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Student Research Report

Shifting Gears: Stadium Road Neighbourhood as a Leader in Connectivity

Chris Mah, Saki Aono, Sasha Van Stavel

University of British Columbia

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SHIFTING GEARS

STADIUM ROAD NEIGHBOURHOOD AS A LEADER IN CONNECTIVITY

REPORT BY

SAKI AONO

CHRIS MAH

SASHA VAN STAVEL

IN PARTNERSHIP WITH

UBC CAMPUS

+ COMMUNITY

PLANNING

SHIFTING GEARS: STADIUM ROAD NEIGHBOURHOOD AS A LEADER IN CONNECTIVITY (2018).

Report by Saki Aono, Chris Mah, and Sasha van Stavel

In partnership with UBC Campus + Community Planning



THE UNIVERSITY OF BRITISH COLUMBIA
Campus + Community Planning

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Table of Contents

EXECUTIVE SUMMARY

INTRODUCTION

INTRODUCTION	3
SITE CONTEXT	3
SRN LOCATION	4
OUR INVOLVEMENT	5
OUR PROJECT APPROACH.....	6

OBJECTIVES

OBJECTIVES.....	10
GEOGRAPHIC SCALES.....	11

NEEDS

BASELINE CONDITIONS	14
TRANSPORTATION TARGETS.....	15

TRAVEL TO, FROM, AND THROUGHOUT CAMPUS.....	16
PLANNING FOR A GROWING CAMPUS ...	18
CURRENT CHALLENGES	19
NEEDS	20

STRATEGIC DIRECTIONS AND PLANNING APPROACHES

STRATEGIC DIRECTIONS.....	23
PLANNING APPROACHES.....	24

FOCUS AREAS

FOCUS AREAS	26
-------------------	----

INTERVENTIONS AND EVALUATION

INTERVENTIONS	28
---------------------	----

EVALUATION 28

RECOMMENDATIONS

RECOMMENDATIONS 30

I. EAST MALL: THE PEOPLE MOVER. 31

CHALLENGES AND OPPORTUNITIES 32

RECOMMENDATION: NORTH-SOUTH
SHUTTLE 33

RECOMMENDATION: REDUCED VEHICLE
ACCESS 35

RECOMMENDATION: REALLOCATION OF
STREET SPACE 39

II. WEST 16TH AVE: THE CONNECTOR. ... 43

CHALLENGES AND OPPORTUNITIES 44

RECOMMENDATION: DOWNSIZING 45

RECOMMENDATION: FROM ROUND TO
SQUARE 48

III. PARKING: FUTURE-PROOF DESIGN .. 49

RECOMMENDATION: REPURPOSABLE
SPACE 50

IV. NEIGHBOURHOOD MOVEMENT DESIGN: HUMANIZED NETWORK 53

RECOMMENDATION: (ALMOST) CAR-FREE
NEIGHBOURHOOD 54

GOING FORWARD

GOING FORWARD 67

REFERENCES 68

APPENDICES

APPENDIX A: STRATEGIC DIRECTIONS. .70

APPENDIX B: ALTERNATIVE
INTERVENTIONS NOT INCLUDED IN
RECOMMENDATIONS.....72

EAST MALL..... 72

EAST MALL..... 73

EAST MALL..... 74

WEST 16TH AVE..... 75

WEST 16TH AVE..... 76

WEST 16TH AVE..... 77

PARKING 78

NEIGHBOURHOOD MOVEMENT DESIGN. .80

APPENDIX C: EVALUATION OF
INTERVENTIONS..... 81

APPENDIX D: LIMITATIONS.....83

EXECUTIVE SUMMARY

The University of British Columbia is a leading institution in creating a place where students, faculty, and staff can live, work, play, learn, and interact. With their vision of creating a sustainable campus that promotes both community and environmental health, transportation is one of the key elements that needs to be addressed to meet their listed targets and goals. UBC is a proven regional trendsetter in sustainable transportation, which makes the university responsible for moving the agenda forward. As a result, the *Shifting Gears* provides a prime opportunity to plan a neighbourhood that supports the university's existing values through a transportation and connectivity lens. Transportation and connectivity in this project entails fostering safe, efficient, and innovative connections that promote active and public modes of transportation to, from, and within the Stadium Road Neighbourhood.

As a neighbourhood that is in its initial planning stages, this project was approached in a way to present comprehensive recommendations that respond to the campus' existing conditions and needs. Therefore, this project includes a thorough review of existing campus policies and existing transportation conditions that led to the creation of a needs assessment to respond to the existing gaps in campus transportation. Given the scope of the project, these needs were addressed in four main focus areas near or within the site where interventions for transportation and connectivity can have the biggest impact. These areas include East Mall, West 16th, parking for the site, and neighbourhood movement design. Several different interventions were evaluated based on the project objectives, and the best performing intervention for each focus area was chosen and presented as our final recommendation. These recommendations support the current transportation values and behaviours of the potential SRN users while also promoting and accommodating a future where innovative and sustainable transportation technologies and designs become the norm at UBC.



INTRODUCTION



INTRODUCTION

UBC Stadium Road Neighbourhood (SRN) is a redevelopment project on a site where the current Thunderbird Stadium is situated. This redevelopment entails the creation of a new campus neighbourhood, and a redesign and potential relocation of the existing Thunderbird Stadium. SRN presents an opportunity to create a neighbourhood where UBC's values regarding accessibility, sustainability, health, and adaptability are at the forefront of community and transportation development. *Shifting Gears* will guide the transportation and connectivity aspects of the SRN neighbourhood plan. As a new development, the neighbourhood is imagined as a place where the current transportation needs on and to/from campus are met, and stand out as a leader of change in the way our campus and region approaches transportation. Therefore, the aim of this project is create interventions that



Photo: UBC Communications & Marketing

envision a neighbourhood that prioritizes sustainable and innovative forms of transportation and connectivity designs to help UBC meet and surpass their transportation targets. To best understand the connectivity needs and reflect UBC's values, these interventions are a result of researching existing transportation conditions and trends at UBC, reviewing relevant transportation and connectivity precedence, and evaluating several interventions against four transportation and connectivity objectives.

SITE CONTEXT

Stadium Road Neighbourhood is a proposed neighbourhood development site estimated to house 2,500+ residents, accommodate stadium events, and provide basic services and amenities. The new neighborhood is situated between Hawthorn Place and Wesbrook Village at the south end of UBC campus and links valuable cultural assets on campus such as the UBC Farm and Botanical Gardens.

SRN LOCATION

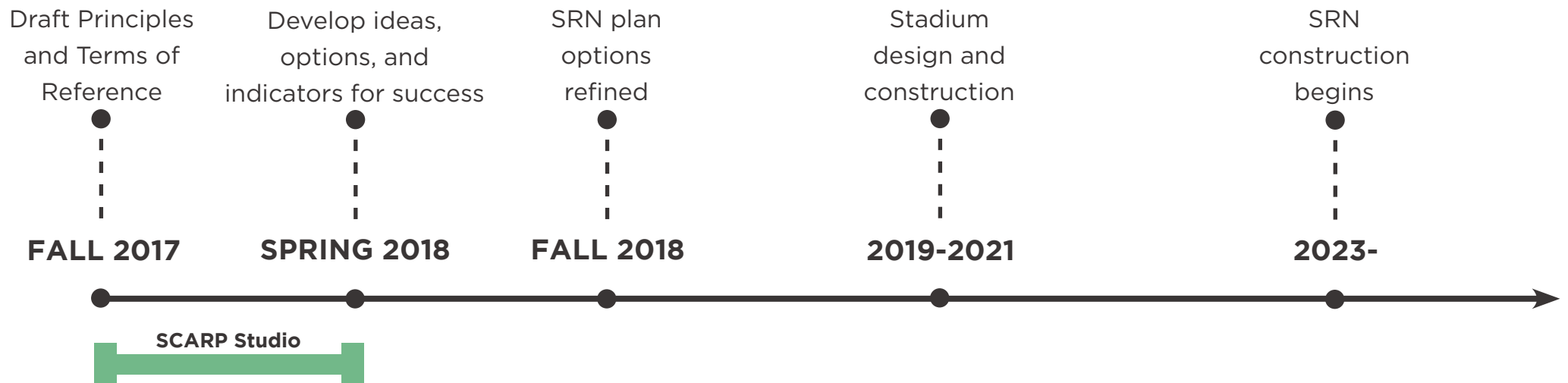


OUR INVOLVEMENT

Currently, UBC has ambitious goals and targets towards achieving sustainable transportation that reflect their commitment to create an exceptional learning environment. As a result, the campus has showcased a number of transportation designs and initiatives that promote sustainable modes of transportation within and to/from the Vancouver campus. However, during the most transformative time in urban transportation in over a century, transportation trends and behaviours are changing vastly at a rapid pace. The extent to which transportation will progress in the future remains uncertain. Thus, as newer forms of transportation are being introduced, it is high time to plan for the future to ensure

that UBC's vision is maintained. Given this context, our group aims to provide solutions that follow the existing trends in transportation uses, while also crafting ideas that imagine a transformative change in the transportation behavior on and to/from campus. This transformation entails new and innovative interventions that surpasses existing boundaries and foster sustainable connectivity within and to/from the SRN. Therefore, our role within the SRN planning process is to provide C+CP with a variety of transportation interventions to help plan a resilient neighbourhood that is able to adapt to the ever growing transformation in sustainable technology.

UBC CAMPUS + COMMUNITY PLANNING SRN PLAN TIMELINE



OUR PROJECT APPROACH

Shifting Gears progresses from broad values to specific actions, starting with objectives and culminating in specific recommended interventions for the SRN neighbourhood plan. This comprehensive process is intended to ensure that all values, obstacles, and constraints are considered throughout the project.





1. OBJECTIVES

An objective is a value for transportation and connectivity in SRN. The values are based on the SRN Guiding Principles developed by UBC C+CP. Our team constructed SRN transportation and connectivity objectives by determining how transportation can affect C+CP's guiding principles. The overarching goal of this project is to make recommendations that achieve these SRN transportation and connectivity objectives.



2. NEEDS

Using a needs assessment framework, a need is a component of one or more objectives that is currently lacking. Therefore, needs are the gaps that impede realization of the SRN objectives. These needs were constructed based on existing policy review, baseline conditions analysis, and UBC C+CP SRN community engagement feedback.



3. STRATEGIC DIRECTIONS

A strategic direction is a broad course of action intended to find potential solutions to one or more needs. Strategic directions are not intended to provide specific actions, but rather a general next step. Therefore under each need, a strategic direction was created to reflect the first step needed to overcome the gap between the objectives and reality.



4. FOCUS AREAS

A focus area is a specific problem or opportunity area that will be investigated in detail. Given the large quantity of strategic directions identified and limited time for our project, four main focus areas around or within the site were selected that address several strategic directions. These areas were selected based on the ideas that were explored at the design charrette, feedback received from C+CP, and areas that are linked to several of the gaps identified in the needs assessment.



5. INTERVENTIONS

An intervention is a specific solution addressing the challenges and/or opportunities of one of the SRN focus areas. For each focus area, multiple alternative interventions have been designed by our team. A comprehensive list of all interventions can be found in the appendices of this document.



6. EVALUATION

Using a multiple account evaluation (MAE) framework, the performance of each intervention was measured qualitatively based on the four SRN connectivity objectives to help formulate our final recommendations.



7. RECOMMENDATIONS

Based on our evaluation of interventions, the best performing interventions were refined and presented as final recommendations for UBC C+CP.



OBJECTIVES

OBJECTIVES

In today's society, mobility is not one-dimensional. The way we move is constantly evolving to accommodate the needs and preferences of a diverse population. As such, it is important for our project to encompass multiple values, as set out in the SRN Guiding Principles by UBC C+CP.

In order to have a clear framework for reaching educated and informed connectivity recommendations for the SRN that represent many unique people, there are four key transportation and connectivity objectives to ensure the guiding principles are met. These objectives are comprised of the major areas that can be affected in the SRN through transportation and connectivity solutions.



Human Movement

Encourage active transportation to promote physical, social, and mental health through movement



Low Impact Links

Connect people and places through transportation modes and infrastructure that minimizes negative environmental impact



Accessible Neighbourhood

Ensure people of all ages and abilities are able to get where they want to go, whether their destination is within or outside the SRN



Dynamic Connections

Create adaptable connections that are flexible to changing user groups, weather, technologies, and other factors

● **Neighbourhood**

STADIUM ROAD
NEIGHBOURHOOD

Connecting areas within
SRN and its immediate
surroundings

● **Local**

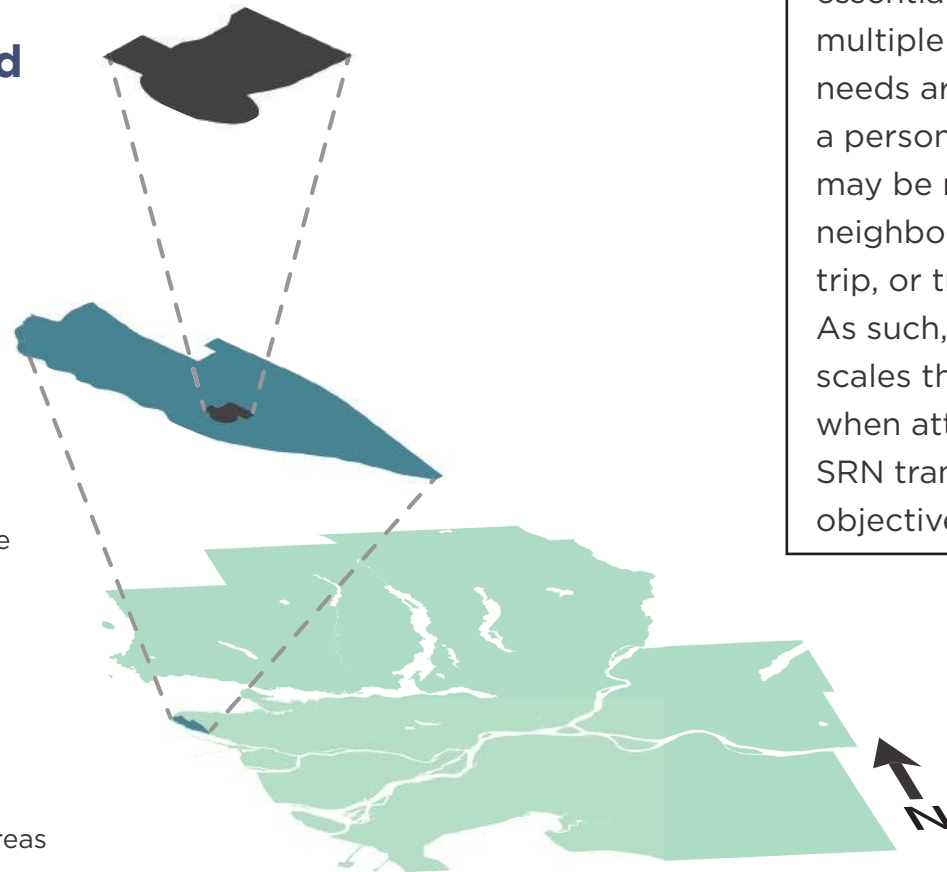
UBC VANCOUVER
CAMPUS

Connecting SRN with the
rest of UBC campus

● **Regional**

METRO VANCOUVER

Connecting SRN with areas
outside of UBC campus



GEOGRAPHIC SCALES

To enable holistic connectivity, it is essential to consider the objectives at multiple geographic scales. Mobility needs are not static and each trip a person makes is unique. People may be moving throughout their neighbourhood, making a quick local trip, or travelling across the region. As such, there are three geographic scales that are important to consider when attempting to achieve the SRN transportation and connectivity objectives.

SCALES



NEEDS



From background policy review, baseline conditions analysis, and UBC Campus and Community Planning's SRN community engagement feedback, a needs assessment was developed. There are several gaps that must be addressed in order for the SRN to meet the defined objectives at each geographic scale. This next section will outline the review of existing policy and baseline conditions, culminating in a needs assessment for the SRN.

BASELINE CONDITIONS

To best understand the existing context of the SRN we evaluated guiding policies and plans, baseline conditions of existing transportation systems, and our partner's SRN community engagement feedback. In order to succinctly categorize relevant transportation data that would provide us a platform to build from we asked four primary questions:

- 1. What are UBC's transportation targets?**
- 2. How do people travel to, from, and throughout UBC?**
- 3. How do we plan for a growing campus?**
- 4. What are the current challenges for UBC's transportation system across each mode?**



Source: UBC Campus + Community Planning

TRANSPORTATION TARGETS

To align our project with UBC's larger visions, goals, and objectives, we reviewed existing UBC planning policy. Specific focus was on the *UBC Land Use Plan*, *UBC Vancouver Campus Plan*, and the *UBC Transportation Plan*.



