **Traffic**<br>Combination of foot, bike, bus, and auto traffic | Lowest traffic areas | Moderate traffic areas | Highest traffic areas |
| **Stakeholder input**<br>Number of concerns expressed by the campus community | Low number of concerns expressed | Moderate number of concerns expressed | High number of concerns expressed |
| **Cost Effectiveness**<br>Relative cost to implement, including consideration for non-monetary costs | Highest cost projects | Moderate cost projects | Lowest cost projects; quick wins |
| **Connectivity**<br>Between housing and the main academic core | Provides no connection or an indirect connection | Provides a somewhat direct connection | Provides a direct connection |
| **Demand**<br>Bicyclist demand based on bike rack occupancy | Not near most popular bike racks | Near moderately popular bike racks | Near most popular bike racks. |

Some of the factors may have quantitative scoring criteria, such as project cost and anticipated demand. Other factors will have qualitative scoring criteria that is more subjective, such as connectivity and stakeholder input. For subjective scoring criteria, members of the Bicycle Advisory Group could score projects and the average score from BAG members could be used for prioritization. After scoring each potential project with each of the five factors, the scores could be totaled and a prioritized list of projects could be developed. Top priority projects would likely score between 10 and 15 points.

# Bicycle Advisory Group Framework

The purpose of this section is to outline a proposed purpose and composition for the Bicycle Advisory Group (BAG) at Iowa State University (ISU). This proposal draws on best practices from bicycle friendly universities around the country, and an understanding of the major issues limiting bicycling at ISU today. An initial BAG was formed to provide input on the ISU Bicycle Planning Services, Phase 1 project and can serve as the foundation of an expanded BAG in the future.

## Typical Bicycle Advisory Group Composition:

## Lessons from Bicycle Friendly Universities

Most successful bicycle friendly universities have an official advisory group or committee in one form or another that helps guide changes and improvements to the bicycling environment on campus, as well as giving input on and championing on-going bicycle initiatives. Often the end goal of a university's advisory group is to increase bicycle ridership through improved safety and accessibility.

Advisory groups serve multiple purposes that can be divided into three core functions: 1) overseeing implementation of bicycle-related infrastructure, 2) advising on and overseeing implementation of bicycle-related programming, 3) advising on but **not** participating in implementation of infrastructure and programming. These three functions necessitate a diverse group as explained below.

### Infrastructure Implementers

Bicycling infrastructure on campus includes facilities for riding (such as streets, service drives, paths and sidewalks) and end-of-trip facilities (such as bicycle parking, storage, and showers). Planning for and maintaining bicycle facilities on streets is influenced by other demands on those streets such as daily commuter needs, deliveries, visitor access, service vehicles, and transit operations. Decisions about location of and space for bicycle parking may be influenced by desires for campus aesthetics and influenced by space planning and maintenance plans. Bicycle parking on many campuses also often results in the problem of abandoned bikes. Providing storage and showers for bicyclists can involve decisions about access to existing facilities and planning for building retrofits or new construction.

These concerns necessitate participation from a wide range of parties, often represented by people that oversee:

- Transportation and parking
- Transit operations
- Facilities maintenance (both buildings and grounds)
- Campus planning and development
- Campus police
- Housing administration
- Recreation

At some universities, a member from the adjacent jurisdiction may be included or asked to attend on an ad hoc basis where streets that traverse campus are owned and maintained by the jurisdiction rather than the institution.

### Program Implementers

The choice to use a bicycle for commuting to or on campus is often influenced by factors other than infrastructure. Bicycle friendly universities often offer programming ranging from all-modes education about rights and responsibilities of using streets and paths, to discounted access to recreation center showers for bicycle commuters. Efforts to create an expectation that bicycling is a normal and accepted mode of transportation to and on campus must be wide-ranging to be effective. Messages must be disseminated broadly to the different campus audiences which means the group should include representatives who can reach those various audiences and speak their language. Typical representatives to serve these roles are:

- University communications
- Admissions
- Campus recreation
- Outdoor recreation, if separate from above
- Student life office
- Human resources
- Student government and/or liaison to student groups (e.g., student sustainability coalition, cycling club)
- Faculty

### Advisory Members

All members of advisory groups serve in an advisory capacity in addition to helping implement infrastructure and programs, but some members may serve purely advisory roles. Inclusion of members who are long-time or new bicyclists on campus can help bring additional perspectives to the table, but it can also be difficult to extrapolate effective advice from individuals' experiences. It is also important to have non-bicyclists' opinions represented in the group so the group can understand perspectives of drivers, pedestrians, and transit riders that need to be considered in relation to changes that benefit bicyclists.

## Function of the BAG

The BAG at ISU will be tasked with implementing solutions that address bicycling barriers on campus. At workshops held in spring 2018, through the online survey, and through consultant observations, numerous opportunities, challenges, and potential solutions were identified that should inform the future composition and role of the BAG:

- Implementing infrastructure, signs, and pavement markings to provide space for bicycling separate from pedestrians
- General education about the rules of the road and etiquette
- Encouragement and education for riding in unpredictable weather
- Coordinating with the City of Ames to increase the availability of safe routes off campus
- Identify and publicize good routes on campus
- Increase the convenience and supply of bicycle parking
- Improve maintenance of streets
- Increase the flexibility of parking passes to encourage biking
- Discounted gym memberships and access to showers
- Provide free bike bells

- Develop Park & Walk locations for aggregating bicycle parking and end-of-trip facilities to key locations

The range of issues and potential solutions for a productive bicycling environment cannot be addressed by infrastructure alone, and most necessitate a multi-pronged approach that includes education, encouragement, and enforcement with specific messaging targeted at the multiple audiences that exist on campus.

### Example Charter Statement

A description of the UC Berkeley Campus Bicycle Committee is provided below as an example charter for the ISU BAG.

*The committee is appointed by the Director of Parking & Transportation to formulate and recommend policy, guidelines, and procedures concerning bicycle use on the Berkeley campus. The Committee: evaluates and recommends strategies for improving the campus environment through the use of bicycles; reviews and evaluates policies and procedures regarding safe and authorized use of bicycles on campus; comments on campus construction project design where bicycle travel and/or storage may be impacted; develops and recommends to Parking & Transportation outreach and public education materials on bicycle use, safety, and security; assists in enhancement the campus environment through promotion of bicycles; reviews and evaluates environmental and transportation studies related to use of bicycles on campus; provides technical guidance to campus departments. Meets 2 times per year for up to two hours.*

## Current Study Representatives

During Phase 1 of the study, representatives from the following departments/in the following positions have filled the role of the BAG:

- Campus Planner, Facilities Planning & Management
- Communications Specialist, Facilities Planning & Management
- Facilities Manager, College of Veterinary Medicine (TAC Representative)
- Director, Parking Division, Department of Public Safety
- Bicycle Department Manager, Outdoor Recreation Program
- Senior Lecturer, Apparel, Events, and Hospitality Management (TAC Representative)
- Wellness Coordinator, ISU Wellbeing
- Library Assistant, University Library (TAC Representative)
- President, ISU Cycling Club
- Community and Regional Planning Club
- New Student Outreach, Student Government

## Proposed BAG Composition

Given the barriers bicycling and potential solutions outlined above, and typical composition for a university BAG, we propose representatives (10-12 total) from the following areas serve the listed functions:

- Facilities Planning and Management

    - Coordination of planning, design, and maintenance of campus bicycle parking and pathways
- Transportation Advisory Council
    - Coordination of BAG activities with other campus transportation issues
- Department of Residence
    - Coordination of residence-related bicycle parking, assistance with messaging to resident students
- CyRide
    - Coordination of street and pathway design with respect to transit routes and stops
- Admissions
    - Communication to prospective and new students
- University Human Resources
    - Communication to ISU employees, messaging to new employees, coordination of potential incentives for registered bicycle commuters
- Student Affairs
    - Communication to prospective and new students
- Student group liaisons (unless Student Government representative can serve this role)
    - Conduit to student groups who can help disseminate bicycle messaging and provide feedback

# Summary and Next Steps

During the spring 2018 semester, ISU's Bicycle Advisory Group was assembled, input was received from the campus community, issues were observed, and a set of focus areas (both infrastructure and non-infrastructure) was identified. This needs assessment sets the foundation for future bicycle planning efforts on the ISU campus, but may need to be updated in the future to account for changes in preferences and the effects of program and infrastructure implementation.

## Next Steps

Phase 2 will focus on developing solutions for the infrastructure focus areas identified in Phase 1. Tasks within this phase will likely include:

- **Brainstorming Workshop** – Meetings and site visits involving ISU staff, TDG staff and the BAG to develop, analyze, and discuss alternative potential solutions for priority areas.
- **Analyze and Refine Solutions** – Analysis of alternative potential solutions for feasibility and compatibility, and development of operational strategies for each area.
- **Develop Concept Plans** – Select preferred solution for each area and prepare plan-view drawings of alignments, typical sections and standard details, and graphics depicting solutions at unique challenge locations. Descriptions of solutions and references to relevant design standards will be provided.
- **Generate Cost Estimates** – Preparation of concept-level cost estimates for each area.

## Beyond Phase 2

After the completion of Phase 2, multiple additional work tasks could be performed as part of a bicycle planning program. Some of these potential future phases include:

- Development of a strategic plan with measurable objectives (e.g., a mode shift target) and strategies and timelines for achievement.
- Identify needs for bike parking and develop strategies to optimize the location of short-term, mid-term, and long-term bike parking to achieve operational objectives (e.g., encouraging or discouraging biking in certain locations).
- Develop content for bike education, encouragement, and outreach programs on campus.
- Develop an attractive, user-friendly map in printable and interactive format illustrating bikeways on and around campus, bike parking locations, and other features (such as potential future bikeshare stations).
- Study the financial and operational feasibility of establishing a bikeshare system. This could also include a business plan element to detail the costs of startup and operations of the system and identify optimal funding strategies for implementing a sustainable bike share system.

# Appendix A – Online Survey Results

An online survey was developed to ask students, faculty, and staff about their current bicycling habits in and around ISU. The survey was available from April 11 to May 20, 2018 and was advertised via email, multiple newsletters, and social media outlets. The survey received 678 total responses—562 fully completed surveys and 116 partially completed surveys.

## Affiliation and Residency

Most people who participated in the survey were either staff or undergraduate students—37% and 34% respectively. Most survey respondents live on campus or in Ames. Only 16% of respondents live outside of Ames.

Chart 1: Which best describes your affiliation with ISU?

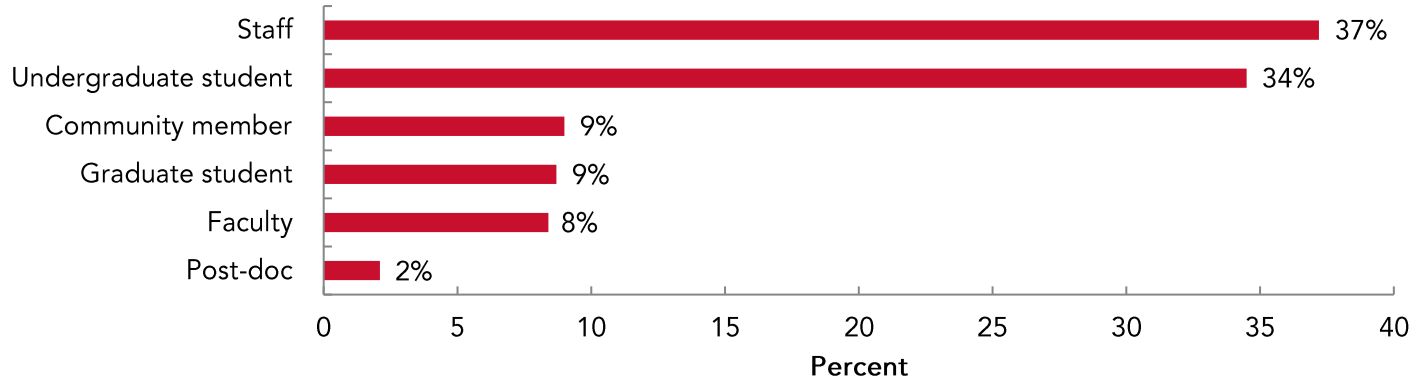
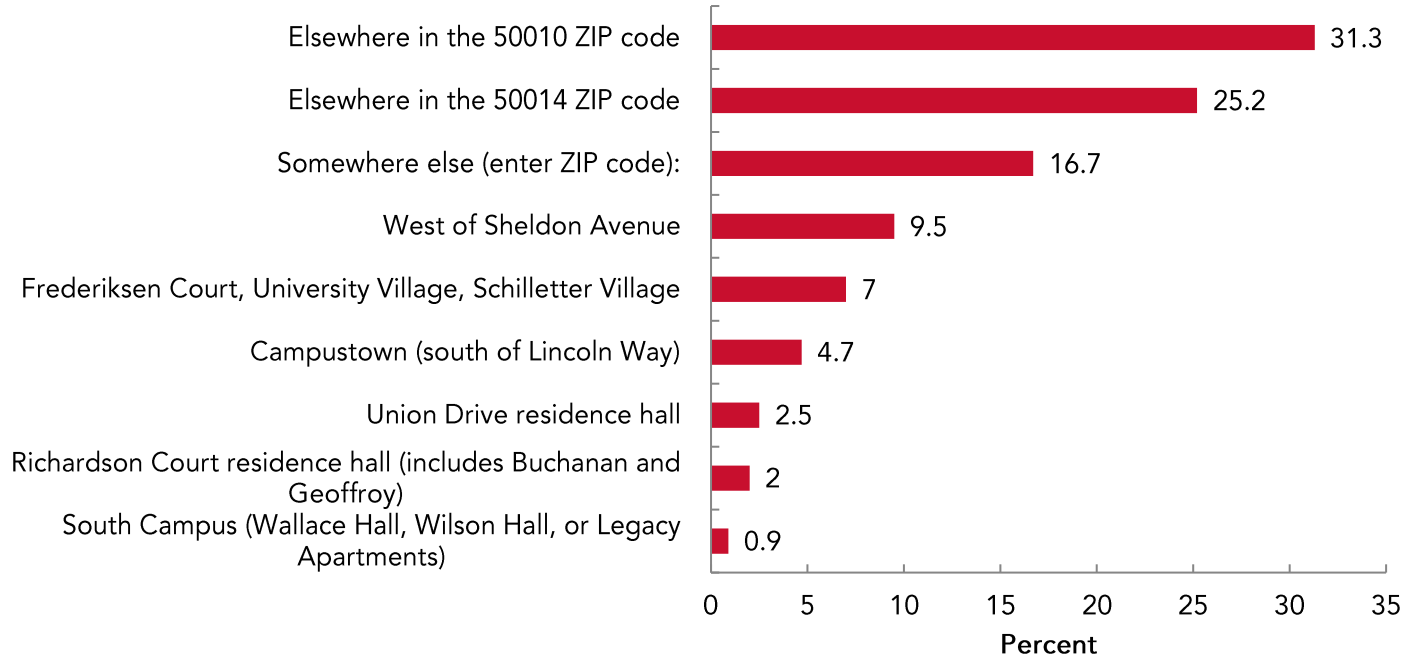


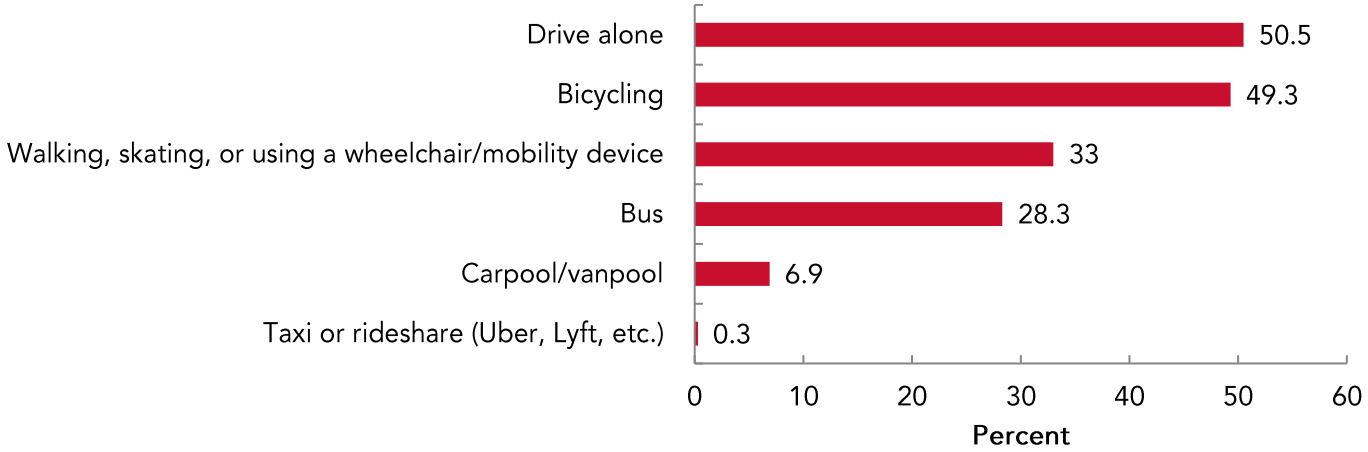

Chart 2: Where do you live?



## Travel Mode to Campus

The survey asked respondents how they typically travel to campus, which was a "select all that apply" question to allow participants to indicated multi-modal trips. Nearly half of survey respondents indicated that they typically travel to campus by bicycle, and one third of participants walk, skate, or use a mobility device for at least part of their typical trip to campus. Fifty percent of respondents drive alone to campus.

