PARKADES OF THE FUTURE

UBC Living Lab Initiative

Prepared for The University of British Columbia

December 22, 2014

TIPS LAB

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GOALS & VISION

In the future, parking structures at UBC could be far more than vessels for the storage of automobiles. Parkades could intentionally evolve into intensified and intelligent hubs that act to promote positive experiences for all students, staff, faculty and visitors of UBC.

These facilities will actively seek to engage and enhance users social lives, while promoting environmental responsibility and economic stability in the process.

Social

- Engage a greater number of students, staff, faculty and visitors to UBC campus including both commuter and non-commuters.
- Provide a rich and diverse set of new amenities and services within existing parkade spaces.
- Generate spaces which act as new points of gathering and connection.

Environmental

- Emphasize renewable forms of energy production and storage.
- Responsibly manage all natural resources which exist on each site: water, air, light, soil, flora and fauna.
- Seek to introduce additional green space while improving engagement with what currently exists.

Economic

- Introduce new opportunities for trade and sharing economies.
- Preference investment in services and amenities which directly benefit the UBC student community.
- Generate new learning opportunities through creative business models and UBC living lab concepts.

PROJECT ICONS

A series of action icons will be used throughout this document which pertain to each engagement category identified (social, environmental, economic) in order to better understand and explore current and future capacity on UBC campus. Each broad category is further defined by a set of human-derived actions which help define how we tend to use and occupy built spaces and their surrounding resources on a daily basis.

These icons are not meant to represent a comprehensive collection of all the ways we might engage with place socially, environmentally and economically, but rather to provide a simple working framework from which we can begin to better understand the usage balance between each though architectural intervention. As a result, these icons will carry throughout the document and initially serve as a visual catalogue for the analysis of existing precedents and current campus occupation and opportunities.

During the production of future ideas and intervention concepts these actions items will serve as an important catalyst in developing robust strategies which have a creative social, environmental and economic balance.

SOCIAL


Play


Fitness/Activity


Eat/Drink


Shop


Study/Learn


Socialize/Gather


Transport/Move


Events


Services


Rest/Relax/Sleep

ENVIRONMENTAL


Generate


Regenerate/Recycle


Collect


Store


Transform


Transmit


Consume

ECONOMIC


Trade


Share


Lend


Invest


Lease

Figure A.1
The "Big Trench": 1960 drawing of the big ditch at Comox and Thurlow shows a series of interconnected roads

Figure A.2
Hotels and parking garage on Richards and Georgia streets,1954. VPL Special Collections Historical Photographs

Figure A.3
Aerial view of UBC campus, 1923. UBC Library Digital Collections

Figure A.4
Aerial view of UBC campus, c.2008

PROJECT INTRODUCTION

THE PARKING STRUCTURE: A DYING TYPOLOGY

The parking structure, garage, or simply parkade, might one day be seen as an ancient relic of a historically significant global automotive industry - a vestibular trait which although once heavily used and valued for its functionality was left lingering behind the evolution of a new high-tech, environmentally conscious and socially engaged transportation system. However, if history can be depended on to provide us clues toward the future existence of the parkade typology we might more easily recognize that external pressures such as increasing land value and emphasis on spatial efficiency will most likely number the days of these structures if they fail to adapt and evolve with the prospective desires of the transportation industry.

While the private automotive sector has seemingly ramped up innovation and marketing towards new fleets of vehicles centered around more renewable technologies such as Electric Vehicles (EVs), there is certainly a long road ahead in shifting the entire industry. This being said, new and exciting technologies and systems have begun to emerge that may end up completely eroding the very notion of the personal vehicle and its associated infrastructure altogether. More specifically we can point to emerging platforms such as Personal Rapid Transit (PRT) systems, light and rapid-speed rail systems, car sharing networks and autonomous vehicles to challenge our existing paradigm. In addition, developments within the information technology and telecommunication sectors continue to change the way we interact and relate to each other and the world around us on a daily basis. Finally we must also recognize how the new-found emphasis on supporting some of the oldest and simplest modes of transit such as walking and cycling through the development of safer infrastructures like dedicated bike lanes and pedestrian-only zones is also fueling the shift away from combustion engine reliance.

Many now agree and accept that a significant industry shift is not only likely and inevitable, but at this point necessary. As inventors, engineers, architects, planners, politicians, entrepreneurs and other creative minds continue to work on developing this future, some subset of the above is tasked with re-envisioning what new infrastructures might be best suited to support such novel changes. As one of the most iconic images of the transportation industry today, parking structures are certainly poised to be at the frontline of this revolution. The parkade itself will never again be what it once was, and so the question stands boldly for current owners, operators along with designers and creative minds: what might the future of the parkade be?

PLACE: UNIVERSITY OF BRITISH COLUMBIA CAMPUS

Approaching an answer to this question is both exciting and extremely complex. At the heart of speculation lies an ocean of uncertainty and potential. Making informed decisions that improve the performance, functionality, and engagement of people within these structures requires ingenuity along with a heavy dose of future foresight. The understanding needing to be uncovered resides at the scales of local, regional and global systems in addition to a broad consideration for change throughout time. At larger scales we must imagine how current technologies may develop realistically into the future while enduring extraneous social, environmental and economic pressures. Locally, we must

Figure A.5
Aerial view of campus and surface parking lots, 1974

Figure A.6
Health Sciences Parkade, 1980

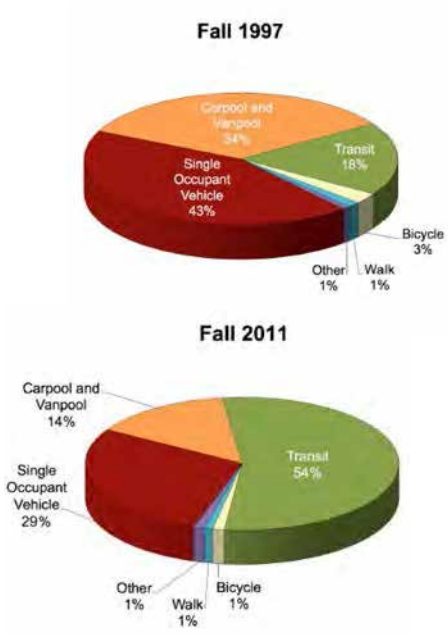

Figure A.7
UBC weekday mode shares, shows the changes from 1997 - 2011 via the UBC Fall 2011 Transportation Status Report.

consider the precise location of project intervention, the site, along with its surrounding context in a holistic notion of place.

For this exploration our notion of place encompasses the Vancouver campus of the University of British Columbia (UBC). Today, the campus is a bustling mix of forested endowment lands, educational buildings, residential towers, recreational facilities and of course, automobile infrastructures. Since the very first site plan for the Point Grey Campus was conceived in 1914 by appointed campus architects Sharp and Thompson, the automobile has held a governing role in campus planning[1] (reference planning scheme drawing from 1914). For the first few decades after the campus was opened in 1925 many students, faculty and staff commuted by car and relied on street or surface lot parking (reference photo of campus in 50's). Over time as the campus expanded so too did the prevalence of surface lot parking, culminating in the 70's with a major portion of campus land dedicated to paved parking lots (reference photo from 1973). As campus sprawl began to subside densification of existing infrastructure produced the introduction of the first parking structure to campus in 1980 within the health sciences precinct. Between 1982 and 2005 five more parkades were built on campus to meet the increasing demand of commuters: Fraser Parkade, North Parkade, West Parkade, Rose Garden Parkade and Thunderbird Parkade, respectively.

However, more recently an increase in adoption of alternative transport options such as public transit, car pooling and cycling have resulted in a reduction in the total amount and percentage of commuters arriving at campus via single occupancy vehicle. Between 1995 and 2011 UBC saw a reduction of weekday person trips via automobile from just over 80,000 in 1997 to around 60,000 in 2005 while the total number of people commuting to campus increased from around 105,000 in 1997 to near 140,000 in 2005[2]. In response to this diminished demand for parking space on campus UBC has been reclaiming surface lot parking areas and designating them to be used for future construction projects. As this trend continues to expand over time and with murmurs of light rail access connection to campus via the Skytrain coming eventually, UBC Parking is set to look forward in time and consider what the future of the 6 existing parking structures on campus might be.

In the short term these structures might be able to undergo intervention to intensify their use and engagement both socially and environmentally while maintaining their position as a strong economic generator on campus. Over a longer spectrum of time the conventional parking facility as we know it may evolve to become something else entirely, providing further access to mixed amenity and services, engaging with the local environment and ecosystems to generate energy and harvest rainwater, and developing new and creative economic schemes which may prove more stable over time. The remainder of this report will identify new and existing parking structures and other architecturally relevant projects which begin to shift their intent from convention to innovation before presenting a set of conceptual explorations of what the future of parkades on UBC's Vancouver campus might look like.

1. UBC Archives (2014) http://www.library.ubc.ca/archives/hist_ubc.html
2. UBC Fall 2011 Transportation Status Report







Snapshots of precedent images discussed in greater detail for their social, economic and environmental impact.

LEARNING FROM THE EXISTING: PRECEDENT STUDIES

The precedent examples discussed here are broken into three main classifications: adaptive-reuse of existing parkade structures, new innovative parkade structures and concepts, and finally other relevant architectural projects which adapt and reuse existing structures. By sifting through these examples we aimed to obtain a stronger foundational overview of parkade infrastructure around the world along with harvesting the ingenuity of several projects which intensify the value of existing and otherwise unremarkable spaces.

UBC ANALYSIS & OPPORTUNITIES FOR SYNERGY

Our analysis of the 6 existing parkades on the UBC Vancouver campus is primarily centered around discovering and mapping current amenities, services and unique locations for social, environmental and economic engagement. By using these maps as a visual tool to further identify deficiencies we also are able to uncover potential opportunities for future intervention to improve experiences by users of parkades on campus.

Figure 1.0.1
Multi-storey car park and 19 apartments by Brisac Gonzalez, Bordeaux, France. Completion 2016.

1.0 PRECEDENT RESEARCH

1.1 | New innovative parkades
1.2 | Adaptive re-use of parkades
1.3 | Other relevant building type adaptive re-use

Figure 1.1.1
1111 Lincoln Place Parkade exterior

1.1.1 PRECEDENT RESEARCH: New innovative parkades

1111 LINCOLN ROAD

Hertzog & De Meuron | Miami, Florida | 2010

1111 Lincoln Road sought to develop a new urban mix-used building containing parking, retail, residential and restaurants. The resulting parkade contains 11 street-level retail units, 3 restaurants, a residential penthouse, a rooftop restaurant, and 300 parking stalls complete with valley parking[1]. There are 7 floors in total; the topmost of which can be rented out for temporary events. There is a unique retail space located on the 5th floor. The proximity of the parkade to the adjacent major pedestrian streets is also a notable source of invention and social engagement within the project.

Figure 1.1.2
A wedding, held on the 7th floor

1.1.2 | SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

1111 Lincoln Parkade has become much more than a designated place for visitor parking. It has taken on a social role within the area becoming a landmark building for events, art, and culture, as well as a destination viewpoint within the city.

Social impact

- The 7th floor can be rented for various temporary events such as weddings, shows and conference uses. It's large 30' ceilings and great sweeping views of the city add to the unique success and popularity of the space[2].
- The space around the parkade has been kept as a "commerce free" area populated with benches and public art which can be adapted over time.
- A large, central stair acts as a social hub and mixed use space. People are known to also use it for physical fitness activities.
- However, the space has also somewhat transformed into a beacon of conspicuous consumption. High rental price restricts occupation of the space from the mass public thereby lending itself more aptly to high-society events.

Figure 1.1.3
Art displayed on the main floor

Environmental impact

- There is a pool and garden with hanging vines on the 7th floor for the penthouse.

Economic impact

- The rentable 7th floor generates income ($12,000 - $15,000 per night), and the various shops and eateries are leased, meaning that the parkade makes much more money than a typical single-use structure[3].
- Parking is $4/hour, with a 10 minute grace period, compared to $1/hour in typical Miami lots, while the valet option generates a further steady source of income..
- The project total was $65 million[3].

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1. 1111 Lincoln Road, (2012) Architecture. http://www.1111lincolnroad.com/
2. New York Times, (23 January 2011), A Miami Beach Event Space. Parking Space, Too. http://www.nytimes.com/2011/01/24/us/24garage.html?_r=0
3. As a Architecture, (30 April 2013), 1111 Lincoln Road by Hertzog & De Meuron. http://aasarchitecture.com/2013/04/1111-lincoln-road-by-herzog-de-meuron.html

Figure 1.1.4
Central public staircase and elevator

Social gathering, various events, eating and drinking as well as retail are some of the most important social components as made possible by the parkade design.

The parkade does not attempt to use alternative forms of energy.

Economically, the parkade is able to lease and rent space for retail, residential and food services. The ability for an entire floor to be rented also greatly adds to the economic success of the project, alongside the (some would say) exorbitant parking prices due to the parkade's prime location.

1.1.3 | MEASURES OF SUCCESS

The success of the Lincoln Road parkade lies in aspects of its design which can be identified and measured in relation to their social, environmental and economic effectiveness.

Many elements of the design enable the Lincoln parkade to take on additional social features. Higher/variable ceiling heights throughout the parkade levels allow for other uses and program to be temporarily inserted. A mix of materials (concrete, glass, wire railing) which are simply designed and painted white make the space appear larger, more polished and allow signage to pop. Simple wire railings do not interrupt views out of the parkade to the city and make it feel weightless. Through a mixture of lighting, both direct and indirect, the functional nature of the parkade is adapted while night lighting allows the parkade to actively engage with its surrounding site creating an inviting atmosphere. The design of the columns and parking devices such that they allow for flexibility, re-use and openness so that floors can be pleasant enough to be rented out for events is an important aspect of the project. A centrally designed grand stair and elevator core act as the main means of egress, instead of the only means of vertical access being in unpleasant, closed off emergency exits. The placement of public art in the stairwell area, emphasized by lighting lends another layer of social interaction to the parkade. The building systems are integrated into the structure, meaning that sprinkler heads, pipes and any HVAC are not extraneous to the building but are built-in, making it feel more intentionally designed. There are limited environmental successes to the project, which is an area that could have hade a lot of potential given the projects social successes. In terms of energy, as far as can be ascertained there have been no attempts made to provide alternative forms of energy generation or storage within the facility. This can be seen as a missed opportunity, especially since retail, rentable space and residences are additions to the typical program of the parkade and thus demand more energy than normal. The ability to rent out an entire floor of the parkade for various events is a huge generator of income for the parkade. Alongside retail, which is incorporated into the various levels of the parkade, rent can be charged to these businesses thus generating additional income. As the parkade appears like an art gallery for cars, people often feel that the above average cost of parking their vehicles in such a nice structure situated in a great location is worth it.

The Lincoln parkade represents the shifting role of parkades in modern society. Instead of being places solely for the purpose of parking vehicles it has been transformed into a gallery, a venue for events, a space for people to exercise in, a place for visitors to come and see a panorama of the city and a landmark within the district of Miami.

Figure 1.1.5
Santa Monica Parkade exterior

1.1.1 PRECEDENT RESEARCH: New innovative parkades

SANTA MONICA CIVIC CENTER PARKADE

Moore Ruble Yudell Architects | Santa Monica, CA | 2007

The Santa Monica Civic Center parkade is the first of its building type to receive LEED (Leadership in Energy and Environmental Design) certification in the US. It takes its source of inspiration from the green mandate of the city, which states commitment to a sustainable future. It's 8 floors contain 881 parking spaces, with 14 electric vehicle parking and charging stations, as well as 10,000 square feet of space for a future cafe and retail space on the second level, and office and retail space on the main level[1].

1.1.2 | SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The Santa Monica Civic Center parkade is primarily focused on alternative modes of energy generation as well as increasing social and economic awareness of the benefits of sustainable-focused design.

Figure 1.1.6
Materiality: recycled glass panels are held away from a mesh screen facade with solar panels seen above

Social impact

- Secure bike storage is available within the parkade to promote alternative modes of transportation.
- Artistic wayfinding sculptures were created out of recycled scrap material.
- Spaces for retail and offices are incorporated into the parkade itself.

Environmental impact

- 213 kW DC photovoltaic panels are installed on the roof of the parkade, generating electricity for facility use. Conversion from DC to AC occurs on site.
- Recycled glass is used on the facade of the building, the concrete contains locally mined aggregate and recycled flyash, and the steel contains 68% post-industrial recycled content[2].
- The parkade was the first of its kind to obtain LEED certification.
- An on site water filtration system allows storm water management runoff to be treated before being released into the municipal system. Reclaimed water is used for toilets and landscaping, reducing the amount of potable water required.
- 14 public electric vehicle parking spaces are provided with charging.
- Natural and high efficiency fluorescent lighting is used throughout to reduce the electrical load.

Figure 1.1.7
Solar canopy on the rooftop

Economic impact

- First 30 minutes free, $1 per each additional hour.

1. IDP, (2014), Santa Monica Civic Center Parking Structure receives LEED Certification! http://www.ipd-global.com/news/?story=SMCCPS_LEED
2. Office of Sustainability and the Environment, (10 March 2014), Green Building Civic Center Parking Structure. http://www.smgov.net/Departments/OSE/Categories/Green_Building/Civic_Center_Parking_Structure.aspx

Figure 1.1.8
Parkade at street level showing material range and glass canopy for sun and rain

1.1.3 | MEASURES OF SUCCESS

The Santa Monica Civic Center parkade upholds the "green" mandate of the city while being an important place for visitors to park their cars and experience first hand the value of alternative forms of energy generation and the effect they can have on even banal spaces such as parking structures.

By allowing the environmental mandate of the city to inform the architecture of the parkade, design elements that deal directly with energy generation are made visible and given priority throughout the project, especially on the facade with recycled glass and solar panels. This allows for social integration of renewable forms of energy to be embedded within the structure of the parkade itself and represents a shift in the goal of parking infrastructure. The contradiction of having a "green" parkade has been mitigated as much as possible throughout the project. Electrical vehicle car parking and charging not only allows visitors with electrical vehicles to charge while in the parkade, it also brings attention to electrical vehicles and prioritizes them with main floor parking and signage. The solar canopy on the rooftop takes advantage of wasted sunlight falling on vehicles and further heating them up while providing some shade to vehicles while still allowing for the roof to be used as an active parking surface. On-site solar power conversion allows energy to come full circle without needing to leave the building to be converted. Utilizing efficient lighting reduces heat production as well as overall costs for bulbs, maintenance and repair. The ability for the building to change over time and accommodate retail and office space is an element of the design which has large social and economic implications. Complete or partial floors can be easily converted into enclosed, habitable spaces because services required such as HVAC, plumbing, lighting, power, etc. are already present and accommodated for in the up-front cost of the building.

Overall, the Santa Monica Civic Center parkade's success stems from the environmental emphasis which is manifested throughout certain design decisions early on in the design process. The flexibility given to future usage and program changes also adds an element of value to the project.

Providing future space for retail and offices is a forward thinking component of the parkade, representing shifting social and economic opportunities.

The parkade focuses on generating, recycling, converting and transmitting different forms of energy. By providing electrical vehicle charging stations and bicycle parking within the parkade it has become the first building of its type to receive LEED certification.