UBC's visions and objectives outlined in overarching policy were considered and aligned with throughout *Shifting Gears*, specifically the transportation targets from the *UBC Transportation Plan*.

- Target 1** By 2040, at least 2/3 of all trips to and from UBC will be made by walking, cycling, or transit. Maintain at least 50% of all trips to and from the campus on public transit.

- Target 2** Reduce single occupant vehicles (SOV) travel to and from campus by 20% from 1996 levels. Maintain at least 30% reduction from 1997 levels in daily SOV trips per person to and from UBC.

- Target 3** Maintain daily private automobile traffic at or less than 1997 levels.

TRAVEL TO, FROM, AND THROUGHOUT CAMPUS

EVERYDAY TRAVEL

The 2016 UBC Transportation Status Report (UBC 2017) proved extremely useful when answering this question and provided us with the following key trends:

52% of trips to and from UBC are by public transit

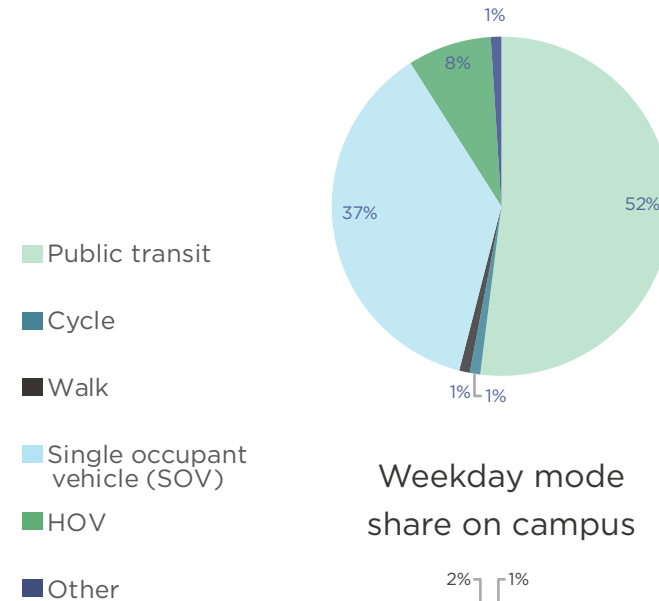
88% of on-campus movement is walking trips

2% of trips to and from UBC are by cycle or foot

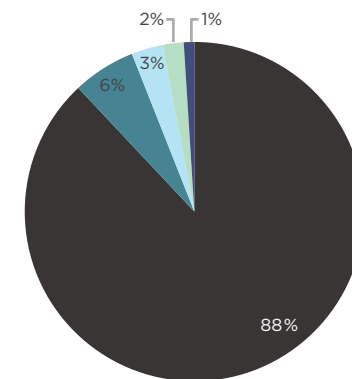
UBC has achieved a **30%** reduction in single occupancy vehicle (SOV) trips per capita in the last 20 years

Total SOV trips have increased by **12%** over the last 20 years

Weekday mode share to and from campus



Weekday mode share on campus



Source: 2016 UBC Transportation Status Report

STADIUM EVENT TRAVEL

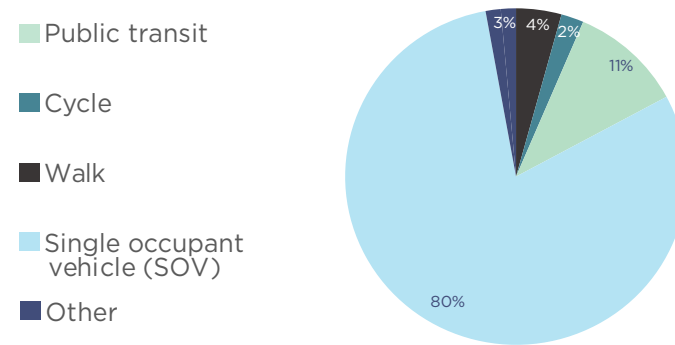
Because SRN is home to one of UBC's largest event venues, it is essential to understand the impact of event travel. Our team conducted a single day travel survey, which interviewed 140 people on a single. The results shows how people were commuting to Thunderbird Stadium for a football game.

91% of visitors came from off campus

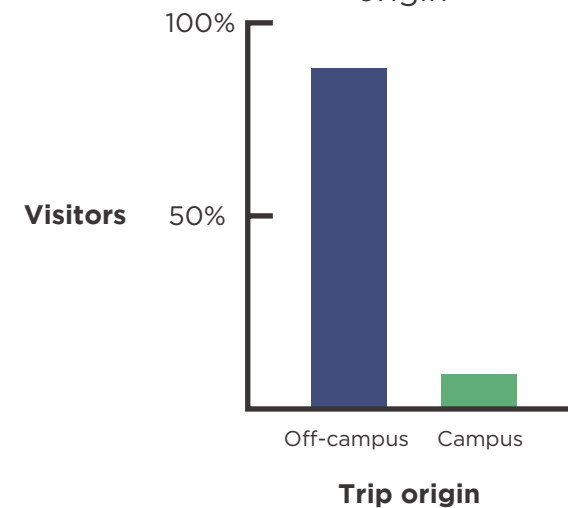
87% of visitors travelled by some form of automobile (personal vehicle, cab, car-share)

Even for trips taking **<10 minutes** most regional visitors travelled by private automobile

Gameday mode share to and from campus



Gameday visitor point of origin

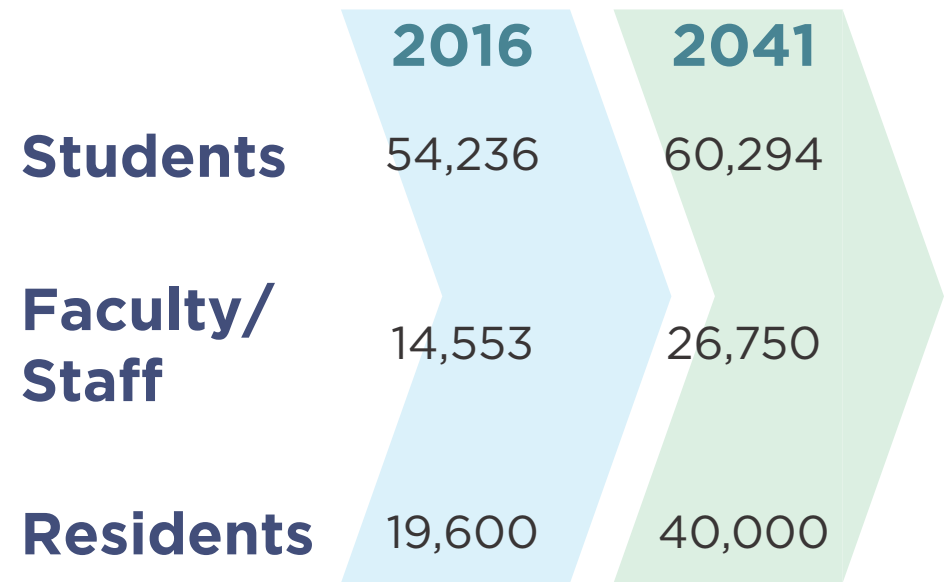


Source: 2017 SCARP Studio team UBC Football game survey

PLANNING FOR A GROWING CAMPUS

By examining available sources, we were able to piece together a rough population estimate for the next 25 years at UBC. Some of these projections are likely more accurate than others, but all sources pointed to an increasing number of people living, working, and studying at UBC. This increase in population affects the SRN directly, especially residents projected to move to our site.

UBC Campus Population



Source: UBC Facts and Overview, UBC Land Use Plan, and 2014 UBC Transportation Plan

CURRENT CHALLENGES

Lastly, our team reviewed the transportation system as a whole and investigated the most significant challenges. More specifically, we identified challenges that are relevant to the SRN and factors that must be considered as the neighbourhood is being planned.



Public transit to UBC is used heavily, creating **overcrowding on buses**



South campus is significantly **less served by public transit** than central campus



Roads near the SRN are major connectors with **large traffic volumes**



UBC campus has **no protected bike lanes**, including near the SRN



Walk time from the UBC bus loop to the SRN is about **20-25 minutes**

Transit data from South Coast British Columbia Transportation Authority 2017

NEEDS

The needs assessment was created by compiling all of our findings from our baseline conditions research. In some cases, a single need is applicable to multiple objectives or geographic scales. A summary of the needs we identified are outlined in the table on the following page.

NEEDS ASSESSMENT

Human Movement



Low Impact Links



Accessible Neighbourhood



Dynamic Connections



Objective

Neighbourhood



- Comfort when travelling by bike or foot, in terms of safety and security
- Animated public realm that encourages human movement

- A transportation system that works in harmony with nature
- A private automobile approach catered toward a sustainable future
- Comfort when travelling by bike or foot, in terms of safety and security
- Integration between bike, foot, and public transit, facilitating multi-modal trips

- Accessibility throughout the SRN for all ages, abilities, and modes
- Integration between bike, foot, and public transit, facilitating multi-modal trips

- Create adaptable transportation systems, infrastructure, and amenities for multiple scenarios

Local



- A safe, efficient, and legible campus active transportation network
- Integration between active transportation and public transit, facilitating multi-modal trips

- A safe, efficient, and legible campus active transportation network
- Good local public transit options on campus

- Good connectivity from the SRN to nature, academics, recreation, and other campus destinations

- Support campus movement to and from the SRN that considers transportation innovation and new technologies

Regional



- Make cycling a great option for trip between the SRN and the region
- Integration between bike, foot, and public transit, facilitating multi-modal trips

- Make cycling a great option for trip between the SRN and the region
- High connection between the SRN and the region by public transit

- Make the SRN an accessible destination for people throughout the region

- Be adaptable to changes to the regional public transit network
- Accommodate an increasing SRN population and user base

Scale

A photograph of a university campus walkway. The path is paved and leads through a lush green area with tall trees and grasses. Several blue banners with the UBC crest are hanging from tall poles along the path. A few people are walking on the path. In the background, a modern building is visible. The sky is clear and blue.

STRATEGIC DIRECTIONS AND PLANNING APPROACHES

Photo: UBC Communications & Marketing

STRATEGIC DIRECTIONS

The needs assessment provides us with useful general issues that must be addressed. However, the needs provide little direction on next steps. Our team determined that general strategy is necessary to confront the needs of the SRN. For this reason, our team developed strategic directions that address these needs. The strategic directions were developed by compiling planning research and considering how certain precedents could apply to the SRN. The strategic directions kept broad to avoid solidly defining a specific approach, and instead help guide the development of ensuing specific interventions. A comprehensive list of all of the strategic directions are listed in Appendix A.

PLANNING APPROACHES

Before getting into interventions, our team developed a spectrum of planning approaches for developing interventions. The spectrum of attitudes represents various different approaches that can be employed when considering how to plan for the SRN. Due to the fact that SRN will not be developed for years to come, there are several different potential planning approaches. Given the precedent UBC has set in its past planning efforts and its policies and principles, certain planning attitudes are more likely to be adopted than others. As such, our team created a spectrum based on two bookend approaches: Progressive Growth and Innovative Shift.

Progressive Growth imagines a future where automobiles continue to be a viable mode of transport, but growth still follows UBC’s overarching goals and vision identified in the 2014 UBC Transportation Plan. Therefore, the main aim surrounding the interventions focuses on producing pragmatic solutions that balance out automobile use with sustainable modes of transport (i.e. walking, cycling, and public transit), while being bound by the existing transportation constraints.

Innovative Shift encompasses ideas that provide an assertive push towards sustainable and active modes of transport. This scenario imagines a dramatic reduction in automobile use, while placing active and innovative forms of transportation to the forefront of connectivity development. Therefore,

innovative shift represents an aggressive shift in culture, focusing heavily on reaching and surpassing UBC’s goals.

Given uncertainty for the future, our team has developed interventions that span the spectrum of planning attitudes and consider several different planning mentalities. By doing this, our report adds value regardless of which attitude is taken as planning of the SRN evolves.

SPECTRUM OF PLANNING APPROACHES



Progressive Growth

A pragmatic approach to achieve UBC’s progressive transportation goals



Innovative Shift

An aggressive push to challenge existing culture and surpass UBC’s transportation goals





FOCUS AREAS

FOCUS AREAS

Given the scope of time for this project, our team had to make decisions on the work that was most useful. We developed interventions for four key focus areas. These focus areas were selected through discussions with UBC Campus + Community Planning and critical thinking to identify major issues that would have the greatest impact on transportation on the campus network and for the SRN.



INTERVENTIONS AND EVALUATION

INTERVENTIONS

For each focus areas, we developed several different interventions that could potentially help meet the SRN transportation and connectivity objectives. We started with a wide range of all possibilities and then narrowed down different actions. These interventions were arrived at by studying the site context, citing relevant case studies, and working through transportation network issues as a group.

Given the volume of interventions created, only recommended interventions are included in this report. For a comprehensive discussion of all the considered recommendations, please see Appendix B.

EVALUATION

Once the interventions were developed, our team evaluated the interventions qualitatively using a multiple accounts analysis (MAE) framework. The criteria for evaluation were the four SRN transportation and connectivity objectives. Embedded in each objective was consideration for all relevant geographic scales. Next, we considered feasibility of the interventions. Some interventions followed a Progressive Growth planning approach, while others required an Innovative Shift. Finally, our recommendations were arrived at following the evaluation process.

The evaluation process and our team's measurements are shown in detail in Appendix C.



RECOMMENDATIONS

RECOMMENDATIONS

Our recommendations consist of the best performing interventions identified for the SRN. Our team was tasked by UBC Campus + Community Planning to think of bold strategies, which challenge the current transportation culture. As such, our recommendations mostly follow the Innovative Shift planning approach. Though some of these recommendations may be logistically or politically difficult, UBC must take on these challenges to continue its leadership in sustainable transportation.

Recommendations will include indicators at the bottom of the page showing the main objectives being targeted and where each recommendation falls on the spectrum of planning approaches.

RELEVANT OBJECTIVES BEING TARGETED



Human Movement



Low Impact Links



Accessible
Neighbourhood



Dynamic
Connections

SPECTRUM OF PLANNING APPROACHES



Progressive
Growth



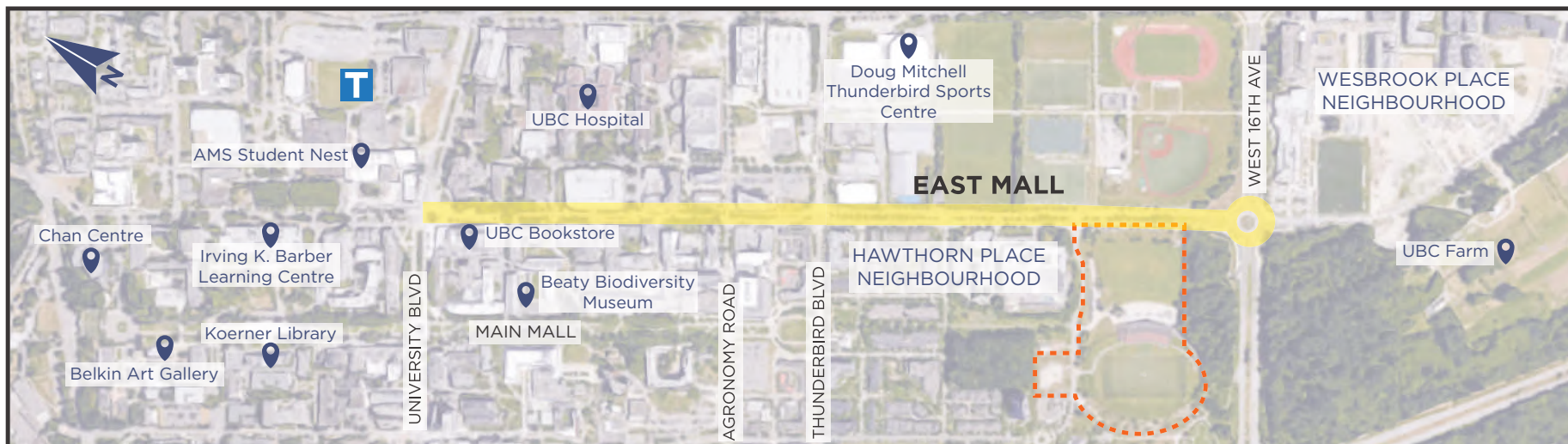
Innovative
Shift

I. EAST MALL: THE PEOPLE MOVER

East Mall provides a prime opportunity to create a space that accommodates the existing campus connections, while also addressing the evident gaps. This particular area is a central place for movement between the academic buildings in north campus and the campus neighbourhoods on south campus. Our aim is to preserve Main Mall as a ceremonial space that pedestrians can walk and interact with each other and with their environment freely and safely. The designed interventions reflect a mission to celebrate East Mall as the *People Mover*, a corridor that fosters the movement of students, faculty, staff, residents and visitors, through walking, cycling, and public transit. Interventions for this particular focus area are integral to the SRN as it is one of the main access roads for both residents and visitors.