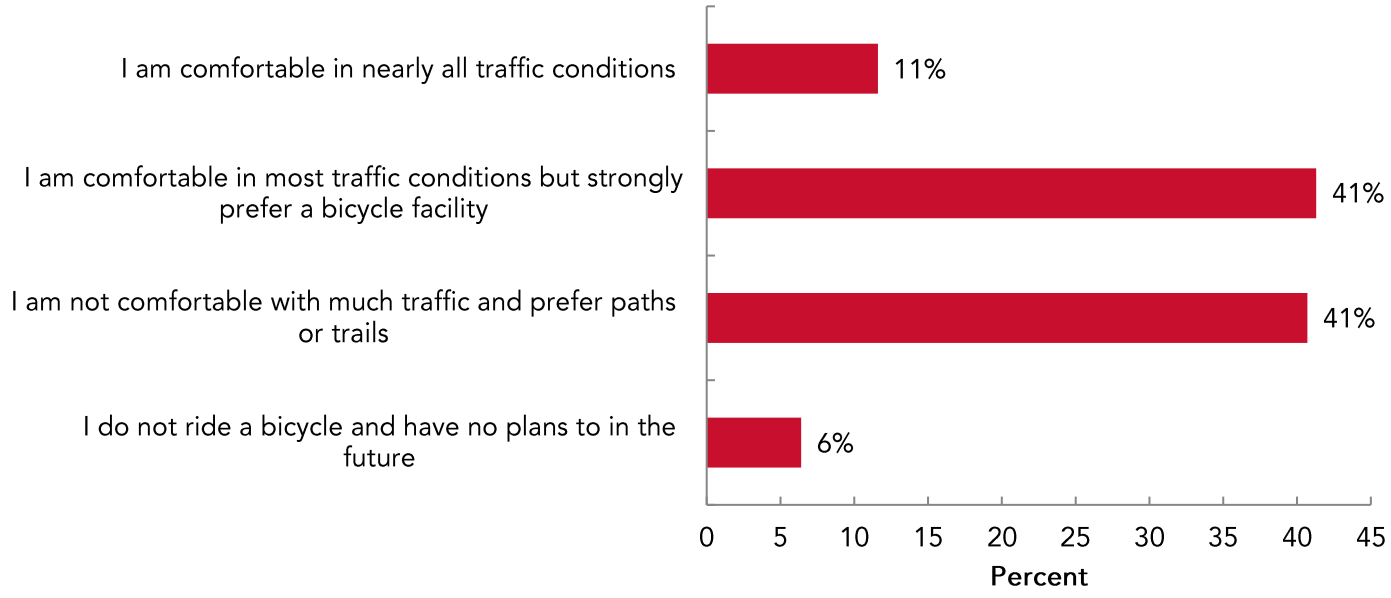
Chart 3: How do you typically get to/from campus? Select all that apply—for example, if you take a bus and then walk more than a block or so, select "bus" and "walking."




## Comfort Biking

The survey data shows that 82% of people prefer having a dedicated bicycle facility, and 41% are not comfortable with much traffic and prefer paths or trails. Of the people who participated in the survey, only 11% said they were comfortable bicycling in nearly all traffic conditions, and 6% said they do not ride a bicycle and have no plans to in the future.

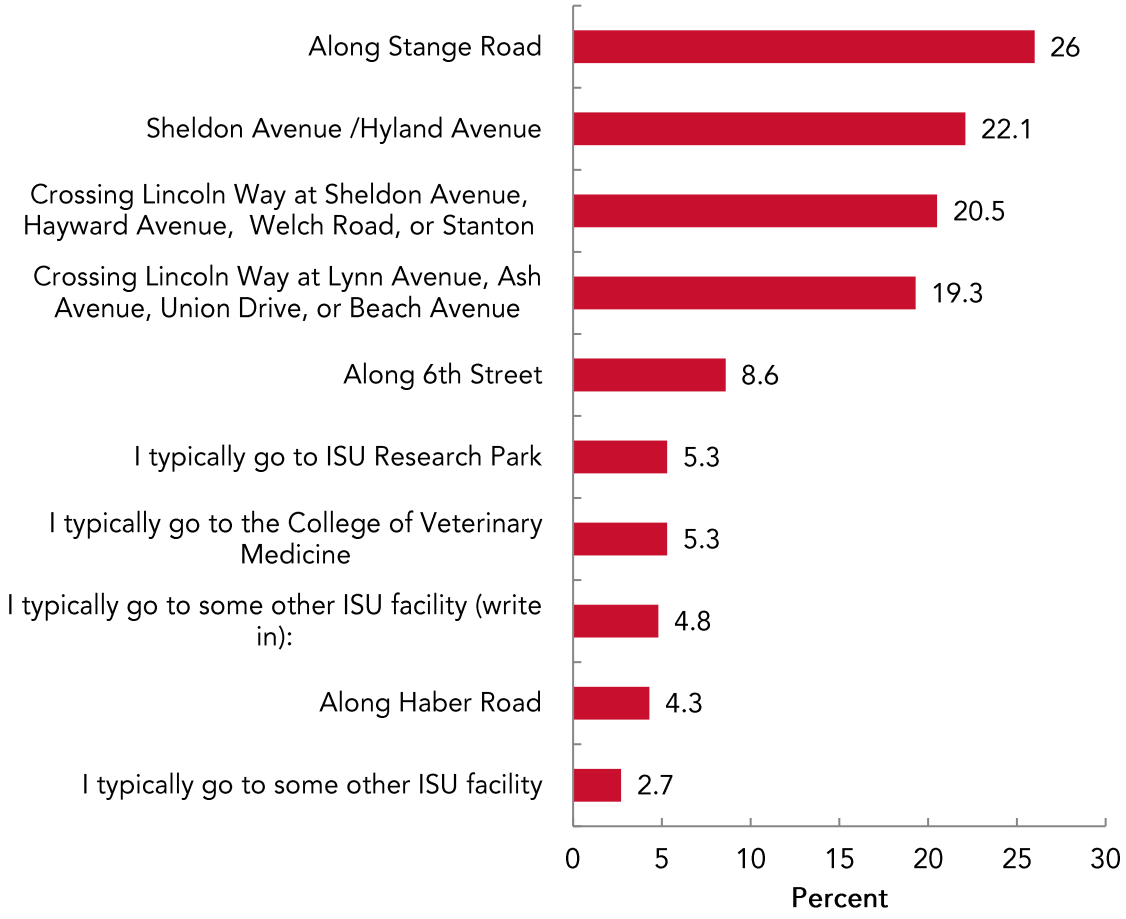
Chart 4: How comfortable are you bicycling with motor vehicle traffic?



## Campus Access Locations

To help understand travel patterns to the main academic core of campus, the survey asked respondents where they usually enter campus. Forty percent of respondents access campus by crossing Lincoln Drive. About 21% of those respondents enter campus from the south by crossing Lincoln Way west of Lynn Avenue/Morrill Road, and the other 19% cross east of Lynn Avenue/Morrill Road. Over ¼ of respondents indicated that they enter campus from the north on Stange Road, and 22% enter from the west along Sheldon Avenue or Hyland Avenue. Less than 9% entered from the east along 6th Street, and only 4% entered from the northeast along Haber Road.

Chart 5: Which of the following most closely describes the location where you usually enter campus (at least once per week)? Choose up to two options.



## Comparison: Affiliation and Residency by Travel Mode to Campus

To help better understand the travel habits of survey respondents, the results of how people typically travel to campus was analyzed based on where they live and what their affiliation is with ISU. Students are far more likely to bicycle to campus, while staff and faculty are more likely to drive. Of the participants who indicated that they regularly bike to campus, 45% are undergraduate students. Over sixty percent of respondents that regularly drive to campus are staff, and many of them live further away from campus. Unsurprisingly, people that live on or near campus are far more likely to regularly bike to campus. Most of the respondents that indicated that they regularly drive to campus live further away from campus.

Chart 6: Which best describes your affiliation with ISU? (of those who regularly BIKE to campus)

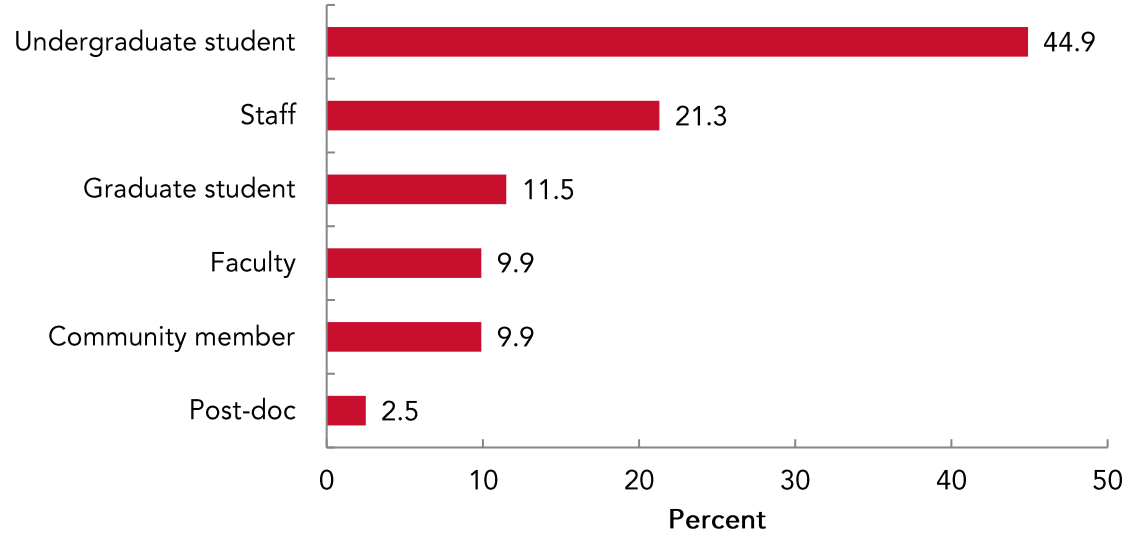



Chart 7: Which best describes your affiliation with ISU? (of those who regularly DRIVE to campus)

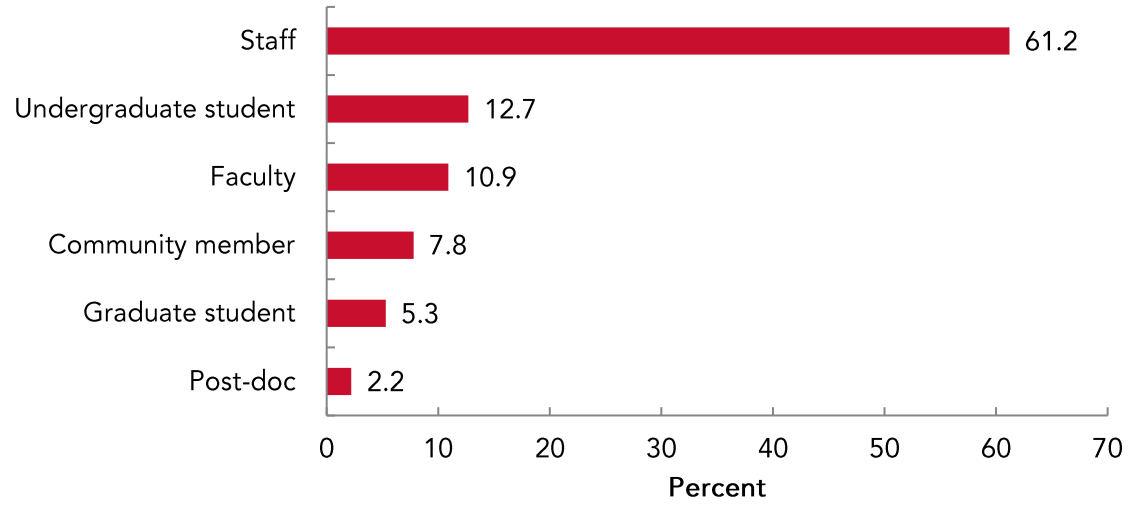


Chart 8: Where do you live? (of those who regularly BIKE to campus)

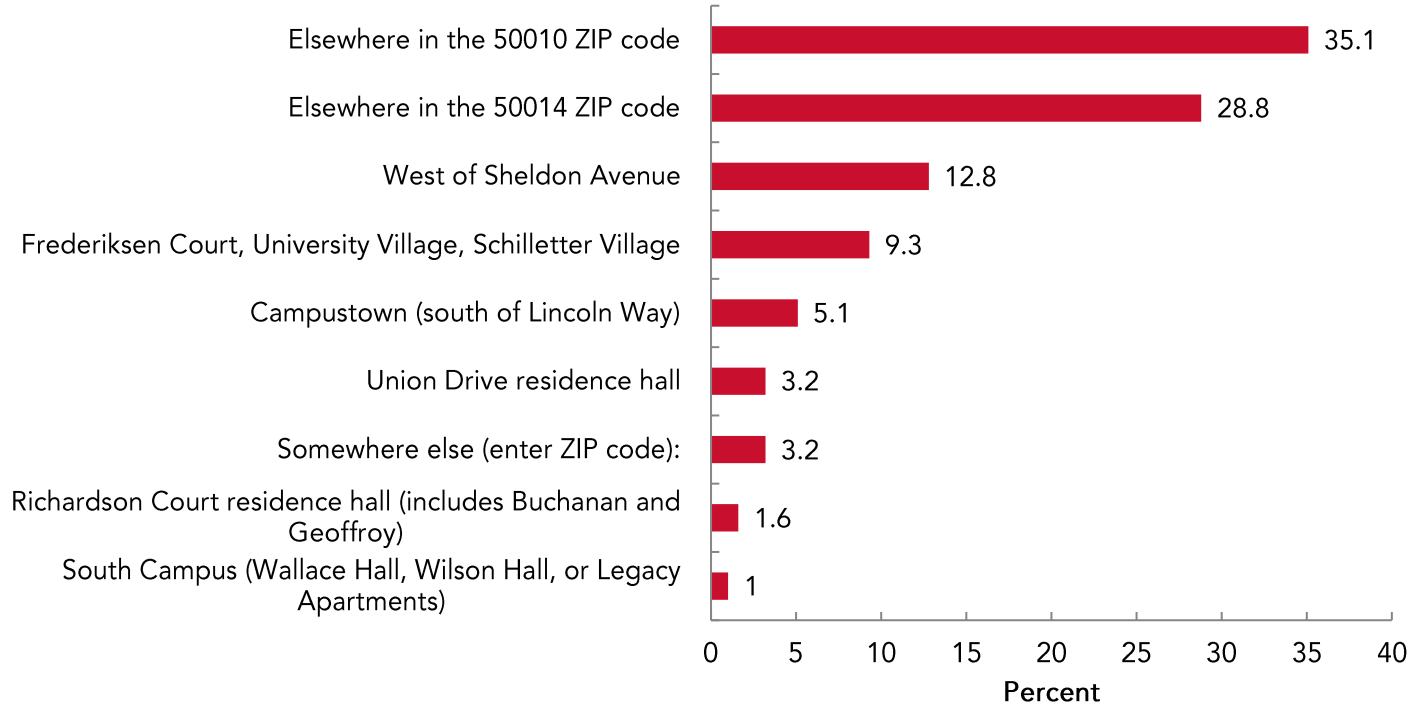
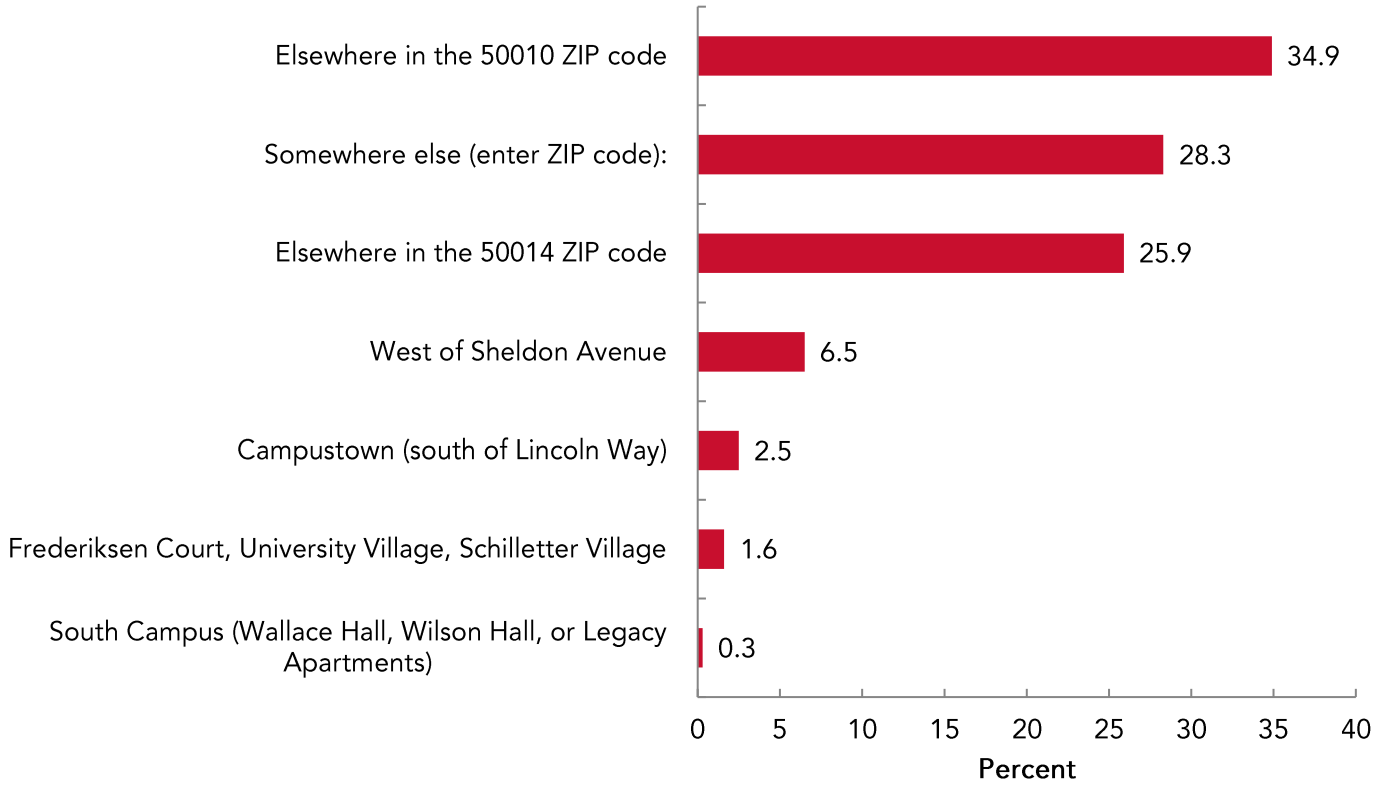



Chart 9: Where do you live? (of those who regularly DRIVE to campus)



## Comparison: Comfort Biking by Travel Mode to Campus

Chart 4 displays survey results of how comfortable all survey respondents feel bicycling with motor vehicle traffic. Chart 10 and 11 display bicycling comfort levels cross referenced with how respondents typically travel to campus. Of those respondents who regularly bike to campus, 56% said they are comfortable in most traffic conditions and an additional 17% said they are comfortable in nearly all traffic conditions. Only one-fourth of respondents who regularly bike to campus are not comfortable with much traffic. For those respondents that regularly drive to campus, over half are not comfortable with much traffic and prefer paths or trails. These results indicate that comfort while bicycling has a significant impact on whether or not people choose to travel by bicycle.