Figure 1.1.9
Aerial view of the SAIT parkade

1.1.1 PRECEDENT RESEARCH: New innovative parkades

SAIT CAMPUS PARKADE

Bing Thom | Calgary, AB | 2009

The 381,000 square foot, 3 level parkade, built at the Southern Alberta Institute of Technology (SAIT), is the first step in a master urbanization plan for the campus[1]. The parkade becomes the central parking facility on campus, taking advantage of its sloped site by building the parking structure into the hill, thereby blending it into the surrounding landscape. A new turf soccer field is situated on the roof, replacing the previous grass field which inhabited the site and providing revitalized sweeping views out towards the city.

Figure 1.1.10
Metal screen below the turf field with gardens stepping down to the parkade vehicle entrance

1.1.2 | SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The SAIT parkade seeks to blend into its landscape as much as possible while still being an active social and environmental hub within the campus life.

Social impact

- The facade is comprised of a metal screen with a cloud-inspired pattern.
- The parkade does not impede views or access to the historic 1921 Heritage Hall building, an important icon of the campus directly perpendicular.
- The soccer field on top of the parkade generates events and is a place for visitors to meet. Adjacencies to nearby campus food services make it a good spot to eat outside on the bleachers and have a positive social experience at the campus.
- Pedestrian entry to the parkade is accessible through large glass boxes which protrude up into the landscape and are illuminated at night, adding a design feature to the area.

Figure 1.1.11
Entry pavilions to the parking below

Environmental impact

- East and South sides of the parkade are covered with metal screening, allowing sunlight and natural ventilation into the structure.
- Gardens have been planted outside the parkades, which step down to the vehicle entrance.
- Glass entry pavilions, complete with an elevator, lead down to the parking structure below the turf field and are filled with natural light and heat during the day, resulting in less energy consumption.

Figure 1.1.12
Entry pavilion view up to turf field

Economic impact

- The cost to build the parkade was $92 million.
- $5 first hour or less. Each additional 1/2 hour $1.75 per 30 minutes to a daily maximum of $16. $7 on evenings and weekends. Monthly student passes are $140.

1. Bing Thom Architects, (2014), SAIT Polytechnic Parkade. http://www.bingthomarchitects.com/project/sait-polytechnic-parkade/

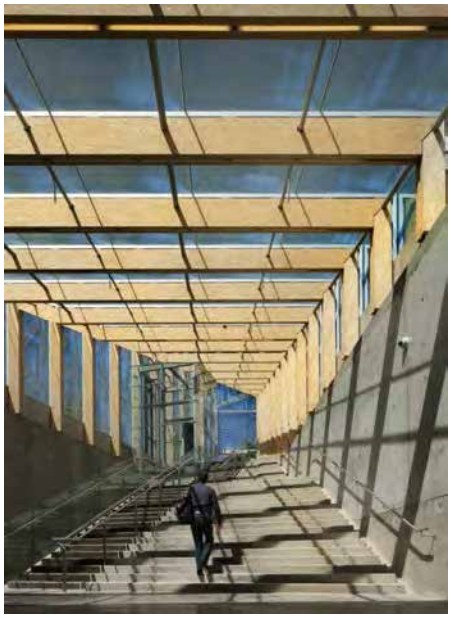

Figure 1.1.13
Entry pavilion interior

1.1.3 | MEASURES OF SUCCESS

Generally, parkades are not considered by many to be beautiful buildings. While they are useful in modern society they are often regarded by many as merely a necessary evil. The SAIT parkade pushes into the landscape and seeks to disappear, while providing a flat roof surface which was made into a permanent sports venue.

The desire for the roof of the parkade to be used as a public space and act to hide the bulk of the parkade underground was used as a social tool to enhance the campus experience, providing a playing field for recreating, and a place to congregate for school events as a lookout point. The perforated metal facade acts as an art piece allowing the areas of the parkade which are visible from its lower sides to appear to blend into the landscape. There is little evidence to support any desire to harvest or provide clean energy on the site for the parkade. This is a missed opportunity as even if the field were grass and not turf it would deal exceedingly more with water and runoff than it does as a turf field. By consolidating all of the parking on campus into one centrally located structure, other areas of the campus are freed up to be developed and parking prices can be more centrally controlled.

The SAIT parkade's success lies in the production of public space as a central aspect to the design process. While environmental and economic factors seem to be less important to the design, the provision of a large gathering space for the campus does still represent a value-added benefit of the project to the campus neighborhood.

Providing a field on top of the parkade allows a space for people to congregate, play, partake in organize sports and provides a green venue for campus events.

The environmental potentials of the project would have been greatly enhanced if the roof was not a turf field but rather a grass field, thus implications for water drainage and potentials for water harvesting could have been explored.

Figure 1.1.14
Parkade rooftop play area

Figure 1.1.15
Site model

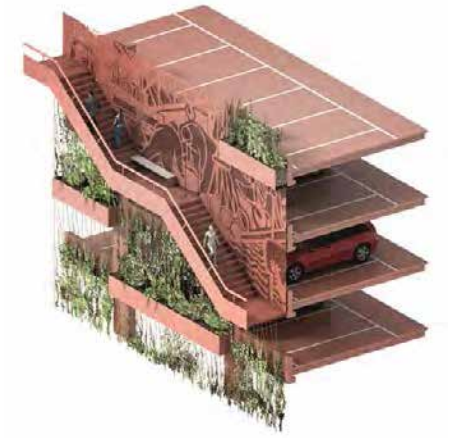

Figure 1.1.16
Green facade extension showing planter boxes, stair and artwork

Figure 1.1.17
Parkade rooftop gym and training center

1.1.1 PRECEDENT RESEARCH: New innovative parkades

NORDHAVN PARKING HOUSE

JAJA Architects | Copenhagen, DK | 2014

JAJA Architects won a competition organized by the Copenhagen Port and City Development to design a "Park 'n' Play car park" for a site in the emerging Nordhavn area. The architects sought to make the proposal fit into its surrounding context via integrating social and environmental contextual factors into the structure while allowing the parkade typology to govern. The project is scheduled to begin construction in late 2014, and is a facade design addition to a new parking structure which has been designed by another firm[1].

1.1.2 | SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The Nordhavn parkade shows that while the need for parking is still in demand even in new developments, there is a desire for the parkade to take on additional active roles.

Social impact

- An "active landscape" of green space and play areas are located on the roof of the building and can be accessed directly from street level by an exterior stair case. The hope here is to draw the public directly to the roof and amenities.
- Many people in Copenhagen use parking structures to exercise. As a result the design also caters to that experience by providing gym space on the roof as well as allowing the main stair to have features such as markers and clocks to be used by Cross Fit trainers[2].
- The main stair case leading up to the "play roof" is a vertical public space, which is extraneous to the parking structure itself and operates independently in terms of access while affording panoramic views out to the city.
- An art piece by local artists was proposed to be drawn adjacent to the exterior stair, depicting the history of the area. Red concrete is used throughout the scheme referencing the area which was historically called the "Red Neighborhood"[2].
- Panoramic harbor and city views are possible from the roof of the parkade, which are made available to the public.

Environmental impact

- A green facade made of plant shelving systems covers the entire exterior transforming it into a living facade which can absorb emissions from vehicles, provide shading and absorb excess heat energy. Different types of growing vines are to be planted on different parts of the facade in accordance to their required environmental conditions.

Economic impact

- The economic implications are yet to be determined.

1. Wired, (30 June 2014), Here's How You Turn a Parking Garage Into a Great Playground. http://www.wired.com/2014/07/heres-how-you-turn-a-parking-garage-into-a-great-playground/
2. Dezeen, (20 March 2014), Pompidou-inspired car park by JAJA Architects to feature planted facade and rooftop park. http://www.dezeen.com/2014/03/20/jaja-architects-designs-a-car-park-covered-in-plants-with-a-park-on-its-roof/

Figure 1.1.18
The parkade from the ground level

1.1.3 | MEASURES OF SUCCESS

While the Nordhavn area is an emerging density within the city, it is beneficial that parking structures are already being thought of as mixed use opportunities early in design conception. The importance of the facade and the roof serve to mask the utilitarian parking function which exists within the structure and beautify the surrounding neighborhood.

By acknowledging and accepting the existing secondary uses of parking structures, such as temporary work-out and viewing platforms, the parkade more successfully integrates itself into its surrounding community on a personal level. Using local art to draw attention to the external stair is a positive method to raise awareness toward the amenities that exist on the rooftop, which poses a difficulty in signage and access. The green facade cloaks the building in natural life, hiding the cars within and providing a pleasant external experience for the other uses of the parkade. By allowing the green facade to exist separate from the building structure, measures for water provision and drainage are incorporated into the design as something autonomous from the building itself. The implications for a rooftop gym and playground could go hand in hand with an economic model, whereby food vendors or small retail components could be added onto the roof for events. Areas of the roof could also be rented for alternative events, generating further income.

By allowing the top floor to be a complete public space, and integrating design aspects into the facade in order to ensure people travel up to the roof, the parkade takes on social roles as a meeting and play space within the district. Through this typology parkades could transform further to become economic hubs, areas for social gathering and green infrastructure within urban centres.

Utilizing the roofscape as a gym and play area allows the parkade to take on park like qualities where people can gather, play, rest and work out.

By creating a green facade and weaving a large stair adjacent, the act of play can be extended vertically down the building to interact with the street and draw people up to the roof.

Economically it is currently unclear if there are facilities which would require monetary investment.

Figure 1.1.19
The car towers, illuminated at night

Figure 1.1.20
Car tower interior

Figure 1.1.21
Car towers at night with conveyor track tube in front

Figure 1.1.22
Section of a car tower

1.1.1 PRECEDENT RESEARCH: New innovative parkades

VOLKSWAGEN AUTOTURME (CAR TOWERS)

HENN Architekten | Wolfsburg, Germany | 2000

The Volkswagen Autostadt is an automobile production facility and visitor attraction located in Germany. The facility is complete with pavilions, showrooms, a theater and two 48 meter tall automated glass parking silo's for new vehicles, which are capable of holding 600 cars each. Centrally located robotic arms move the cars within the structures which connect underground with the main showroom via a 700 meter long conveyor belt tunnel system where visitors can pick up their new cars with the odometer still at 0[1]. The mechanical arms which move around a central beam move the cars around at a speed of 2 m/s, and glass elevators allow visitors to experience this awesome feat of engineering and technology[2].

1.1.2 | SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The available technology which allows cars to be vertically stacked means the car tower makes feasible economic and environmental sense. Coupled with the social agenda of the Volkswagen museum campus, the car towers represent an innovative method of display, storage and experience.

Social impact

- The car towers are immersive, high-tech and visually striking. They add to the experience for car buyers and are considered the best attraction of the area.
- At night the towers are lit up from inside, displaying the new vehicles and superior technology like works of art. During the Christmas season, light shows from inside the silo's at night create a festive light display, further drawing people to the parking structures.

Environmental impact

- Emissions from vehicles are nonexistent, however increased technology and machinery uses fuel and energy that otherwise would not be necessary in a parking structure.
- The car towers are surrounded by a moat of water.

Economic impact

- 37% of Volkswagen owners come to the Autostadt to pick up their new vehicles.
- 175,893 cars were physically sold at the Autostadt in 2011[1].
- The "car towers discovery" lift which takes visitors up to the 20th floor observation deck of the Silo's costs 8 euro and lasts for a duration of 20 minutes[3].

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1. Amusing Planet, (24 October 2012), Volkswagen Car Towers in Wolfsburg, Germany. http://www.amusingplanet.com/2012/10/volkswagens-car-towers-at-autostadt-in.html
2. Design Boom, (24 January 2012), Volkswagen parking lot towers at Autostadt. http://www.designboom.com/technology/volkswagen-parking-lot-towers-at-autostadt/
3. Autostadt, (2014), Car Towers Ascent. http://www.autostadt.de/en/explore-the-autostadt/car-towers/car-towers-ascent/

Figure 1.1.23
Elevator within the car tower for tours

1.1.3 | MEASURES OF SUCCESS

The technological feat of the car towers increases productivity of the parking structure, which allows for a relatively high density of cars to be stored within each space as robotic arms move the cars vertically and insert them into shelf like spots. This feat of engineering produces a very unique structure which acts as a tourist beacon within the region and raises local and global engagement with the building and automotive services provided by the company.

By allowing the parking structure to be more efficient, vertical and robotic parking structures can become smaller in their footprint as cars no longer need to be able to drive around/up/down them. In this way, more public space could be opened up because of smaller footprint sizes for parkades. By eliminating emissions of vehicles within the parking structure, less chemicals are released into the atmosphere. However, the robotics require energy in order to move the vehicles around, thus the parkade still requires some form of energy which is most likely greater than current demand. Allowing more vehicles to park in a single parkade by stacking them vertically may be seen as an efficient typology for capital investment. The additional benefit of creating a spectacle through architecture adds additional value to company awareness and consumer perceptions.

Overall, by increasing the elements of a parkade in terms of densifying the infrastructure, these towers have optimal levels of efficient technology representing their potential for adaptability over time.

The car towers are first and foremost a service, allowing for pure storage of many new vehicles. Alongside this, it is a transportation hub for the factory and has been woven into the experience of picking up your car.

Environmentally, there are few benefits other than allowing many cars to occupy a smaller footprint through the use of robotics.

Economically the towers are investments that allow many vehicles to be stored and moved throughout the facility, increasing production.

Figure 1.2.1
Atlanta SCADpad garden and micro-home, 4th floor

1.2.1 PRECEDENT RESEARCH: Adaptive re-use of parkades

SCADPAD

Savannah College of Art & Design | Savannah, Atlanta | 2014

The Savannah College of Art and Design (SCAD) responded to the rising need for small residences in a dense urban centre by converting existing parking stalls in a downtown parking structure into micro-homes. The design team was comprised of 75 students, 37 alumni and 12 SCAD professors from 12 academic degree programs. After realizing the project within 10 months students lived in the 16' x 8' spaces (135 sq ft) for a maximum of 10 nights each, from April - July 2014. Similar projects have also been initiated in other SCAD affiliated cities in Europe and Asia due to the success of the North American prototypes.

Figure 1.2.2
Before: the 4th floor of the Atlanta parkade

1.2.2 | DOCUMENT BEFORE / AFTER STATE

Before

The parkade located at the SCAD Atlanta campus is integrated into the school, with free parking for faculty, staff and students. However, a decal is required to be displayed at all times.

After

A series of pods were built and then moved into the parkade. Each pavilion contains a bed, kitchenette, and a bathroom with a shower and toilet. There are no TV's in the units, however there is Wi-fi, plumbing, lighting and electricity. Current regulations mean that people can only stay in the SCADpad's for 10 consecutive nights, for a total of 90 days[1]. Policy will need to change in order to accommodate this type of mixed use program for long term usage. Other types of SCADpad installations include communal outdoor spaces, lounges and 3d printer maker-space.

Figure 1.2.3
After: the 4th floor of the Atlanta parkade

1.2.3 | FACTORS INFLUENCING CONVERSION

The parkade, as a typology, is typically seen as a cold, unfriendly and underutilized space. Some statistics identify that the average parking structure in the US is half empty 40% of the time[2]. SCAD decided to reappropriate areas of the parkade in order to capitalize on generational shifts which indicate a rise in adoption of alternative modes of transit among younger demographics. Rising costs of vehicle ownership and operation coupled with more accessible alternative transport solutions in urban centres such as biking, walking, and public transit are some factors at the heart of this shift.

Figure 1.2.4
The SCADpad during construction

1. Way into Atlanta, (10 April 2014), SCADPAD. http://wayinto.com/atlanta/scadpad/
2. SCADPAD (2014) http://www.scadpad.com/

Figure 1.2.5
Communal play space with living Pods in the background, Atlanta parkade

Figure 1.2.6
SCADpad 3d printer

Figure 1.2.7
SCADpad integrated software for utility control

1.2.4 |SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

One of the drivers of the project was the belief that re-purposing inefficient space is more socially, economical and environmentally friendly than undertaking a new development. To date, the SCADpads seem to be successful at engaging people socially while balancing an environmental conscience with economic freedom.

Social impact

- Various temporary events, shows and community gatherings occur outside of the pads in the re-purposed parkade spaces. Interventions such as gardens, decks, recliners and large chess boards create an enlivened communal space.
- The Atlanta SCADpad is equipped with a $2,800.00 3d printer, which can print missing home items as well as objects designed by SCAD students[1]. Customization is at the root of this idea. It is inexpensive to operate but takes hours to print simple items such as cutlery.
- Users are encouraged to use social media to share their experiences in the SCADpads, creating a global online presence and a rich social network.
- The Pad's are technologically advanced, showing their social rigor with apps designed to allow users to control water, electricity and other utilities[3] as well as monitor their usage in order to change perception and reduce consumption.

Environmental impact

- The SCADpads use 'vermicomposting'[1]. Located inside containers made with recycled materials worms convert organic food waste into nutrient rich soil at a rate of up to 1 pound per day. The composted soil is used on-site in the adjacent gardens, where people can grow their own herbs and vegetables.
- 'Parans', a fiber optic technology, is used to harvest sunlight from the roof of the parkade to be used within the Pad deck.
- Graywater is filtered on-site from the toilets and sinks in order to water nearby gardens.

Economic impact

- In an unofficial estimate, each SCADpad pavilion in the Atlanta project was budgeted at costing $20,000 for set-up.
- The Asia SCADpad renovation was totalled at costing roughly $40,000.00[4]
- As the parking stalls did not make money prior to their conversion, it was not necessarily important for the new project interventions to generate income.

3. Eric Green, (2014), padLEARN. http://ericgreensite.com/padlearn
4. Inhabitat, (4 April 2014), SCADpad North America Lets Tiny House Lovers Live Large in a Parking Spot. http://inhabitat.com/scadpad-north-america-lets-tiny-house-lovers-live-large-in-a-parking-spot/

Figure 1.2.8
SCADpad Europe, Trish Andersen

1.2.5 | MEASURES OF SUCCESS

The social success of SCADpad is prevalent throughout social media; it seems to be a fun space designed by young people for young people. The ability of the school to integrate all aspects of design into the finished product is a testament to the complete package of the idea. Of particular interest is the integration of easily implemented energy saving strategies as well as advanced technologies, which cater towards a younger generation who engage daily with technology and social media.

A host of social successes have been made possible by the design of the SCAD pad and have helped highlight the value of such adaptive re-use projects. Changes of finishes and a simple material palette of white painted surfaces and bright insertions of color render the parkade more inviting and warm and help to combat the existing harsh concrete materiality. The addition of plants throughout the parkade also makes it more inviting and warm, bringing natural elements into an otherwise lifeless place. The addition of furniture and designed elements into "common areas" of the parkade change the landscape of the parkade and invite people to not only enter but stay and socialize comfortably. The integration of social media and technology into the project provides a useful platform for documenting the design and installation process as well as acting as a virtual hub for ongoing discussion about assessing project impacts. The integration of art into the parkade increases its aesthetic value and demonstrates the potential for these spaces to become temporary galleries. Additional services such as heating, plumbing for showers and toilets as well as electricity were all required as part of the new interventions adding basic amenity to the parkade. The integration of passive and active forms of energy harvesting into the parkade represents a good model for balancing intervening programs with new energy demands. Vermicomposting, small scale agriculture, sunlight collection/ conversion and harvesting graywater are basic but intelligent and the least invasive energy strategies, which improve the value of the space significantly from its base state. It is hard to ascertain the economic successes of the SCADpad as parking passes for the particular Atlanta campus parkade are rolled into student fee's. It is unclear if students wanting to stay in the SCADpad pay rent for the time they are there, however it does seem likely that this economic model would be in place for renting out liveable hub's within parkades in the future.