STRATEGIC DIRECTIONS ADDRESSED

- Cycling and walking infrastructure such as lanes and paths that increase safety and ease of movement for all users
- Create a complete and connected pedestrian and cycling network that serves the SRN and other key destinations on campus
- Useful, efficient, and accessible public transit that considers on-campus trips



CHALLENGES AND OPPORTUNITIES

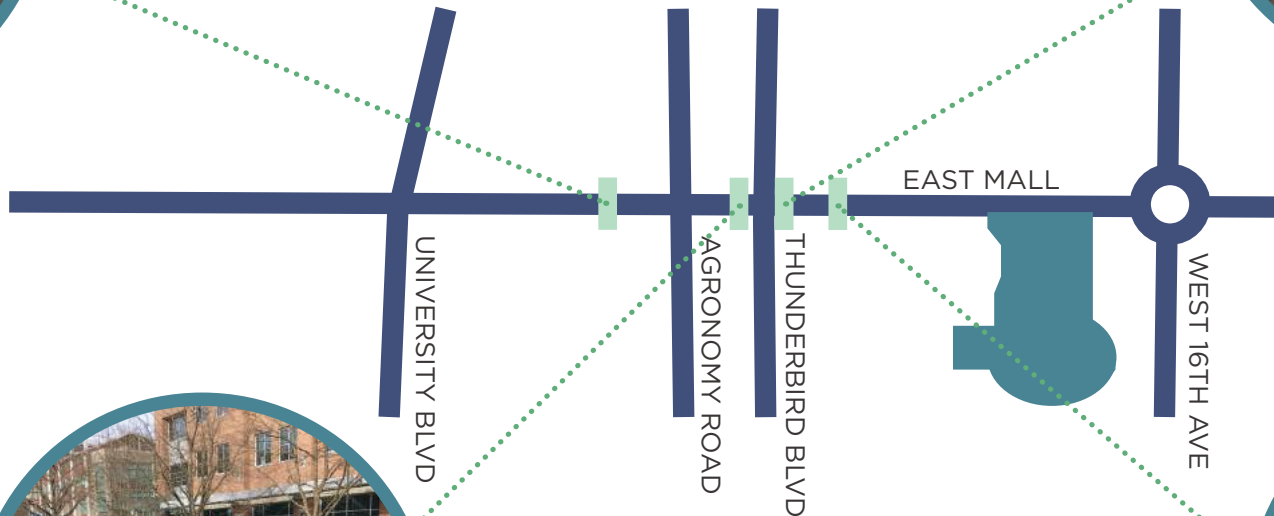


NARROW RIGHT-OF-WAY

As East Mall transects the academic campus, the roadway is just two lanes of vehicle traffic.

WIDE RIGHT-OF-WAY

South of Thunderbird Road, the roadway widens with on-street parking and a large median.



POOR BIKE FACILITIES

East Mall north of Agronomy Road has no bike lanes and cyclists share the road with automobiles.



HIGH VEHICLE SPEEDS

The wide roadway at the south end of East Mall invites high vehicle speeds along the corridor.



RECOMMENDATION: NORTH-SOUTH SHUTTLE

This recommended intervention is a campus transit route along East Mall. This bus route would be a central connector that bridges the current disconnect between north and south campus. Additionally, this intervention allows capacity for change, as the route may either terminate at Wesbrook Village or at the south end of East Mall. Wesbrook is currently the logical anchor point given its development as a main commercial and residential hub. However, as the SRN develops, the route may become an exclusive East Mall service. Adding dedicated transit will help the SRN thrive by providing visitors, students, residents, faculty, and staff efficient access to the services, amenities, and events offered in the neighbourhood.



The route for an East Mall shuttle, with southern terminus at the SRN or Wesbrook Village



Low Impact Links



Accessible
Neighbourhood



Progressive
Growth



Innovative
Shift



Photo: Caetano Bus

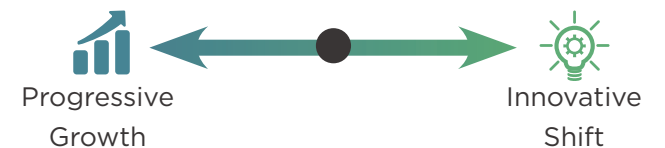
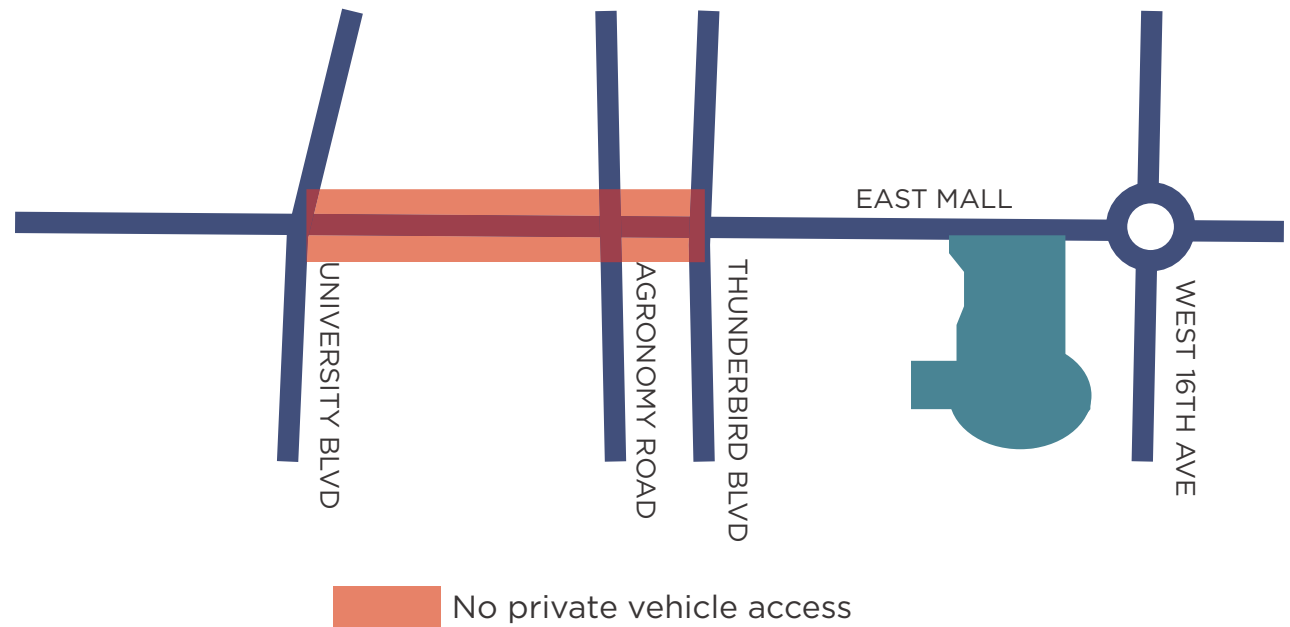
Double-ended bus technology currently exists in many parts of the world, where there is steering capability from each end of the vehicle

TECHNOLOGY

To accentuate the pedestrian and cycling prioritized environment in front of the AMS Nest, the bus route ends at University Boulevard. However, this narrow and short trip route calls for cutting-edge transportation technology that allows buses to operate in a safe and efficient manner such as double-ended steering buses. These buses allow the driver to exit the vehicle and enter the other end of the bus and drive in the opposite direction. This is suitable as it allows the bus to change direction without turning at the narrow section at University Boulevard. Therefore, this recommendation not only welcomes but requires forward thinking to incorporate innovative and sustainable technology.

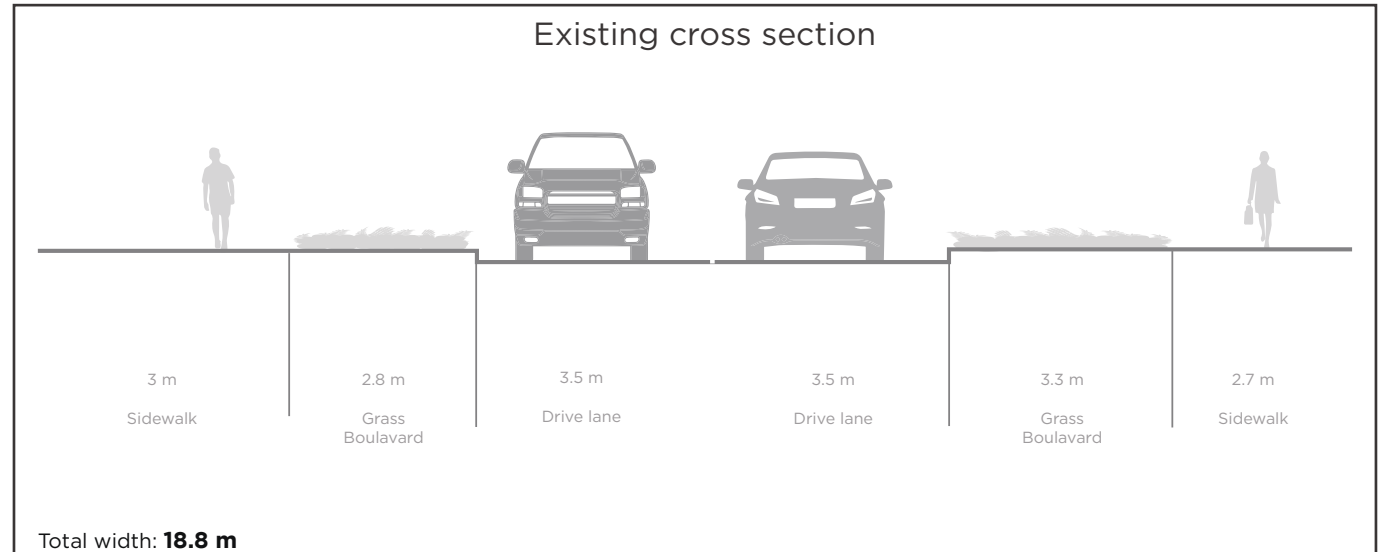
RECOMMENDATION: REDUCED VEHICLE ACCESS

This recommendation proposes to restrict private vehicle access on East Mall between University Boulevard and Thunderbird Boulevard. Limiting private vehicle access on this section of East Mall allows for the street to be focused on sustainable modes transit, cycling, and walking. This would be the first corridor on campus focused on moving people in a safe, efficient, and sustainable manner.

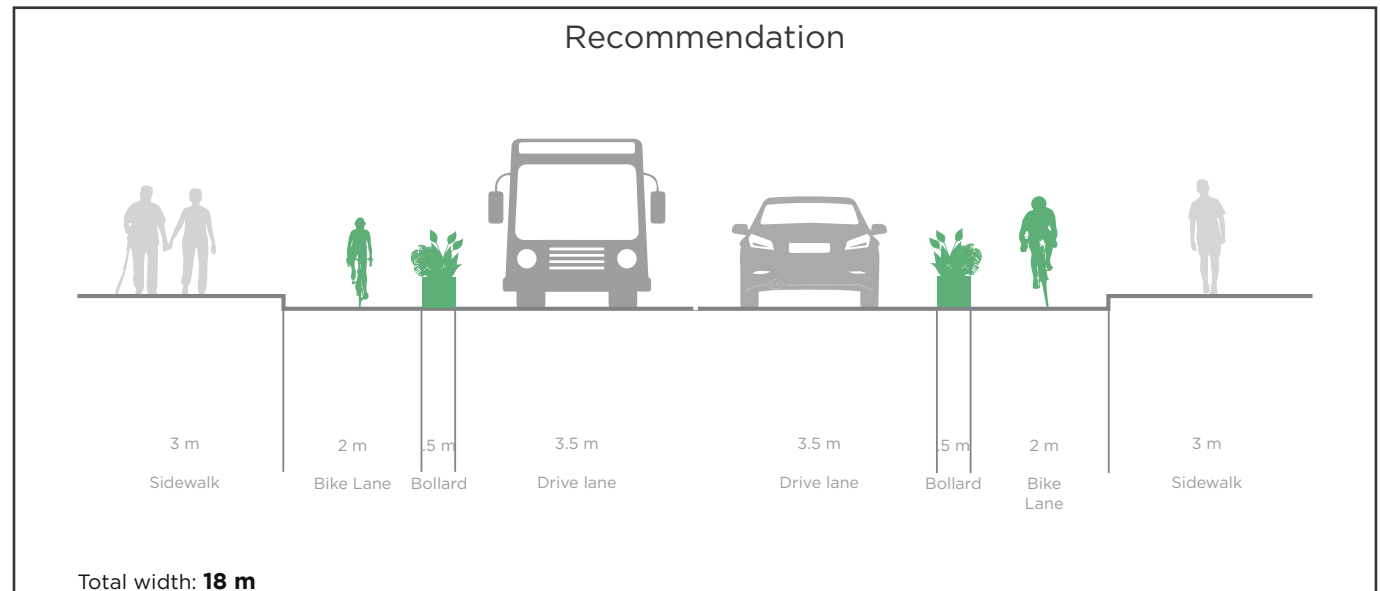


USE OF SPACE

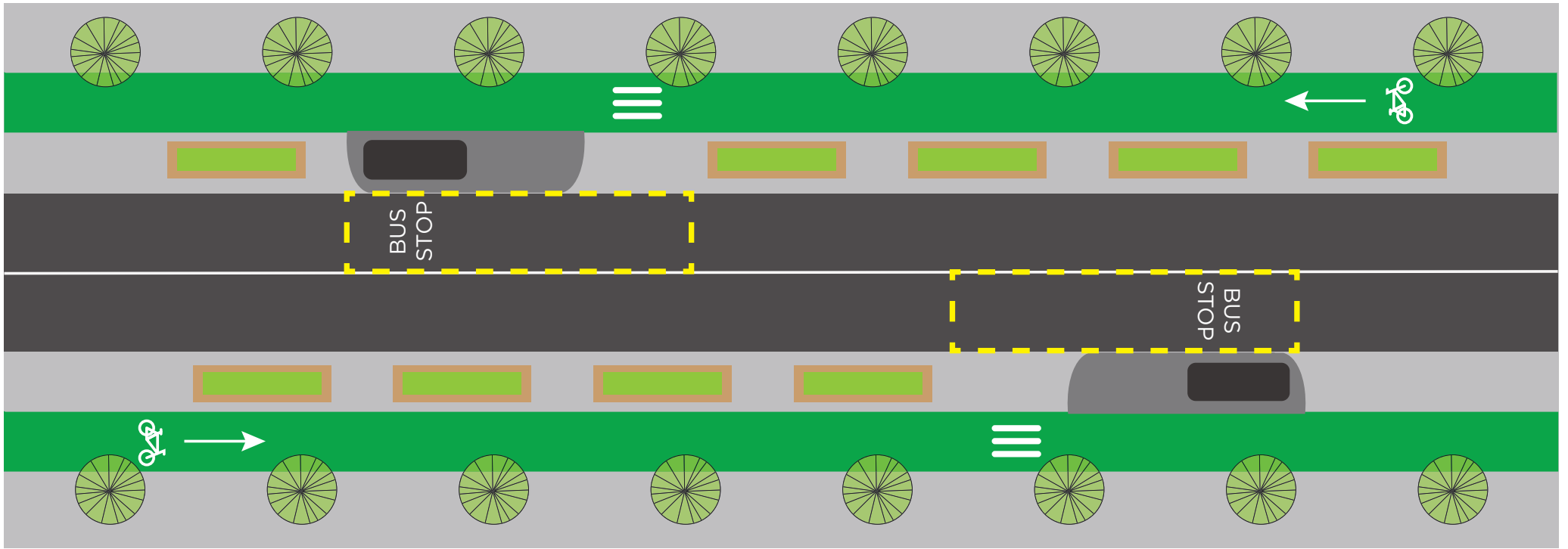
The street right-of-way at this section of East Mall is quite narrow. To accommodate the recommended bus route, a design where the existing traffic lanes are converted into dedicated bus lanes is recommended for this section. This design is the most effective way to drive the future of East Mall as the *People Mover* due to the restriction of private automobiles. Creating a corridor that prioritizes transit, cycling, and walking facilitates active and sustainable transportation as the reliance on private automobiles for travel within the campus is dramatically reduced.