Chart 10: How comfortable are you bicycling with motor vehicle traffic? (of those who regularly BIKE to campus)

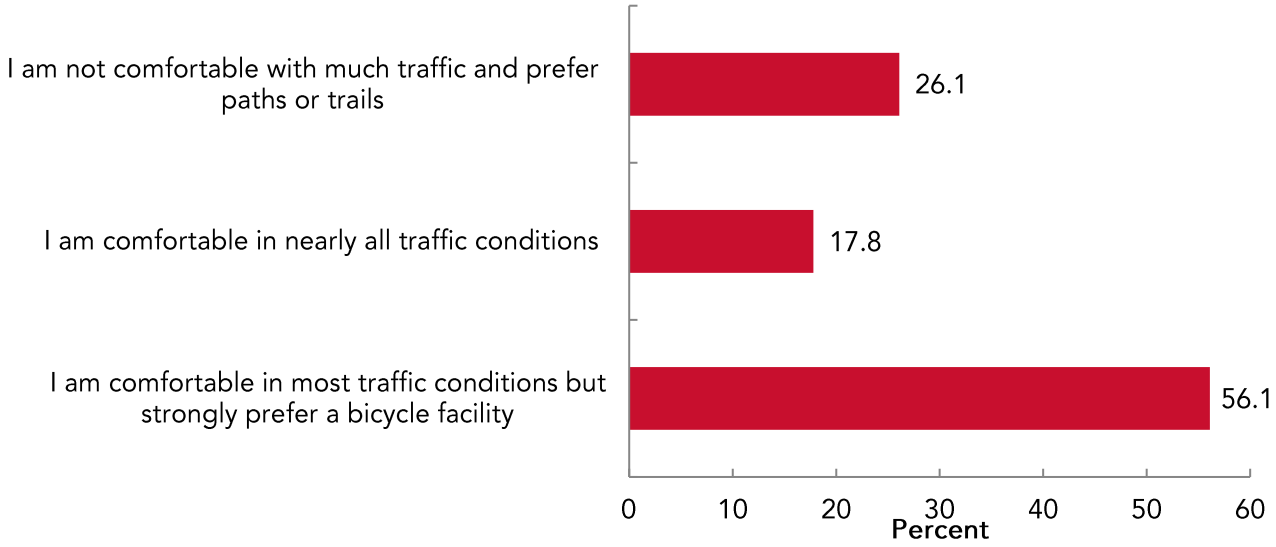
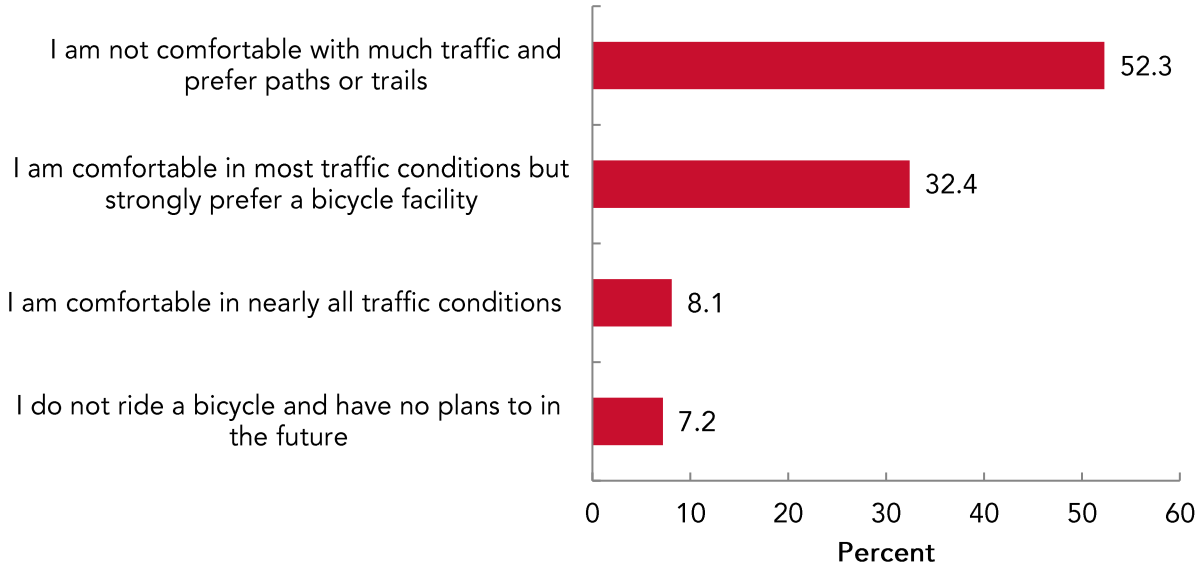



Chart 11: How comfortable are you bicycling with motor vehicle traffic? (of those who regularly DRIVE to campus)



## Comparison: Incentive Preferences by Travel Mode to Campus

The survey asked respondents what incentives or services would make them more likely to bike to, from, or on campus. For both people who regularly bike to campus and people who regularly drive to campus, the largest incentive for them to bike more often is having bike-only paths that are separate from pedestrians on campus. The second-most important incentive for both groups is having safer route options to and from campus. Have secured or covered bike parking was another incentive that ranked highly amongst both groups.

Chart 12: Incentives for biking (of those who regularly BIKE to campus)

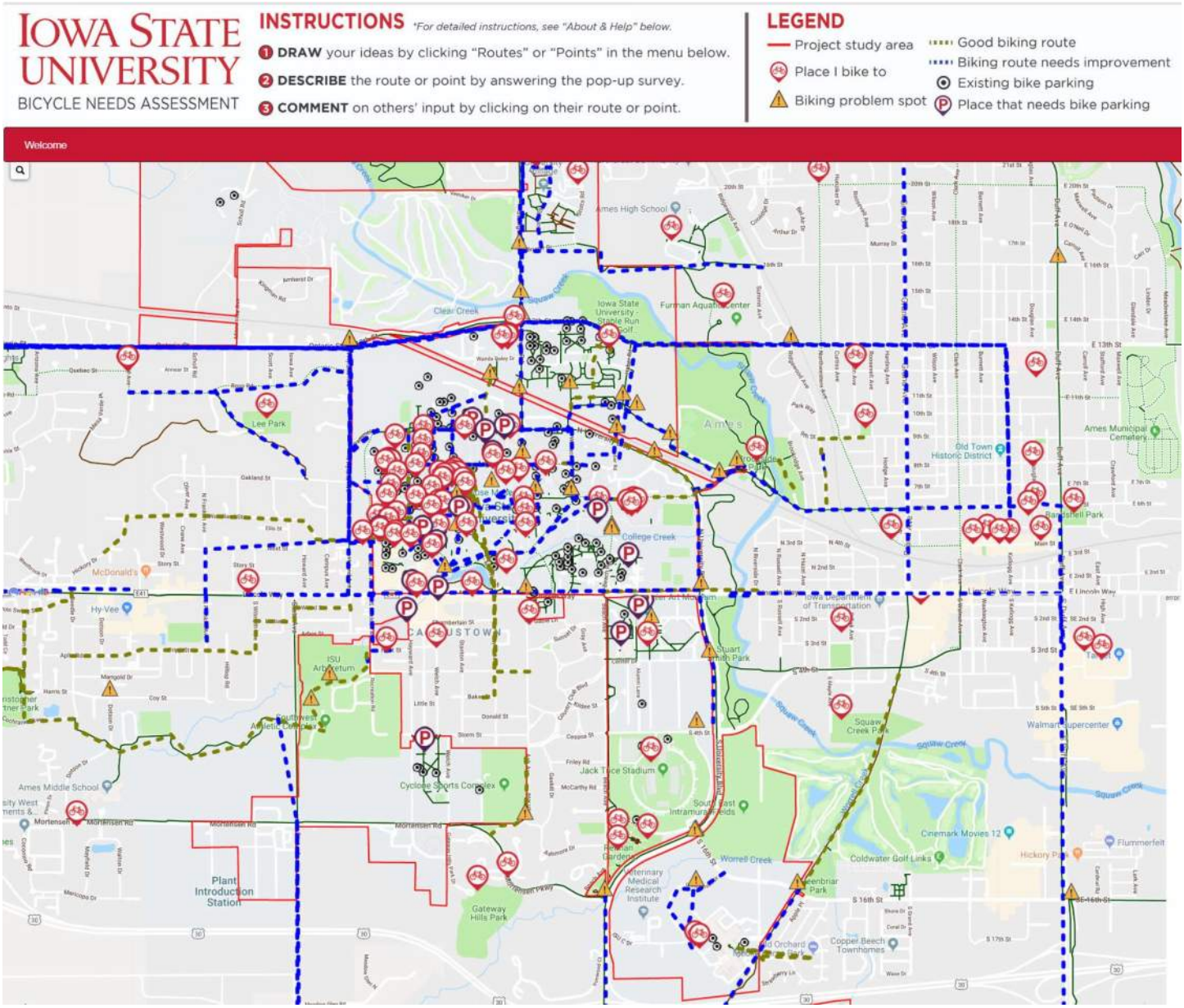
| Item | Overall Rank | Rank Distribution | Score |
|---|---|---|---|
| Bike-only paths separate from pedestrians on campus | 1 | | 3,159 |
| Safer route options to/from campus | 2 | | 2,092 |
| Secured or covered bike parking | 3 | | 1,969 |
| Improved maintenance (street sweeping/repair of streets) | 4 | | 1,889 |
| Safer route options on campus | 5 | | 1,592 |

Chart 13: Incentives for biking (of those who regularly DRIVE to campus)

| Item | Overall Rank | Rank Distribution | Score |
|---|---|---|---|
| Bike-only paths separate from pedestrians on campus | 1 | | 2,760 |
| Safer route options to/from campus | 2 | | 2,052 |
| Bikeshare system (self-serve stations across campus to check out a bike) | 3 | | 1,590 |
| Secured or covered bike parking | 4 | | 1,472 |
| Lockers and/or showers | 5 | | 1,358 |

# Appendix B – Online Interactive Map Results

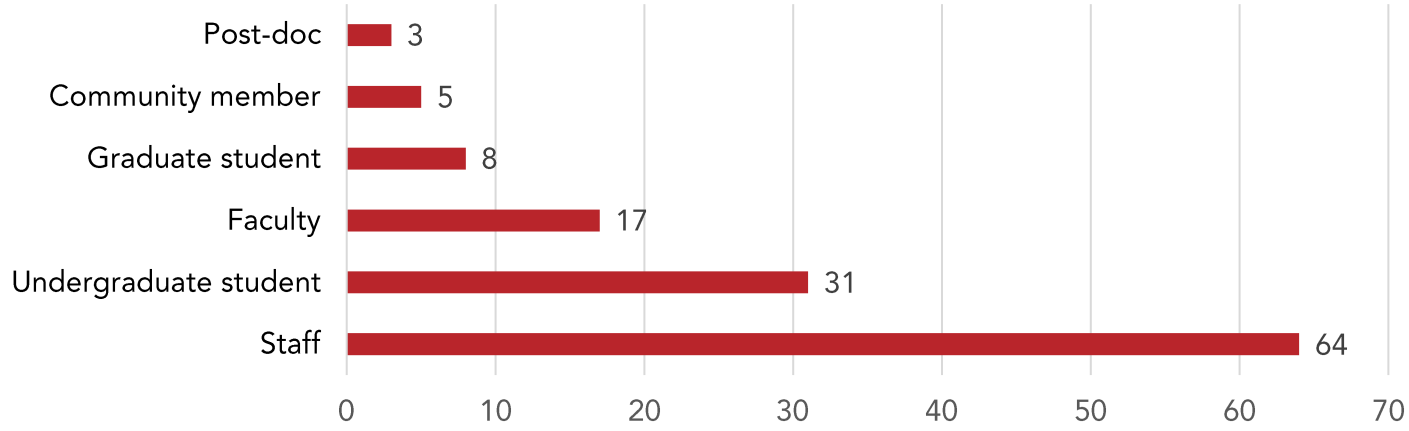
The project team developed an online interactive map (WikiMap) as a tool to gather public input on biking infrastructure on campus at ISU. Respondents identified biking destinations, biking problem spots, places that need more bike parking, good biking routes, and biking routes that need improvement. There were 143 respondents that provided a total of 322 comments on the WikiMap. The map below displays all 322 routes or points that were identified, and the subsequent pages display comments for each individual category separately.



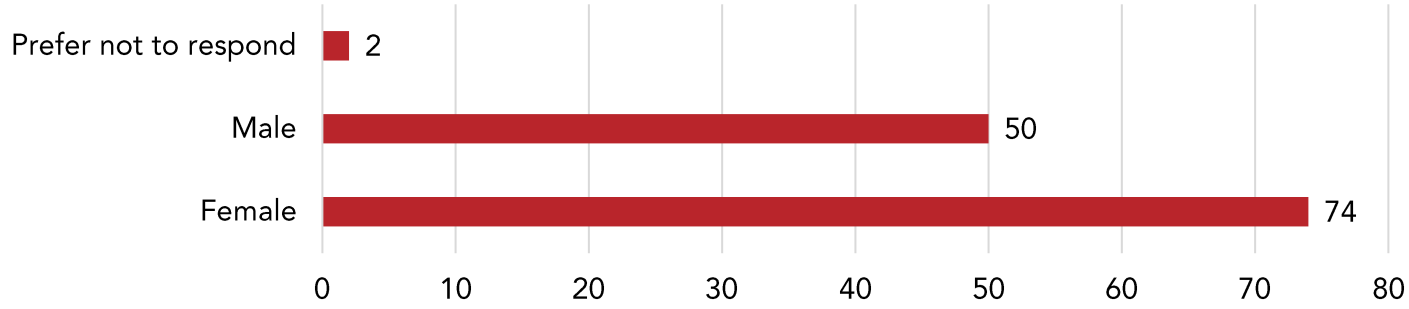
## Participant Overview

At the beginning of the online interactive map, participants were asked to complete an optional survey to describe themselves and their bicycling comfort level. Of the 143 participants who participated in the Wikimap, 128 completed the survey. The survey asked three questions, and participant responses are shown below.

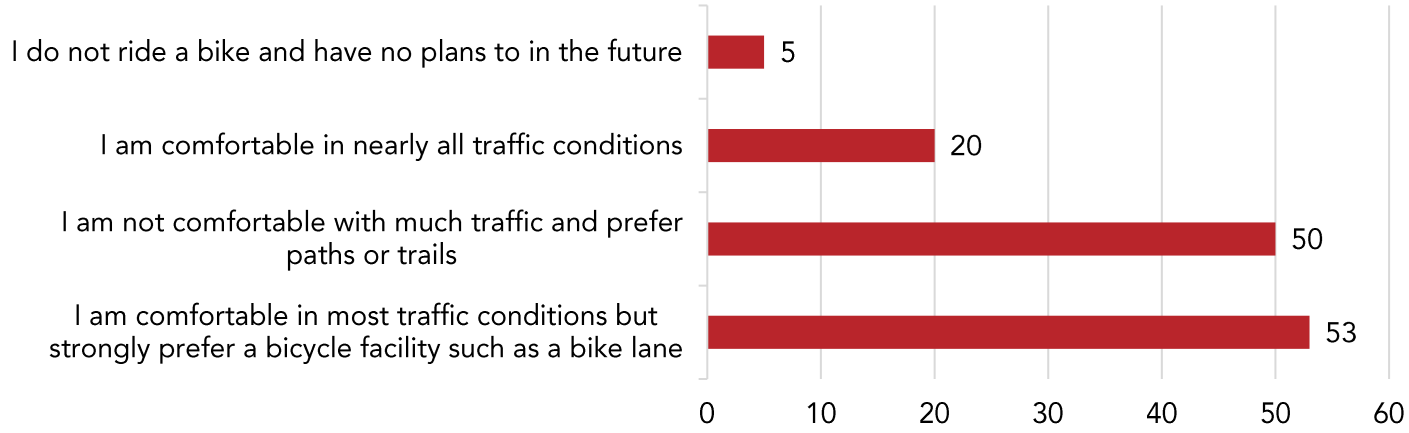
What best describes your affiliation with ISU?




What is your sex?