Overall, the SCADpad project recognizes current limitations and drawbacks of existing parking structures and further recognizes these spaces as an untapped opportunity for new residential occupation. As younger generations like to commute less and live closer to city centers, occupying renovated parking spaces represents one creative and compelling solution using an adaptive-reuse framework.

Social gathering, various events, as well as residential living pods and places to study are main components of the SCADpads. The pad's are also socially connected via app's, websites and photo sharing of user experience.

The project aims to be environmentally conscious by growing, harvesting, converting and supplying energy via renewable resources to the added program of the parkade.

The economic aspects of the living pod's seem to be reasonably priced to build, can be easily moved and are autonomous from any existing building systems. This allows for economic flexibility, meaning rent could be charged in order to promote increased investment of these types of units. Increased investment could potentially lead to retail and commercial pod's generating further income.

Figure 1.3.1
Underside of the motorway used as a movie cinema and social gathering space

1.3.1 PRECEDENT RESEARCH: Adaptive re-use of other relevant building types

FOLLY FOR A FLYOVER

ASSEMBLE Studio | Hackney Wick, London, EN | 2011

ASSEMBLE studio, a non profit organization of architects, designers and creative minds, along with over 200 volunteers used donated and reclaimed materials to "take over" the underside of a disused motorway and convert it into a vibrant public space for 9 weeks. 40,000 visitors came to the resulting gallery, canal side cinema and bar as it was part of the CREATE festival, demonstrating the value and success of the project[1].

Figure 1.3.2
Before state

1.3.2 | DOCUMENT BEFORE / AFTER STATE

Before

Before the space beneath the motorway was completely empty, underutilized, had harsh materials and was covered in graffiti suggesting it was already a local hang out spot for artistic activity. Lack of lighting on the underside of the bridge made it an unsafe and unpleasant space to inhabit.

After

After the area beneath the motorway was an invigorated and thriving public space and became an important area for local artists and the community to gather for the CREATE event[2]. By occupying the underside of the motorway people became more conscious of other such spaces like this which could also be transformed for similar public events in the future.

Figure 1.3.3
After state

1.3.3 | FACTORS INFLUENCING CONVERSION

Some of the factors which influenced the conversion of the underside of the motorway have to deal specifically with ASSEMBLE's design strategy, which is that small projects in unused spaces can generate large events and make people aware of the many disused spaces in society which can be injected with life. The close proximity of the site to the Olympic Park, which could easily be accessed via the canal, coupled with the empty space which already had various utilities and overhead shelter available for use allowed the intervention to exist. Combined with the CREATE event, the space then became the ideal area for artistic and community events.

Figure 1.3.4
Social gathering spaces and pavilion

1. ASSEMBLE, (2014) Folly for a Flyover. http://assemblestudio.co.uk/?page_id=5
2. CREATE, (2011) Projects Archive: Folly for a Flyover. http://createlondon.org/event/2011-create-art-award/

Figure 1.3.5
Pavilion protruding to motorway above

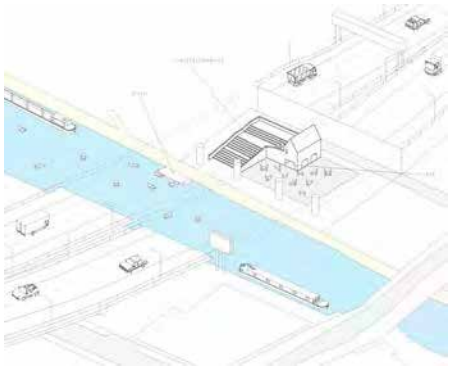


Figure 1.3.6
Project Diagram

Figure 1.3.7
Construction of the main pavilion

Figure 1.3.8
After state: the area is returned to its original condition

1.3.4 | SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The main driver of the project was creating a public space that people would use in an area of possibility. Even though the site was restored to its original condition after 9 weeks, the design team took great care in making sure that flexibility, adaptability and ability for disassembly was possible. As such, the space had an element of industrial history to it which allowed it to fit into its surroundings as if continuing a narrative already embedded in the area.

Social impact

- Many volunteers built the pavilion and donated their time, energy and support to the project resulting in overwhelming positive response from the community.
- A system of boats were put in place to take visitors to the nearby Olympics site, acting as a transportation hub and interacting with the adjacent running path which goes along the canal and under the motorway[3].
- Drawing attention to underutilized space within the city and occupying it with creative and fun elements helps educate people as to the hidden potentials within already densified urban settings.

Environmental impact

- Reclaimed and donated wooden bricks, clay, wood and scaffoldings were used in the construction of the main pavilion building, which consists of a bar, cafe and outdoor stepped seating for cinema events.
- Because the pavilion was temporary the brick facade of wood was held together with string instead of mortar, so the materials can be taken apart and re-used for other purposes[2].
- Instead of making a new building to host the events the ability to simply add recycled materials to an already existing space reduced the carbon footprint and resulted in less waste as a by-product

Economic impact

- Retail and food services generated income for the time that they occupied the underside of the motorway, which received many visitors over the 9 weeks meaning lots of exposure to a wide variety of different people.

3. Dezeen, (5 July 2011) Folly for a Flyover by Assemble. http://www.dezeen.com/2011/07/05/folly-for-a-flyover-by-assemble/

Figure 1.3.9
Social gathering spaces inside the pavilion

1.3.5 | MEASURES OF SUCCESS

The folly project was primarily a huge social success, however environmental and economic implications of such projects are equally as interesting and represent many potentials.

By protruding up from below, the roof of the main pavilion becomes noticeable from the motorway above, peaking interest and drawing attention to this once empty space. Using the motorway overhead as a form of shelter and building very minimally around it, the project showed that infrastructure and public space can coexist. By allowing a mix of creative program, boat cruises, film screenings, a cafe, studio and bar many different people were attracted to the space, allowing for creative and inventive public interaction. By allowing the temporariness of the structure to define the aesthetic and feel of the space the resulting design fit well into its infrastructural landscape. Creating public interventions in underused areas uses less materials than if a new building or space were to be built within the city. Using recycled and donated materials in a temporary way also ensured that materials could be re-used for other projects resulting in adaptability and flexibility. There are huge implications for young businesses to be a part of not only facilitating interventions within the already built fabric of cities, but also creating the potential for more real estate in areas which are commodifying. Drawing economic benefits to in-between space represents many challenges in terms of land ownership, however there are many potential economic opportunities which could prove to be very successful.

Assemble Studio's hope is that more projects like this take off in the future as a means of capitalizing upon already existent public space in the city, and giving a new social face-lift in order to improve awareness and use.

Using the underside of the canal as a transportation hub to the Olympics site, creating an area to screen and view movies as well as open space for people to gather and eat/drink allowed the underside of the motorway to become a vibrant public space.

Recycling materials and using them in temporary ways ensured the project fit into its surroundings. Perhaps it would not have been as successful in alternate circumstances.

Economically, this could have huge implications for real estate as new parcels of land within other parcels could start to open up spurring investment, trade and sharing.

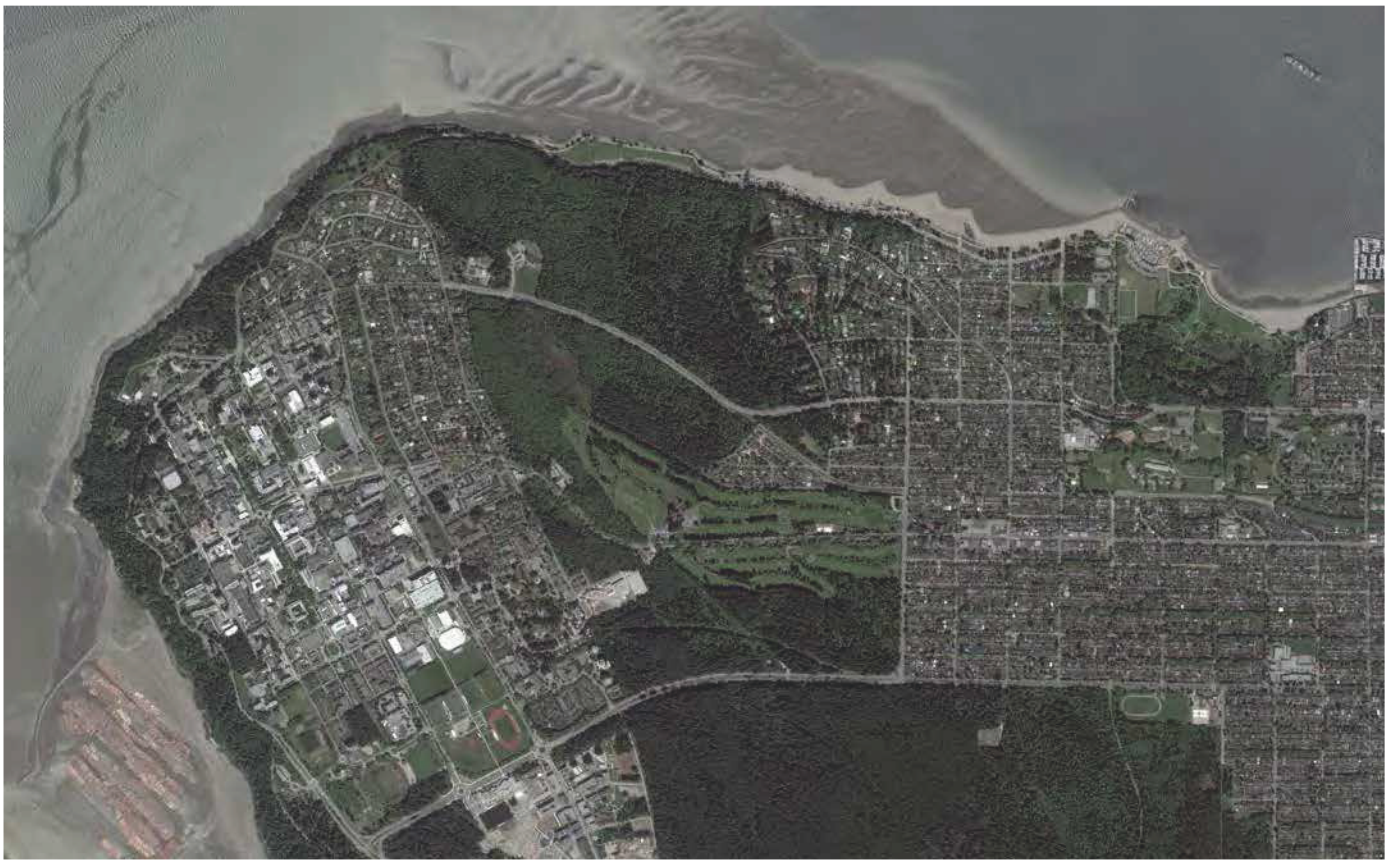
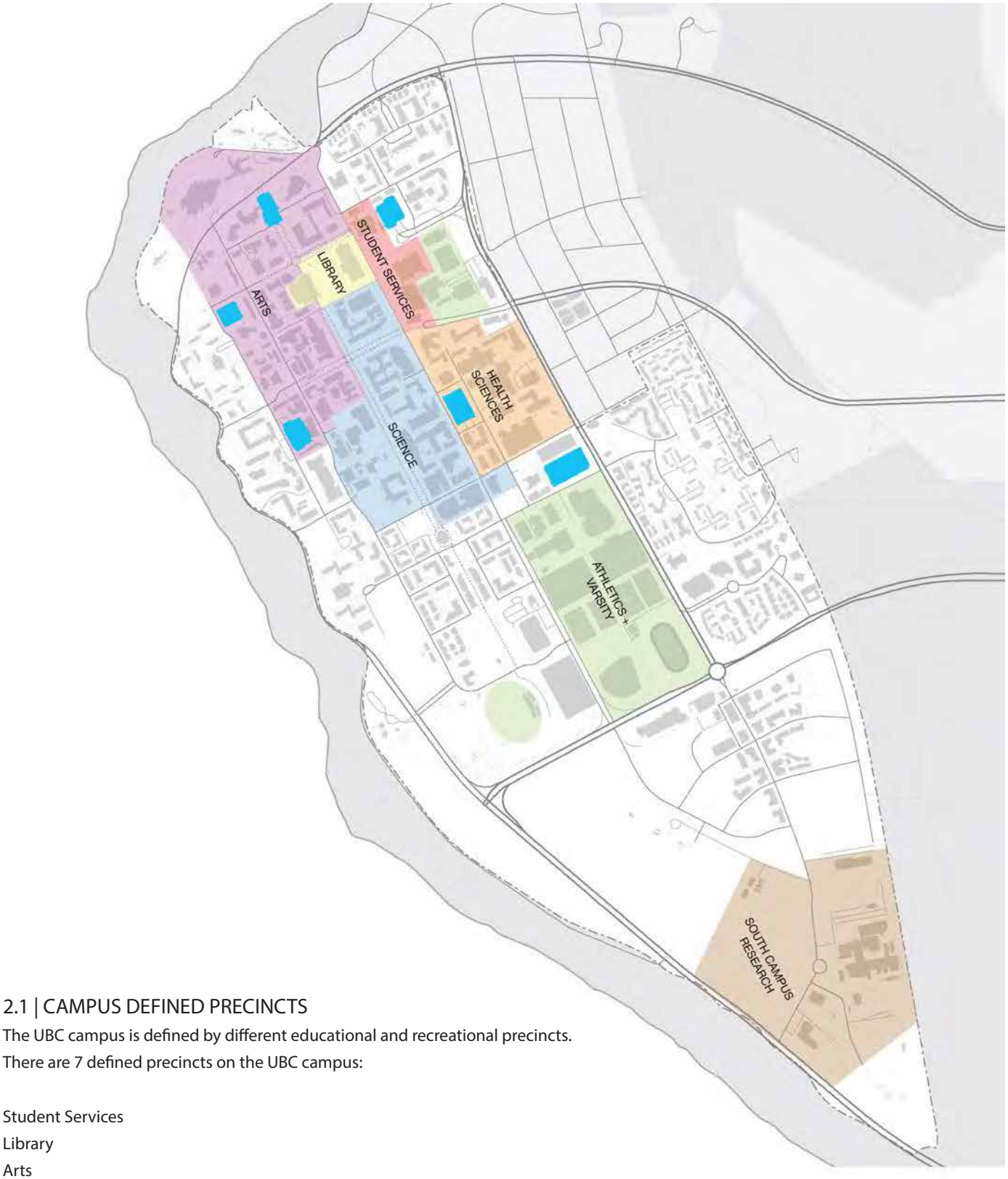


Figure 2.0.1
UBC Campus

2.0 UBC Analysis

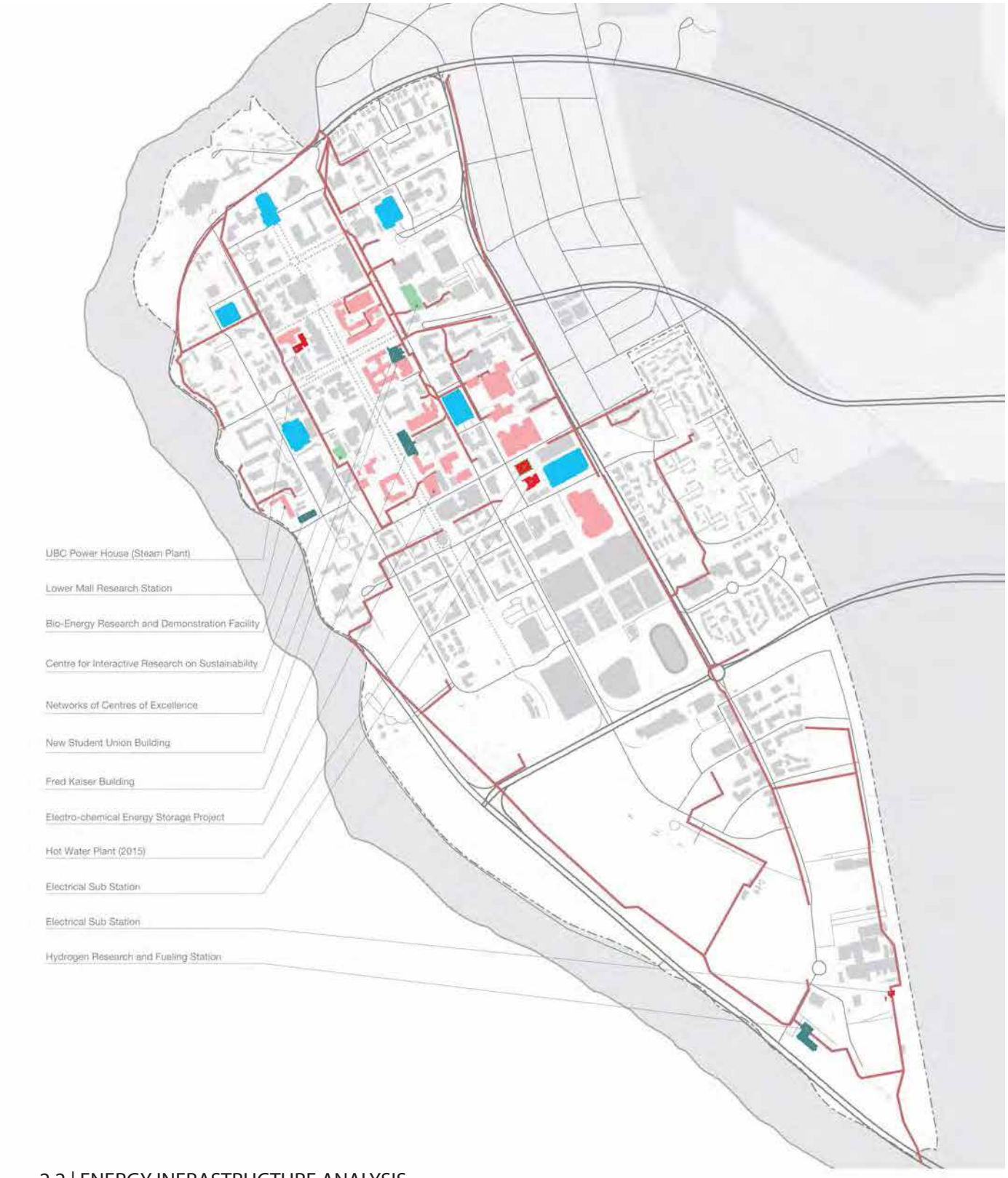
2.1 | Campus defined precincts
2.2 | Energy infrastructure analysis
2.3 | Alternative methods of defining 'precincts'
2.4 | Parkade site analysis



2.1 | CAMPUS DEFINED PRECINCTS

The UBC campus is defined by different educational and recreational precincts.
There are 7 defined precincts on the UBC campus:

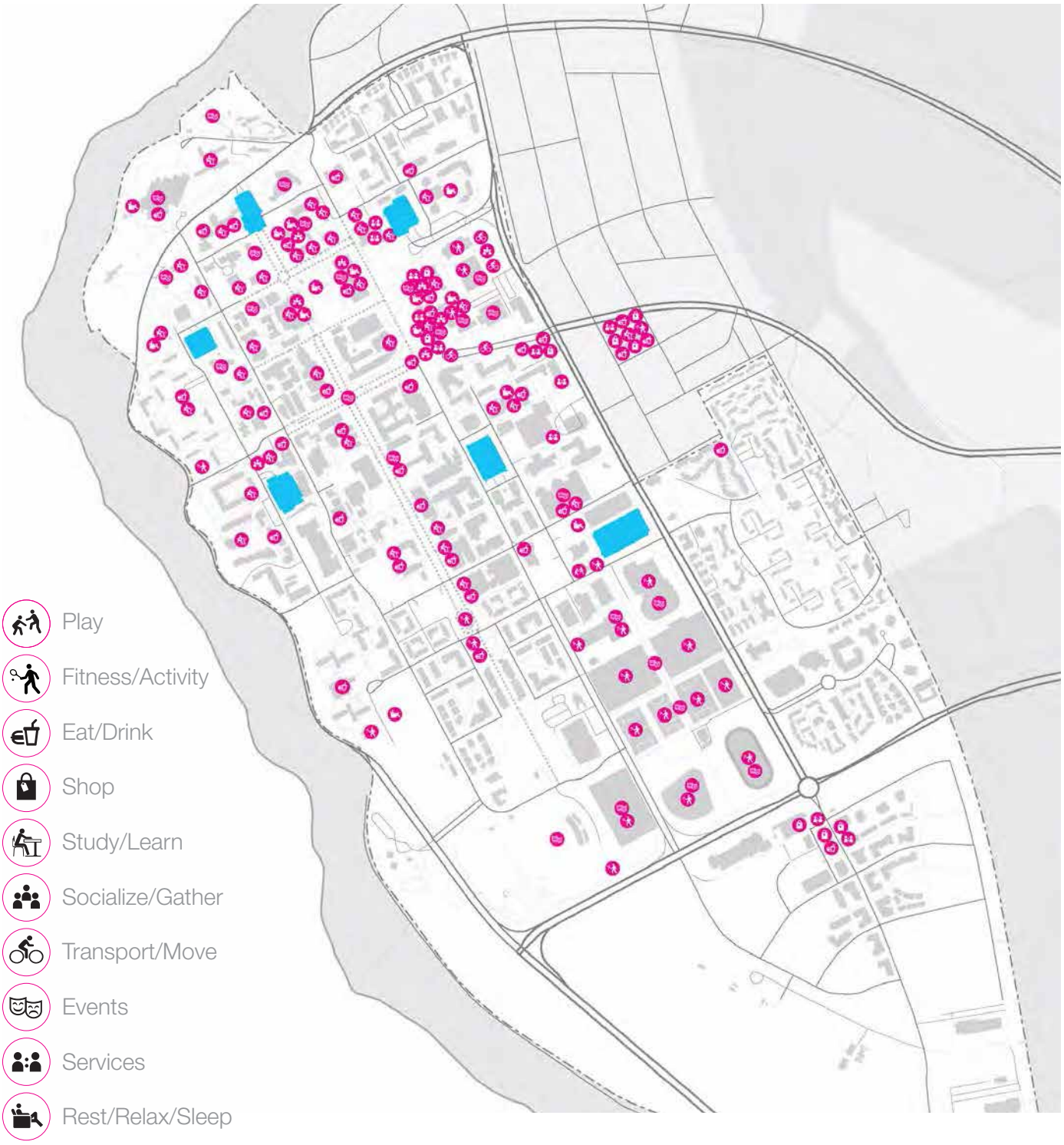
Student Services
Library
Arts
Health Sciences
Science
Athletics & varsity
South campus research



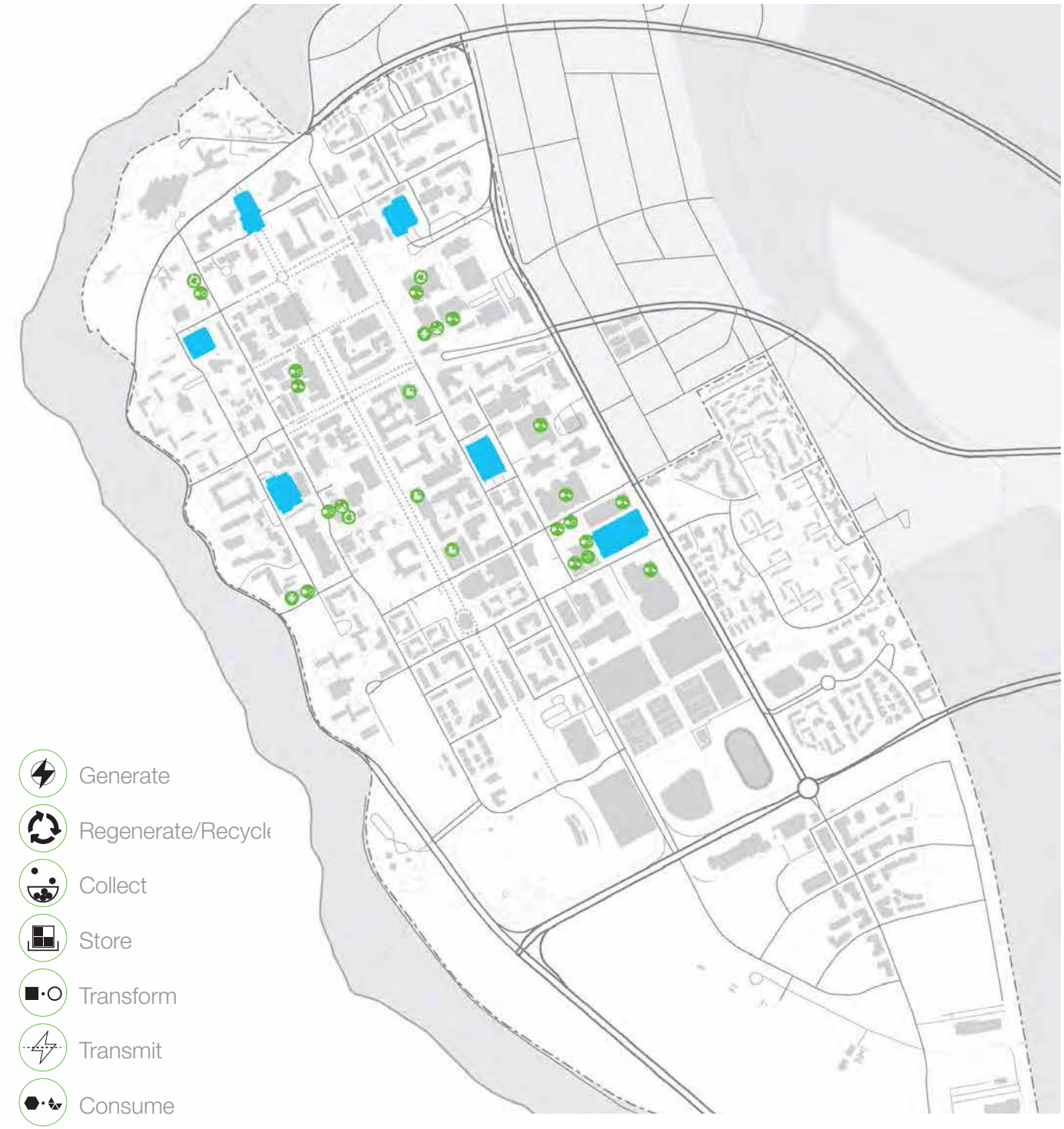
2.2 | ENERGY INFRASTRUCTURE ANALYSIS

Locations of Energy Generation on Campus

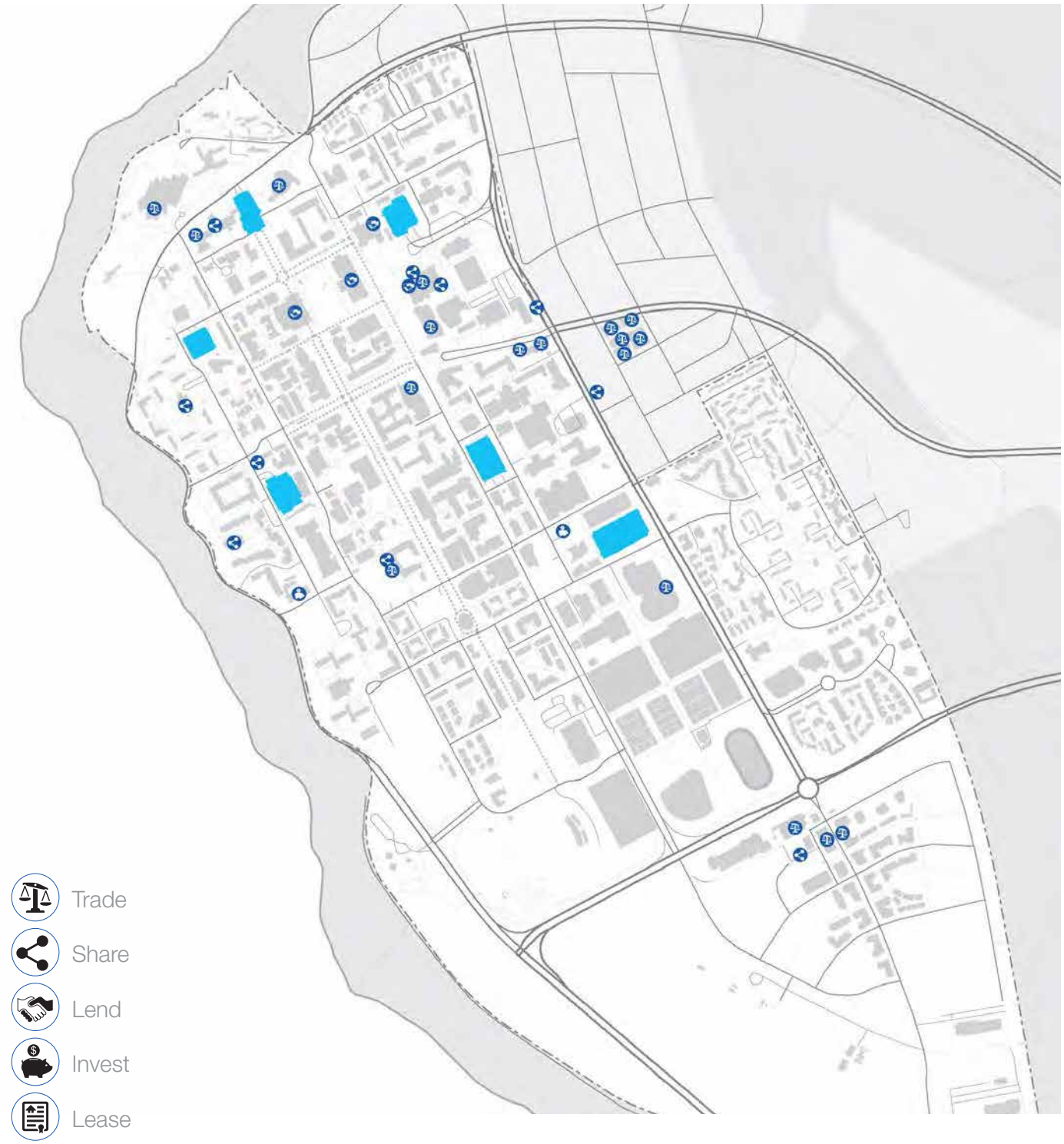
- Energy Storage
- Solar Energy Generation
- Future Projects
- Large Waste Heat Potential
- Small Waste Heat Potential
- Sewer Line Waste Heat
- Parkades



2.3 | CURRENT ENGAGEMENT ON CAMPUS: SOCIAL



2.3 | CURRENT ENGAGEMENT ON CAMPUS: ENVIRONMENTAL



2.3 | CURRENT ENGAGEMENT ON CAMPUS: ECONOMIC

Thurnderbird parkade location on UBC campus

2.4 PARKADE SITE ANALYSIS: Existing parkade features

THUNDERBIRD PARKADE | 6065 Thunderbird Blvd, UBC, Vancouver, BC, Canada

YEAR BUILT: 2005
ARCHITECT: Davidson Yuen Simpson Architects
TOTAL SQUARE FOOTAGE: Approx. 524, 955 square feet
TOTAL # OF FLOORS: 5
TOTAL # OF PARKING STALLS (BY TYPE): tbd
OVERALL BUILDING HEIGHT: Approx. 49'-0"
TYPICAL CEILING HEIGHT: Approx. 10'-0"
BIKE PARKING: Yes, locked cage storage
ELEVATOR: Yes
SLOPED FLOOR: Yes, everywhere
VEGETATION: Yes, rooftop
FACADE: Concrete

Overview:

The Thunderbird Parkade is located adjacent to many sports and activity facilities, including Thunderbird Stadium, the Arena and a skate park that is very vibrant and used by many different types of people. Various energy hubs (including the new Hot Water Plant, to be finished in late 2015) are also located adjacent to Thunderbird, making it a prime spot for potential excess energy donation. Thunderbird parkade is made up of a series of ramps, which meet/coalesce on the roof at a central raised area where a view out to the ocean is made possible. Its slanting floor plates are important to keep in mind when thinking about accessibility and usability of the interior of the parkade for events/program. Thunderbird is one of the few parkades on campus to have elevators as well as integrated planting boxes complete with irrigation on the roof level. It is the newest parkade on campus, located in between the Athletics & Varsity and Health Sciences campus districts.

Thunderbird parkade (view from Agronomy Road looking East)

Thunderbird parkade roof view, looking West

Thunderbird parkade interior

2.4 PARKADE SITE ANALYSIS: adjacent Social, Economic and Environmental services

SOCIAL:

There are many recreational facilities available in the surrounding area of the Thunderbird parkade. A skatepark and basketball court to the south of the parkade are the closest unorganized rec and hang out spots. Close proximity to the arena as well as the playing fields make this an area ripe with various kinds of recreation.

Few student study or relaxation spaces are available in the surrounding area, and food availability is also lacking.

The possibility for Thunderbird parkade to become a student hang out and relax spot for post-game drinks and food is something which the area lacks and presents an opportunity to increase the parkades synergy with its surrounding social uses.

ENVIRONMENTAL:

Currently, the area surrounding Thunderbird parkade is undergoing intensive energy infrastructure changes. The addition of the Campus Energy Center Hot Water Plant will replace UBC's steam plant with a hot water distribution center, and is already under construction. It's location (directly across from the parkade) could be a potential synergy for sharing modes of energy and recapturing lost heat. The LEED Gold UBC Pharmaceutical building (located adjacent to the parkade) also represents the shifting focus on energy in the area.

The possibility for Thunderbird to take on energy storage and transmission in the form of capturing lost heat from surrounding buildings, harvesting rain water, or employing a green vegetative facade are all applicable energy focused options.

ECONOMIC:

There is a lack of economic incentive in the area surrounding Thunderbird as it is an area of high social and recreational use. Memberships as well as events generate capital, and the parkade is a close place to park for such events.

By inserting social program (micro-brewery, eatery, cafe) areas of the parkade could be temporarily or permanently rented out, which in turn would generate income at times when events do not demand maximum parking space.

Health Sciences parkade location on UBC campus

2.4 PARKADE SITE ANALYSIS: Existing parkade features

HEALTH SCIENCES PARKADE | 2250 Health Sciences Mall, UBC, Vancouver, BC, Canada

YEAR BUILT: 1979
ARCHITECT: Zoltan S. Kiss and Partners
TOTAL SQUARE FOOTAGE: tbd
TOTAL # OF FLOORS: 6
TOTAL # OF PARKING STALLS (BY TYPE): tbd
OVERALL BUILDING HEIGHT: tbd
TYPICAL CEILING HEIGHT: tbd
BIKE PARKING: locked cage currently used as storage space
ELEVATOR: No
SLOPED FLOOR: Yes, everywhere
VEGETATION: facade vines
FACADE: Concrete and opening mixed with metal screen

Overview:

Health Sciences Parkade was the first parking structure built on campus at the heart of the health sciences precinct which includes the UBC hospital, Dentistry, Biomedical Research Centre, Life Sciences Centre, Instructional Resource Centre, Woodward Library as well as the new Centre for Brain Health which opened in early 2014. In addition, the Health Sciences Parkade is also the closest parking structure to the Engineering area which consumes many buildings to the east of the parkade. As a result of these adjacencies the parkade is a primary parking location for students, faculty, staff and professionals associated with the Health Sciences and Engineering disciplines as well as patients. The parkade is currently undergoing seismic upgrading which is slated to finish by the end of 2014.

Health Sciences parkade (view from East Mall looking East)

Health Sciences parkade roof, looking North

Health Sciences parkade interior

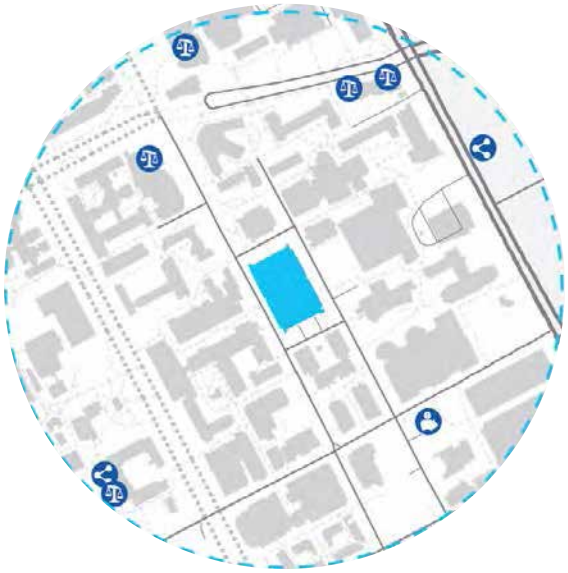
2.4 PARKADE SITE ANALYSIS: adjacent Social, Economic and Environmental services

SOCIAL:

The Health Sciences Parkade has relatively few social amenities in close proximity beyond provision of educational spaces and health services. As a result there is a strong prevalence of places where students can study. The SUB is a close walk from the parkade which also provides a higher density of student services and food outlets. Due to the homogeneity of the social spaces opportunity certainly exists for the addition of places where the user group could engage in other activities such as play, sporting venues or places to rest and relax from stressful work and learn spaces.

ENVIRONMENTAL:

Of notable proximity to the Health Sciences Parkade are several venues for the Electrochemical Storage System (ESS) project which provides 1000 kWh of distributed energy storage in the form of Lithium Ion batteries placed in a variety of buildings. Additionally, several sources of high energy consumption such as the UBC Hospital and the Health Sciences Centre represent an opportunity to develop shared energy resources through district energy strategies. While none of the parkades on campus currently engage with rainwater, the Health Sciences Parkade does have a few vines which grow up parts of the facade adding an element of biophilia to the structure which could be enhanced in the



ECONOMIC:

The Health Sciences Parkade is perhaps one of the most well used and thus represents a thriving economic generator already. However, the design of the parkade deploys sloped floors on almost 100% of the entire floor area of the parkade, posing a challenge to the future of any intervention which benefits from flat flooring.

North parkade location on UBC campus

2.4 PARKADE SITE ANALYSIS: Existing parkade features

NORTH PARKADE | 6115 Student Union Boulevard UBC, Vancouver, BC, Canada

YEAR BUILT: 1987
ARCHITECT: Zoltan S. Kiss Architects
TOTAL SQUARE FOOTAGE: Approx. 384, 282 square feet
TOTAL # OF FLOORS: 9 (split levels)
TOTAL # OF PARKING STALLS (BY TYPE): tbd
OVERALL BUILDING HEIGHT: tbd
TYPICAL CEILING HEIGHT: tbd
BIKE PARKING: Yes, caged
ELEVATOR: No
SLOPED FLOOR: Middle ramp sloped only, parking floors flat
VEGETATION: planter boxes on facade
FACADE: concrete with metal screens

Overview:

The North parkade is adjacent to many student services and amenities, including the old SUB and new SUB's. In addition Brock Hall has many student services. Of important note is also the development of the new underground UBC bus loop, upon which a new UBC aquatic center will be located. Additionally the possibility of new residential buildings located nearby will represent new opportunities for social engagement with students and residents alike. The proximity of UBC rec to the parkade represents further opportunities for recreational synergies within the parkade, especially on the roof.