Currently, this section of East Mall does not allocate space for transit or cyclists



Addition of protected bike lanes



Plan view of a reimagined East Mall between University Blvd and Thunderbird Blvd

REIMAGINED CORRIDOR

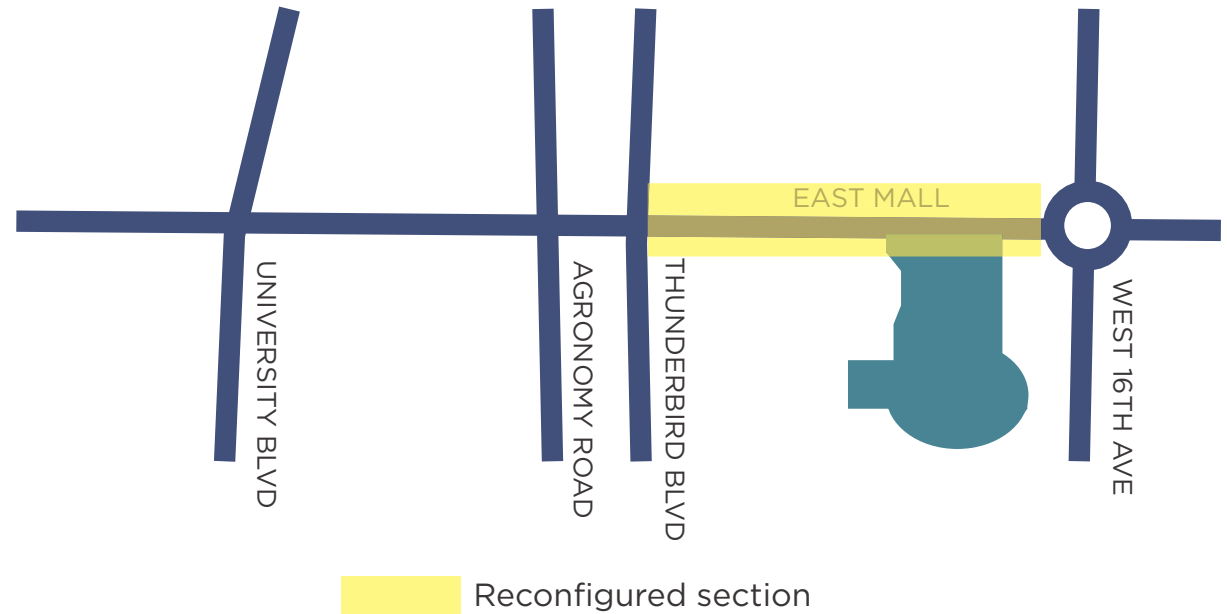
In making minor changes to vehicle access, the East Mall corridor can become an enhanced version of itself. Our team imagines an inviting, human-oriented East Mall, with shuttle buses and cycle tracks moving students, faculty, and staff across UBC's vast campus.



A future view of East Mall under the recommended interventions

RECOMMENDATION: REALLOCATION OF STREET SPACE

The southern section of East Mall between Thunderbird Boulevard and West 16th Avenue could benefit from a reallocation of space. As mentioned in challenges and opportunities, the right-of-way is very wide at this section of the corridor. Our recommendation does not drastically alter the existing conditions for this area, but instead works with what is currently there.

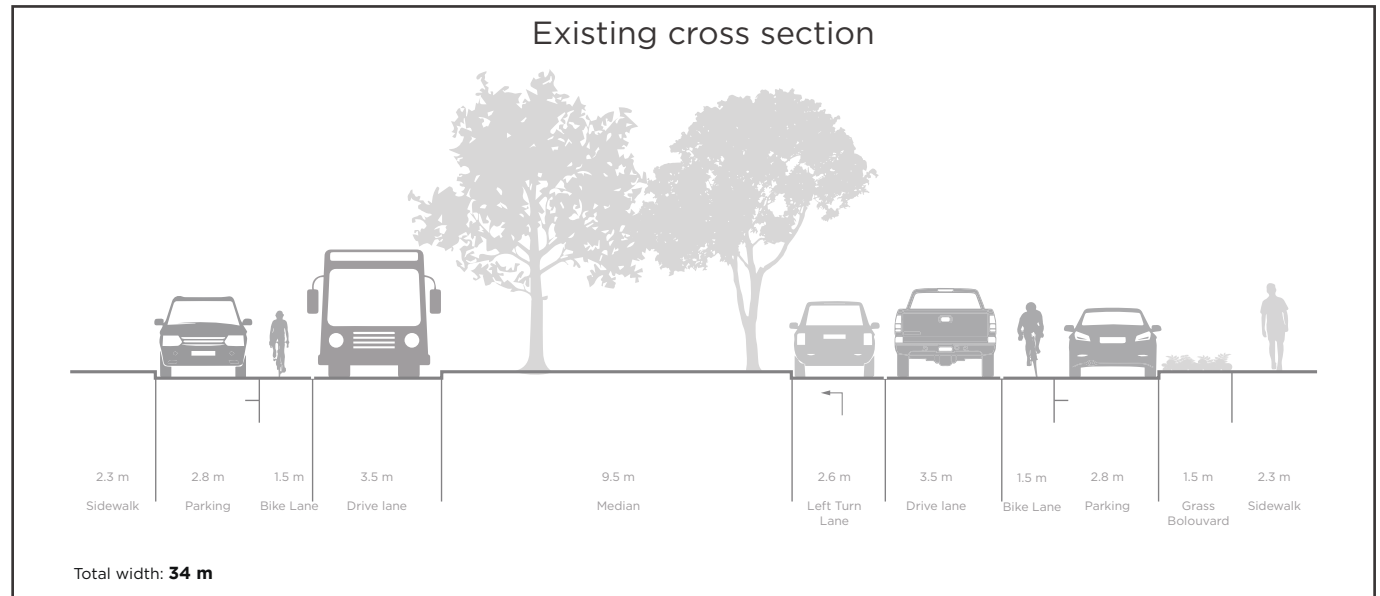


- Human Movement
- Low Impact Links
- Dynamic Connections

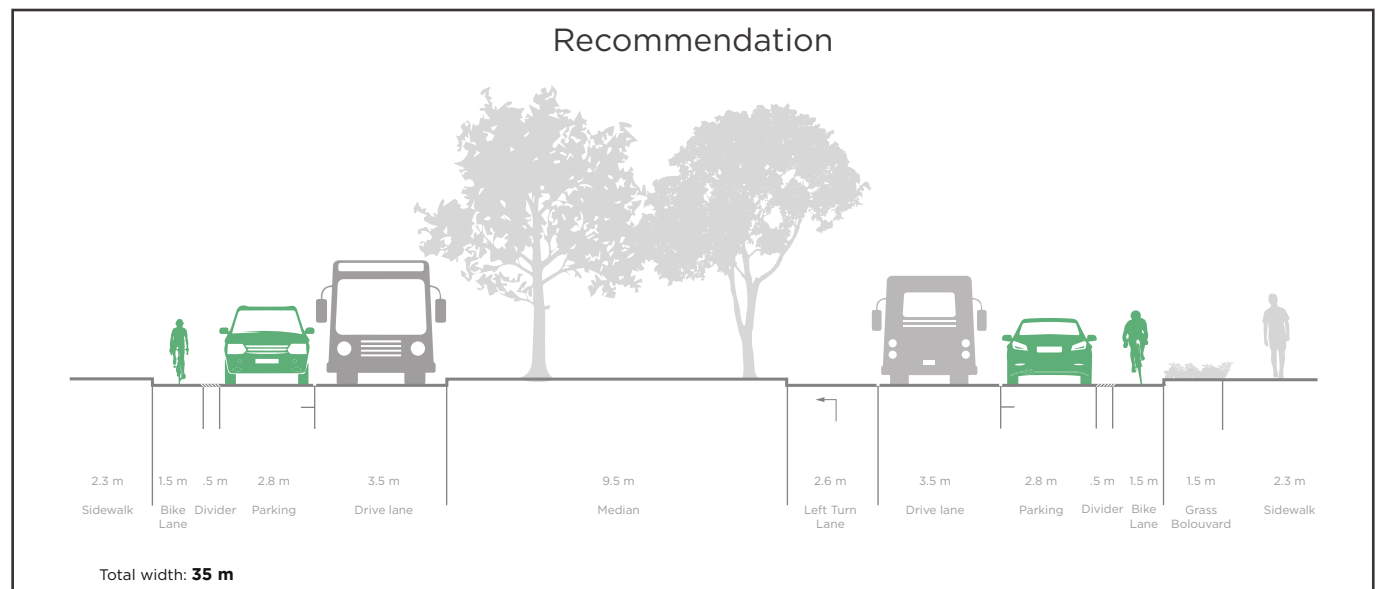


USE OF SPACE

Once entering the wider section of East Mall between Thunderbird Boulevard and West 16th Avenue, there is opportunity to enhance cycling safety. In switching the positions of on-street parking and the current bike lane, parked cars serve as a buffer for cyclists from vehicle traffic. The recommended street mix is similar to the existing condition as it simply proposes switching the parking and bicycling lane. These bike lanes are also protected by bollards to increase safety when automobiles are being parked in the next lane.

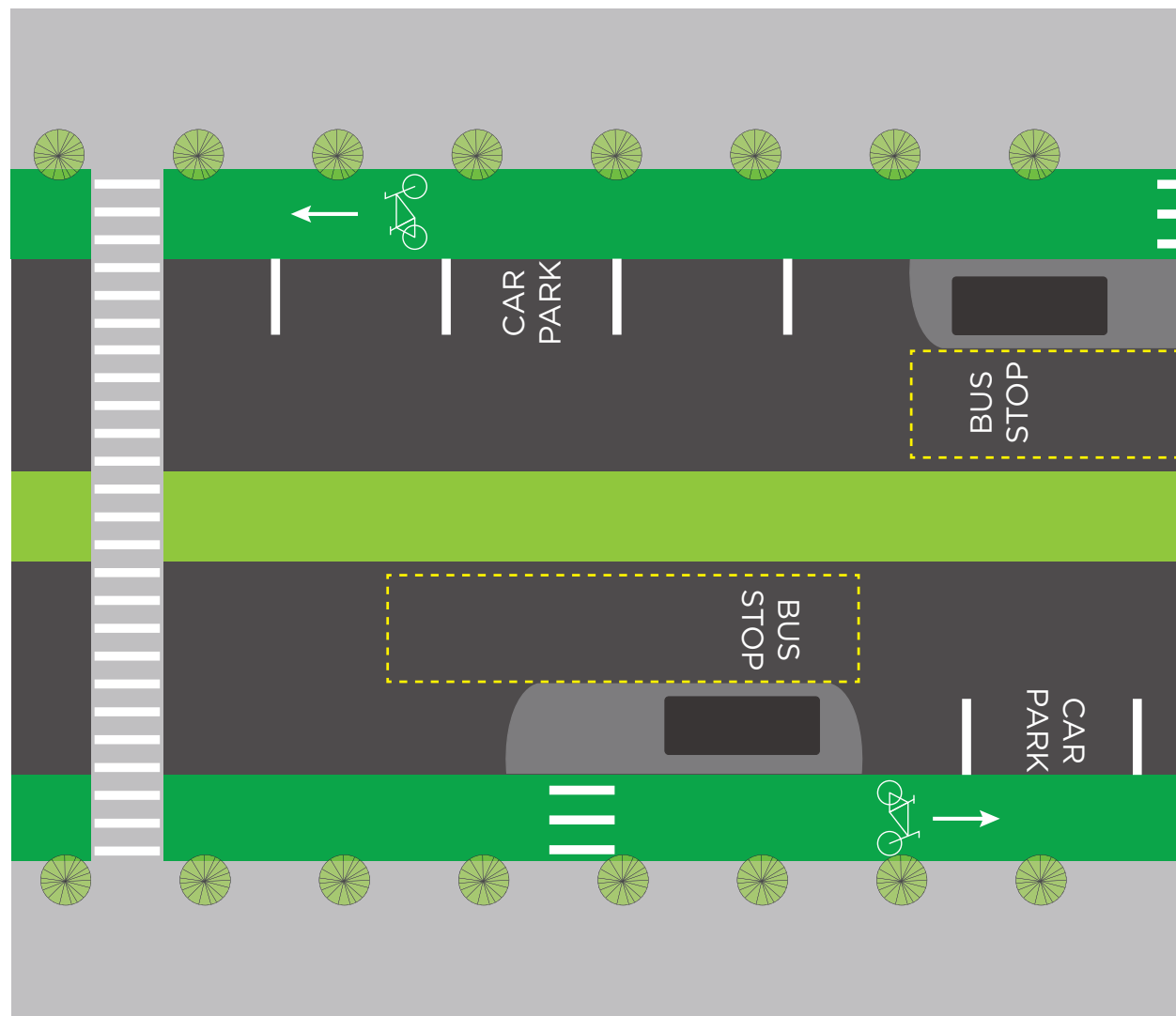


Currently, this section of East Mall has on-street parking at the curb

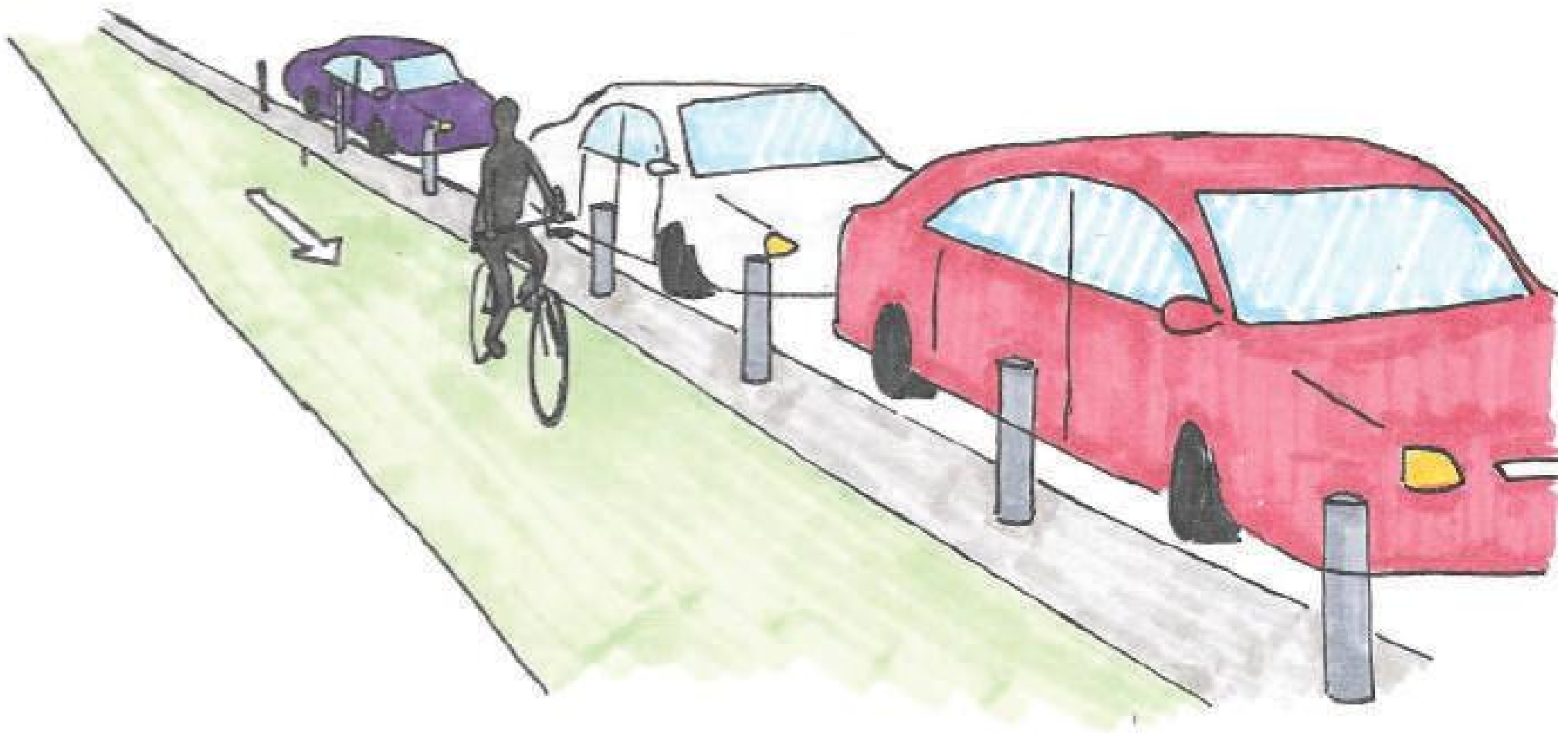


By reorganizing on-street parking, parked cars protect cyclists from traffic

Another design feature that is essential in this intervention is the implementation of bus shelter islands at the dedicated bus stops. These bus shelter islands will create breaks in on-street parking, and crosswalks will be designed to allow pedestrians to cross safely across the bike lane to the bus stop, while indicating cyclists to yield to pedestrians at these areas. This design allows for accessibility to a certain extent as parking close to the SRN site is made available for individuals with accessibility needs. Therefore, this design accommodates the current travel behavior, while also allowing the potential for future changes. This potential realizes our objective of incorporating dynamic connections that provides a variety of possibilities for change that accommodate the future transportation needs at UBC.