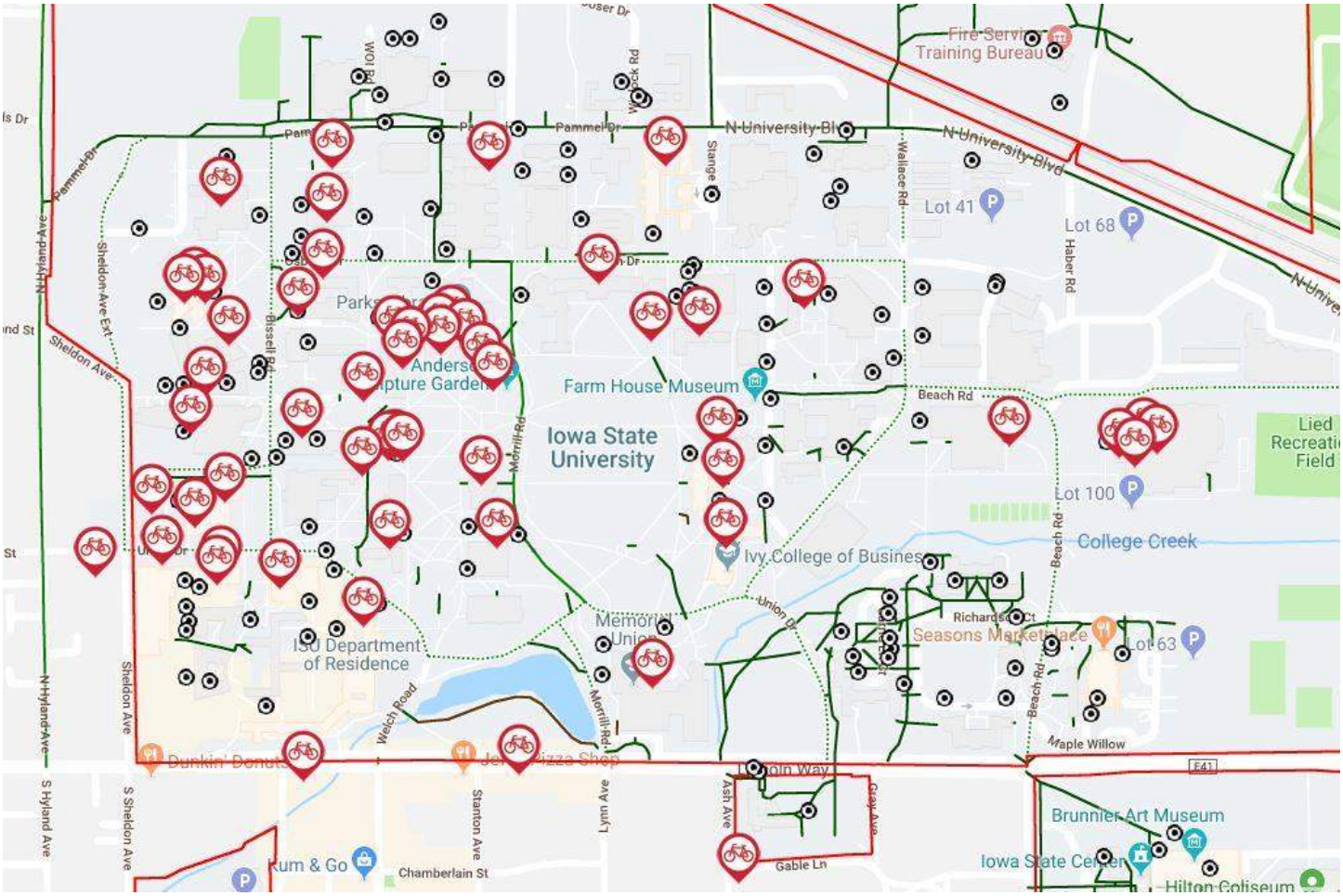



How comfortable are you bicycling with motor vehicle traffic?



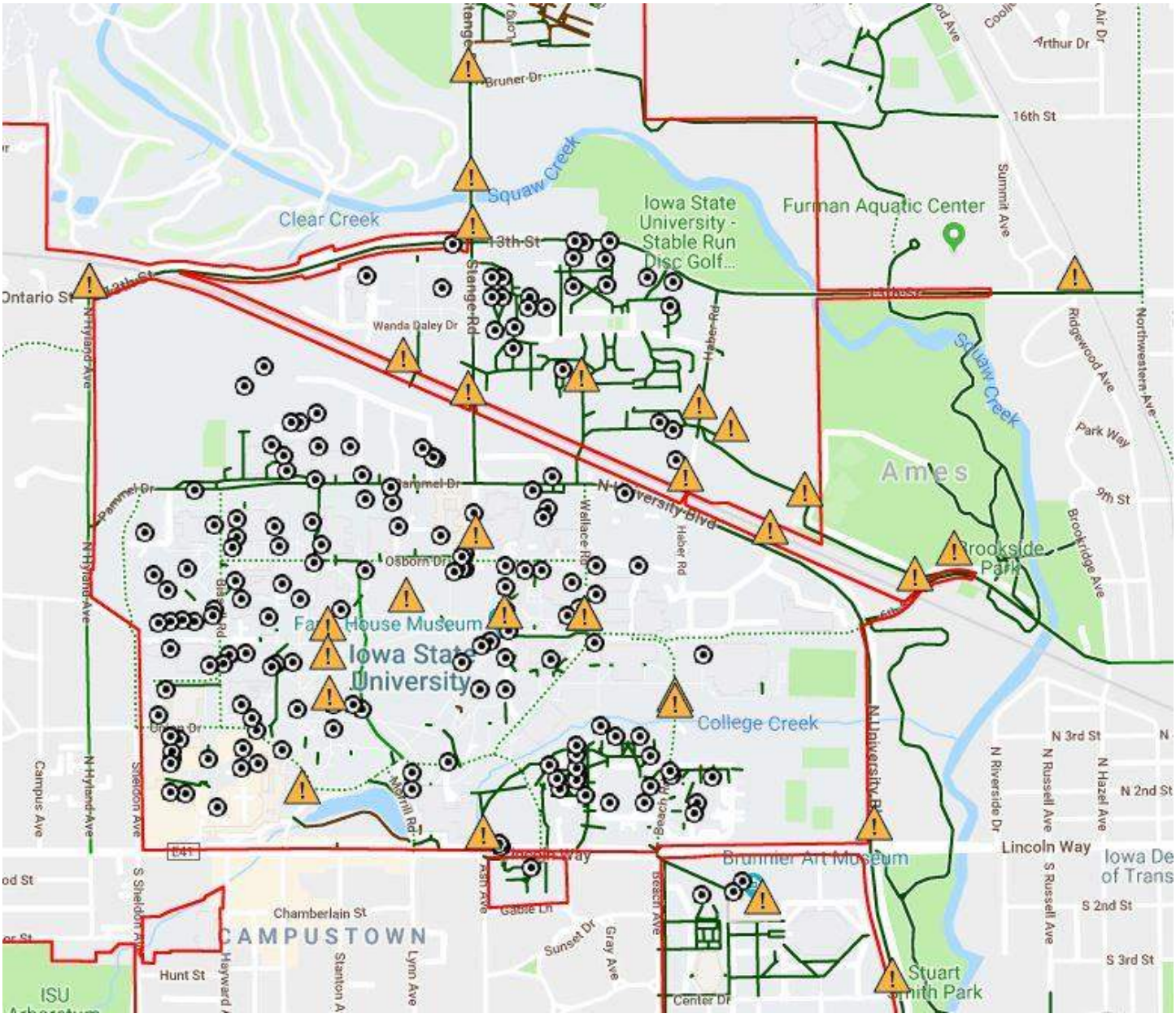
## Biking Destinations

Respondents identified 137 places they bike to. Most of the biking destinations identified are in the northwest quadrant of the ISU campus - south of Pammel Drive, east of N Hyland Avenue, north of Union Drive, and west of Morrill Road.



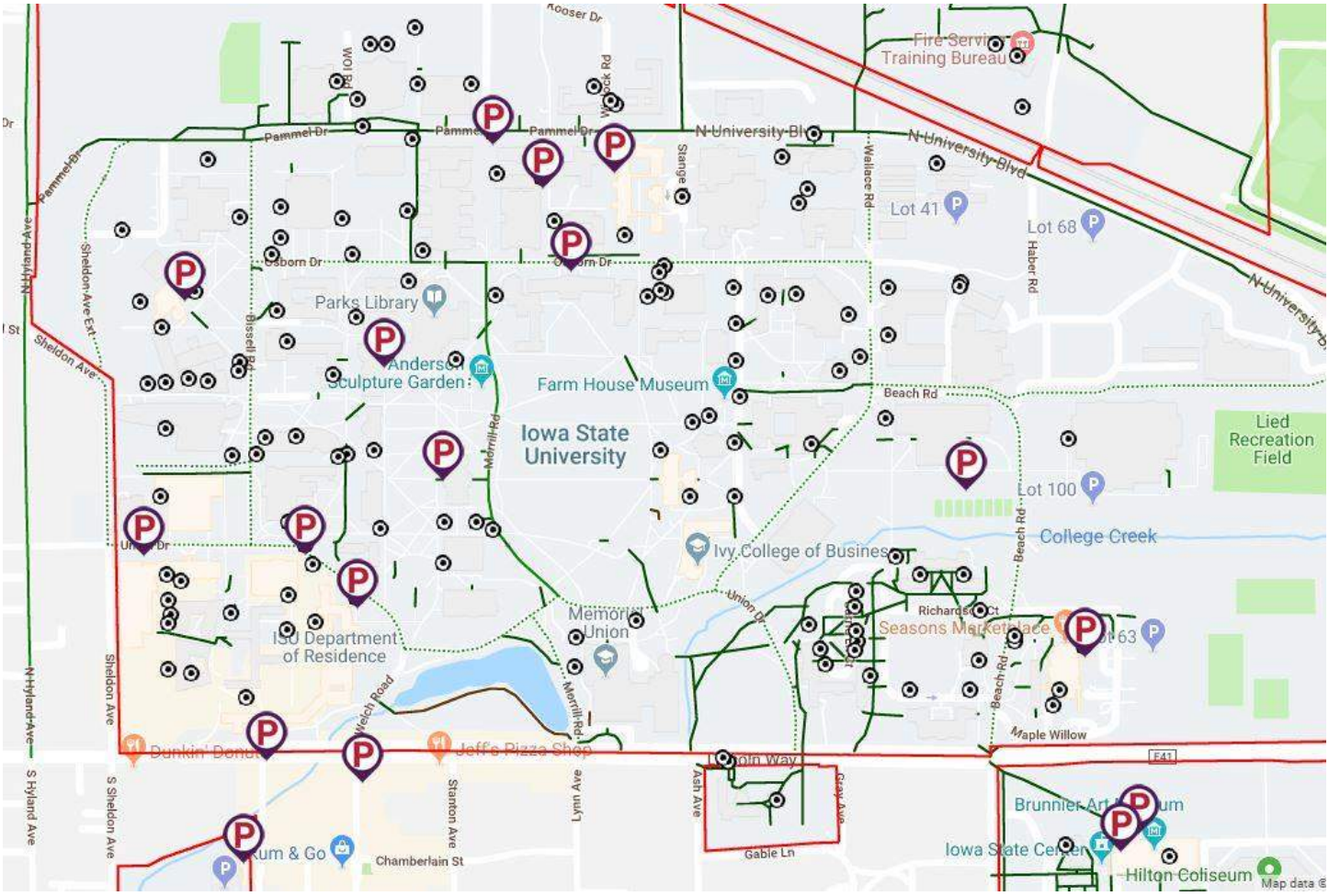
## Biking Problem Spots

Respondents identified 59 biking problem spots. Problem spots were spread out evenly across campus. One common barrier for biking is the railroad that runs NW-SE on the northern half of the ISU campus. Respondents commented on the difficulty of crossing underneath the railroad through the tunnels or along the sidewalk on Stange Road. Another problem spot identified multiple times is University Boulevard on the southern half of the campus, particularly the intersection of S University Boulevard and S 16th Street.



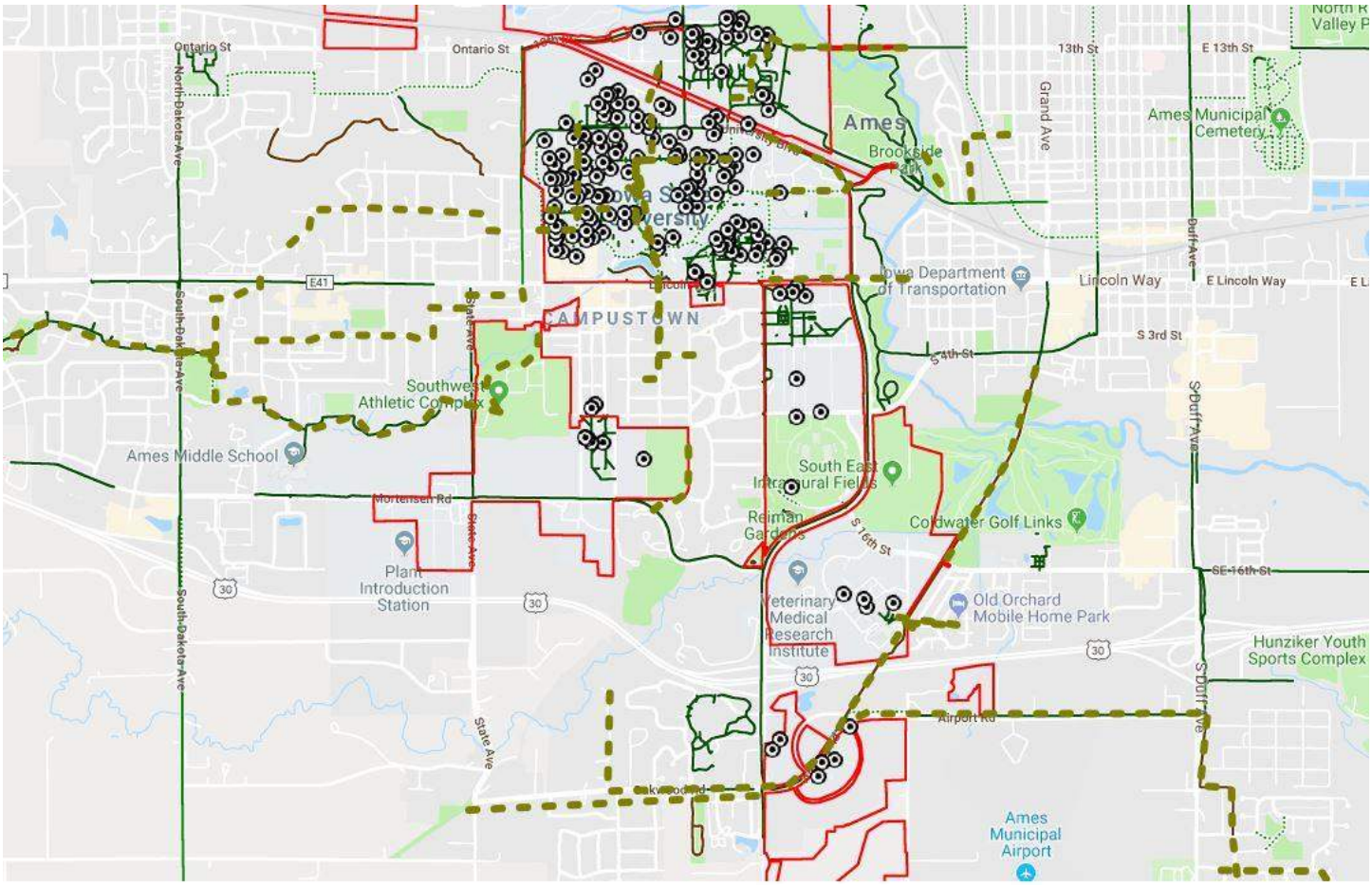
## Bike Parking Needed

Respondents identified 25 places that need bike parking. Most places identified were in the northwest corner of the campus - south of Pammel Drive, east of N Hyland Avenue, north of Lincoln Way, and west of Morrill Road. Two respondents also identified a need for improved bike parking north of the Brunnier Art Museum.



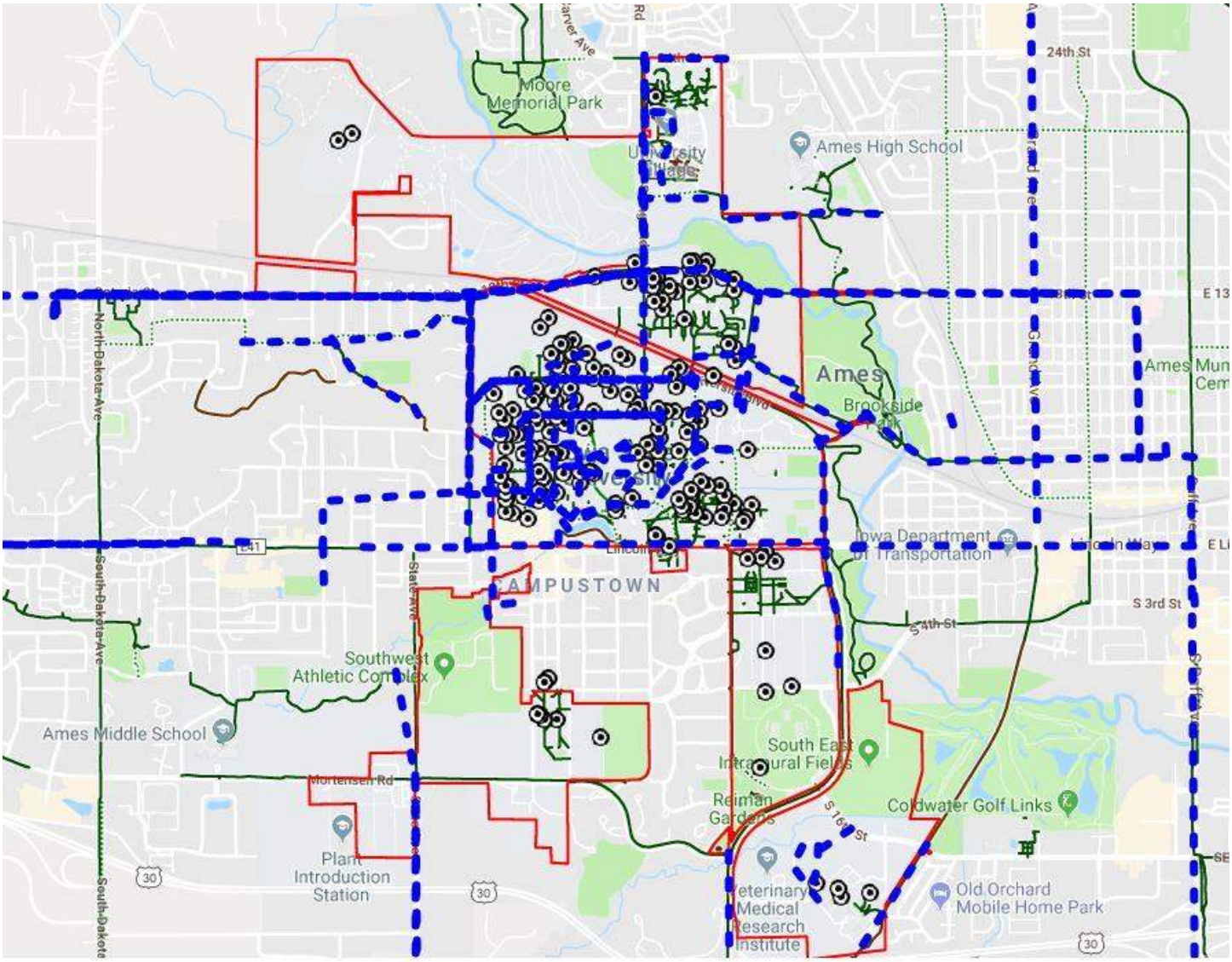
## Good Biking Routes

Respondents identified 30 good biking routes. Most of the good biking routes identified are on existing off-street trails or paths. Morrill Road was also identified by multiple respondents as a good biking route due to the existing bike lane, slow traffic speeds, and low traffic volumes. Osborn Drive was one of the few east-to-west routes identified as a good biking route because of its directness, access to destinations, low traffic volumes, and few stops or intersections.