North parkade (view from Student Union Blvd. looking West)

North parkade roof, looking West

North parkade interior

2.4 PARKADE SITE ANALYSIS: adjacent Social, Economic and Environmental services

SOCIAL:

There are many student amenities surrounding North parkade including the new Student Union Building, Brock Hall, venues for shows and movies and a variety of campus food venues. UBC Rec is also close by, located next to the current bus loop where major express busses depart and arrive at campus.

There is a lack of available student study and relax spaces in the surrounding area. This is especially prevalent given the adjacency of nearby residences.

Study/relax space, student recreational space in the roof are some social options for North parkade.

ENVIRONMENTAL:

The new SUB building will have some environmental generation facilities to collect, transmit and recycle energy.

In general there is a lack of intensive energy focused services on this portion of campus.North parkade could have a green facade system put in place that harvests rain water to keep itself sustained as well as other possible energy collection and storage methods for energy

ECONOMIC:

The SUB houses many economic facilities which share and trade resources and commerce. Many of the food services operate under this umbrella.

Adjacent housing, recreation, transportation and social infrastructures limit the economic services currently in this area.

Student run shops, cafe, support for the nearby bike kitchen, and lease of

Rose Garden parkade location on UBC campus

2.4 PARKADE SITE ANALYSIS: Existing parkade features

ROSE GARDEN PARKADE | 6278 North West Marine Drive UBC, Vancouver, BC, Canada

YEAR BUILT: 1994
ARCHITECT: Guzzi Perry & Associates INC. (landscape architect for the roof garden)
TOTAL SQUARE FOOTAGE: tbd
TOTAL # OF FLOORS: 5
TOTAL # OF PARKING STALLS (BY TYPE): tbd
OVERALL BUILDING HEIGHT: Approx. 16m (52'-0")
TYPICAL CEILING HEIGHT: Approx. 10'-4"
BIKE PARKING: tbd
ELEVATOR: No
SLOPED FLOOR: Yes
VEGETATION: Roof rose garden
FACADE: Concrete

Overview:

The Rose Garden parkade is perhaps the most synergistic parkade on campus. Not only does it present two different sides (one to the campus roundabout and the other to busy Marine Drive) thus acutely responding to its surroundings, it is a major lookout point and destination on campus for students, faculty and visitors. The adjacency of a large roundabout on the uppermost level complete with Canadian flag is part of the processional route for graduation ceremonies at the nearby Chan Center. The roundabout also represents a major transportation pick up and drop off location on campus, which helps create a bustle of pedestrian and vehicular activity. Since the rooftop of the Rose Garden parkade is already in use, it represents a successful parkade model whereby the roof has been visualized from design inception to help the building recede into the hillside it occupies, while providing a contemplative and serene garden for people to relax, study and stroll.

Rose Garden parkade (view from Marine Drive looking East)

Rose Garden parkade roof, looking West

2.4 PARKADE SITE ANALYSIS: adjacent Social, Economic and Environmental services

SOCIAL:

The Rose Garden parkade is a lookout point on campus, occupying the underside of a major focal point off of the trajectory of Main Mall. Graduation ceremonies, temporary events, and receptions are held adjacent to the parkade on the upper level. Student study and relax spaces are also adjacent, along with various food services. The roundabout in front of the parkade's uppermost level is an area of rest, as well as an active transportation hub for pick up's and drop off's. Providing adjacent space for food trucks and seating are some possible options for increasing the use of this area without impeding the view out to the landscape.

ENVIRONMENTAL:

Other than the nearby CK Choi building (which utilizes passive ventilation, composting toilets, recycled materials and natural lighting) there is a lack of environmental initiatives in the area surrounding the Rose Garden parkade. The roof of the parkade itself utilizes rainwater to sustain itself, thus it does more environmentally than it would if it were just a bare concrete surface. The rose garden is a destination garden on campus, a place for wildlife and a serene lookout amongst campus life. Many bicyclists use the nearby NW Marine Drive hill for training, and running and bicycle races occur frequently on this part of campus, thus some synergies between bike/running use and fitness could be employed on the Marine Drive level to take advantage of these kind of high level energy activities.

ECONOMIC:

The nearby adjacency of the Chan Center, Frederic Wood Theater and the Museum of Anthropology mean that many people use the Rose Garden parkade for event parking. During times of influx for such events the parking rate at the Rose Garden is sometimes increased, making more money than usual by taking advantage of increased use. Additional synergistic uses with temporary events could be employed to economically make a profit, such as rentable stalls for food trucks, art supply dealers for the nearby arts district, bicycle repair etc.

Fraser parkade location on UBC campus

2.4 PARKADE SITE ANALYSIS: Existing parkade features

FRASER PARKADE | 6440 Memorial Road UBC, Vancouver, BC, Canada

YEAR BUILT: 1982
ARCHITECT: Read Jones Christoffersen LTD. (Engineers)
TOTAL SQUARE FOOTAGE: tbd
TOTAL # OF FLOORS: 4
TOTAL # OF PARKING STALLS (BY TYPE): tbd
OVERALL BUILDING HEIGHT: tbd
TYPICAL CEILING HEIGHT: tbd
BIKE PARKING: Yes, storage cage
ELEVATOR: No
SLOPED FLOOR: Fully sloped
VEGETATION: Yes, planter boxes on facade
FACADE: concrete with planting

Overview:

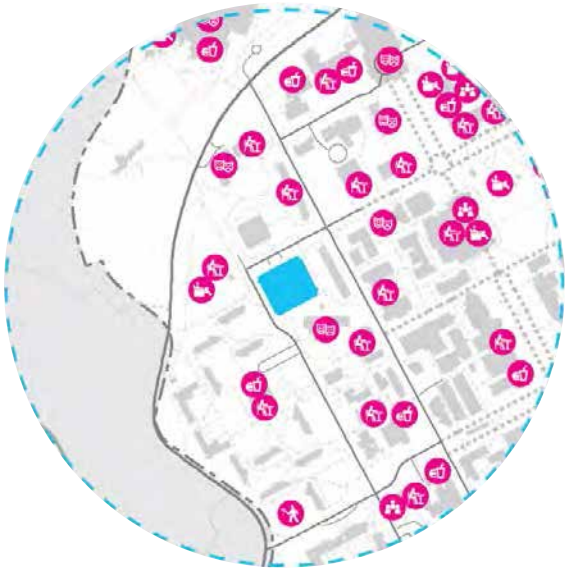
The Fraser parkade is surrounded by tall trees, which protect its roof from nearby sounds and breezes. As a result the rooftop has a calming effect, and represents many opportunities for quiet student spaces. Its adjacency to various cultural centers means that it can act as a hub for different people to come together in a calm setting, to study, read, relax or socialize. Fraser parkade is entirely sloped, therefore the roof represents the most fruitful area of intervention. The opportunity for Fraser parkade to further blend in with its natural surroundings via a green facade, solar canopy and renewable energy generation/storage/conversion are all opportunities for synergies.

Fraser parkade (view looking West)

Fraser parkade roof, looking East

Fraser parkade interior

2.4 PARKADE SITE ANALYSIS: adjacent Social, Economic and Environmental services

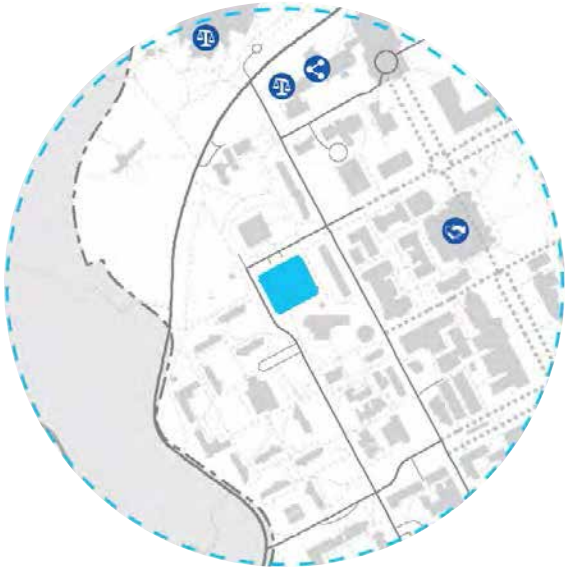


SOCIAL:

Nearby social uses around Fraser parkade represent a variety of cultures and languages, from the Asian Center, CK Choi building, Liu Institute for Global Learning, and International House to the First Nations House of Learning. The opportunity for many different cultures coming together in a student study/relax space seems to be a fruitful merger of the existing calmness exuded by tall surrounding trees and the adjacency of the nearby Nitobe Japanese Garden across the street. The introduction of temporary seating (such a hammocks hung by hooks or bean bags for rent) could be an easy way to provide student space to the roofscape or interior of the parkade.

ENVIRONMENTAL:

Tall trees surrounding the Fraser parkade. As a consequence the roofscape is clam and quiet. The possibility for the facade to be an activated green landscape, which captures rain water for use while adding to the calm nature of the area makes sense in terms of energy as well as student atmosphere. A solar canopy which could generate, store and transform energy on-site as well as provide shade for student study space is also an opportunity to take advantage of unused solar energy while adding to the student experience.



ECONOMIC:

Fraser parkade is in a quiet setting, where nearby services deal mostly with student language and culture. As a result there are many economic opportunities for Fraser to integrate itself into its surroundings. The possibility of a rooftop student run cafe, coupled with harvesting energy could reduce overall energy costs while being a space to lease or rent.

West parkade location on UBC campus

2.4 PARKADE SITE ANALYSIS: Existing parkade features

WEST PARKADE | 2140 Lower Mall UBC, Vancouver, BC, Canada

YEAR BUILT: 1991
ARCHITECT: Zoltan S. Kiss Architecture
TOTAL SQUARE FOOTAGE: Approx. 336, 288 square feet
TOTAL # OF FLOORS: 11 (split level)
TOTAL # OF PARKING STALLS (BY TYPE): tbd
OVERALL BUILDING HEIGHT: Approx. 52'=0"
TYPICAL CEILING HEIGHT: Approx. 10'-5"
BIKE PARKING: Yes, storage cage
ELEVATOR: No
SLOPED FLOOR: Only centre ramp is sloped
VEGETATION: Yes, planter boxes on facade
FACADE: concrete

Overview:

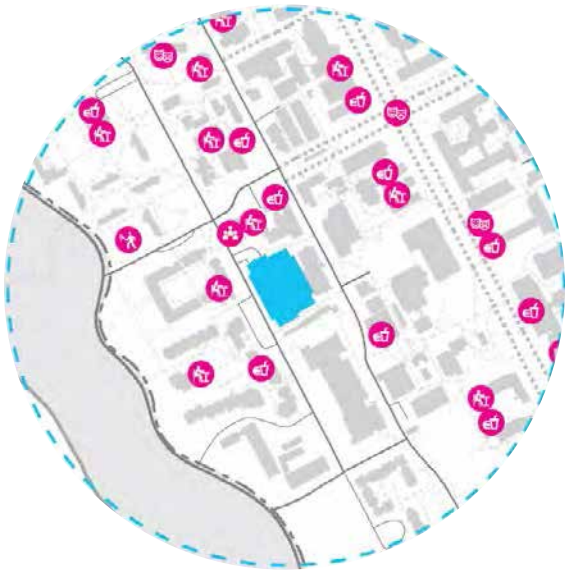
The West Parkade was constructed a few years following the North Parkade and was designed by the same architect. This overlap in design is clear through many shared elements included in both parking structures. Of special note for the West Parkade is it's split level design which negotiates a slope between West Mall and Lower mall. On the West Mall side the parkade is close to the main Psychology building, Swing Space, University Service Building, the Centre for Interactive Research on Sustainability (CIRS) as well as the new Ponerosa first-year residential mixed-use developments. Across lower mall are the Marine Drive Residences as well as St. John's College which serve as residences for undergraduate and graduate students, respectively. The rooftop of the West Parkade is fairly large and open and affords good views to the West where one can spectate the shoreline among the trees as well as the ocean horizon.

West parkade (view from West Mall looking West)

West parkade roof, looking South

West parkade interior

2.4 PARKADE SITE ANALYSIS: adjacent Social, Economic and Environmental services

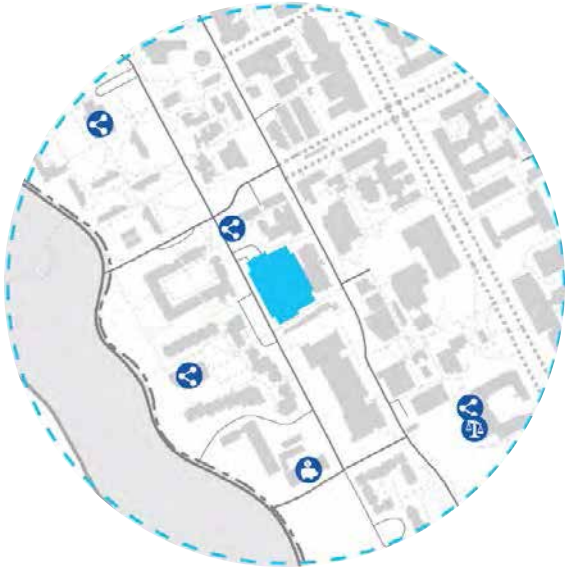


SOCIAL:

The West Parkade is socially interesting in that it resides as a buffer between a mixed educational precinct and residential structures. Close by are a few options for restaurants and cafes as well as a few open spaces and tennis courts for sport and play. Of note is also the presence of the first Collegia space which resides in the new Ponderosa phase 1 developments to the north. This space acts as a social hub for a subset of students on campus, providing a comfortable living type space for lounging, socializing and studying. Special social opportunities exist here for students living in residences to provide additional spaces for play, studying or resting.

ENVIRONMENTAL:

Environmentally, the West Parkade is unique in its proximity to CIRS, a hotspot for living lab projects and creative sustainability ideas. Additionally, the West Parkade is also near to the new Bio-Energy Research and Demonstration Facility which works to convert wood chips to electrical energy. As a result of these two adjacencies the parkade could aspire to engage with new or existing energy and resource systems and undertake a living lab project. A prime example for engagement in this way would be a rainwater harvesting system which connects to CIRS water treatment facility and ongoing Industrial Ecology projects.



ECONOMIC:

The presence of communal and shared student spaces is most notable through the economic lens of the West Parkade. With such a large number of students living and learning nearby, the opportunity to expand engagement of these students within the parkade should certainly not be ignored. As the new Bio-Energy Research and Demonstration facility can also be seen as important investment by UBC on campus, further engagement with the facility through education or energy synergies could be promising.

Figure 3.0.1
Les Yeux Verts multi-storey car park by Jacques Ferrier Architecture, Soissons, France.
Completed 2010.

3.0 OPPORTUNITIES FOR PARKADES OF THE FUTURE

Rendering showing food trucks and seating

Rendering showing micro-brewery

Rendering showing bike co-op

3.1 | IDENTIFY INDIVIDUAL IDEAS FOR PARKADES OF THE FUTURE

3.1.1 Main Floor opportunities

The main floor of a parkade has the advantage of being easily accessible by the largest amount of people. The ability for signage to easily interact with people at eye level can draw people into the parkade for social uses, making it ideal for gathering. Ease of entry as well as convenience of exploring something which peaks interest by those passing by are important factors when considering the type of program best suited for main floor use.

Some examples of program which might be applicable to the main floor of a parkade are illustrated on the left.

The top render illustrates food trucks either inside or outside of the parkade itself. As food trucks are self-sufficient and part of vehicular history, they do not rely on the parkade necessarily, but due to their car culture atmosphere can be paired with hard or soft seating inside the parkade itself where shelter from the elements is abundant. In this way, it is possible that the area around the parkade can also become activated.

The middle render shows the main floor utilized, in part, as a micro brewery. The social activation of the main floor of the parkade as a result of the introduction of locally crafted beverages could activate the surrounding area.

The bottom render shows the main floor utilized as a bike co-op center. Here, ideas of bike storage, maintenance, art, and interaction are key to maintaining the transportation infrastructure of the parkade while allowing it to be a meeting place for bicyclists.

Rendering showing designated densified car-share parking area

Rendering showing temporary student study/relax hammock space

Rendering showing pop up theater

3.1 | IDENTIFY INDIVIDUAL IDEAS FOR PARKADES OF THE FUTURE

3.1.2 Mid-Floor opportunities

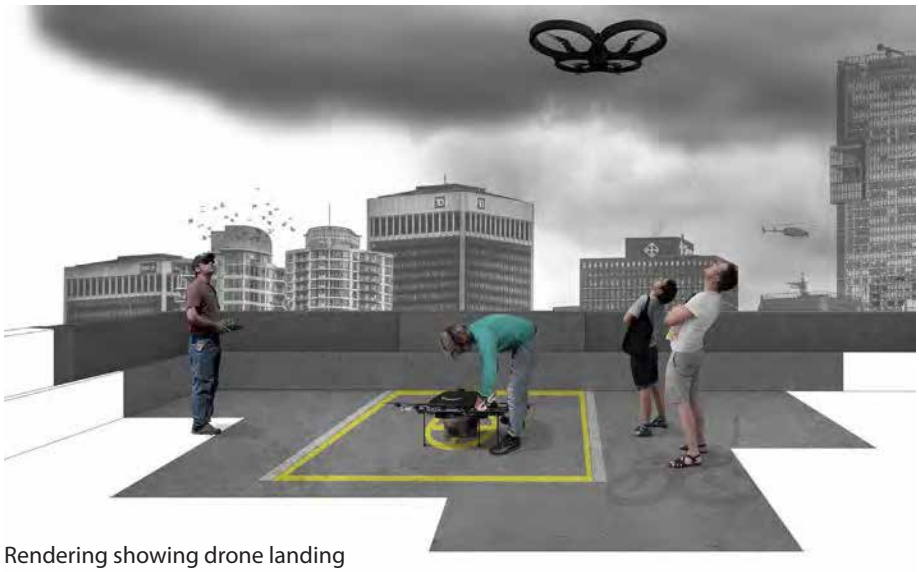
The mid-floor levels of parkades can be further intensified to become hyper-functional spaces. Likewise, they can also include temporary elements which can be installed quickly and easily to enhance student life.

Some examples of program which might be applicable to the main floor of a parkade are illustrated on the left.

The top render shows an intensification of the parkade. By allowing for a car sharing system to park on a dedicated floor, or portion of a floor, cars can be parked closer to one another as the specific car rented doesn't necessarily matter. In this way, on a first come first serve basis cars can come and go as demand is necessary. Sometimes the area may be full while at other times it might be nearly empty. This leaves a host of temporary possibilities for temporary installations shown in Figure 5 and 6.

The middle render utilizes the empty space of the mid-level parkade to be used as a student study and relax space. Hooks could be mounted in the ceiling whereupon hammocks could be installed or rented in order to allow students relaxing, quiet places to study and gather.

The bottom render shows some surface treatment adjustments, such as warmer lighting as well as plantings on the facade in order to soften the parkade interior. Projection screens could show movies at temporary events, or the area could be a pop up venue for art shows or other student campus gatherings.