Plan view of how bus stops, bike lanes, and car parking can be accommodated on East Mall using the existing space



This illustration is an example of how on-street parking can be used to protect bike lanes, based on design guidelines for transportation (NACTO 2013).

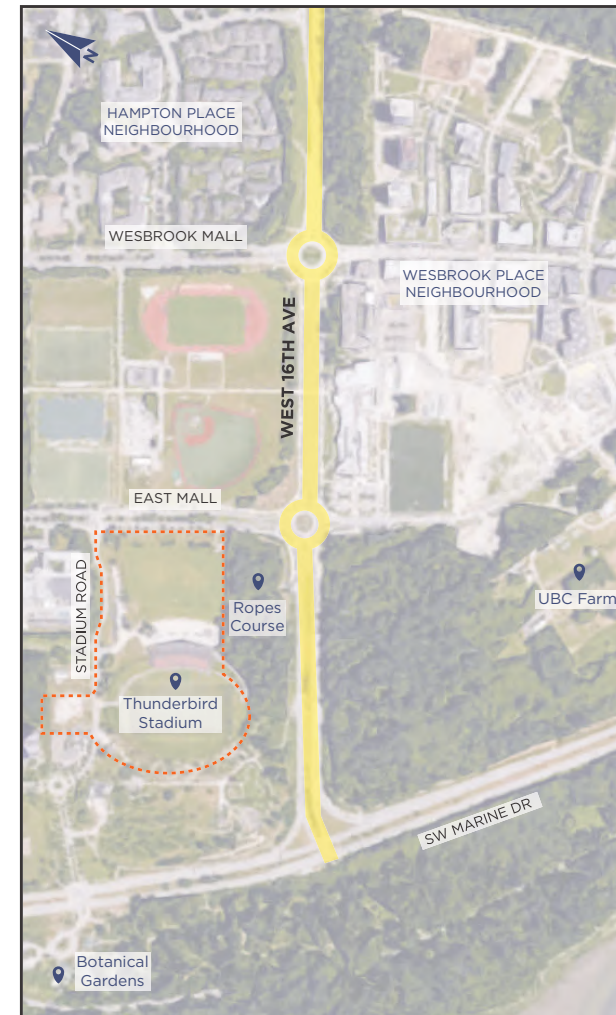
II. WEST 16TH AVE: THE CONNECTOR

West 16th Avenue is one of the biggest barriers in addressing connectivity to and from the SRN site. As a highway, the current conditions emphasize the presence of private automobiles, heavy trucks, and public buses, with limited consideration for pedestrians and cyclists. West 16th also provides an essential connection for people to travel from the SRN to Wesbrook Village and other assets on south campus. However, this connector is currently a barrier as the heavy vehicle traffic divides the two ends of campus. Therefore, *The Connector* entails resizing the existing highway to provide spaces for active transportation and complete the active street network. Reallocating spaces to cater to pedestrians and cyclists will improve the perceptions of safety and enhance livability. Narrowing the existing road widths will also help

STRATEGIC DIRECTIONS ADDRESSED

- Cycling and walking infrastructure such as lanes and paths that increase safety and ease of movement for all users
- Create a complete and connected pedestrian and cycling network that serves the SRN and other key destinations on campus
- Useful, efficient, and accessible public transit that considers on-campus trips

decrease vehicle speeds and break down the barrier of West 16th.



West 16th Avenue passes SRN on the south

CHALLENGES AND OPPORTUNITIES

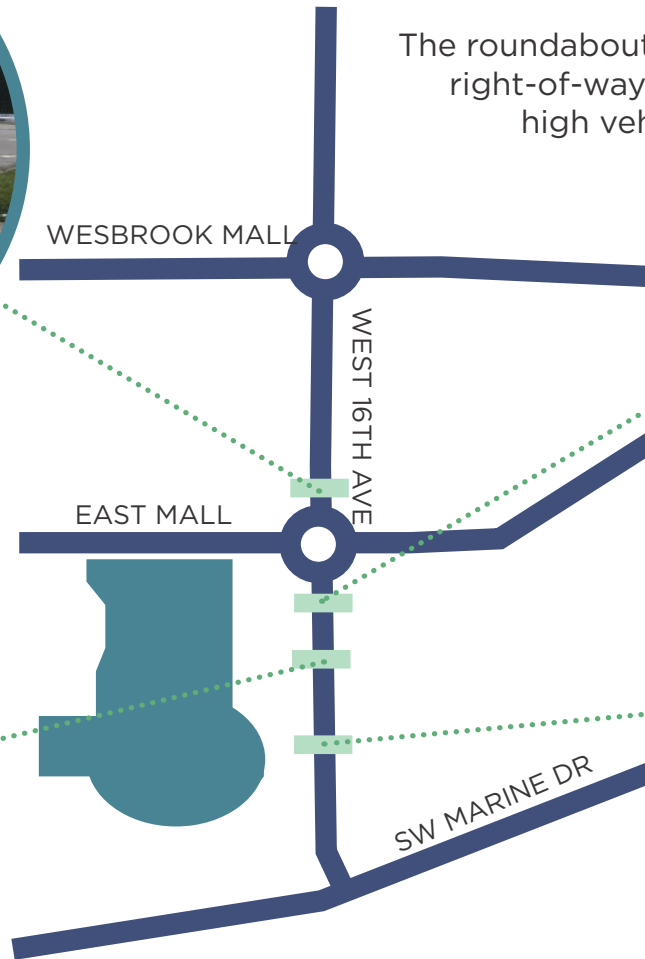
ROUNDABOUTS

W 16th has two large two-lane roundabouts, which are difficult for pedestrians and cyclists to navigate.



HIGH VEHICLE SPEEDS

The roundabouts and wide right-of-way encourage high vehicle speed.



WIDE RIGHT-OF-WAY

The entire street right-of-way is very wide, providing ample space for movement.

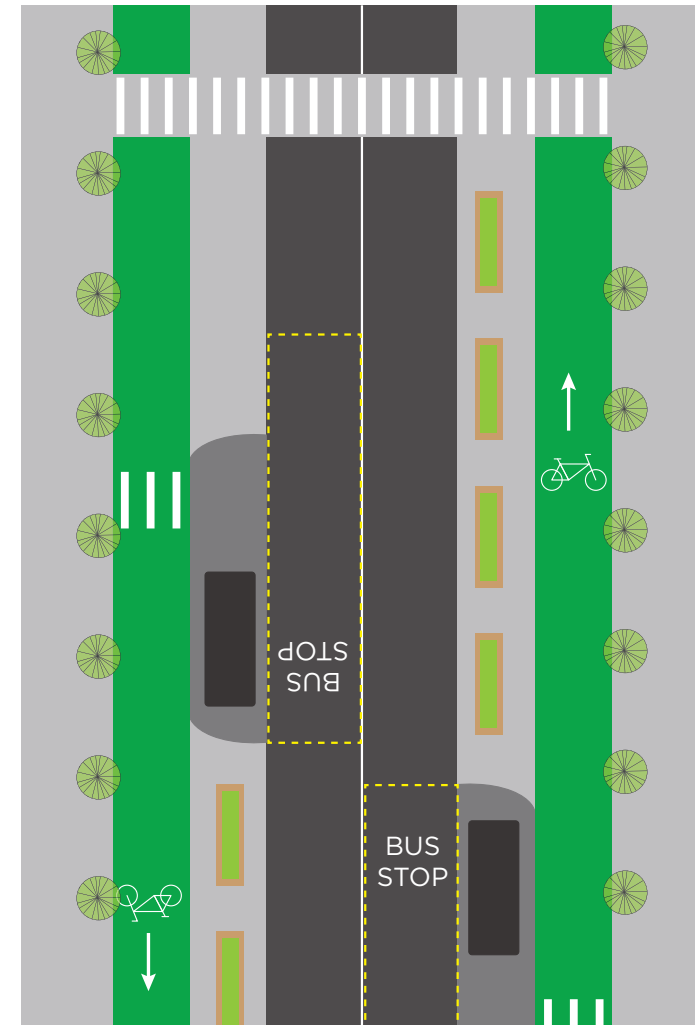


POOR SIDEWALKS

On West 16th south of East Mall, sidewalks and bus stops are in poor condition.

RECOMMENDATION: DOWNSIZING

A major challenge for West 16th Avenue is its wide right-of-way and heavy vehicle usage. Essentially, West 16th Avenue is a highway that transects an urban campus, public school, and residential neighbourhood. As such, it is necessary for this road to be reimagined in order to meet UBC's transportation goals. As SRN interfaces with West 16th Avenue, the development of the neighbourhood presents an excellent opportunity to address the issues UBC faces with West 16th Avenue.

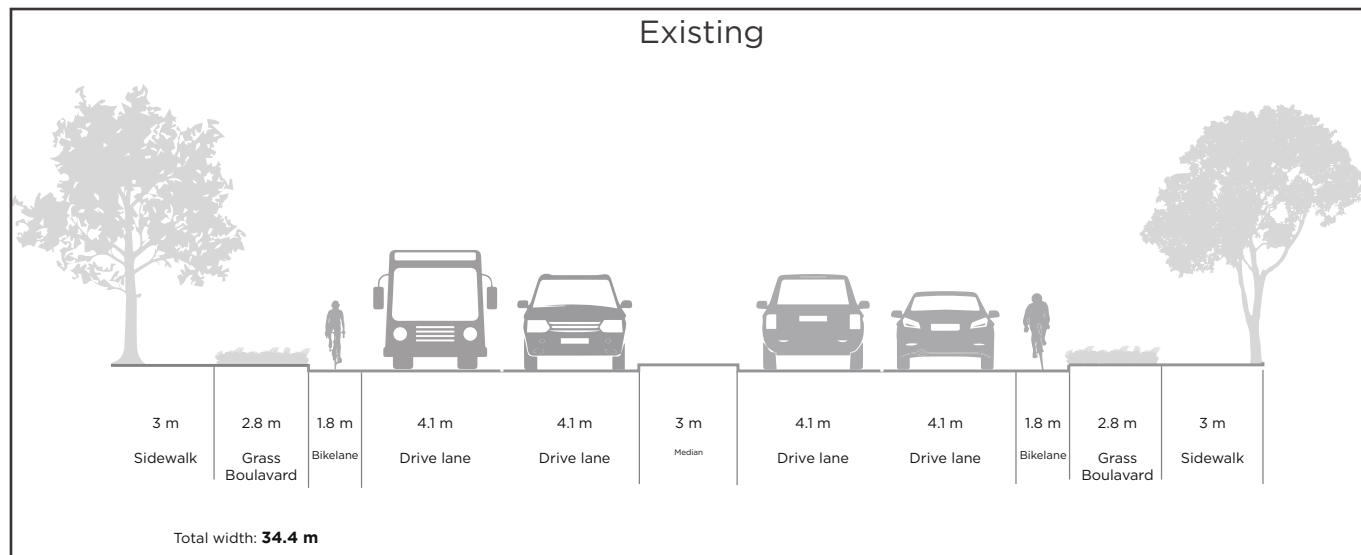


Our team is proposing to create a narrow roadway on West 16th

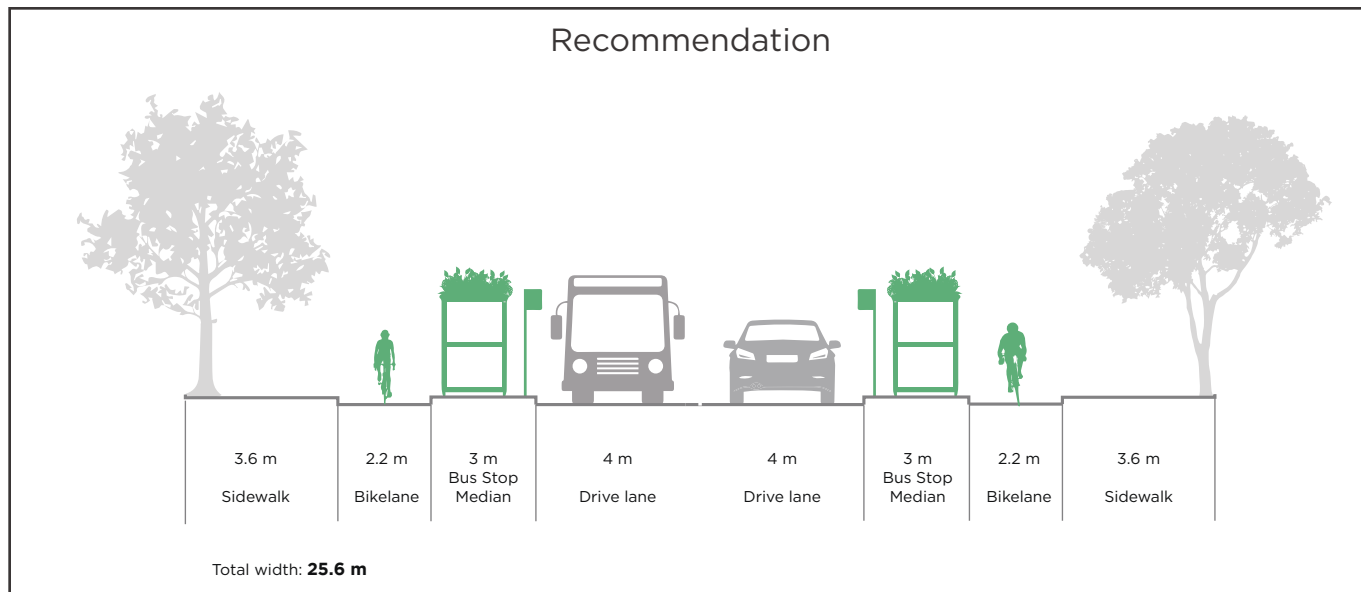


USE OF SPACE

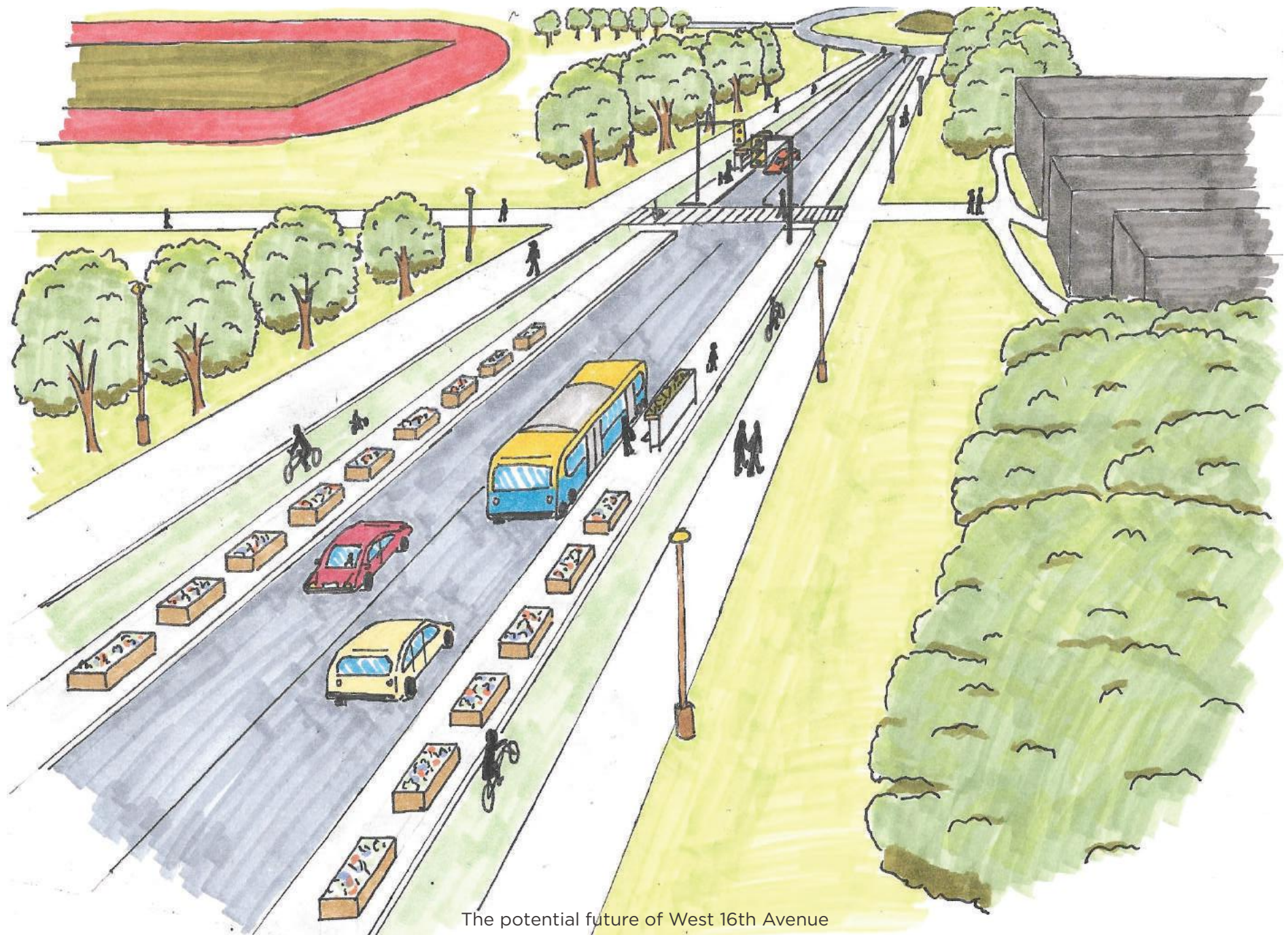
In taking away a vehicle lane in each direction, there is a significant amount of road space that can be repurposed. The addition of protected bike lanes and excellent transit infrastructure will help West 16th become a place for transit and cyclists.