## Biking Routes Needing Improvement

Respondents identified 71 biking routes that need improvement. Routes identified were very evenly distributed across campus, with a mix of north-to-south and west-to-east routes. A concentration of routes need improvement were located in the core of the campus - south of Pammel Drive, east of N Hyland Avenue, north of Lincoln Drive, and west of Wallace Road. Several respondents identified the desire to have more direct, connected north-to-south and west-to-east routes that go through central campus, particularly off-street paths or trails.



IOWA STATE UNIVERSITY

# Bicycle Planning Services

Phase 2: Concept Development | November 2019

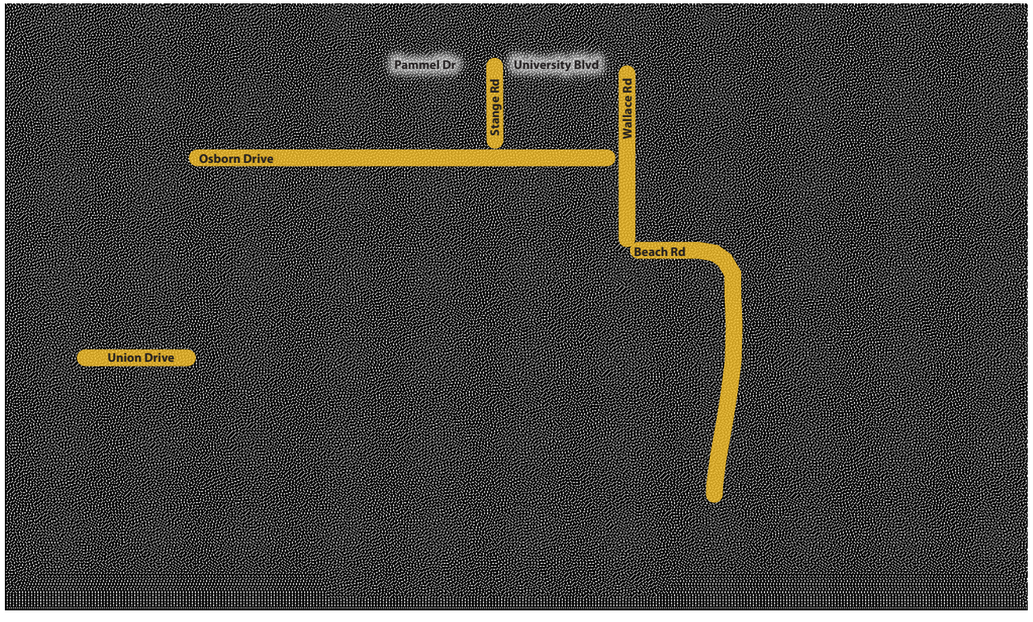
## OVERVIEW & PROCESS

This effort is the second part of a multi-phase initiative to identify needs, develop strategies, and set priorities for bicycle access and mobility on the Iowa State University campus. This is a follow-up to Phase 1, which identified five locations for improved bicycle infrastructure. The focus of Phase 2 was to develop concepts, cost estimates, and prioritization for these five locations to inform budgeting and guide future design and implementation. This phase was structured around three steps:

- **Brainstorming** – ISU staff and the consultant team developed initial ideas for each location and then presented these ideas in a workshop to the Bicycle Advisory Group (BAG) to discuss ideas, generate new ideas, and eliminate undesired solutions. During this visit, consultant staff visited each location to take photos and observe operations.
- **Concepts** – Consultant staff used BAG input to refine ideas into viable alternative concepts, including cross section graphics and design details. These refined concepts were presented to the BAG for review and comments were received.
- **Solutions** – Consultant staff incorporated BAG comments, which required additional concept development for some locations. Concepts were then refined, cost estimates were created, and additional details and graphics were produced.

The Bicycle Advisory Group—which included student, faculty, and staff representatives from various departments—was consulted at each of these steps to provide input and review.

## MAP OF PROJECTS




## SUMMARY OF PROJECTS

| Project | Project Estimate* | Horizon |
|---|---|---|
| **Stange Road // Pammel Drive & University Boulevard Intersection to Osborn Drive**<br>This project includes safety improvements to the intersection with Pammel Drive and University Boulevard. It also includes a continuation of the two-way separated bike lane on Stange Road north from Osborn Drive, requiring reconfiguring parking and resulting in a reduction of 3 to 4 stalls. | **$31,000 to $67,500** (depending on elements selected) | **Next 2 years** |
| **Osborn Drive // Bissell Road to Wallace Road**<br>This project entails policy/programmatic changes to reduce the speed differential and conflicts between buses and bicyclists. | **$4,000 to $10,000** | **Next 2 years** |
| **Beach Road // Wallace Road to Lincoln Way**<br>This project includes a two-way separated bike lane. It will require three floating bus stops. Near-term reconfigurations of the intersections with Wallace Road and Lincoln Way can be leveraged to implement this project. This project will require close coordination with the City of Ames. | **$271,000 to $440,000** | **2-5 years** |
| **Wallace Road // University Boulevard to Beach Road**<br>This project includes removing two travel lanes from Wallace Road to provide a two-way separated bike lane. There are potential challenges associated with bus operations and access to nearby parking lots, requiring additional study. | **$136,000 to $203,500** | **2-5 years** |
| **Union Drive // Sheldon Avenue to Bissell Road (Pilot)**<br>This project entails removing the inside travel lanes on this four-lane street and replacing them with a two-way separated bike lane. It may require restriction of left turns into and out of Parking Lot 2. This is a pilot project to test impacts and reactions. | **$22,000 to $55,000** | **2-5 years** |
| **Osborn Drive // Bissell Road to Wallace Road (Parking Removal / Sidewalk Widening)**<br>This potential project entails removing on-street parking to allow a wider sidewalk on the north side. | **$82,000 to 136,000** | **Potential Future Project** (beyond 5 years) |
| **Union Drive // Sheldon Avenue to Bissell Road (Permanent)**<br>This project would be a permanent installation of the Union Drive pilot project, potentially using concrete medians instead of flex posts. | **$68,000 to $109,000** | **Potential Future Project** (beyond 5 years) |

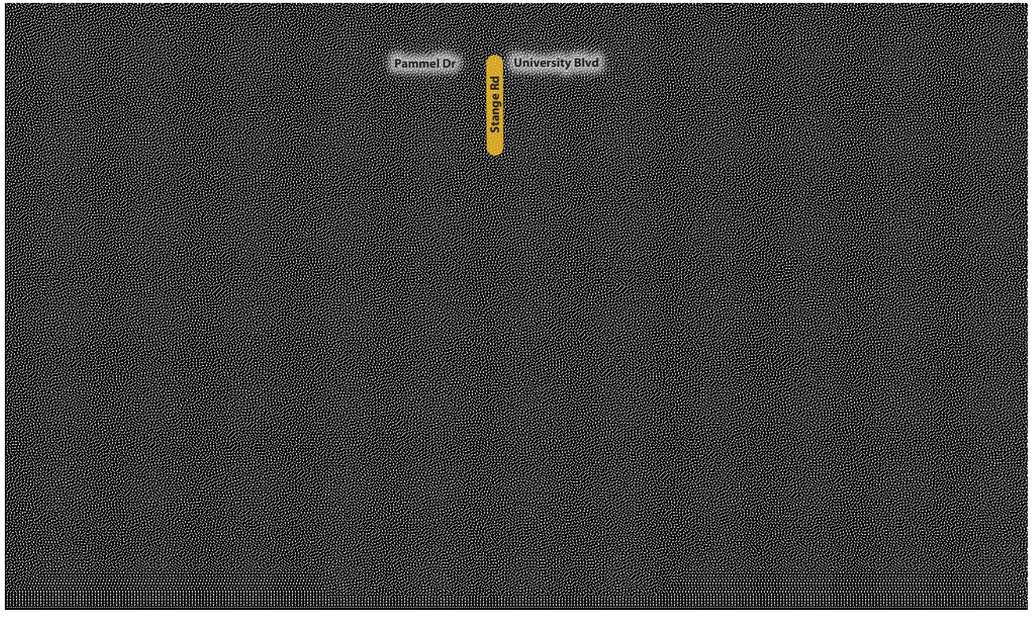
* Projects estimates are aligned to project horizons; Next 2 years (2021 dollars), 2-5 years (2023 dollars), Beyond 5 years (2023 dollars).

## NEXT STEPS

The first step in moving forward with implementation of these projects is to identify and secure a source of funding for each project. Depending on funding availability, ISU may not be able to implement projects according to the horizon identified in the above summary. Some of the projects contained herein include options and alternatives, which should be considered and narrowed-down during the budgeting process. ISU will need to coordinate with the City of Ames Public Works Department and Traffic Engineer on several projects, especially those that interface with City-controlled streets and those that involve changes to traffic signals.

Upon securing funding for each project and selecting preferred designs, ISU will move forward with developing detailed engineering plans for each project, using these concepts as a starting point. Engineering design may occur in-house, or ISU may hire professional engineering consultants to perform the work. Finally, construction will need to be programmed. Implementation will likely occur over summer or other periods when classes are not in session in order to minimize impacts on existing pedestrian, bicycle, transit, and motor vehicle traffic. After implementation, ISU should seek to measure and quantify the outcomes of each project, whether by counting the number of users or seeking feedback from people using the infrastructure. Adjustments and changes can be made as necessary to improve operations and increase safety.

## INTERSECTION LOCATION & PROPOSED BIKEWAY EXTENTS




## INTERSECTION DETAILS

- **Existing curb-to-curb width:**
  - Stange Rd: 45 feet
  - University Blvd: 56 feet
  - Pammel Dr: 42 feet
- **Existing traffic volumes:**
  - 10,500 average vehicles per day (Stange Rd, North of University)
  - 9,400 average vehicles per day (Pammel Dr, west of Stange Rd)
- High volume of left-turning vehicles from Stange Rd, turning onto University Blvd
- Conflicts on east side of intersection between all travel modes
- Existing leading pedestrian interval (LPI) provides an approx. 3 second head start
- People bicycling cross University Blvd on both sides of Stange Rd

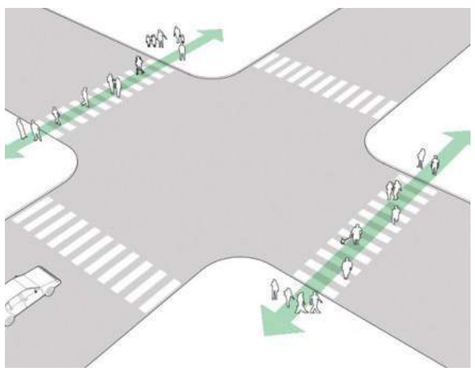
## STANGE ROAD DETAILS

- **Existing curb-to-curb width:** 45 feet
- **Existing traffic volumes:** n/a
- Existing shared lane markings
- Existing street design features a combination of shared lane markings, standard one-way bike lanes, and a two-way bike lane
- High pedestrian volumes
- Dead-end road at Osborn Drive; turnaround in driveway loop
- Motorcycle and bicycle parking located on south end of corridor
- Food trucks located on south end of corridor

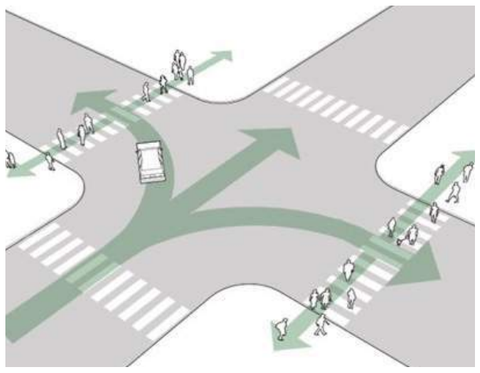
## PROPOSED INTERSECTION DESIGN TREATMENTS

### LEADING PEDESTRIAN INTERVAL (LPI)

#### PHASE 1: PEDESTRIANS AND BIKES

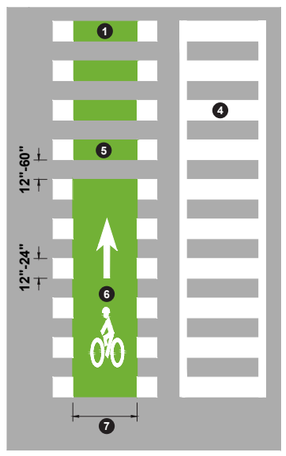


#### PHASE 2: PEDESTRIANS, BIKES, AND VEHICLES

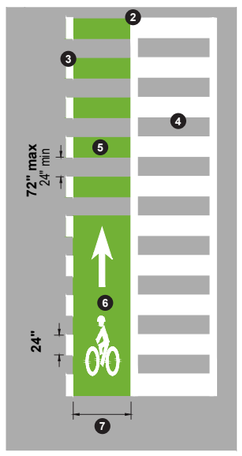


- Allows pedestrians and bikes to enter a conflict area prior to motor vehicles receiving a green light
- In some cases, a leading pedestrian interval may allow users to clear the conflict point before motor vehicles enter
- Consider increasing the LPI interval to 7 seconds to provide additional time for pedestrians and bicyclists to enter the intersection.

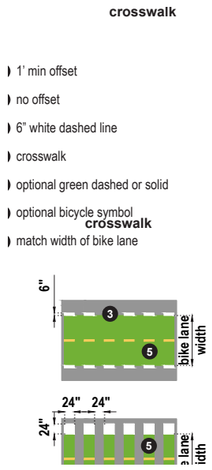
### BIKE CROSSING




one-way bicycle crossing with 1' min offset from crosswalk




one-way bicycle crossing with no offset from crosswalk




- Green pavement markings identify exclusive use for bicyclists
- Guide bicyclists through transition areas between bikeway types and bikeway crossings to improve the legibility of the route

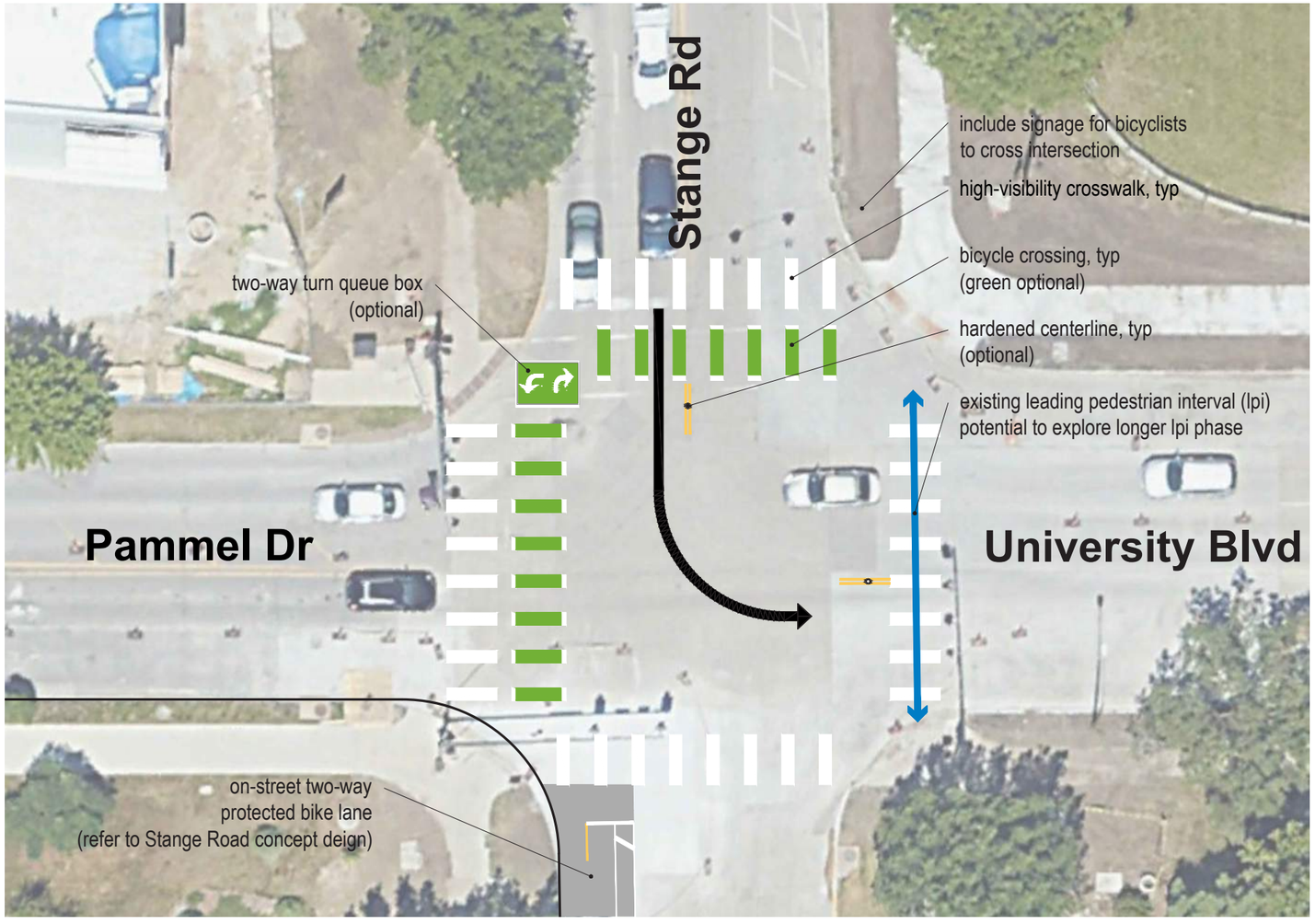
### HARDENED CENTERLINE

- Hardened centerline consists of a painted centerline supplemented with flexible delineators, rubber curb, in-street crossing sign (R1-6) or combination of these treatments