Rendering showing drone landing

Rendering showing solar canopy and social space

Rendering showing a parkade roof as a recreational facility

3.1 | IDENTIFY INDIVIDUAL IDEAS FOR PARKADES OF THE FUTURE

3.1.3 Roof opportunities

The roofs of parkades are the most under-utilized spaces in terms of actual parking. They are the farthest from the ground and take the most energy to climb up/down to, especially considering many parkades do not have elevator access. Due to this, the roofs of many parkades sit barely used most of the time. Heat, water, vegetation and other possible forms of energy fall on open asphalt, and open space is left unused and wasted.

By taking over the roofs as spaces for temporary events, energy harvesting or drone landing it is possible to begin to re-imagine how the roofs of parkades can become synergistic with their surroundings, and become active public spaces.

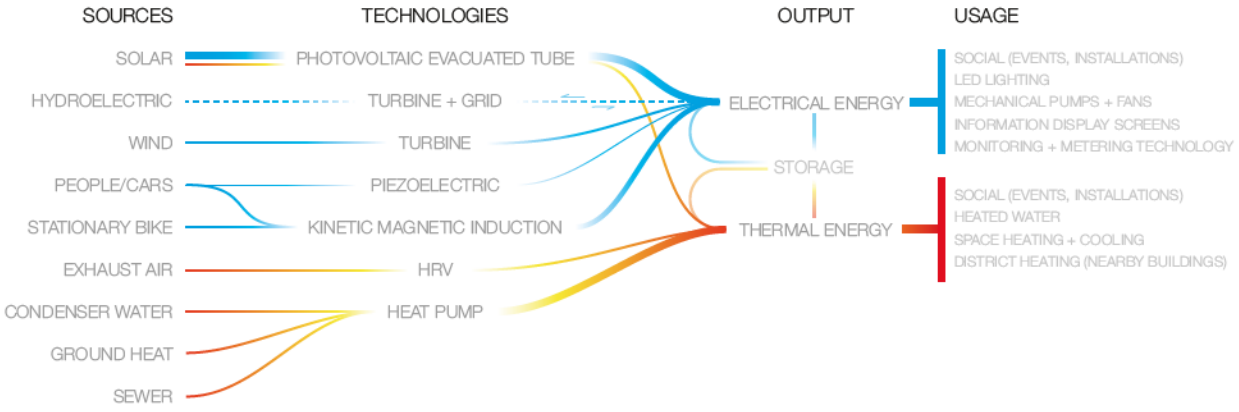
Some examples of program which might be applicable to the main floor of a parkade are illustrated on the left.

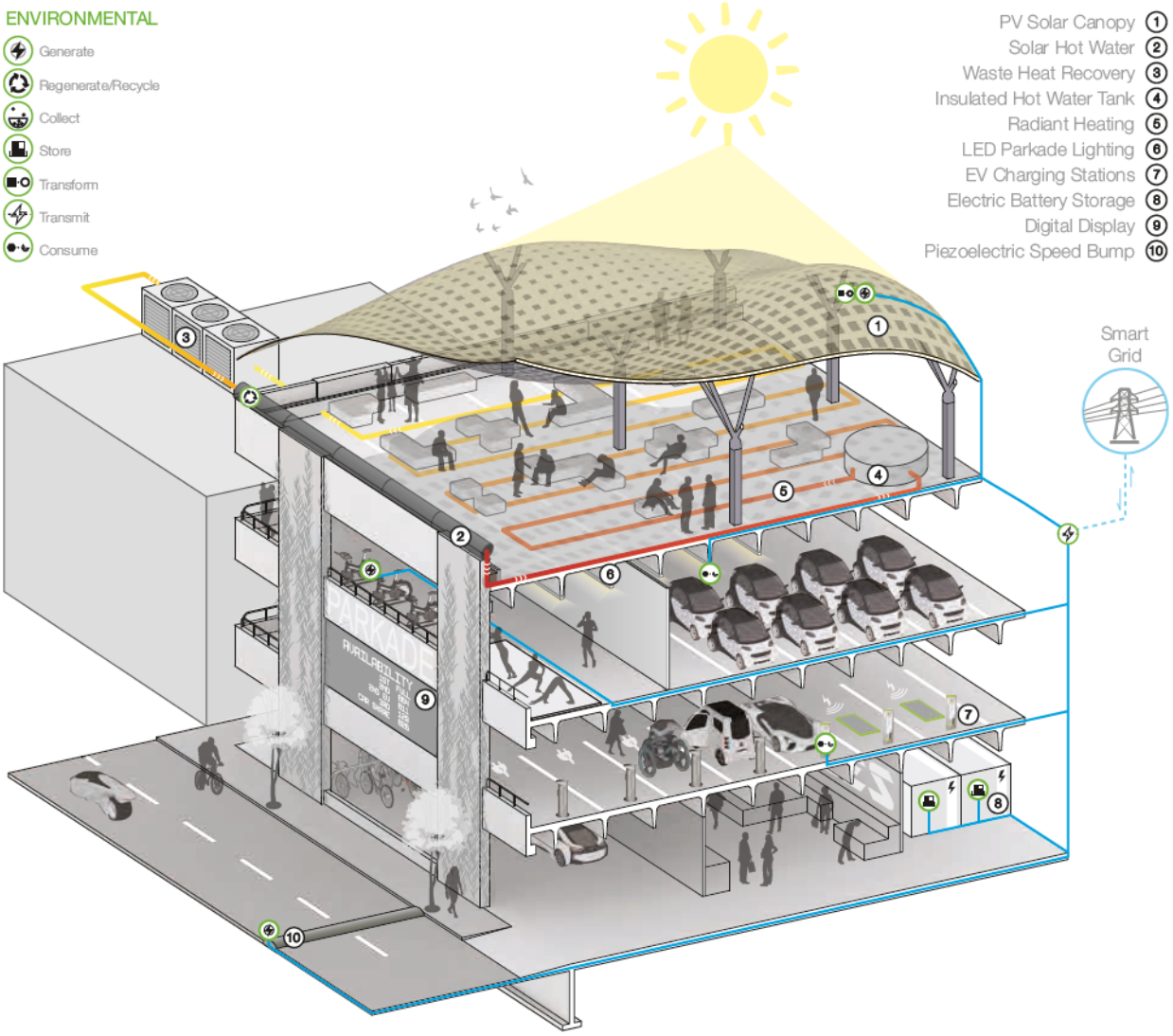
The top render utilizes the open roof as a possible drone landing area. Amazon is currently going through the process to begin testing drones for small package deliveries (80% of Amazon's deliveries are 5-7 lbs). Likewise UBC could employ drones throughout campus, whereby the roofs of parkades could act as landing hubs, charging stations and sorting areas.

The middle render shows a rooftop canopy of photovoltaics which could convert sunlight into energy for use within the parkade. The canopy could also shade portions of the roof for social functions.

The bottom render shows the roof as a recreational facility for various sports.

3.2.1 POINTS OF DEPARTURE: Energy Systems and Resources





Energy Systems and Resources Diagram

3.2.2 | MEASURES OF SUCCESS: Energy Systems and Resources

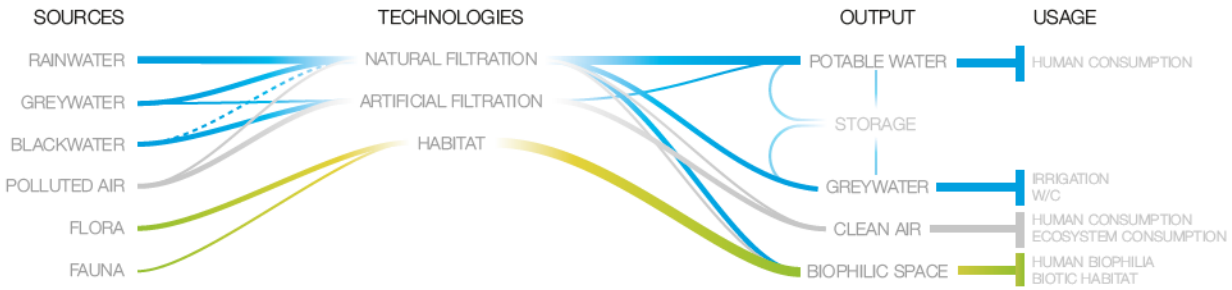
Several opportunities exist to harness, transform and utilize forms of energy within a parkade system. Depicted here is a mix of energy strategies which all function interdependently to provide benefit to the parkade, the surrounding environment, as well as its users.

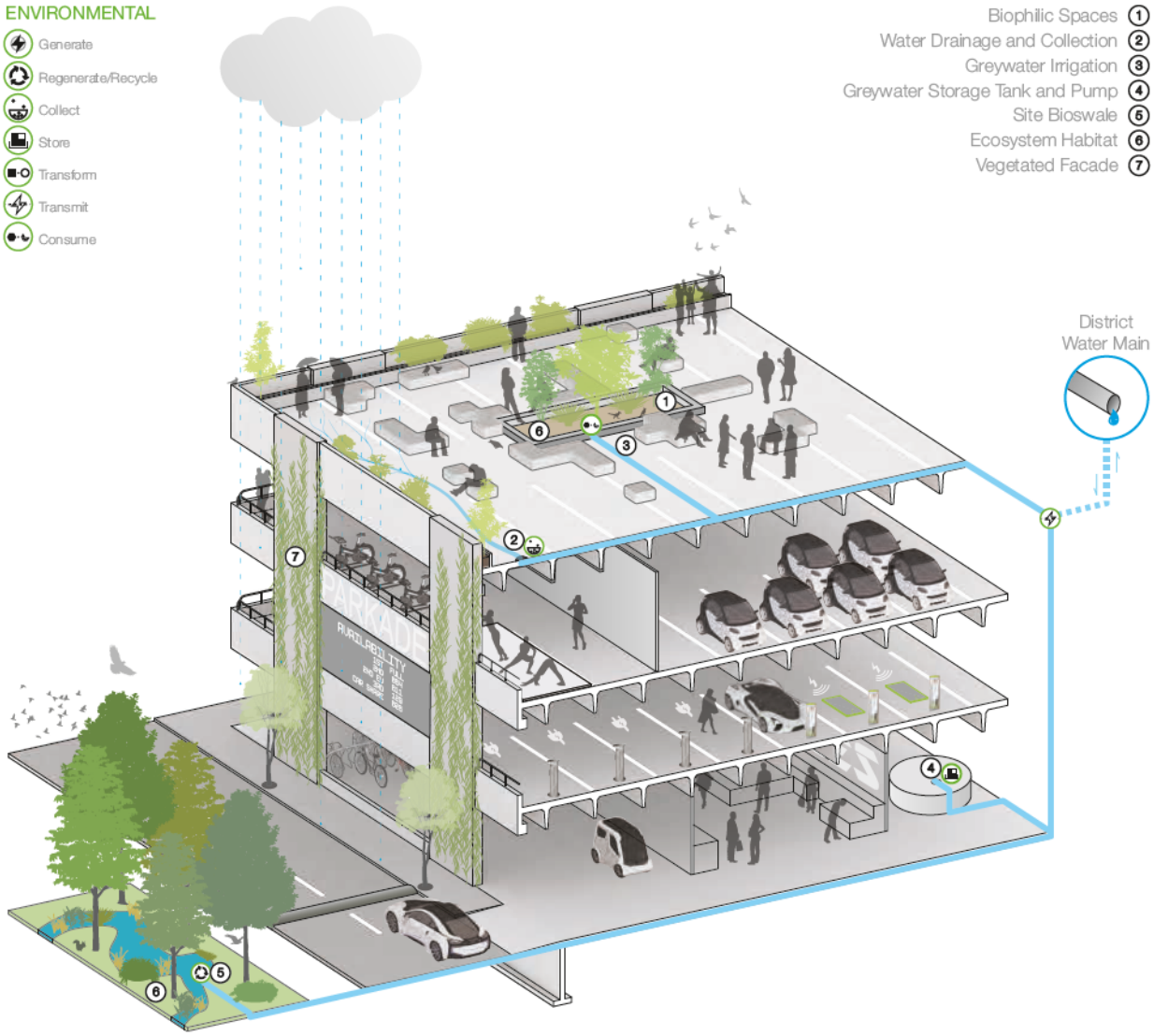
Several relevant energy sources have been identified along with the associated technologies developed to harness energy from each. The use of photovoltaic cells along with a solar hot water system are suggested as the primary source of on-site energy generation. As energy is collected it can then be further transformed into either electrical or thermal energy. Subsequent technologies such as batteries or insulated hot water tanks further allow these forms of energy to be stored and utilized at a more desirable time during the day. For instance, solar hot water tanks tied into a radiant heating system could be turned on during social events to heat seating or floor sections during occupation. Additionally, any excess form of energy converted into electricity can also be tied into the Grid and used by neighboring buildings, or other nearby consumers.

The ultimate intent is to arrive at a net-positive solution where each parkade is able to generate more energy than it consumes when operational. As parkades today are typically not energy intensive this aspiration is much more easily attained and sustained over time. The biggest challenge to meeting this goal is climatic fluctuation and maintaining energy generation during winter months. To build more resiliency options for a district-wide energy system could also be further explored and have each parkade act as an "energy hub" which transforms and directs energy from nearby buildings, thereby increasing the efficiency and redundancy of the system and improving its value. During the winter months the parkade could depend on waste heat from neighboring buildings using heat recovery technologies to warm spaces of occupation or prevent freezing where undesirable.

As more advanced technologies continue to develop the integration of smart systems can offer further benefit to parkades. Use of technologies that reduce energy consumption and can provide real-time feedback mechanisms to display energy usage will additionally help to increase the efficiency of the overall system. However, other changes such as an increase in electric vehicles (EVs) may work to increase electrical load within parkades during times of charging. The development of a robust, interconnected and dynamic energy system is therefore best suited to endure into the future and accommodate changes to come.

3.2.1 | POINTS OF DEPARTURE: Environmental Systems and Resources





Environmental Systems and Resources Diagram

3.2.2 | MEASURES OF SUCCESS: Environmental Systems and Resources

In addition to energy several other environmental factors can be used by parkade facilities to improve functionality and provide amenity. In particular, the harvesting and use of water has a strong potential within parkade systems. Depicted here is the integration of a water catchment and filtration system which ties the parkade into the surrounding landscape.

As parkades typically have large open roofs the collection of water for diversion is already needed. However, the opportunity to use the collected water in a variety of productive ways exists. Since much of the water that runs along the parking surface is prone to picking up toxic chemicals associated with combustion-engine vehicles and rubber tires, it must be treated in some fashion before it can be further used by people or the surrounding environment. This process of filtration can be attained either through human-created artificial systems, natural flora systems or a mixture of both.

The creation of external bioswales provides a strong opportunity for the parkade to divert collected graywater into a natural system for filtration or overflow runoff which benefits the surrounding ecosystem rather than simply entering the district water system. If integrated on the roof, small-scale bioswales could provide an initial step of biofiltration which could be paired with a more active human filtration system and provide potable water for human use and consumption. In addition graywater can also be stored in tanks and used intermittently during the day, week or month to maximize efficiency and control. Integration of vegetation systems on the roof or throughout the parkade also provides the added benefit of a biophilic effect - a positive human response to natural living systems.

3.2 PRECEDENT RESEARCH: New innovative parkade technologies

Smart Parking

Smart parking is a new system of technology which tracks the availability of parking space through a network of wirelessly connected infrastructure. The collected information is assessed 24/7 to achieve demand-responsive pricing. By increasing the rate at a congested area and decreasing it at a more vacant area, the system ensures a balanced use of all the parking spaces. The information can be accessed online or on a smartphone app to allow users to choose where to park based on the up-to-date rate and availability of the various parking spots.

Smart parking can be achieved two ways:

Figure 3.2.1
License plate recognition camera

I. License plate recognition system

Required Components

- Industrial PC
- Automation System
- Data Concentrator
- License plate recognition camera
- Parking Display
- App

Figure 3.2.2
Captured images of license plate

System of Parking

1. A camera at the entrance of the parkade captures the license plate of incoming vehicle.
2. The computer receives the data, marking the exact time of entrance.
3. User parks the car in the parkade.
4. When the user exits the parkade, the camera once again captures the license plate number and automatically charges the appropriate amount according to the duration of stay.

Advantage

- Can use existing parking structure
- Can be implemented now with many precedents
- Increased parking efficiency
- Relatively inexpensive

Disadvantage

- Not as accurate as sensors
- Cannot determine the location of cars in the parkade
- Requires the registration of license plate number of each vehicle to be efficient.

Figure 3.2.3.
Parkade with real time parking display

Figure 3.2.4.
Ultrasound sensor on the ceiling detects presence of cars below

Figure 3.2.5.
Real-time parking displays on the street guide drivers the optimum parking garage

II. Ultrasound sensors

Required Components

- Industrial PC
- Automation System
- Data Concentrator
- Sensor
- Parking Display
- App

System of Parking

1. The sensors detect the presence of car in each lot. The data is collected, processed, and displayed real time
2. User can view all available paking spaces and the corresponding rate through the app or the outdoor displays
3. User books a parking spot in the parkade using the app
4. User parks in the reserved spot
5. User pays using the app

Advantage

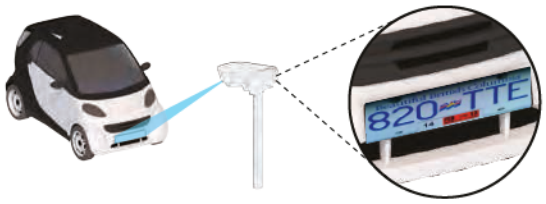
- Can use existing parking structure
- Can be implemented now with many precedents
- Increased parking efficiency
- Works on a city scale, providing systematically efficient parking for all cars

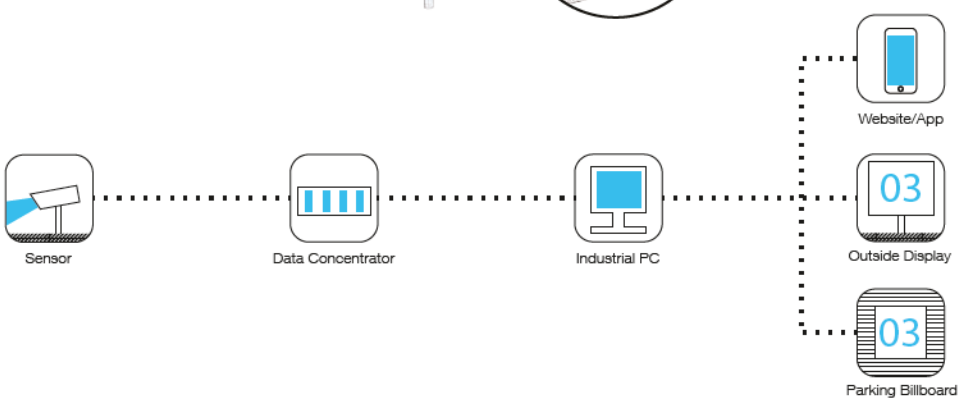
Disadvantage

- Many required components that could add up to be costly
- Requires installation of sensors on every stall
- Still required to park in a traditional manner