Currently, West 16th Avenue has two vehicle lanes travelling in each direction through UBC campus



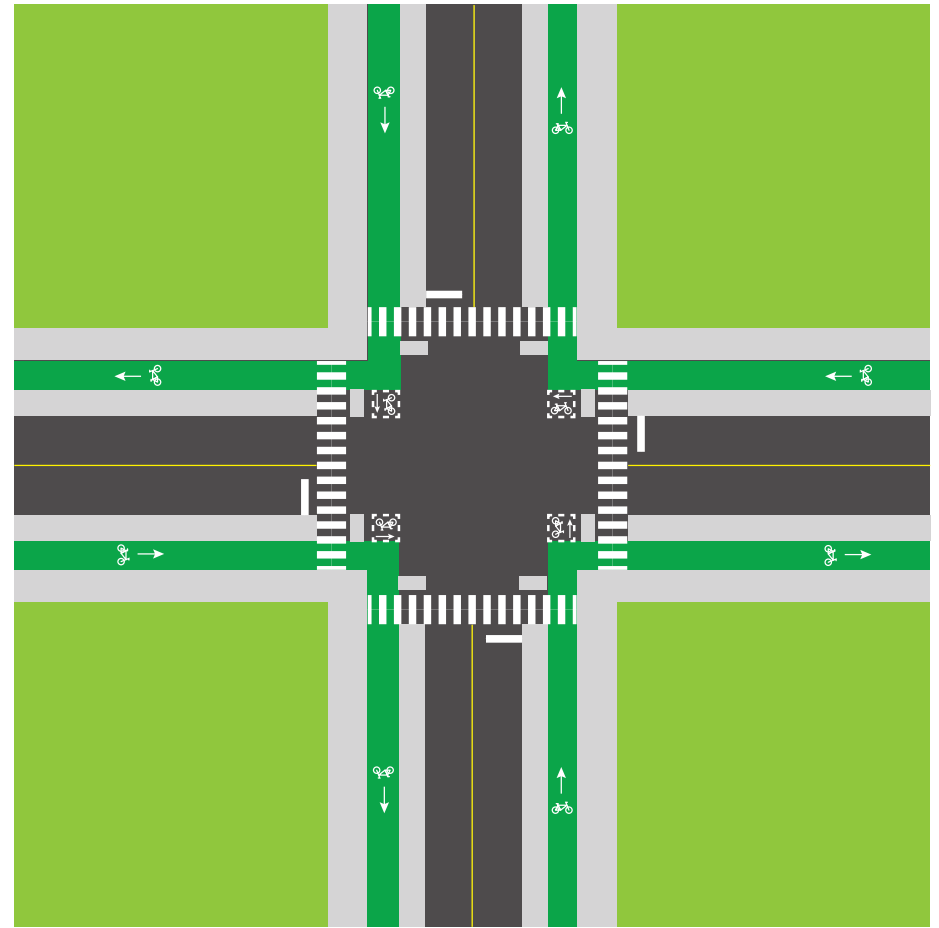
By reducing the amount of space allocated for cars, vehicle traffic can be minimized



The potential future of West 16th Avenue

RECOMMENDATION: FROM ROUND TO SQUARE

The intervention for the roundabout at West 16th recognizes the necessity to transform the existing highway to a pedestrian- and cyclist-friendly environment, especially for residents of the SRN to access the services and amenities offered in Wesbrook Village. The recommended interventions were designed in a way so it can be applied to both or either of the roundabouts at East Mall and Wesbrook Mall. The solution is to transform the roundabout into a normalized, four-way intersection. However, to improve access across and on West 16th for cyclists, separated bike lanes are included, which also is harmonious to the previous recommendation. With these normalized intersections, we also have the opportunity to input bus prioritized turn signals. This will help enhance transit on campus and maintain route reliability and efficiency.



A plan view of a normalized intersection as West 16th, which is designed for pedestrians and cyclists



Human Movement



Low Impact Links



Accessible Neighbourhood



Progressive Growth



Innovative Shift

III. PARKING: FUTURE-PROOF DESIGN

Parking in general is one of the largest transportation issues that the campus and region are facing today. As a site that is yet to be developed, the SRN provides several possibilities for parking solutions that can both accommodate the current use of automobiles, while also preparing for a future where parking will not be a necessity to the neighbourhood. Therefore, our team utilized this project as a way to reshape the perspective and culture around parking through innovative solutions. As a result, *Future-Proof Design* entails a parking strategy that minimizes the possibility of parking becoming an underutilized space through adaptable designs. Therefore, the chosen parking intervention reflects the present and future of transportation behaviors and habits. It will accommodate the current demand for parking while also creating an opportunity for a car-free neighbourhood in the future. Given the uncertainty regarding building type and design in the SRN, these parking interventions are intended to provide general guidelines and ideas that can later be specified by C+CP once building type, design, and location are determined. Additionally, these interventions focus primarily on residential parking as visitor parking for gaming and other events at the Thunderbird Stadium will most likely be accommodated by the existing Thunderbird Parkade.

STRATEGIC DIRECTIONS ADDRESSED

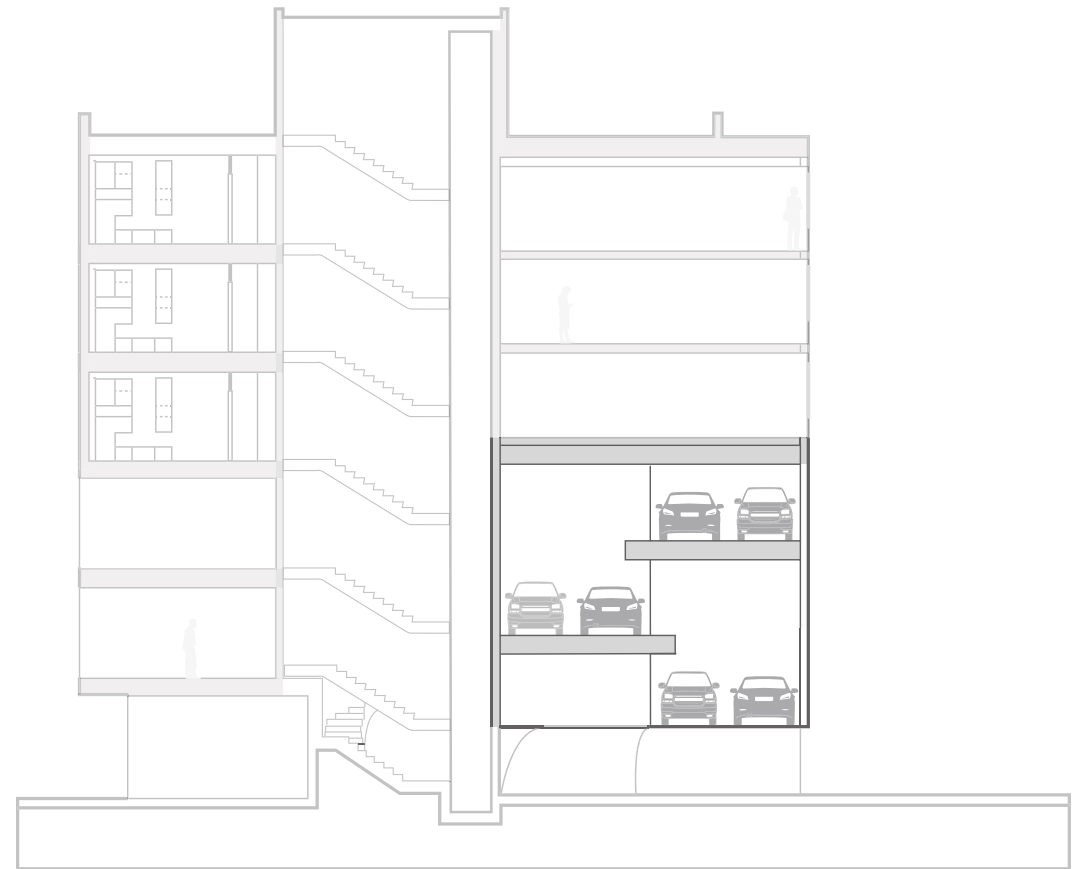
- Anticipating changes in private vehicle technology, developing innovative solutions towards parking, vehicle pick-up/drop-off, the sharing economy, and carbon intensive technologies
- Parking infrastructure that can be repurposed for other uses
- Enhance existing and potential sharing programs (bikes, cars, ride, etc.)
- Multipurpose spaces/paths that can function for a variety of activities/modes of play and movement (plaza's with seating sports areas, play areas, etc.)



Thunderbird Parkade has the ability to provide parking for events at Thunderbird Stadium

RECOMMENDATION: REPURPOSABLE SPACE

This intervention emphasizes retrofittable parking spaces by proposing ground level parking spaces for both residential and commercial uses on the SRN site. These designs were inspired by existing parking structures on certain commercial strips, where ground level parking is located behind shop fronts. Our proposal entails attaching parking lots behind shop fronts or residential lobbies, which may be multi-level depending on the parking needs of the building. Multi-level parking will be designed using flat floors with ramps that can be later removed. This will simplify the redesign and retrofit of these parking spaces for alternative and sustainable uses in the future. These level-ground parking surfaces have the potential to be retrofitted into commercial, office, and residential spaces if no longer required for cars. A transition away from parking can create a more interesting building frontage, which can help activate alleyways in the neighbourhood.



Possibilities for accommodating parking within buildings to be converted to better uses in the future





Photo: Ozarch.com

The World Trade Center of Denver campus being constructed provides precedence for convertible parking space. It includes 700 above ground parking spaces, designed to be converted to other uses if parking is no longer required in the future (Denver Post 2016).

SHARING ECONOMY

Given these retrofittable parking spaces, this intervention envisions a neighbourhood that embraces the transformation towards an environment where sustainable and active transportation modes are valued as the primary mode of travel. Instead, renters who require a parking space will be required to purchase a parking permit for their building. A small surface parking lot will be available near the stadium to accommodate for stadium visitors with accessibility needs. Lastly, to further reduce the reliance on automobiles, car-sharing parking spaces will be available at mixed-use buildings to incentivize both residents and visitors to cultivate a sharing economy.

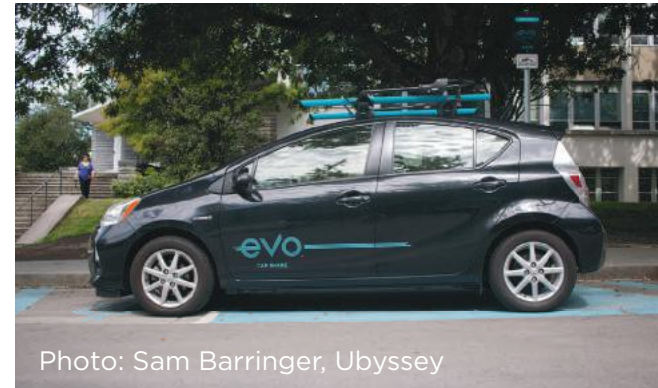


Photo: Sam Barringer, Ubysey



Photo: Sam Barringer, Ubysey



Photo: Velometro.com

Evo and car2go car-share are well established on UBC campus, creating an opportunity to leverage within development in the SRN

Veemo is a new electric-assist recumbent tricycle sharing program on campus. This program is a prime opportunity to encourage more people to use active transportation modes

IV. NEIGHBOURHOOD MOVEMENT DESIGN: HUMANIZED NETWORK

The recommended interventions in this report have provided several areas and designs that will help foster connections to the site. Following these interventions, the final recommendation focuses on neighbourhood movement design which is the the core concept that activity within the SRN will rely on. As a site that is not constrained to pre-existing street grids or movement patterns, the SRN provides an opportunity to design the neighbourhood in a way that pushes the boundaries of the shapes and forms that movement can take place in. To align with the listed objectives, the recommended intervention entails street designs and components that embrace human movement. As a result, *Humanized Network* represents a neighbourhood that builds a relationship between the users of the SRN and their surrounding community through safe and playful movements.

STRATEGIC DIRECTIONS ADDRESSED

- Incorporate universal designs and accessibility features into streets and transit/transportation infrastructure
- Amenities and infrastructure that can be utilized during any season or time of day (rain covers, heating, lighting, etc.)
- Multipurpose spaces/paths that can function for a variety of activities/modes of play and movement (plaza's with seating sports areas, play areas, etc.)
- Anticipating changes in private vehicle technology, developing innovative solutions towards parking, vehicle pick-up/drop-off, the sharing economy, and carbon-intensive technologies
- Creation of destinations within and near the SRN that are connected and catered to human movement
- Cycling and walking infrastructure such as lanes and paths that increase safety and ease of movement for all users

RECOMMENDATION: (ALMOST) CAR-FREE NEIGHBOURHOOD

The interventions for neighbourhood movement design entails concepts that prioritize pedestrians and cyclists. Automobile vehicle access is considered to the extent that it will be allowed in the neighbourhood, however, the designs will naturally discourage accessing and navigating neighbourhood spaces with automobiles. Although Wesbrook Village provides a strong precedent for pedestrian and cyclist prioritized design, the goal with the SRN is to create a neighbourhood that takes this prioritization further. Therefore, recommended interventions reimagines the concept of a neighbourhood as a space where people are not confined to the sidewalk. Instead, fosters a degree of informality in structure, where human movement is allowed anywhere in any form. As a result, the SRN will be a leading neighbourhood that redefines and reshapes safety as a concept that is car-free for pedestrians and cyclists.



Photo: General Growth Properties

A rendering of a connected neighbourhood without cars in Utah



Human Movement



Low Impact Links



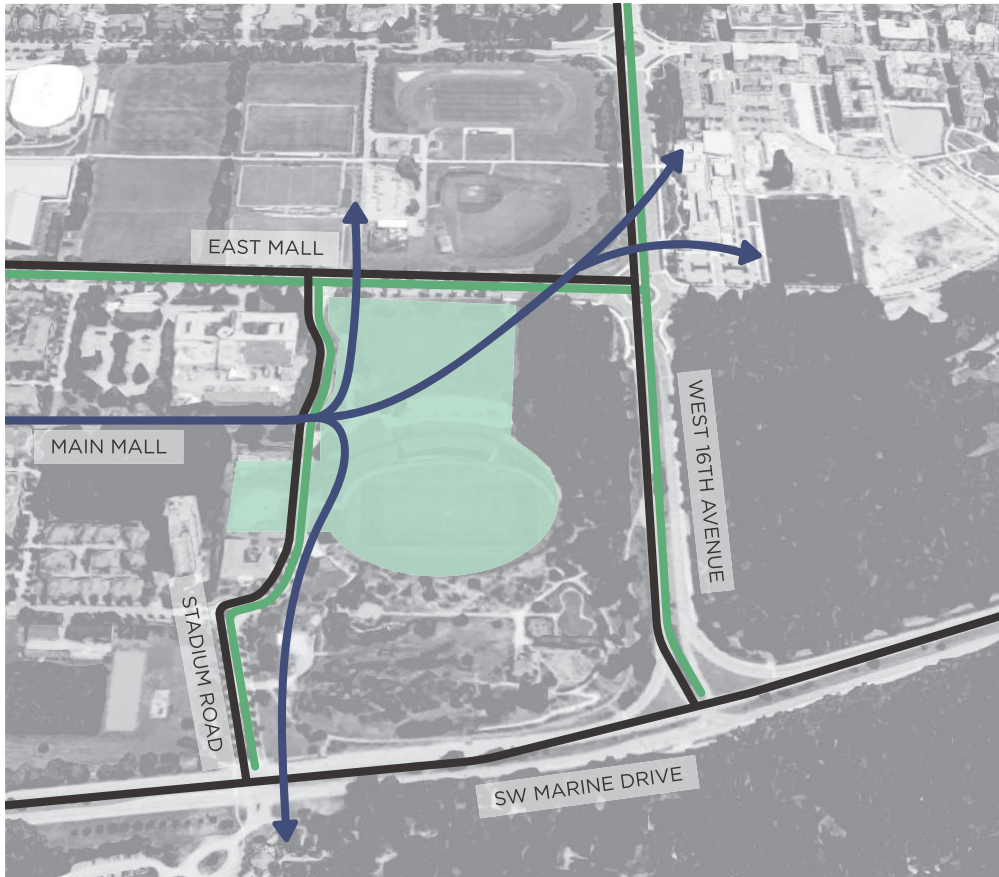
Accessible
Neighbourhood



Progressive
Growth



Innovative
Shift



- Through auto traffic
- Pedestrian movement
- Cyclist movement

ENGAGED NEIGHBOUR

The SRN neighbours many important destinations on UBC campus. As such, our team wants to ensure connection with those immediate areas. The *UBC Land Use Plan* designates Main Mall to continue through the SRN and connect to Wesbrook Village. We also want to connect pedestrian greenways to UBC Farm, Thunderbird Park, and the UBC Botanical Gardens. For cycling, East Mall, West 16th, and Stadium Road are the ideal areas for safe and efficient movement. Lastly, to afford the SRN the benefits that come with minimal auto traffic, cars will be kept to East Mall, West 16th Ave, and SW Marine Drive, with through access only on Stadium Road, while vehicles will not be allowed within the heart of the SRN.