IOWA STATE UNIVERSITY TOOLE DESIGN

## EXISTING INTERSECTION

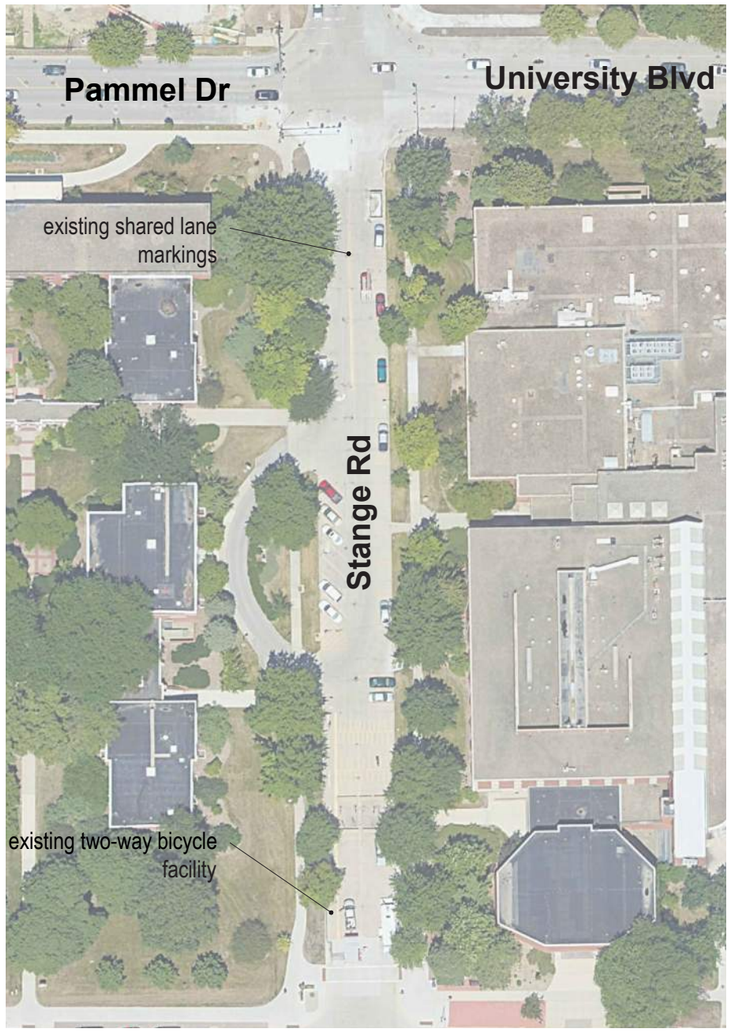

## PROPOSED CONFIGURATION




## NOTES

- Excessive pavement widths make for a long and uncomfortable pedestrian crossing environment
- Leading Pedestrian Intervals (LPI) increase the visibility of a pedestrian or bicyclist in the crosswalk or bike crossing and reinforces their right-of-way over turning vehicles
- Green colored pavement can be used to enhance the visibility of the bicycle crossing and to differentiate it from pedestrian crosswalks; the graphic illustrates one potential configuration but a diagonal crossing with a dedicated signal phase is also a possibility; modifications to the signal cycle will likely be necessary with either configuration
- Hardened centerlines slow left turning vehicles, increase visibility of pedestrians in the crosswalk for motorists, and modifies the turning angle from cross street onto receiving roadway to create safer, slower left turns with no change in traffic capacity

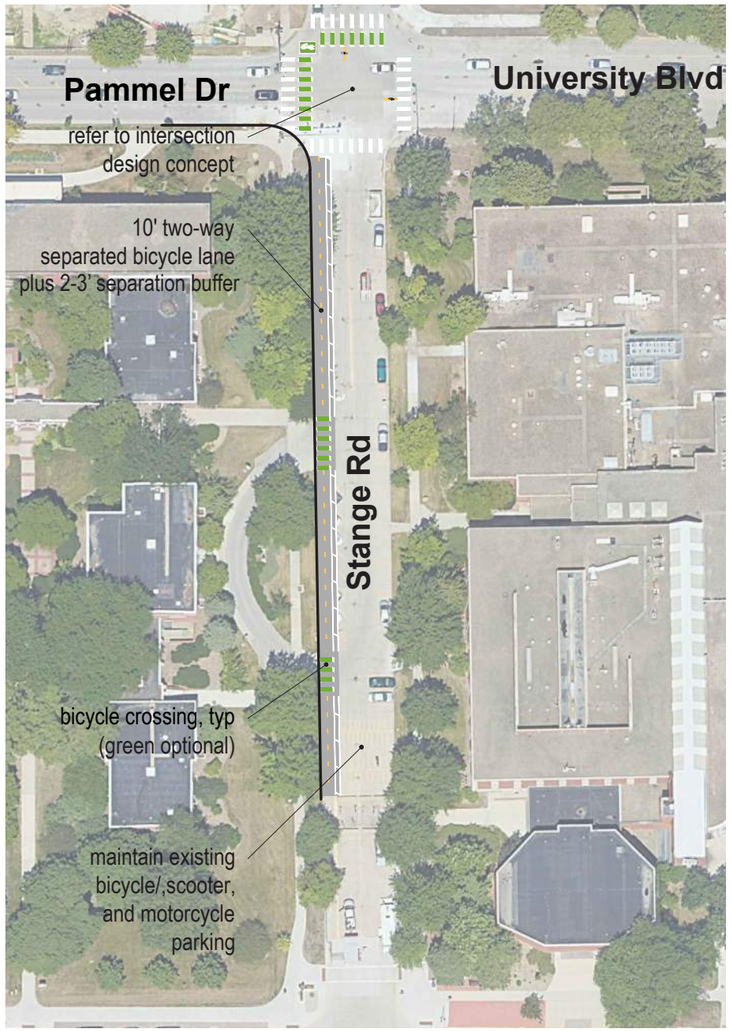
## EXISTING STANGE RD CONFIGURATION




### NOTES

- Revised pavement marking layout includes perpendicular parking on the east side and a one-way on-street bicycle lane south on the west side
- Existing two-way bicycle facility on the west side south of the driveway turn around loop

## PROPOSED CONFIGURATION




### NOTES

- On-street two-way separated bike lane on west side would connect existing shared use path on the west side of Stange Road to Osborn Drive
- Design treatment may impact existing on-street parking layout, requiring reconfiguring parking and would likely result in the loss of three to four parking spaces.
- Solid vertical separation materials (such as permanent medians, precast concrete wheel stops, etc.) should be used to prevent cars from backing/pulling into the bike lane while parking
- Design treatment would not impact existing street trees in the buffer on the west side

## EVALUATION MATRIX

The design concepts presented were evaluated in a matrix format that assigns a ranking based on criteria and priorities. Preferred alternatives will be identified for each roadway section for the purposes of estimating project costs and generating an implementation schedule.

| Intersection Design Treatments (not mutually-exclusive) | Design Evaluation | | | |
|---|---|---|---|---|
| | Pedestrian Comfort | Transit Benefits | Bicyclist Comfort | Cost Effectiveness |
| Leading Pedestrian Interval | High | Low | High | High |
| Bike Crossing | Medium | Low | High | High |
| Hardened Centerline | High | Low | High | High |

Note: Hardened centerlines may require buses to take turns more slowly. Cost of incorporating Leading Pedestrian Intervals depends on existing signal hardware.

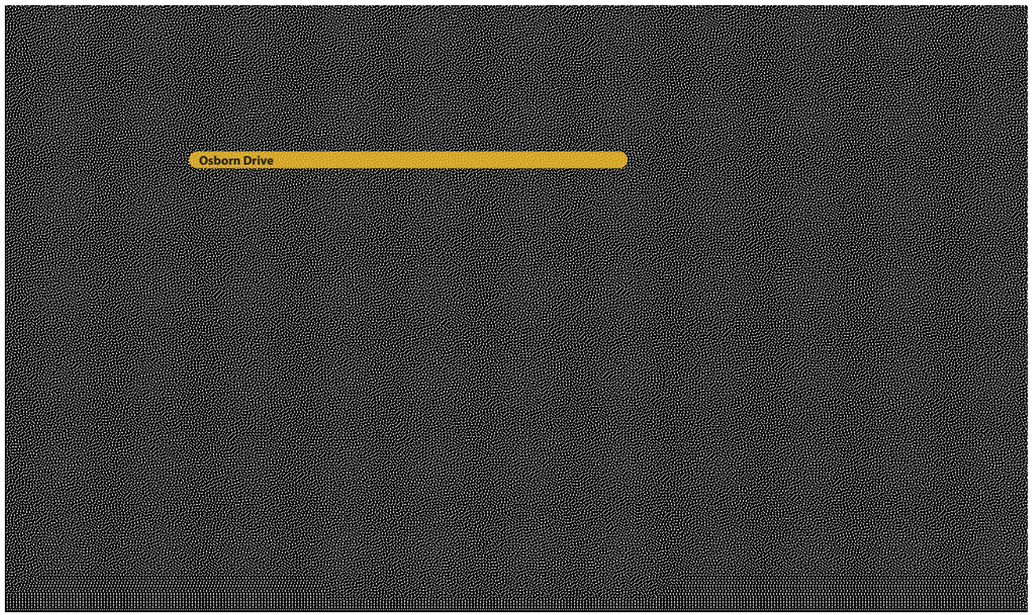
## COST ESTIMATE RANGES

| Option | Cost Range |
|---|---|
| Leading Pedestrian Interval | $600 - $2,500 |
| Bike Crossing | $3,000 - $5,000 |
| Hardened Centerline | $6,000 - $10,000 |
| Separated Bike Lane | $20,000 - $50,000 |

Note: These cost estimate ranges are for implementation as a ***retrofit***. Implementing as part of a larger resurfacing or reconstruction project can be substantially less expensive.

IOWA STATE UNIVERSITY TOOLE DESIGN

## PROPOSED BIKEWAY EXTENTS



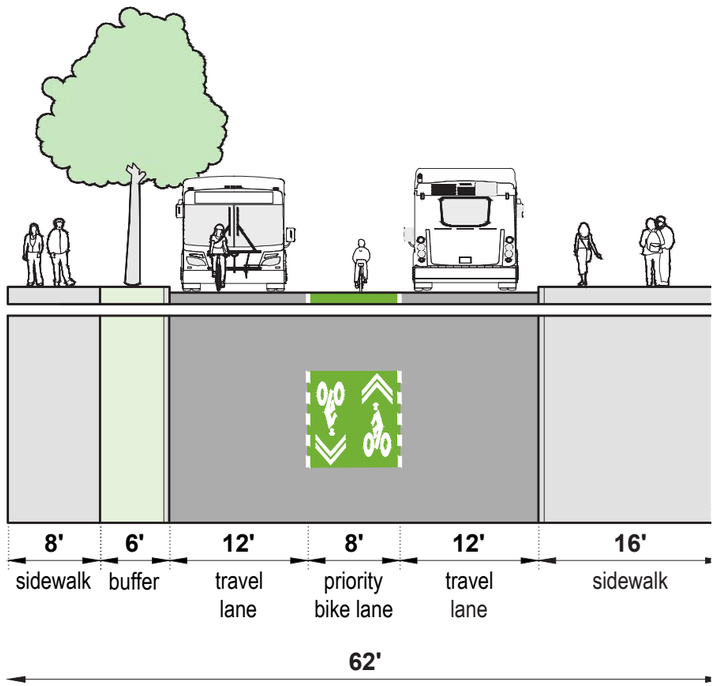

## CORRIDOR DETAILS

- **Existing curb-to-curb width:** 32 feet
- **Existing traffic volumes:** n/a
- **Existing shared lane markings**
- Access control gates located at Bissell Road and Wallace Road result in low motor vehicle volumes
- High existing bus volumes
- Frequent CyRide bus stops
- High number of pedestrian crosswalks
- Existing on-street parking located on north side of Osborn Drive after 5:30 PM
- High pedestrian volumes due to classrooms and departments located along corridor

## EXISTING CROSS SECTION




## ALTERNATIVE 1: CENTER PRIORITY BIKEWAY



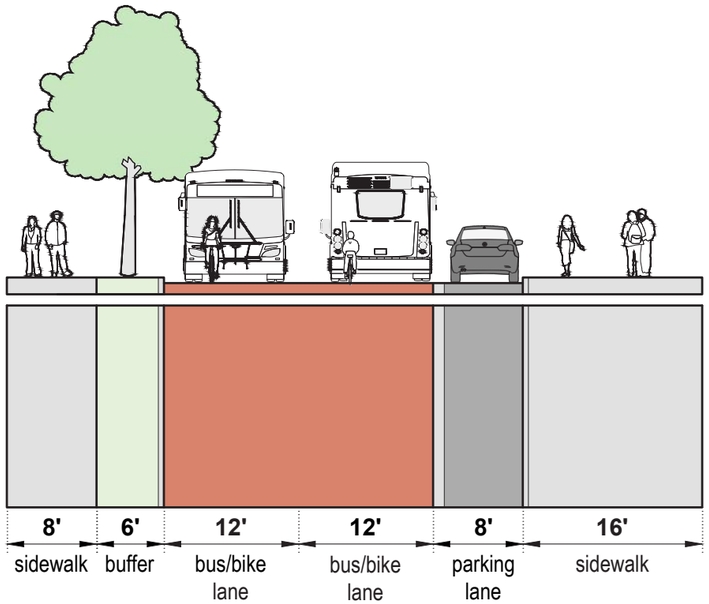

## NOTES

- Bikeway centered in roadway
- Parking is removed on north side
- Buses and bikes may continue to compete for the same space, however identified passing area centered in roadway
- Sidewalk width on the north side is maintained

## EXISTING OSBORN DRIVE TRANSIT WAY


- Existing transit and bus volumes suggest buses are already traveling at low speeds
- Maintains existing pedestrian environment
- No impacts to existing curb, on-street parking, or street trees

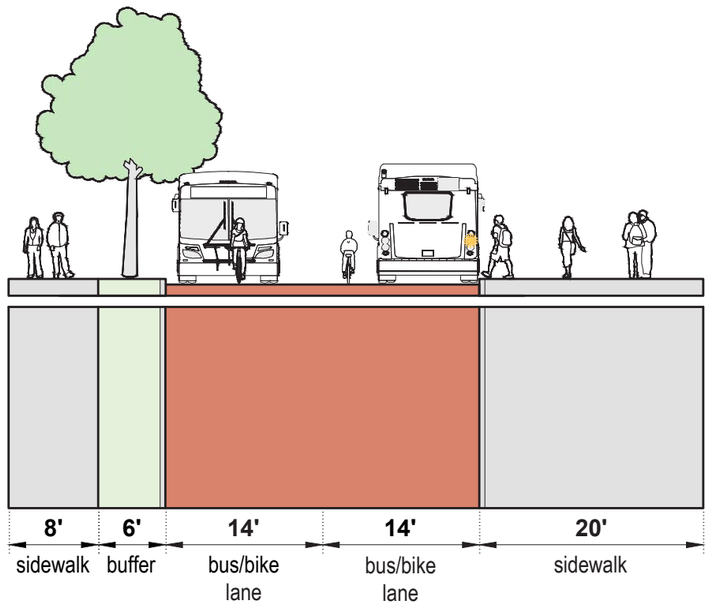
## ALTERNATIVE 2: TRANSIT MALL




### NOTES

- Shared lane between buses and bicyclists
- Lower speed limit to 15 mph to increase safety and comfort for people walking and bicycling
- Instruct CyRide drivers to not overtake bicyclists in the transit mall
- Long term, consider lower emission or electric buses on the transit mall and throughout campus
- Pavement color distinguishes bus/bike lane from parking (optional)
- Parking preserved on north side
- Existing sidewalk widths preserved
- No impacts to existing curb, on-street parking, or street trees

## ALTERNATIVE 2A: TRANSIT MALL NO PARKING




### NOTES

- Shared lane between buses and bicyclists
- Lower speed limit to 15 mph to increase safety and comfort for people walking and bicycling
- Instruct CyRide drivers to not overtake bicyclists in the transit mall
- Long term, consider lower emission or electric buses on the transit mall and throughout campus
- Pavement color distinguishes bus/bike lane from parking (optional)
- Parking removed on north side
- Widen existing sidewalk on the north side

## EVALUATION MATRIX

The design concepts presented were evaluated in a matrix format that assigns a ranking based on criteria and priorities. Preferred alternatives will be identified for each roadway section for the purposes of estimating project costs and generating an implementation schedule.

| Alternatives | Design Evaluation | | | |
|---|---|---|---|---|
| | Pedestrian Comfort | Transit Benefits | Bicyclist Comfort | Cost Effectiveness |
| Alternative 1: Center Priority Bikeway | Lowest (no change) | Highest (no change) | Medium | Medium |
| Alternative 2: Transit Mall | Medium | Medium | Higher | Higher |
| Alternative 2A: Transit Mall No Parking | Highest | Medium | Higher | Medium |

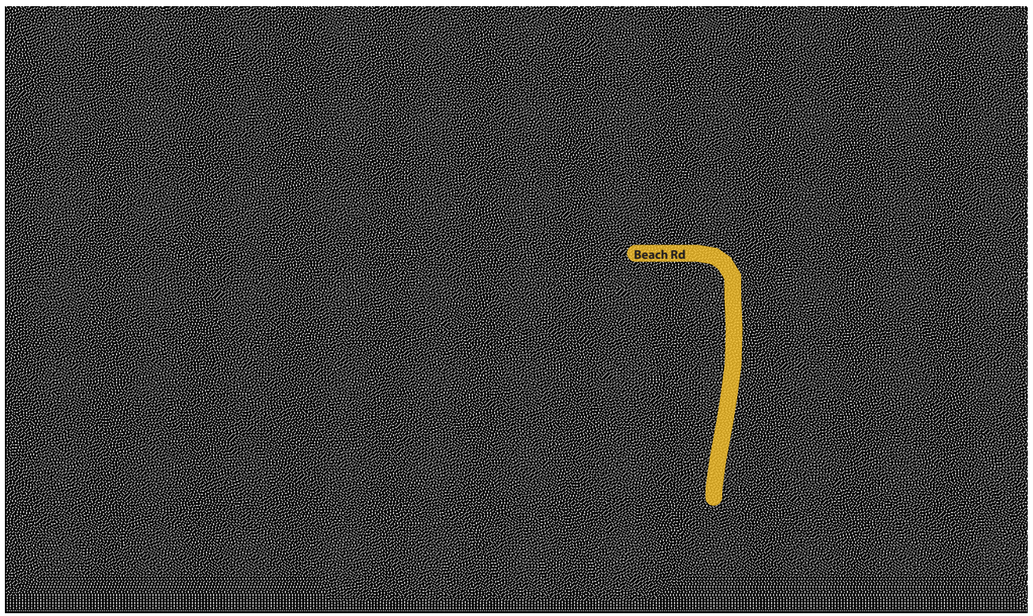
## COST ESTIMATE RANGES

| Option | Cost Range |
|---|---|
| Option 1: Center Priority Bikeway | **$18,500 - $37,000** |
| Option 2: Transit Mall (policy-focused change with signs; no significant pavement coloration) | **$4,000 - $10,000** |
| Option 2A: Transit Mall, No Parking (widen sidewalk on north side) | **$82,000 - $136,000** |

Note: These cost estimate ranges are for implementation as a ***retrofit***. Implementing as part of a larger resurfacing or reconstruction project can be substantially less expensive.