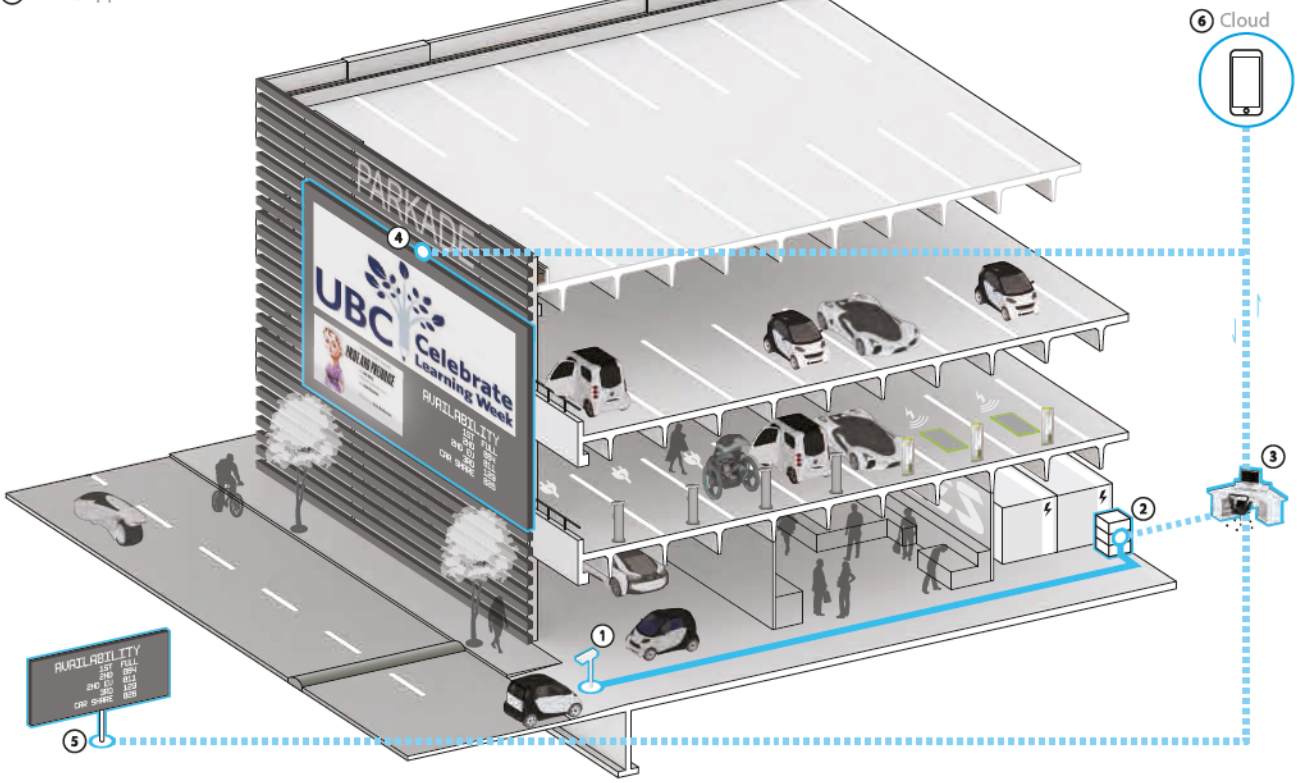
3.2.1 | POINTS OF DEPARTURE: Technology Systems

License Plate Recognition System



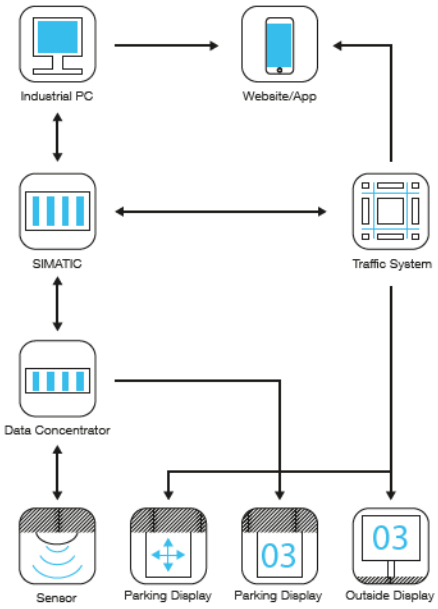


1. License Recognition Camera
2. Data Collection
3. Industrial PC (Off-site)
4. Parking Billboard
5. Off-site Display
6. Web/App



3.2.1 | POINTS OF DEPARTURE: Technology Systems

Ultrasound Sensor System



Industrial PC
Workstation and server for fast, parallel processing of large data volumes in industrial image processing, process visualization, data collection and processing.

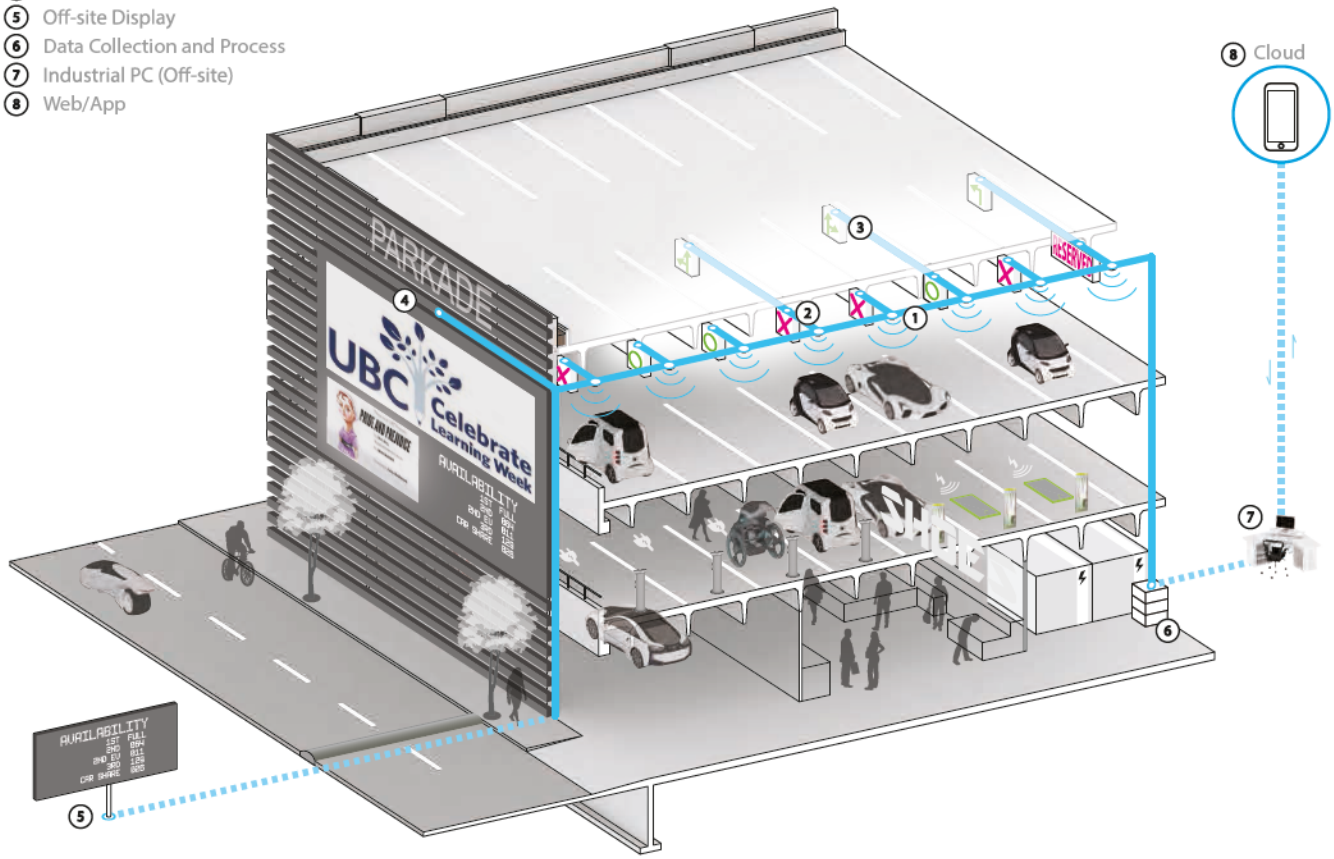
SIMATIC
An industrial automation system. Used for controlling, integrating technology, archiving data, and coordinating entire systems.

Data Concentrator
Transformer stations that compile and process the data from the meters.

Sensor
Every single parking space is equipped with an overhead ultrasound sensor that detects its occupancy status and transmits the data in real time to the control system.

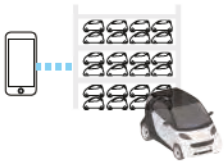
Parking Display
Off-site parking displays show parking available in the vicinity.

1. Sensors
2. Parking Display (Availability)
3. Parking Display (Direction)
4. Parking Billboard
5. Off-site Display
6. Data Collection and Process
7. Industrial PC (Off-site)
8. Web/App



3.2.1 | POINTS OF DEPARTURE: Technology Systems

Fully Automated Parkade



1. *The user orders a car to be in front of the house at a specific time*

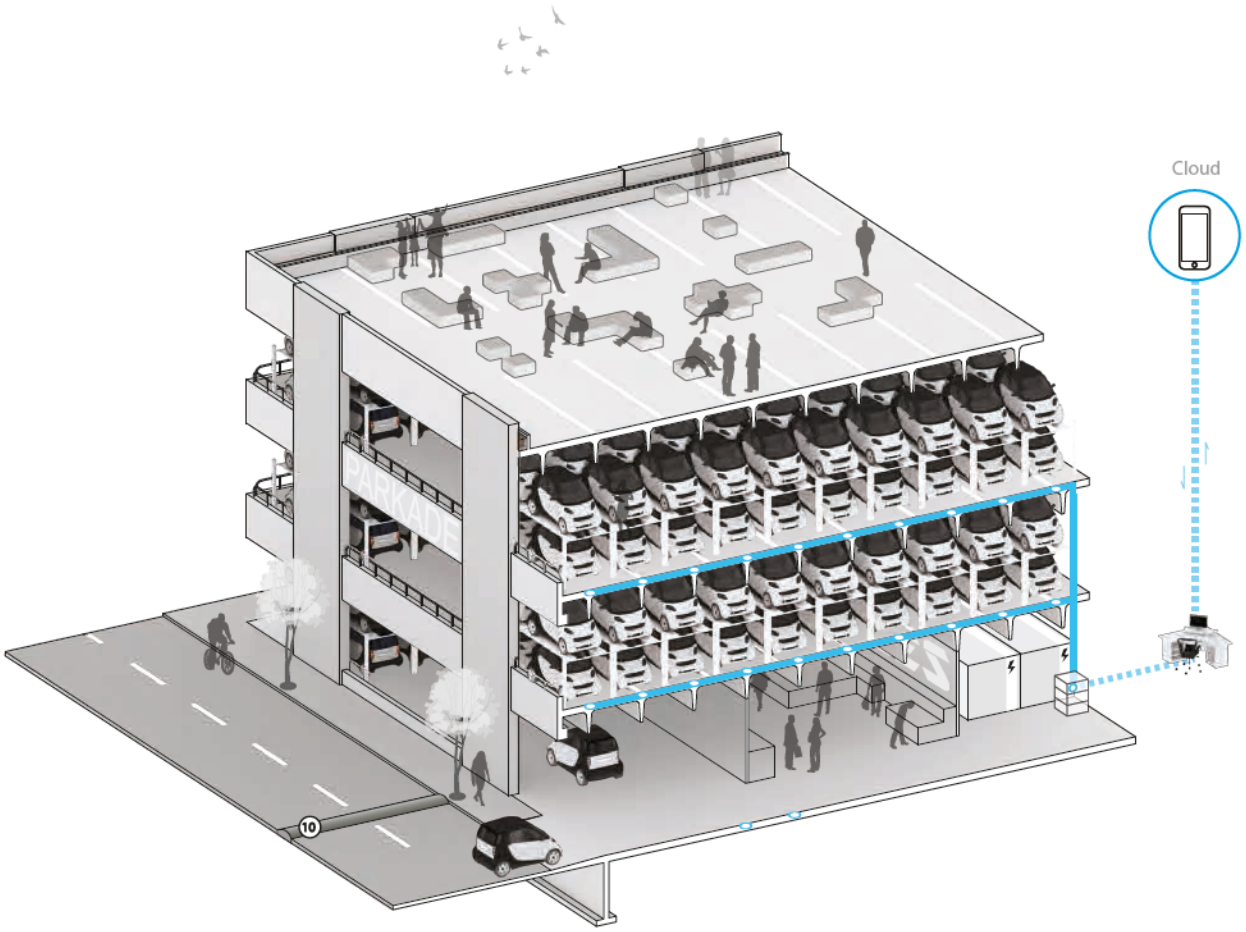
2. *The user is greeted by a car at home*

3. *The user gets off at work and the car leaves to the parkade*

4. *The user orders a car*

5. *The user is greeted by a car*

6. *The user gets off at home and the car leaves to the parkade*



3.2.2 | MEASURES OF SUCCESS: Technology Systems

LICENSE PLATE RECOGNITION SYSTEM

The first technological enhancement the parkades can receive to improve its efficiency is the license plate recognition system. This system is the most affordable and easily installed on any type of parkade. The license plate recognition camera at the entrance of the parkade captures the license plate number of incoming vehicles. The captured image is analyzed and collected in the data collection system. This way the administrator is always aware of the exact number of cars in each parkade as well as the exact time which each car entered the parkade. Such information can be used to alter the rates of each parkade according to the occupany level to have an even distribution of cars in the various parkades. The relevant information can also be transmitted to outside displays, parking billboard, and associated app to facilitate the parking experience for the users.

ULTRASOUND SENSOR SYSTEM

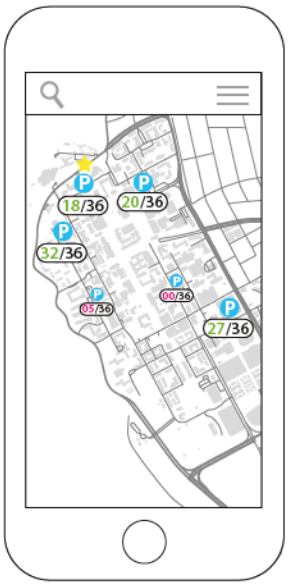
The second type of technological internvetion is achieved through the installation of ultrasound sensors. Compared to the license plate recognition system, the cost is considerably higher as the sensors must be installed above each lot. On the other hand, the sensors provide the administrator with a more detailed analysis of the parking occupancy condition. Unlike the previous technology which can only indicate the overall occupancy level of the parkade, each sensor indicates exactly which lots are occupied and available. This allows for greater control over parking and manipulation of parking space according to the changing level of demands. For example, certain lots can be reserved for certain events. The different types of parking spaces, such as electric charging lot, reserved lot, and/or handicap lot, can all be manipulated freely. Through the app, the user is always informed of these changing conditions, able to plan ahead of time.

FULLY AUTOMATED PARKADE

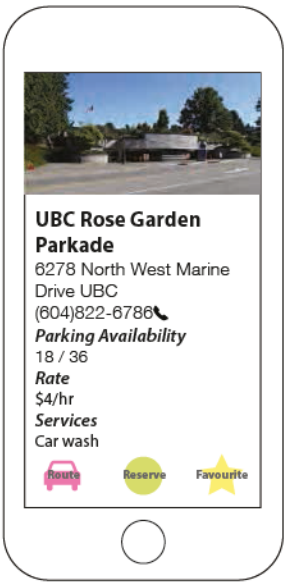
The third type is a futuristic scenario in which the parkade becomes fully automated. This scenario assumes that the automated cars take on the trajectory of a largely car sharing model akin to car2go. In such case, the existing parkade can be retrofitted to accomodate many more cars as they can be stacked on top of each other. The automated cars would leave the parkade as it is requested by a user, and return and park itself as it finishes its duty. The user does not need to go to the parkade, but the car comes to the user at all times. The higher concentration of cars means that other spaces in the parkade can open up to have a more social function such as a rooftop patio or ground level commerce.

3.2.1 | POINTS OF DEPARTURE: Technology App

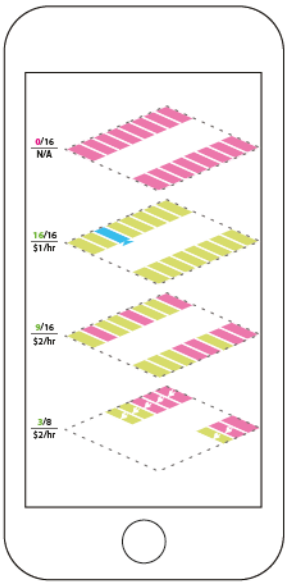
In all scenarios the app plays a large role in defining the experience of the users. The use of app has the potential to greatly enhance the parking process, reducing traffic on campus and improving parking availability. The app can connect users not only to the parkades but also to the overall UBC network to provide a parking experience that is more social and productive. The following diagrams indicate the process of parking with the ultrasound sensor system in place.



1. The map in the app indicates the location of parkades at UBC and their availability.

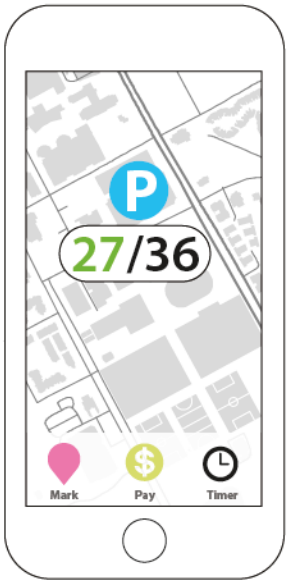


2. A detailed information on each parkade is available by simply tapping on it. In addition to providing information such as the address, contact information, current rates and availability, this page also allows the user to show the routes, make a reservation, or favourite it.



3. A real-time 3D infographic of parking availability is available for each parkade. The diagram shows the availability and rateof parking on each floor as well as electric charging stations.

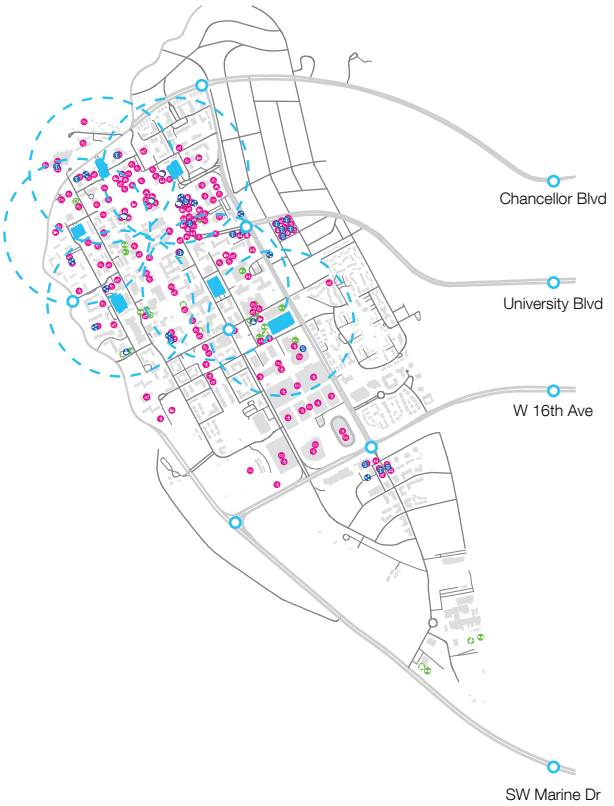
4. Once the user sets a particular parkade as a destination, the app gives driving directions. The map shows the 5km radius reservation area where the chosen parkade is automatically reserved when the user enters it. The reservation can be confirmed, cancelled or changed.