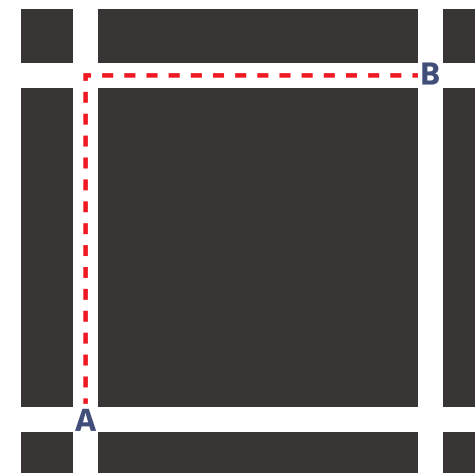
PEDESTRIAN PERMEABILITY

Below, we see two examples. To the right of this page, the top grid shows large block faces, which force pedestrians to walk along the outside of the block. On the bottom, there is greater pedestrian permeability, through building cut-throughs, pathways, pocket parks, and other pedestrian-oriented connections. This permeability is what we want to achieve in the SRN, as it creates enormous benefits for walking trips.

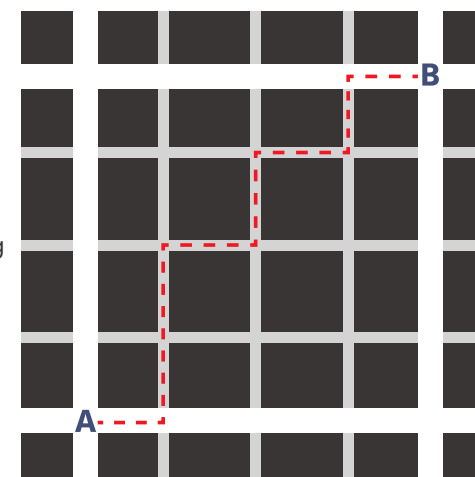


An example of a pedestrian pathway through buildings in Wesbrook Village at UBC

Large blocks with no pedestrian permeability, creating long walk distances



Pedestrian permeability through block face for more direct walking paths



FROM PRIVATE TO PUBLIC

By restricting vehicle access in the SRN, valuable public and street spaces are freed up for people. Streets can be less regulated and allow activity within private buildings to spill out into the street. In doing this, the interface between buildings and public realm is less of a barrier.



Without needed regulation for vehicles, patios, benches, and public life consume the street

IRREGULARITY

Without heavy vehicle traffic, street regulation is not a point of emphasis. As such, we are allowed to become playful with how we design our streets. Irregularity can create a vibrant pedestrian realm and shape places where people want to be.



Photo: Methleys-headstogether.org

Without cars, heavy street regulation is not required, making “woonerfs” possible as displayed in a neighbourhood in the UK



Photo: Parsons Brinckerhoff



Photo: Marek Slusarczyk

Above, a rendering of an informal space. Below, a street market in Dublin

INFORMAL SPACE

Without the danger that cars create for pedestrians and cyclists, streets can become informal spaces, where uses change over time. One day, the corridor could host a festival. The next, it might be a public market.

ALL WEATHER STREETS

With an emphasis on active transportation, the SRN has an opportunity to plan for changes in weather and climate. With the often wet Metro Vancouver climate, the SRN will be a place where people can go outside in rain or shine.



Photo: Dreamstime.com



Photo: Thestar.com

In Japan, covered shopping streets are common, creating pedestrian refuge from weather. Below show's a covered street in Kuching.

PICK-UP AND DROP-OFF AREAS

With the possibility of autonomous vehicles gaining use in our society, pick-up and drop-off locations will become what parking used to be. In the SRN, we want to ensure we have places for pick-up and drop-off that may be prevalent in the future.

We have maintained these areas to the exterior of the neighbourhood to limit vehicles in pedestrian areas. Planning pick-up and drop-off locations creates a dynamic neighbourhood that is able to respond to technological changes.



Pick-up/drop-off area

SUSTAINABLE SURFACES

Stormwater run-off is an environmental issue caused by an excess of rain water flowing on paved surfaces into sewers and immediately back into bodies of water. There are ways we can mitigate these adverse effects, including through the infrastructure we choose for transportation.

Our team envisions an SRN that uses surfaces that minimize environmental impact. Methods for this include permeable surfaces, or paving that allows water to penetrate through and reach the soil beneath. Bioswales are another way to reduce stormwater run-off.



Photo: Urbantoronto.ca

Bioswales capture storm water and filter the water through soil before the water returns to natural water bodies



Photo: LID Permeable Paving

An example of permeable paving surfaces, which are designed to allow water to drain through the surface

VIBRANT STREETS

Something often taken for granted in urban planning is very simple design. Places that are animated, safe, green, and inviting persuade people to move and get out into the neighbourhood.

Our aim is to create a vivid environment in the SRN that is integrated into the transportation infrastructure.

Examples of green bus shelters and heated bus shelters, which could be incorporated on East Mall, West 16th Ave, and within the SRN



Cross-walks can double as public art, as seen in London



Vibrant places with activity attract pedestrians to move about the space



Main Mall through Hawthorn Place, approaching Stadium Road



Looking into Main Mall from Stadium Road

LEGIBILITY

As currently designed, Main Mall is not legible through to Stadium Road. It is a narrow path without any landmarks, wayfinding, or significant signage. As the SRN develops, it is important to Main Mall connects to the SRN and is an identifiable corridor for pedestrians. Main Mall could become the promenade into the SRN.

CONNECTING TO WEST 16TH AVE

There is a significant grade change from the SRN down to West 16th Avenue to the south of the site. Currently, there is no connection for people down the hill to the street, where transit is located. In planning the SRN, our team wants to ensure that people have access to the road and transit.



This photo shows the grade change as you walk down from a pathway on the edge of the SRN to the bus stop at West 16th Avenue. As seen, the hill is an accessibility challenge and the current walkways and bus stop are not in good state.



Photo: Carole Osterink

Stairs and ramps can be used to connect people of all abilities down from the SRN to West 16th Avenue. Given that this area is forested, ample lighting is necessary. A design similar to the one shown above would work well for the SRN.



GOING FORWARD

GOING FORWARD

UBC as a leading institution has the potential to shift the culture of transportation to both meet their own transportation targets as well as set the bar for those to follow. Perhaps most importantly, this project begins the discussion of UBC beginning on a new transportation trajectory and culture.

This project has helped realize this potential with specific design solutions that can be applied as the SRN develops into a complete community. Through a detailed and comprehensive approach, our team considered several interventions that address Human Movement, Low Impact Links, Accessible Neighbourhood, and Dynamic Connections to various degrees. As a result, the consistent theme across the final recommended interventions is a neighbourhood that is responsive to the current connectivity needs on campus and creates a change in transportation culture where innovation and sustainability align with one another. To supplement the recommendations and further characterize SRN as this leader of change, programs and policies that complement these design-based interventions should be implemented.

To achieve the envisioned future that has been illustrated through our interventions, extensive data collection of travel trends and behaviors within and to/from UBC is essential. Understanding the current and recent gaps between UBC's transportation targets and current transportation behaviours by students, residents, faculty, and staff is integral to further identify the current connectivity needs and forecast the future of transportation on campus. These collective efforts will help develop Stadium Road Neighbourhood as a resilient, adaptable, and sustainable neighbourhood that transcends the current transportation targets and reaches new avenues of forward-looking transportation approaches.

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APPENDICES

APPENDIX A: STRATEGIC DIRECTIONS

ACTIVE TRANSPORTATION

- Education, training, and incentive programs to help SRN residents and users want to cycle and walk
- Safe bike storage facilities for all bike types
- Cycling and walking infrastructure such as lanes and paths that increase safety and ease of movement for all users
- Creation of destinations within and near the SRN that are connected and catered to human movement
- Create a complete and connected pedestrian and cycling network that serves the SRN and other key destinations on campus
- Develop a campus-wide bike share program that is well connected to public transit and is useful
- Connect the active transportation network to the public transit network
- Implement programs for walking, cycling, and public transit options near the neighbourhood that promote affordability and familiarity

PUBLIC TRANSIT

- Public transit amenities like bus shelters that encourage transit usage
- Useful, efficient, and accessible public transit that considers on-campus trips
- Ensure sufficient coverage and frequency of available transit routes that connect off-campus areas to the south campus where the SRN is located

NATURAL SYSTEMS

- Incorporate nature into neighbourhood transportation and connectivity
- Through transportation infrastructure minimize negative environmental effects, such as air and noise pollution, stormwater runoff, and ecosystem disruption
- Create direct and safe cycling and pedestrian paths to nature, including the UBC Botanical Gardens

GENERAL INFRASTRUCTURE, PROGRAMS, AND POLICIES

- Anticipating changes in private vehicle technology, developing innovative solutions towards parking, vehicle pick-up/drop-off, the sharing economy, and carbon-intensive technologies
- Parking infrastructure that can be repurposed for other uses
- Incorporate universal designs and accessibility features into streets and transit/transportation infrastructure
- Transportation infrastructure within the SRN that can be connected/reconfigured to future changes in the regional transportation network
- Create amenities/infrastructure that are able to service larger numbers of residents, students, faculty/staff, and visitors
- Enhance existing and potential sharing programs (bikes, cars, ride, etc.)
- As transportation evolves, maintain connection for multi-modal trips
- Amenities and infrastructure that can be utilized during any season or time of day (rain covers, heating, lighting, etc.)
- Amenities and infrastructure that can be reconfigured in case of environmental changes (ie. flooding, climate change, earthquakes)
- Multipurpose spaces/paths that can function for a variety of activities/modes of play and movement (plaza's with seating sports areas, play areas, etc.)

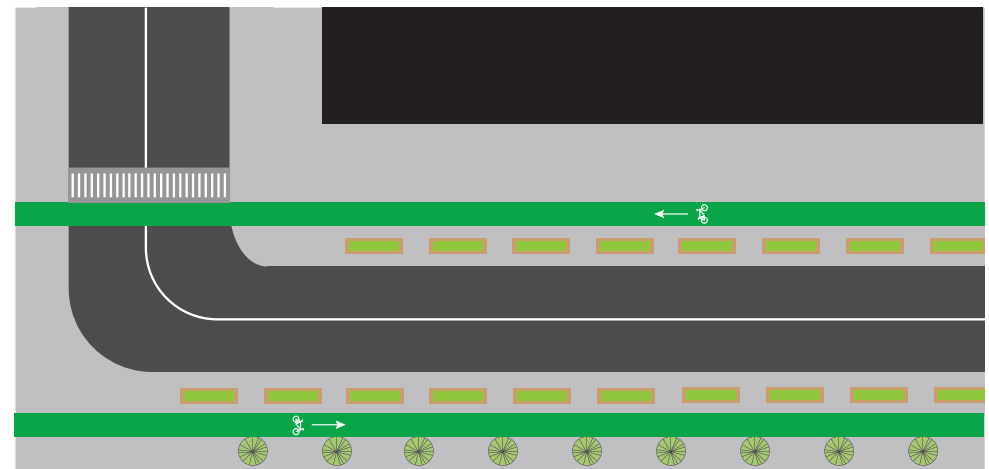
APPENDIX B: ALTERNATIVE INTERVENTIONS NOT INCLUDED IN RECOMMENDATIONS

EAST MALL

COMMUNITY TRANSIT ROUTE

Intervention 1A: Connection to bus loop

This intervention explores the possibility to extend the trolley buses that currently terminates at University Boulevard to run through East Mall and terminate at either SRN or Wesbrook Village. This intervention will utilize the existing bus services operated by TransLink and simply be an extension of an existing route. With this extension, a redesign of the intersection at University Boulevard and East Mall is required, where it is currently a dedicated space for on-street parking as shown in the images below. Therefore, this redesign would entail the road at University Boulevard bus loop to connect to the current parking area on East Mall.



Plan view of East Mall at University Boulevard, with a connection to the bus loop

EAST MALL

BETWEEN UNIVERSITY BLVD AND THUNDERBIRD BLVD

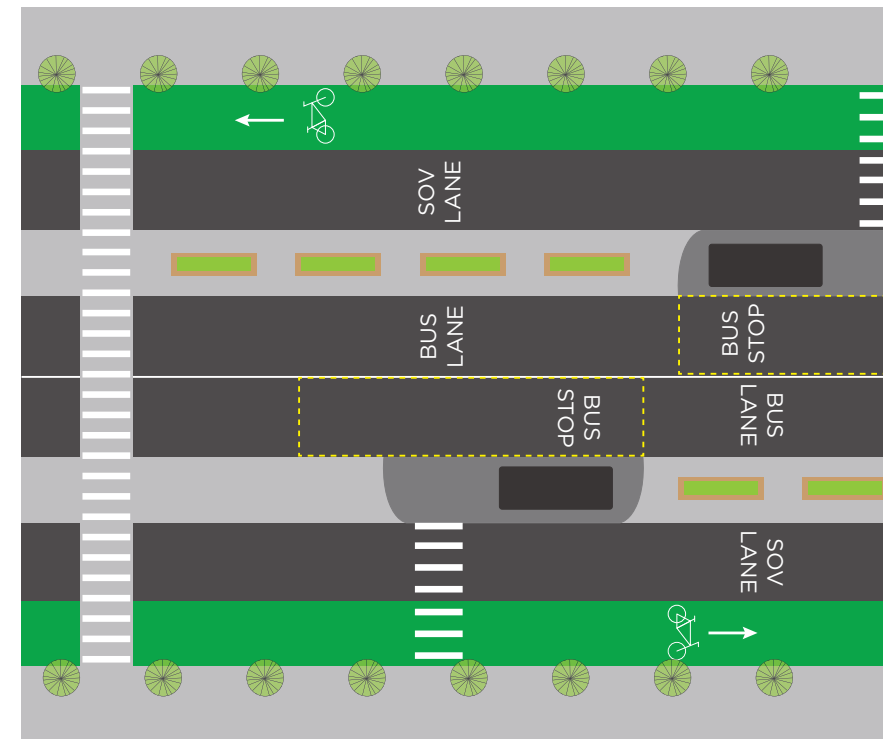
Intervention 2A: One lane traffic lane that accommodates both cars and buses

This intervention is the same as our recommendation for this section of East Mall, except for one difference. In intervention 2A, private vehicles would be allowed on this section of East Mall, while in our recommendation, private vehicles were restricted.

BETWEEN THUNDERBIRD BLVD AND WEST 16TH AVE

Intervention 3A: Bus lane with boarding islands, one traffic lane, and separated bike lanes

In this intervention, the dedicated bus lanes and its accommodating bus shelter islands are centralized in the available road space. Therefore, the vehicle traffic lane is designed next to the bike lane. However, to ensure cyclist and automobile safety, the bike lanes will be separated and protected with bollards along this section of East Mall. The rationale for this option is to allow for centralized bus service in the middle of the road that mimics a streetcar and prioritizes transit. This may pose challenges in terms of accessibility as pedestrians must cross a bike lane and vehicle traffic lane to reach the bus shelter islands.