IOWA STATE UNIVERSITY TOOLE DESIGN

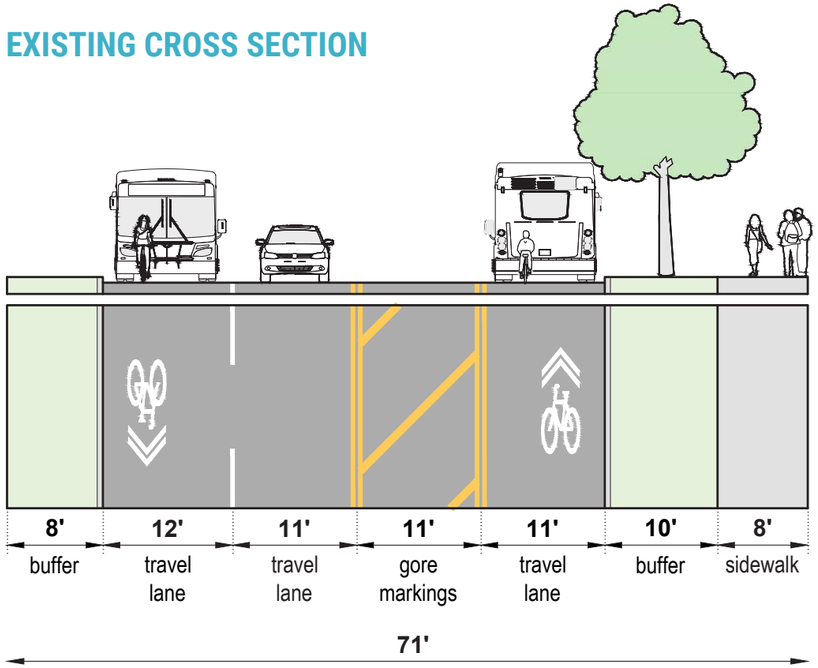
## PROPOSED BIKEWAY EXTENTS




## CORRIDOR DETAILS

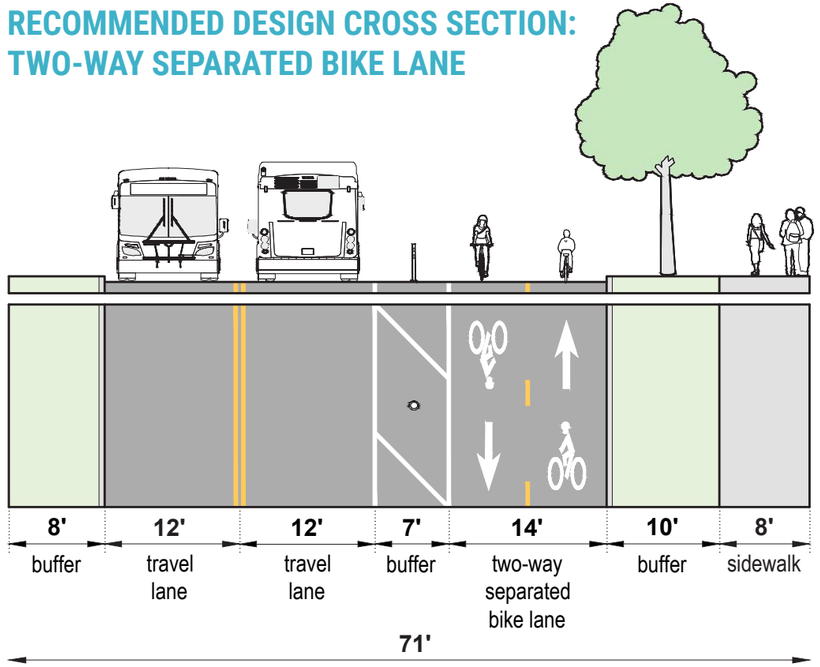
- **Existing curb-to-curb width:** Varies
- **Existing traffic volumes:** 6,500 average vehicles per day (2015)
- North/west end of corridor connects to existing off-street bicycle trail west of Beach Rd
- East-west off-street trail connects University Blvd to Beach Rd
- Underutilized pavement space (diagonal gore markings) along corridor
- CyRide bus stops located along corridor
- Lied Recreation Athletic Center and Maple Residence Hall located on corridor

## EXISTING CROSS SECTION




Note: Pavement markings and roadway configuration varies considerably throughout this corridor.

## RECOMMENDED DESIGN CROSS SECTION: TWO-WAY SEPARATED BIKE LANE




## NOTES

- Two-way separated bike lane along entire corridor, located on the east side of Beach Rd on the southern half of the corridor and on the north side on the northern half of the corridor
- If implemented as a retrofit, the bike lane could be cost-effectively implemented with flexposts
- A concrete median separation could be provided either as part of a reconstruction project or as a more costly retrofit
- Regardless of separation material, this cross section retains the existing curbs on either side of the roadway

IOWA STATE UNIVERSITY TOOLE DESIGN

## CYRIDE BUS STOP DESIGN TREATMENT AT MAPLE RESIDENCE HALL

### EXISTING


### NOTES

- Shared lane markings
- Underutilized pavement space (diagonal gore markings)
- Narrow bus stop waiting area
- Perpendicular parking in Maple Hall parking lot

### PROPOSED


### NOTES

- Two-way separated bike lane on east side of road with green pavement markings used to indicate bicycle crossing conflict areas
- Maintain perpendicular parking for Maple Hall while also creating additional space for floating bus stop and landscaped median
- Existing median between parking lot and roadway modified to including trees and possibly other landscaping
- Modify crosswalk locations to shorten crossing distances
- Similar treatments would be necessary at bus stops near Lied Recreation Center and the Wallace Road intersection

### COST ESTIMATE RANGES

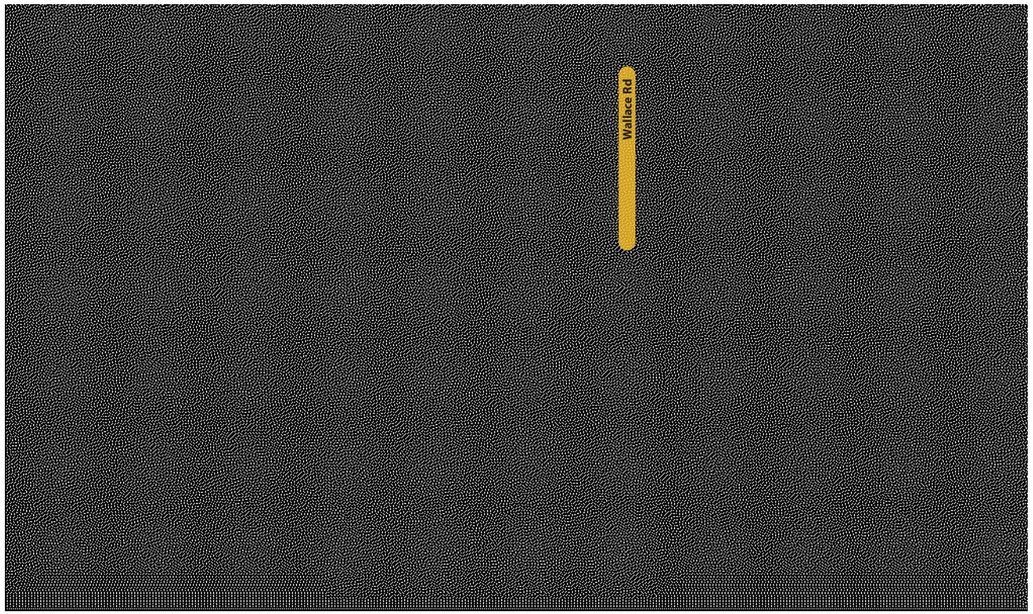
| Option | Cost Range |
|---|---|
| Separated Bike Lane with Floating Bus Stops | **$271,000 - $440,000** |

Note: These cost estimate ranges are for implementation as a ***retrofit***. Implementing as part of a larger resurfacing or reconstruction project can be substantially less expensive.

| Preferred Treatment | Design Evaluation | | | |
|---|---|---|---|---|
| | Pedestrian Comfort | Transit Benefits | Bicyclist Comfort | Cost Effectiveness |
| Separated Bike Lane | Medium | Medium | High | Medium |

IOWA STATE UNIVERSITY TOOLE DESIGN

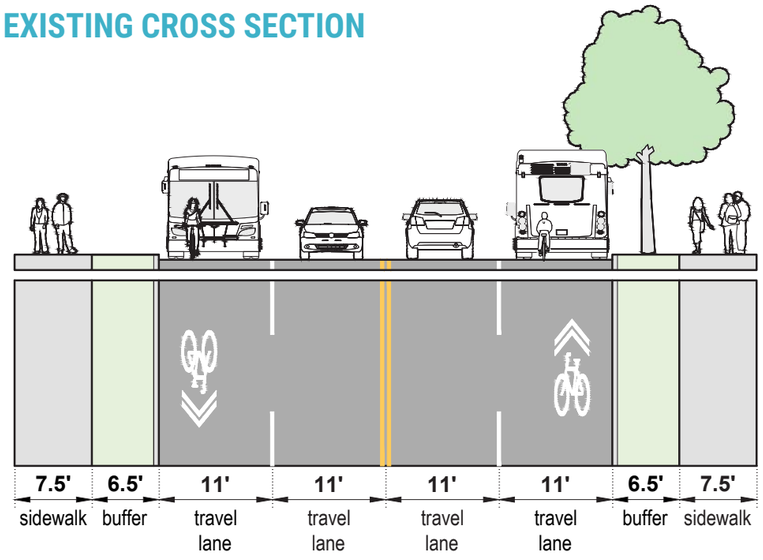
## PROPOSED BIKEWAY EXTENTS




## CORRIDOR DETAILS

- **Existing curb-to-curb width:** 44 feet
- **Existing traffic volumes:** 6,000 average vehicles per day (2015)
- Existing traffic volumes are very low for a four-lane cross section
- South end of corridor connects to existing off-street bicycle trail west of Beach Rd
- CyRide bus stops located on Wallace Rd between Osborn Dr and Beach Rd
- Mature street trees located on both sides of street (back of sidewalk on the west side)

## EXISTING CROSS SECTION

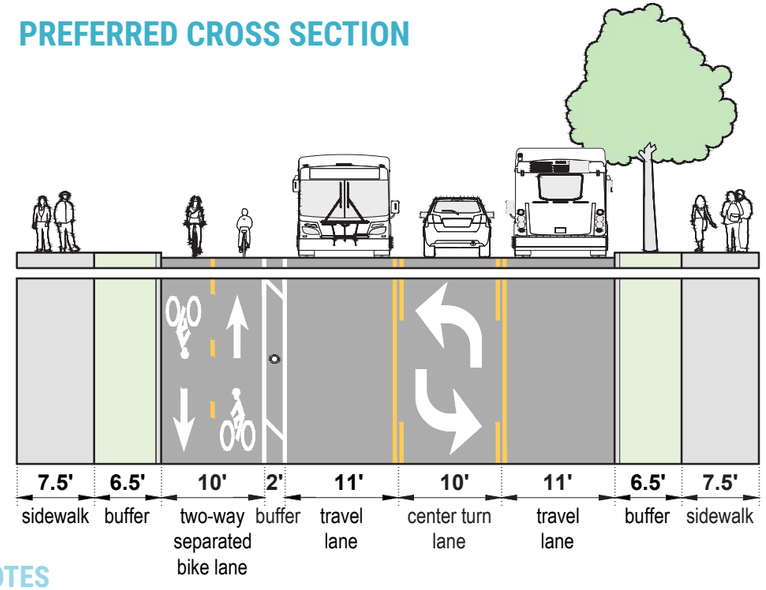



### NOTES

- Shared lane markings on outside lanes
- 4-lane cross section

## PREFERRED CROSS SECTION

### SEPARATED BIKE LANE

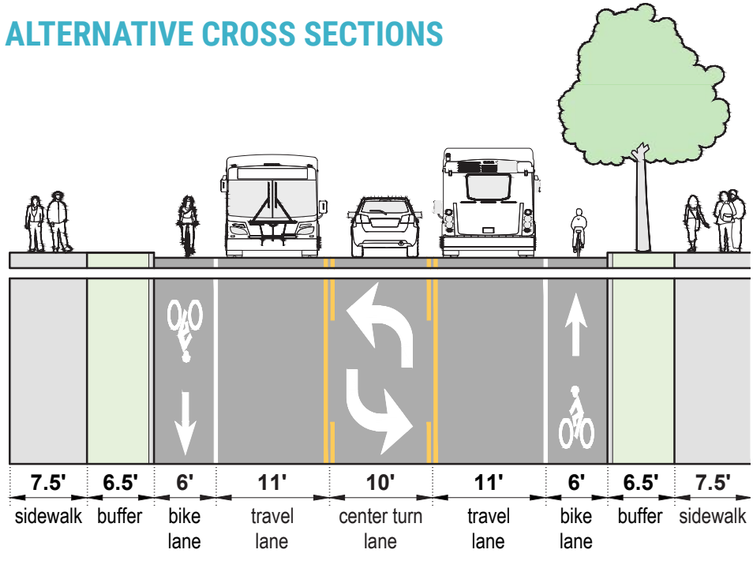



### NOTES

- Vertical separation could take the form of flexible delineators or concrete curbs
- This configuration requires floating bus stops so the cross section would be different at these locations
- Requires modification to the pedestrian and/or traffic signal at Osborn Drive

## ALTERNATIVE CROSS SECTIONS

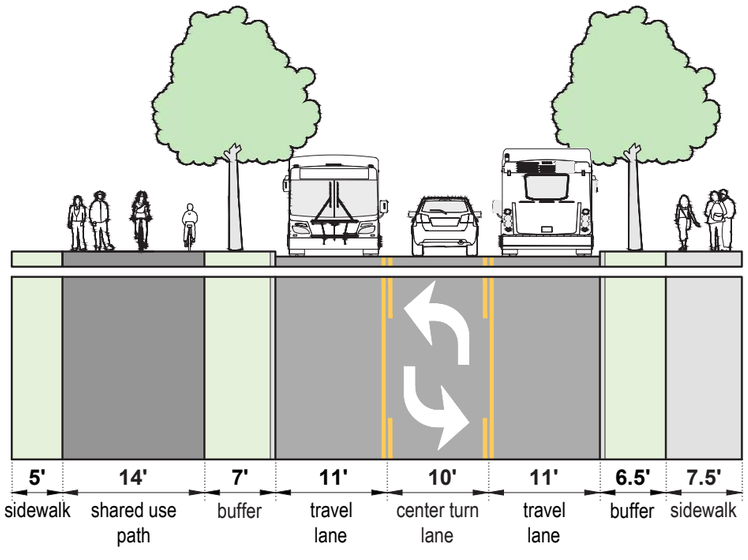
### ALT 1: BIKE LANE




### NOTES

- Roadway converted from 4-lanes to 2-lanes plus center turn lane
- Bike lane in each direction
- Requires treatments such as bike boxes to transition to path north of University Boulevard intersection

### ALT 2: SHARED USE PATH




### NOTES

- Roadway converted from 4-lanes to 2-lanes plus center turn lane
- Pedestrians and bicyclists share space

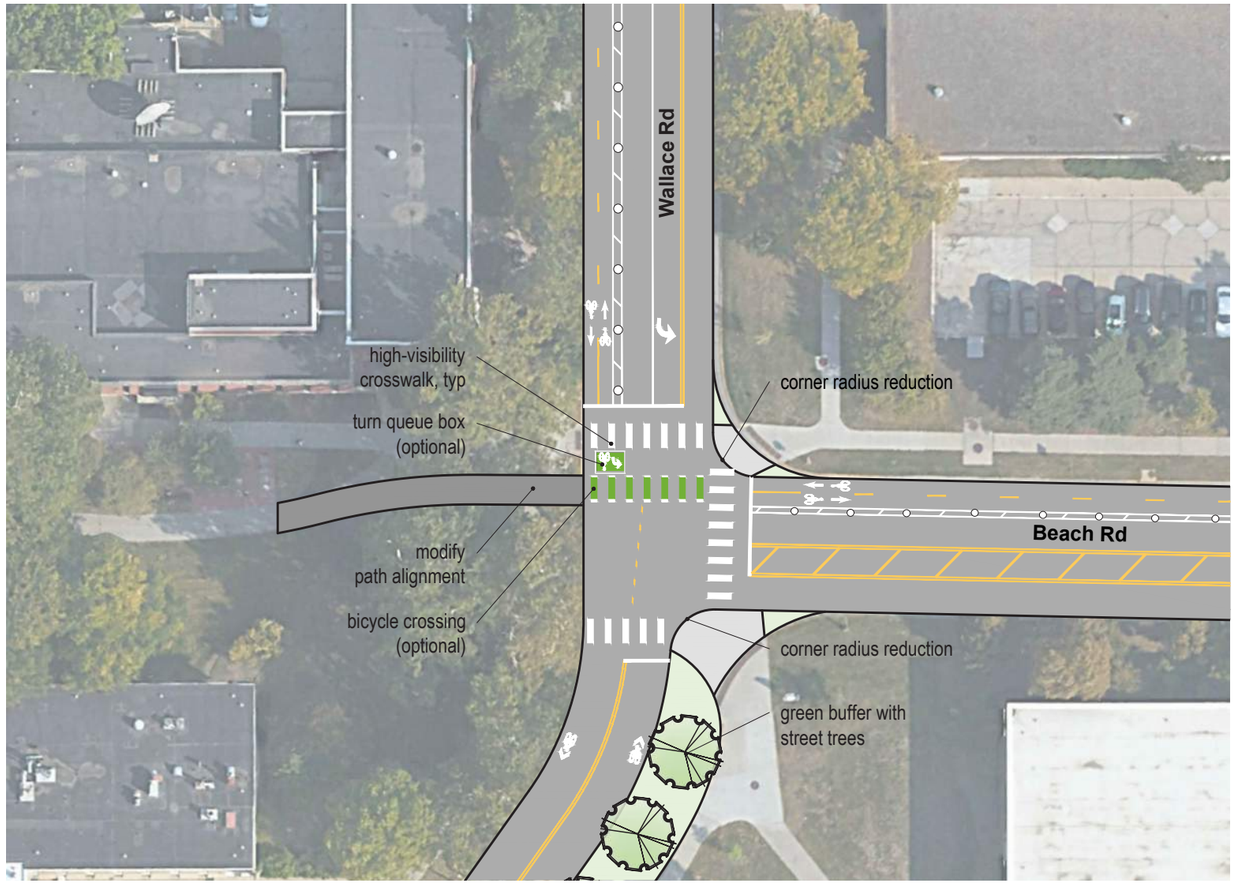
IOWA STATE UNIVERSITY TOOLE DESIGN

## WALLACE ROAD AND BEACH ROAD: EXISTING INTERSECTION DETAIL


### NOTES

- Potential intersection reconstruction 2021
- Intersection is stop-controlled
- Large curb radii allow personal automobiles to make turn at high rates of speed
- Existing bike-only path terminates at intersection

## WALLACE ROAD AND BEACH ROAD: PROPOSED INTERSECTION DETAIL

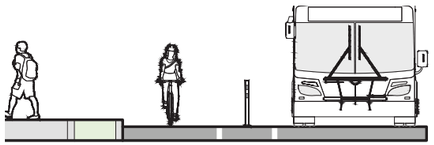



### NOTES

- Two-way separated bike lane on west side of Wallace Road and north side of Beach Road
- Green pavement markings used at intersection to indicate bicycle crossing
- Bicycle crossing facilitates direct connection to proposed realignment of existing bike-only path
- Propose realignment of existing bike-only path west of Wallace Road to align with two-way separated bike lane on Beach Road (may require alteration or modification of sidewalks/paths in the vicinity)
- Corner curb radius on southeast and northeast corner reduced to slow motor vehicle turning speeds; allow south crosswalk to be straightened out, reducing the crossing distance for pedestrians
- Bicycle turn queue box provides space for turning bicyclists to wait for signal

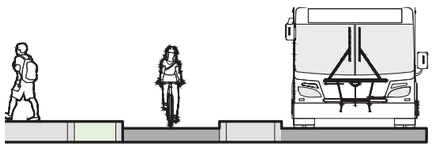
## VERTICAL SEPARATION OPTIONS

### FLEX POSTS



- Flexible delineators (also called 'flex posts') are commonly used for retrofit projects
- Can be easily removed for maintenance or during the winter for snow removal
- Designed to prevent vehicle encroachment and provide physical separation between bicycle lane and travel lane
- May require closer spacing to prevent vehicle encroachment (typically 15 feet on-center)

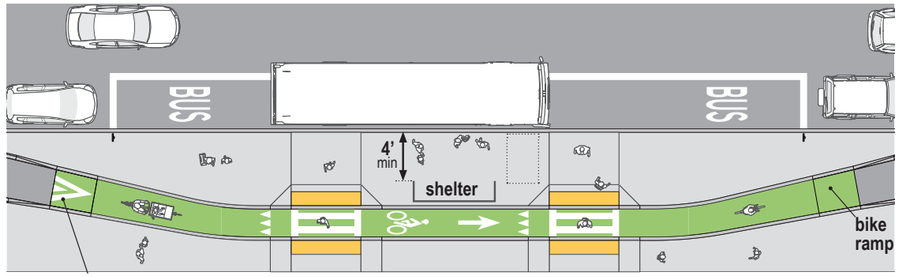
### CONCRETE CURBS

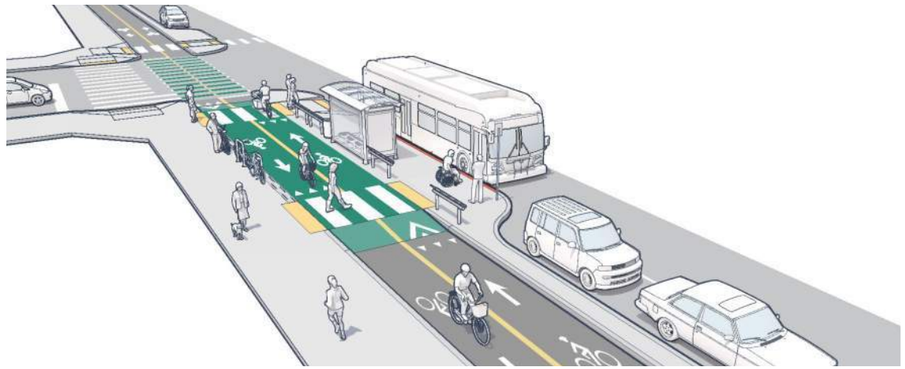


- Curb separation  commonly used for reconstruction projects
- Designed to prevent vehicle encroachment and provide physical separation between bicycle lane and travel lane
- May require utility modifications

## BUS STOP TREATMENT OPTIONS

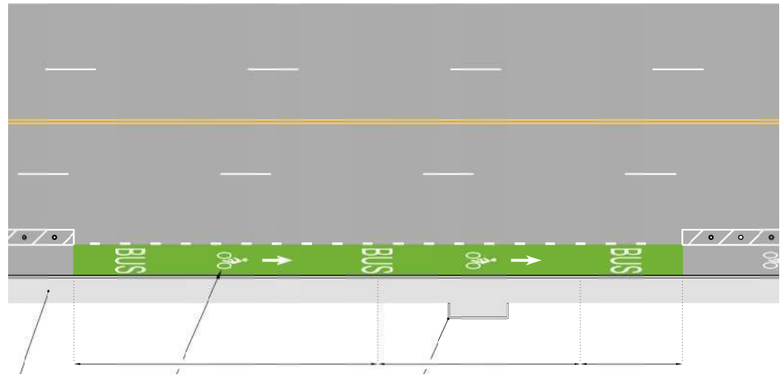
### FLOATING BUS STOP (REQUIRED FOR TWO-WAY SEPARATED BIKE LANE)



- Floating bus stop routes bike lane behind transit stop
- Designed to prevent bike and bus conflicts
- Bike facility level may be designed at sidewalk, street, or intermediate level depending on site conditions
- Depending on conditions, this design may require drainage modification, although designs are possible to reduce impacts on drainage

### BUS STOP MIXING ZONE (NOT COMPATIBLE WITH TWO-WAY SEPARATED BIKE LANE)




- Mixing zone-style bus stops are NOT compatible with two-way separated bike lanes; this solution may be suitable for use with cross section Alternative 1: Bike Lane (see page 9)
- Buffer and vertical separation ends in advance of bus stop; buses enter and temporarily block the bike lane for boarding and alighting
- High-visibility green conflict markings to alert potential bus and bicycle conflicts (optional)
- Bus and bicycle lane symbols (optional)
- Dash bike lane line for anticipated length of bus stop to indicate bus merging zone

## EVALUATION MATRIX

The design concepts presented were evaluated in a matrix format that assigns a ranking based on criteria and priorities. Preferred alternatives will be identified for each roadway section for the purposes of estimating project costs and generating an implementation schedule.

| Alternatives | Design Evaluation | | | |
|---|---|---|---|---|
| | Pedestrian Comfort | Transit Benefits | Bicyclist Comfort | Cost Effectiveness |
| Preferred Design: Separated Bike Lane with Floating Bus Stop | Highest | Highest | Highest | Medium |
| Alternative 1: Bike Lane | Lowest | Medium | Lowest | Highest |
| Alternative 2: Shared Use Path | Medium | Highest | Medium | Lowest |

Note: Cost impact of Separated Bike Lanes assumes flexpost vertical separation. Continuous concrete medians would cost substantially more.

## COST ESTIMATE RANGES

| Option | Cost Range |
|---|---|
| Preferred Design: Separated Bike Lane with Floating Bus Stop | **$136,000 - $203,500** |
| Alternative 1: Bike Lane | **$13,600 - $20,350** |
| Alternative 2: Shared Use Path | **$136,000 - $408,000** |

Note: These cost estimate ranges are for implementation as part of a ***larger reconstruction project***. Implementing as a retrofit can be substantially more expensive. Does not include costs associated with intersection geometric changes or realignment of existing paths.

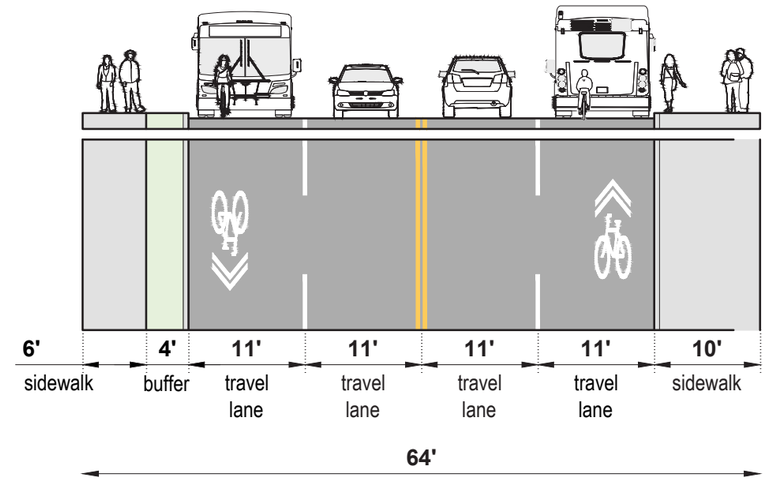
IOWA STATE UNIVERSITY TOOLE DESIGN

## PROPOSED BIKEWAY EXTENTS


## CORRIDOR DETAILS

- **Existing curb-to-curb width:** 44 feet
- **Existing shared lane markings**
- **Existing traffic volumes:** 3,480 average vehicles per day (2015)
- Low motor vehicle volumes given existing travel lane configuration
- Two existing CyRide bus stops - one on each side of road
- High volume of students accessing main campus from the west on foot, by bike, and by multiple bus routes
- Union Drive is stop controlled at Sheldon Drive and Bissell Road

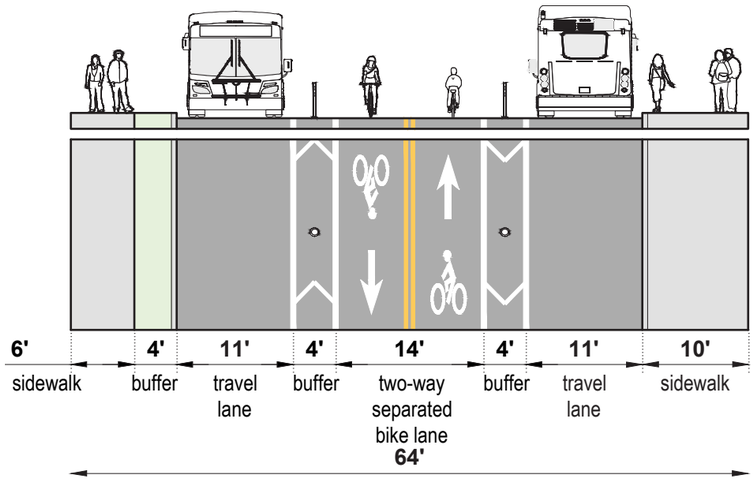
## EXISTING CROSS SECTION




### NOTES

- Shared lane markings on outside lanes
- 4-lane cross section

## PREFERRED CROSS SECTION




### NOTES

- Roadway converted from 4-lanes to 2-lanes
- Center bicycle facility alignment- buffer provided between travel lanes
- Compatible with vertical separation options (see next page)
- This configuration would be a significant change from current conditions and could affect transit operations and parking lot access. An initial, reversible pilot project consisting of paint, signs, and flexposts is recommended before moving to more permanent treatments. Prior to and during the pilot phase, outreach should be conducted and traffic patterns and behaviors should be observed and analyzed.

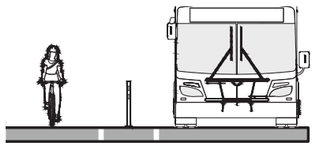
## TRANSITION AT BISSELL ROAD


### NOTES

- Recent reconstruction narrowed the Union Drive roadway west of the Bissell Road intersection; this creates a pinch point for future bike lanes west of Bissell Road
- The proposed treatment from the pinch point west to Sheldon Avenue is shared lanes
- Solutions for transitioning bike lanes to shared lanes in a way that minimizes negative impacts on bicyclists are available and should be explored during the detailed design phase

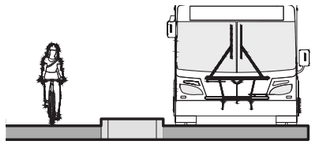
## VERTICAL SEPARATION OPTIONS

### FLEX POSTS



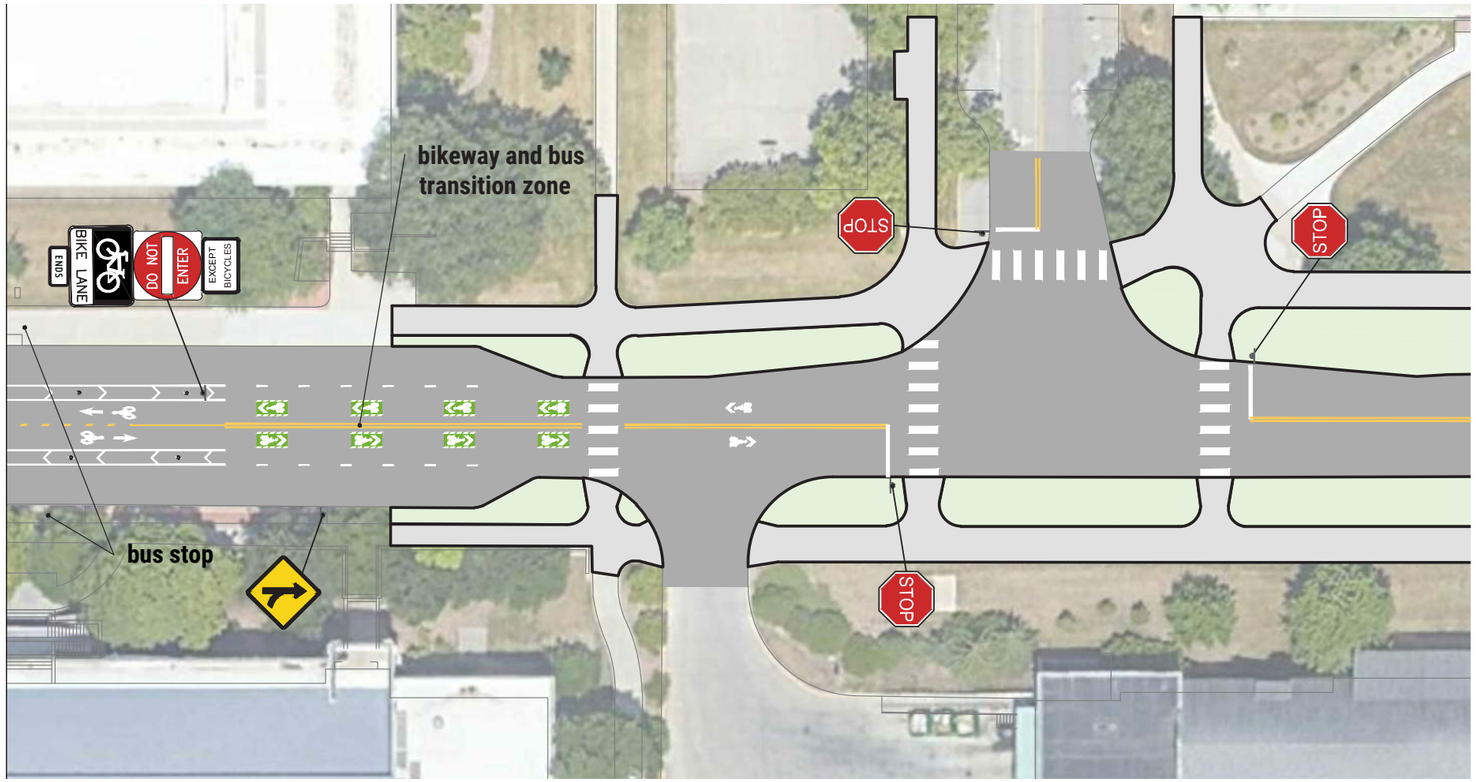
- Flexible delineators (also called 'flex posts') are commonly used for retrofit projects
- Can be easily removed for maintenance or during the winter for snow removal
- Designed to prevent vehicle encroachment and provide physical separation between bicycle lane and travel lane
- May require closer spacing to prevent vehicle encroachment (typically 15 feet on-center)
- Flexible delineators may need to removed at intersecting driveways

### CONCRETE CURBS



- Curb separation commonly used for reconstruction projects
- Designed to prevent vehicle encroachment and provide physical separation between bicycle lane and travel lane
- May require utility modifications
- Concrete curb may need to be removed at intersecting driveways

## PROPOSED BIKEWAY TRANSITION AT BISSELL ROAD




### NOTES

- Two-way bicycle facility would transition to shared lane
- Design concept would work within recently reconstructed intersection of Union Drive/Bissell Road

## EVALUATION MATRIX

The design concepts presented were evaluated in the matrix format below that assigns a ranking based on criteria and priorities. Preferred alternatives will be identified for each roadway section for the purposes of estimating project costs and generating an implementation schedule.

| Preferred Treatment | Design Evaluation | | | |
|---|---|---|---|---|
| | Pedestrian Comfort | Transit Benefits | Bicyclist Comfort | Cost Effectiveness |
| Center-running Two-way Separated Bike Lane | Medium (no change) | Medium | Higher | Medium |

## COST ESTIMATE RANGES

| Option | Cost Range |
|---|---|
| Implementation via Paint, Signs & Flexposts | **$22,000 - $55,000** |
| Implementation via Concrete Medians | **$68,000 - $109,000** |

Note: These cost estimate ranges are for implementation as a ***retrofit***. Implementing as part of a larger resurfacing or reconstruction project can be substantially less expensive.

IOWA STATE UNIVERSITY TOOLE DESIGN