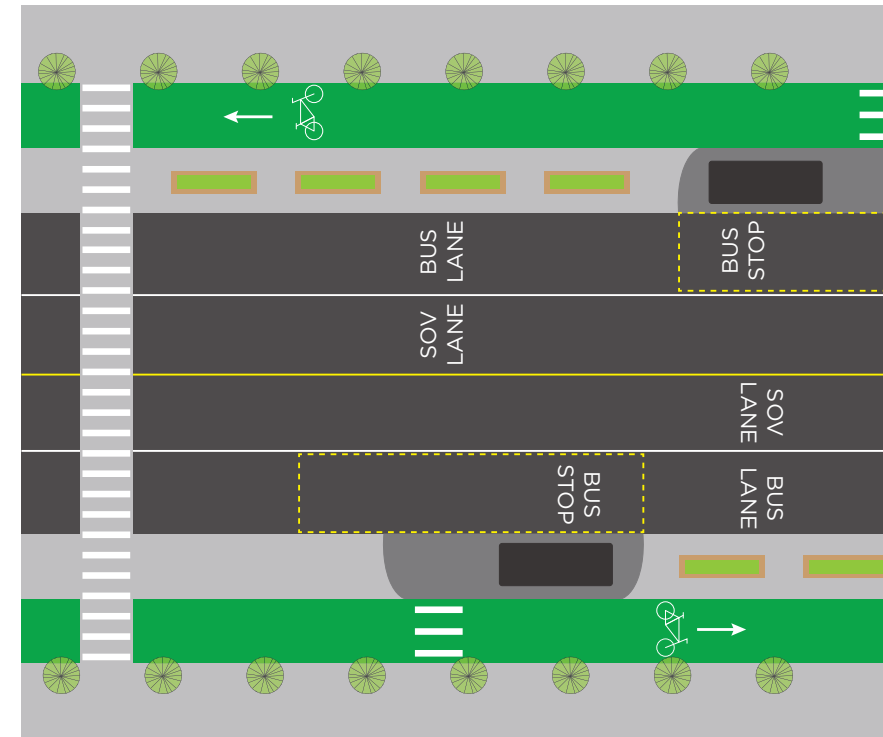
Plan view of Intervention 3A for East Mall

EAST MALL

BETWEEN THUNDERBIRD BLVD AND WEST 16TH AVE

Intervention 3B: Removal of on-street parking and create a bus lane

This intervention takes a parking-free approach to dedicate the available road space to sustainable modes of transportation, primarily, public transit and bicycling. Therefore, the following design guidelines include creating one bus lane and one traffic lane for each direction. This bus lane would be dedicated to campus shuttles to help them run efficiently between University Boulevard and Wesbrook Village. Moreover, the vehicle traffic will be terminated at Hospital Lane in order to prioritize buses in the narrower section of East Mall. It should be noted that this particular intervention proposes a difficulty when East Mall transitions from being a wide to narrow right-of-way, since the buses will have to transfer lanes to continue all the way to University Boulevard, while the vehicle traffic will have to turn at Hospital Lane. To enhance safety and comfort for active transportation modes, a separated bike lane will be implemented that is protected from vehicle traffic by the bus shelter islands. Thus, with this dedicated bus lane and a separated bike lane, bus shelter islands are required where bus shelters can be built and accessed from the sidewalk.



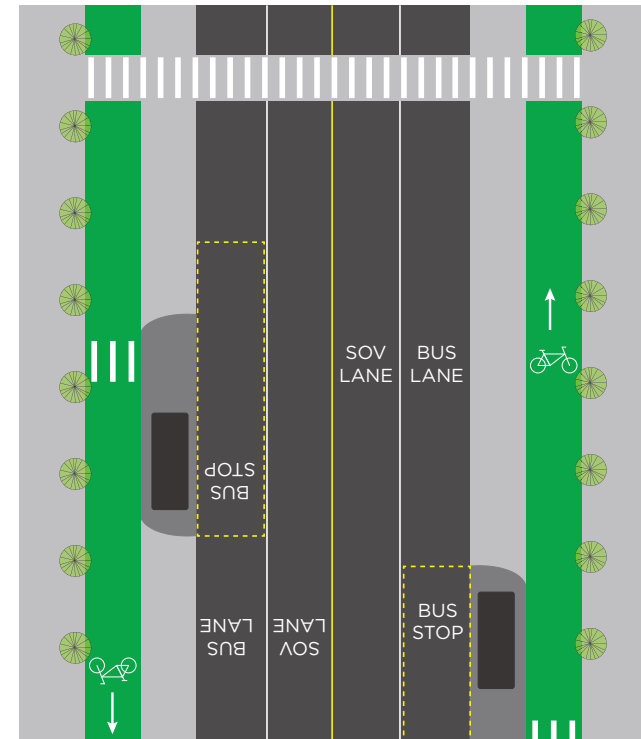
Plan view of Intervention 3B for East Mall

WEST 16TH AVE

ROAD AND STREET DESIGN

Intervention 4A: Two lane vehicle traffic with bike lanes

This intervention maintains much of the existing infrastructure on W. 16th. Currently, West 16th does not have protected bike lanes or good transit facilities, which compromises pedestrian and cyclist safety and comfort. To remedy these issues, this intervention proposes the addition of bus shelter islands to accommodate buses running on W. 16th and provide the bike lane with some protection from vehicle traffic. Additionally, the bike lanes are slightly widened to provide cyclists more space and comfort when riding along this heavy traffic road.



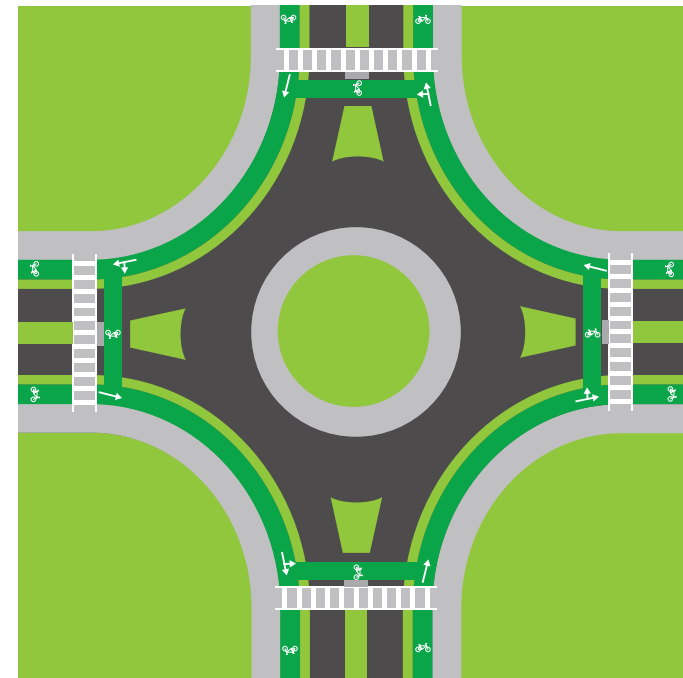
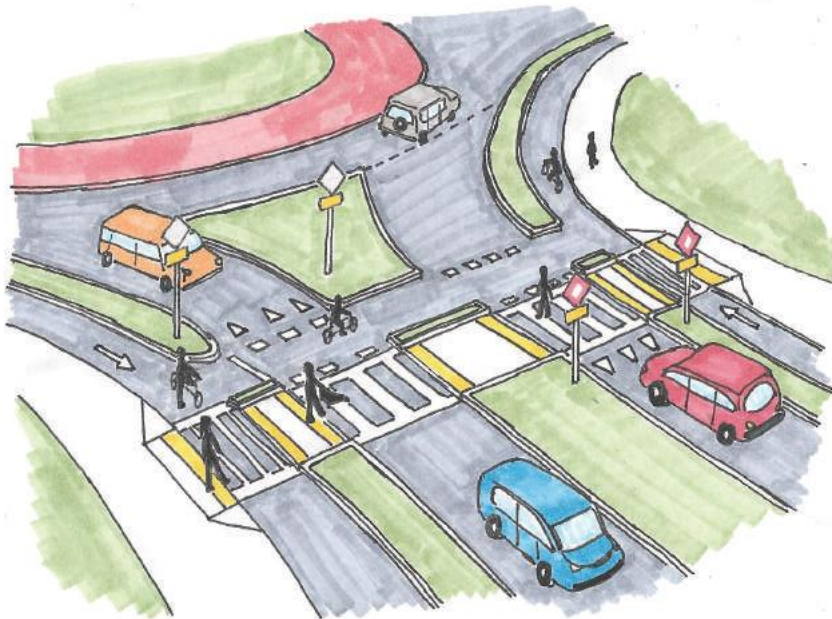
Intervention 4A for West 16th Ave

WEST 16TH AVE

ROUNDAABOUT

Intervention 5A: One lane roundabout with separated bike lanes

As mentioned in the existing challenges and opportunities of this particular area, the current roundabout is highly auto-centric with two lanes of vehicle traffic in each direction. Pedestrians are currently required to cross two lanes of traffic with no proper traffic signals which contributes to its high perceived safety risk. In response, this intervention incorporates pedestrians and cyclists to the roundabout by creating dedicated spaces that are highly visible to automobiles. To foster a smooth connection through this roundabout for cyclists, this intervention proposes a separated bike lane that is visible to other road users by its paint, and is protected from vehicle traffic. This recommendation is inspired by the National Association of City Transportation Officials Urban Street Design Guide (NACTO 2013).



A plan view of a pedestrian and cycle friendly roundabout

WEST 16TH AVE

ROUNDAABOUT

Intervention 5B: Elevated roundabout

This intervention proposes an addition to the existing infrastructure that allows cyclists and pedestrians to cross West 16th in any direction in a safe and convenient manner. The design entails building a suspended roundabout that is dedicated for pedestrian and cyclist use over the existing roundabout. This design intervention is practiced in the Netherlands, where a suspended roundabout for cyclists was built over a vehicle traffic roundabout. Therefore, this design fosters a free-flow condition for cyclists and pedestrians by avoiding vehicle traffic entirely. It should be noted that although this intervention fosters active transportation, it also maintains the current vehicle traffic levels on West 16th.



A rendering of what an elevated roundabout could look like at West 16th Ave and East Mall

PARKING

Intervention 6A: Underground residential parking with small surface lot for visitors

This intervention follows a similar approach to what is currently implemented in other UBC campus neighbourhoods where underground parking is the primary parking strategy used to accommodate residents. Following these existing designs, this intervention proposes underground parking for most residential buildings. However, to minimize the space needed for underground parking, market rental buildings will have shared underground parking spaces. Therefore, this intervention requires the allocation of rental buildings on the site to be close together to allow for these shared parking spaces. Moreover, to promote car-sharing as a viable and convenient mode of transport for residents, car-share parking will be designated within these shared underground parking spaces. Lastly, all of the underground parking structures will be designed as flat-floor parking that utilizes ramps to travel between levels. This will help maximize the potential of retrofitting these parking spaces in the future as these ramps can later be removed to utilize these spaces for other uses if necessary.

In regards to visitor parking, there will be a small parking lot near the Thunderbird Stadium for visitors which will primarily be designated for individuals with accessibility needs. Given

the available capacity of Thunderbird Parkade to accommodate visitors for gaming events at Thunderbird Stadium, a small parking lot is allocated for the site.

Intervention 6B: Underground residential parking below new Thunderbird Stadium

This intervention also utilizes underground parking as the primary solution, however, proposes one large underground parking structure for both visitors and residents under the new Thunderbird Stadium. This intervention is deemed suitable as it can be planned and constructed with the new Thunderbird Stadium. Moreover, this will reduce the need to build different parking structures and designs to accommodate different residential buildings as parking will strictly be located in this one area.

In regards to parking design, the entry and exit of this parking will be located off of 16th Avenue to utilize the existing grade change. Therefore, this intervention requires the new Thunderbird Stadium to be located near West 16th on the site. Moreover, similar to intervention 5A, the multi-level underground parking structure will be designed with ramps that can later be removed for retrofit for alternative uses in the future.

In terms of parking space allocation, the majority of the parking

spaces will be geared towards residents. Rental units in the SRN will not have a parking minimum, instead, a number of spaces will be allocated to renters who purchase a parking permit. Additionally, similar to Intervention 5A, another set of spaces will be designated for car-sharing services to reduce the need for private automobiles when travelling to and from the SRN. To ensure accommodation for residents with accessibility needs, a limited number of surface parking lots will be available near the residential buildings. Lastly, visitor parking will be limited in this underground parking structure as Thunderbird Parkade will be advertised as the main visitor parking area for gaming and other stadium events.

Intervention 6C: Heavy vehicle restrictions in the neighbourhood

This particular intervention aligns with the assertive push towards an active and sustainable transportation culture represented in the Innovative Shift scenario by imagining a neighbourhood that is able to heavily restrict automobile movement. Therefore, the underlying assumption and requirement of this intervention is that the SRN site is located in close proximity to a SkyTrain station, allowing residents to travel more frequently by public transit. As a result, parking is restricted to the exterior of the residential area. This then

creates a neighbourhood that centers around pedestrians and cyclists. As an intervention that significantly limits parking availability and prioritizes sustainable transportation modes, the parking on the exterior will be surface parking lots that can be retrofitted to other uses if necessary. However, it is important to note that there will be a number of surface parking lots scattered within the neighbourhood for individuals with accessibility needs. Moreover, car-sharing services will be available at Thunderbird Parkade or nearby parking areas to provide car-sharing as an accessible service for SRN residents.

NEIGHBOURHOOD MOVEMENT DESIGN

Intervention 7A: Neighbourhood movement oriented to cars

This intervention explores how to facilitate and navigate the movement of automobiles, cyclists, and pedestrians in the safest way possible. Although automobiles are permitted in the neighbourhood under this intervention, the aim is to create an environment where residents and visitors feel safe walking and cycling in and around the neighbourhood through creative design solutions.

APPENDIX C: EVALUATION OF INTERVENTIONS

Each of these interventions were evaluated by the four main objectives of Human Movement, Low Impact Links, Accessible Neighbourhood, and Dynamic Connections. The evaluation was conducted qualitatively by estimating the performance of each intervention and the extent to which they would achieve the four objectives on a scale from low to high. The performances of each intervention was compared to the existing baseline conditions. Therefore, a low rating indicates the intervention does not meet the objectives or provide any improvement from the existing conditions. Meanwhile, a high rating indicates significant progress to achieve the objectives compared to its current conditions.

		Human Movement	Low Impact Links	Accessible Neighbourhood	Dynamic Connections
East Mall	1A: Connection to bus loop	Medium	High	High	Medium
	1B: Without connection to bus loop	Medium	High	High	High
	2A: One lane traffic lane that accommodates both cars and buses	High	Medium	Medium	Low
	2B: One lane traffic only for buses and service vehicles	High	High	Medium	Low
	3A: Bus lane with boarding islands, one traffic lane, and separated bike lanes	High	High	Low	Low
	3B: Removal of on-street parking and create a bus lane	High	Medium	Low	Low
	3C: One traffic lane with street parking and protected bike lanes	High	Medium	Medium	High
West 16 th Avenue	4A: Two lane vehicle traffic with bike lanes	High	Low	Low	Low
	4B: One lane vehicle traffic with bike lanes	High	High	Medium	Medium
	5A: One lane roundabout with separated bike lanes	Medium	Medium	Medium	Low
	5B: Elevated roundabout	High	Low	Medium	Low
	5C: Normalized intersection	Medium	Medium	Medium	Medium
Parking	6A: Underground residential parking	Low	Low	High	Low
	6B: Underground residential parking below new Thunderbird Stadium	Medium	Low	Medium	Medium
	6C: Heavy vehicle restrictions in neighbourhood	High	High	High	Medium
	6D: Ground level parking behind shop fronts and residential lobbies	Low	Medium	High	High
Neighbourhood Movement Design	7A: Neighbourhood movement that prioritizes cars	Medium	Medium	Medium	Medium
	7B: Neighbourhood movement that prioritizes walking/cycling	High	High	High	Medium

APPENDIX D: LIMITATIONS

DATA GAPS

While addressing baseline conditions around transportation trends, our team encountered certain data gaps, especially in terms of active transportation usage to/from and within the UBC campus. Therefore, a supplemental recommendation is to create opportunities to conduct further research on campus that capture transportation behaviours of students, staff, and faculty and potential influencing factors such as age, gender, and seasons. This will also provide crucial data on changes in transportation trends within and to/from campus from the anticipated additions in transportation options on campus such as the e-bike and bike share program.

UNCERTAINTY

As the planning processes for the SRN began in the fall of 2017 with four phases planned over the next two years, our strategic directions and interventions relied on our team's assumptions regarding the vision and future development of the neighbourhood to a certain extent. Of note, our transportation and connectivity vision, objectives, and actions are based on the draft guiding principles currently in place from Campus and Community Planning, which we understand are subject to change. In order to ensure these assumptions

are feasible given the uncertainty of the future conditions and decisions regarding housing types, transit developments, and stadium location, assumptions have been based on the relevant literature and developed with advisors at C+CP. Additionally, regional transit plans are not yet solidified or funded, which is just one of several variables that will be undetermined.

TIME

Given the scope of the project, there has been certain time constraints as this has been an eight-month project that is part of a bigger project that is intended to take place over two years. Therefore, our background research, alternatives, and recommendations have somewhat been limited to what is achievable within a 6-credit course. Given that the SRN neighbourhood planning process will continue after this project, there may be changes necessary to the recommendations proposed within *Shifting Gears* to complement the new developments for the neighbourhood.