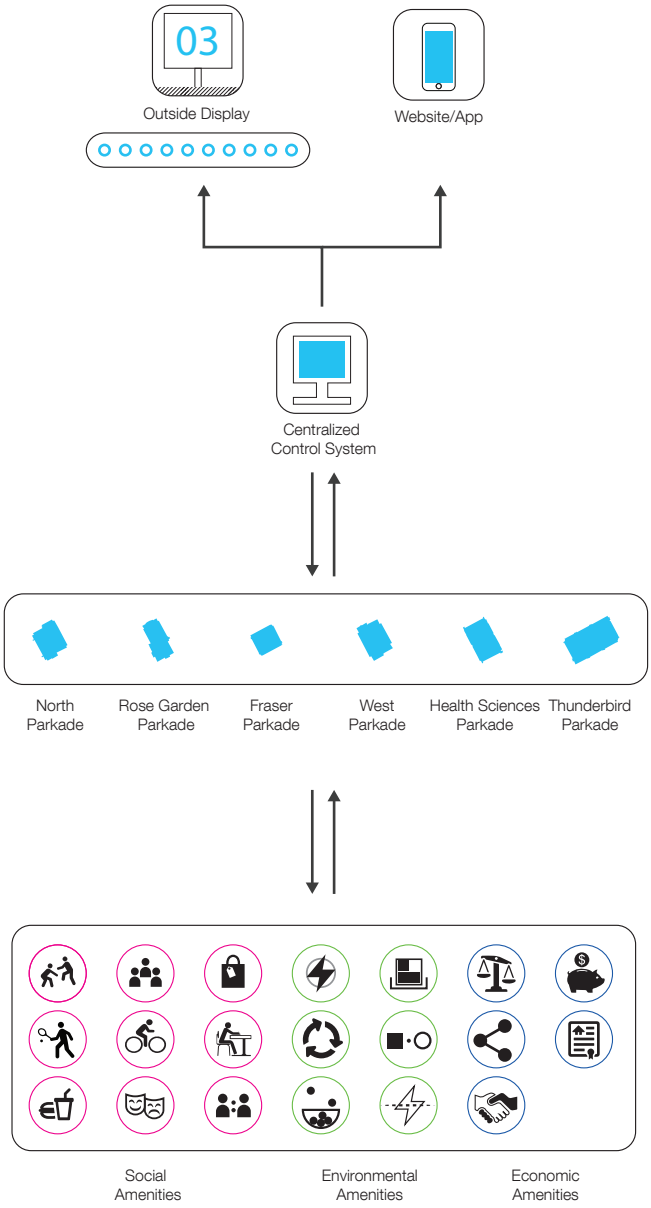


5. Once parked, the user can pay with phone. The payment would be automatically processed when the car enters the parkade if the user is registered.

6. The map can be toggled to also show other layers of information such as nearby restaurants, cafes, sports facilities, events etc.

3.2.1 | POINTS OF DEPARTURE: Technology Network





The six parkades on campus have the potential to be integrated into one system through a digital network.

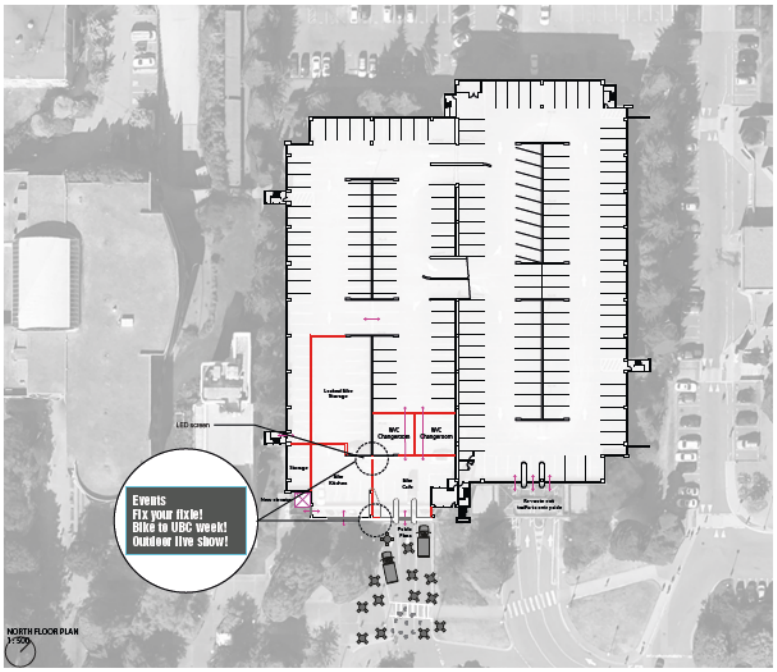
The first map shows the locations of the parkades and the potential locations of outside displays on and off campus. Real time information on parking availiability would be shown on the displays, and also accessed through a dedicated app.

The second map shows the potential integration of the parkades to the surrounding amenities. The appropriated spaces of the parkades can function to accmodate extended services from nearby amenities.

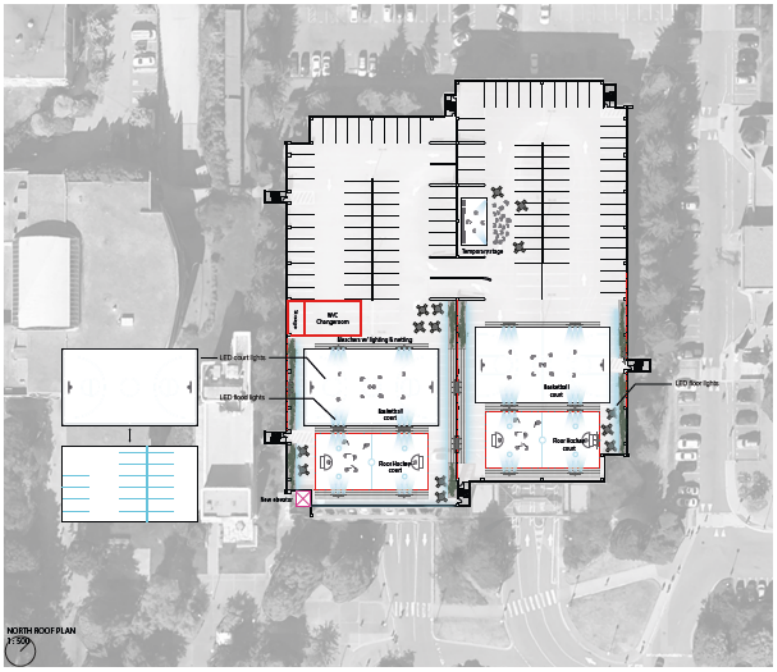
Economic, Environmental and Social maps

3.3.1 | FUTURE SCENARIOS: NORTH PARKADE

North Parkade is envisioned as a student sports and recreation hub.



North Parkade Main floor plan



North Parkade Roof plan

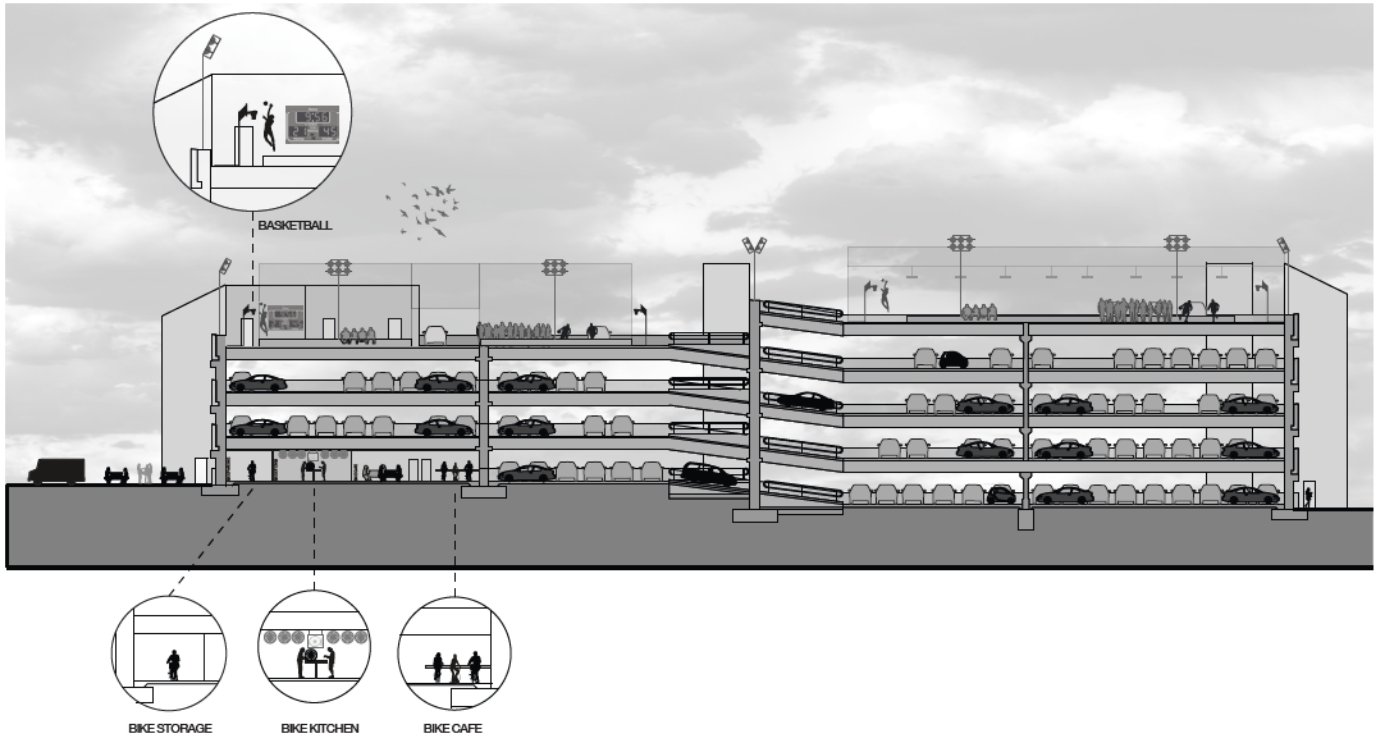
NORTH PARKADE: PROGRAM ADDITION OVERVIEW

Due to its close proximity to the Student Union Building, North parkade has a potential to house more student led events. It is nearby a major transportation node, indicating heavy foot traffic along the southern facade. In this scheme, the exit of the parkade has been re-routed alongside the entry, opening up the left southern portion of the parkade for retail use. The UBC Bike Kitchen, bike commuter facilities and lockers as well as a bike cafe have been inserted into this space with retail frontage. The entry to this new retail space is re-imagined as a landscaped plaza, where food trucks and temporary seating can be installed for events.

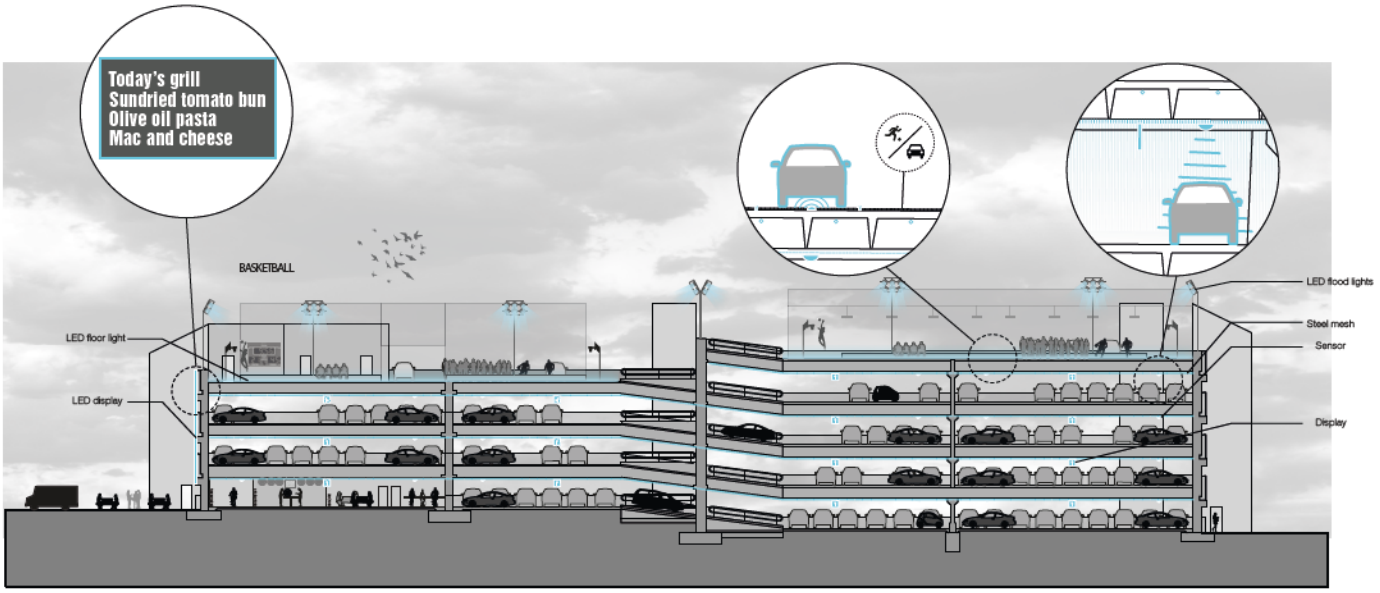
NORTH PARKADE: PROGRAM ADDITION OVERVIEW CONT'D

A proposed elevator as well as main floor and rooftop washrooms/change rooms are necessary to maintain these spaces as comfortable and convenient for their associated program additions.

The roofscape is imagined as a space for basketball and ball hockey courts. Moveable bleacher seating, LED court lighting (both on the ground and in the air) and netting have been added in order to facilitate play during the day and night. Lighting can change between a parking configuration for parking hours and a court configuration for play hours, meaning that flexible parking can remain. Courts could cover the roof or only take up a portion, and a temporary stage could be installed on the upper portion of the roof for events and ceremonies. Vegetation in planters around the courts can help soften the user experience and absorb sound.



North Parkade Section showing social activation



North Parkade Section showing new technology

North Parkade photograph of current condition showing the underutilized roof area

North Parkade rendering depicting the roof courts and social seating

North Parkade photograph of current condition showing the underutilized roof area

North Parkade rendering depicting the roof courts and social seating at night

Roof activation: sporting events during the day

Roof activation: sporting events during the night

3.3.2 | NORTH PARKADE: SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The changes to North parkade primarily deal with the social and sport activation of the roof and insertion of bike commuter facilities on the main floor to symbiotically fit into its surroundings.

Social impact

- Re-routing the exit of the parkade on the main floor opens up easily accessible space for retail along the south facade.
- Having North parkade act as a bike hub encourages people to use the various commuter facilities and partake in bike culture in a more accessible and social way.
- Re-routing the exit of the parkade allows social space to spill out of the parkade and into a new landscaped plaza area in front, where food trucks can park and temporary seating can be installed for school events, lunch, etc.
- Activating the roof of the parkade as a rentable sports area creates camaraderie and connectivity between North parkade and its surroundings, such as nearby UBC Recreation and the Student Union Building.

Environmental impact

- LED lighting should replace all existing lighting throughout, resulting in bulbs which last longer over time reducing maintenance costs and are more energy efficient.
- Encouraging biking as an alternative mode of transportation by providing a social hub for bikers to gather, safely store their bikes and shower reduces emissions and has the potential to build a strong bike culture that can grow into the future.

Economic impact

- Technology additions include: vehicular sensors, LED display screen relaying campus information, rooftop events, and parking availability. These all have economic repercussions.
- By utilizing the rooftop, which is currently underused for parking, for other social and student events the hope is that money spent on parking on the roof would not be lost, and the roof could be rented for a fee which would allow the parkade to potentially make money in ways which it currently does not. (See the Lincoln Road precedent study for more information on renting out areas of a parkade for events.)

3.3.3 | NORTH PARKADE: MEASURES OF SUCCESS

The success of North parkade lies in increasing the intensity of the parkade through sport and recreational facilities in order to fit into its immediate context.

UBC in general is in need of more commuter facilities for students who do not live on campus. This is evident by the success of the UBC collegiate program, and the hope to build more commuter facilities in new developments across the campus.

The campus is also lacking easily available and secure bike storage as well as adjacent shower facilities for those who travel by bike from afar. By creating a bike hub and commuter facility in one, the hope is that commuter students can meet and increase the social connectivity of the campus.

Theming the main floor retail space along bike facilities ensures connectivity amongst new inserted program to its surrounding context. For instance, the bike cafe proposes to use a stationary bike system which encourages users to pedal in order to power their electronic devices. This system was used in the Wilder Snail cafe in Strathcona with success.

Activating the roof space by providing program that can be rented or leased makes economic sense as the roof is the most underutilized parking area. However, allowing the roof event space to be temporary means that parking in times of high demand can still be maintained.

Figure 3.3.1
Wilder Snail cafe pedal powered electrical outlets

Play is encouraged on the roof of the parkade in various forms. Flexible space for more organized sports, as well as space for temporary events can be demarcated with temporary seating and in floor LED lighting. LED screens on the parkade facade could display scores as well as information on events, for both the roof and the main floor. In this way, North parkade will become an active member in its social surroundings

Allowing the main floor to act as a social bike hub and landscaped plaza area increases the social connectivity along the main southern facade of the parkade, which has heavy pedestrian foot traffic.

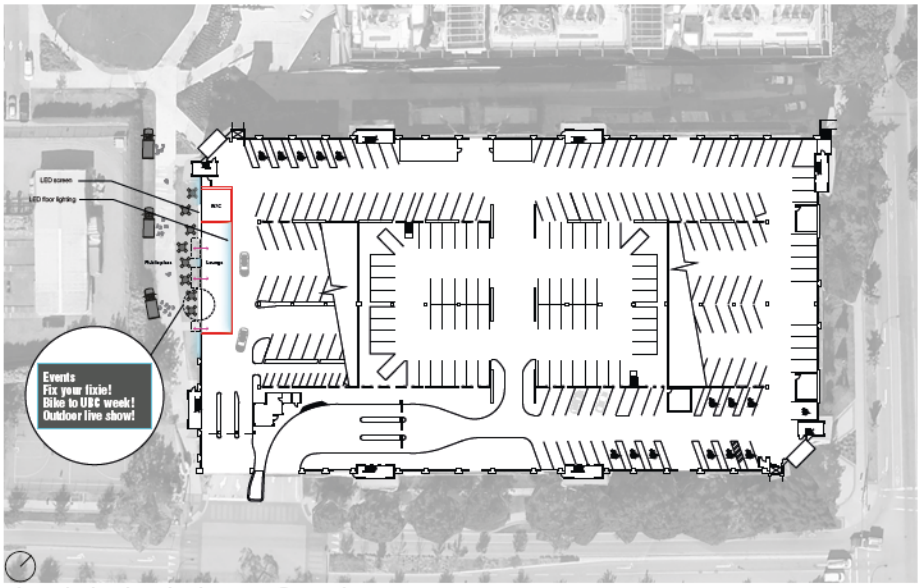
The ability to rent the roof for various sporting events means that it can better contribute to the economic viability of the scheme. In addition, the retail space on the ground floor would also be leased or rented, increasing economic feasibility of the scheme.

The bike kitchen could work on a shared system of lending, whereby students volunteer to work in the shop to create a community of bike savvy enthusiasts. This would add to the bike culture of the school and promote biking as an important and social mode of transportation.

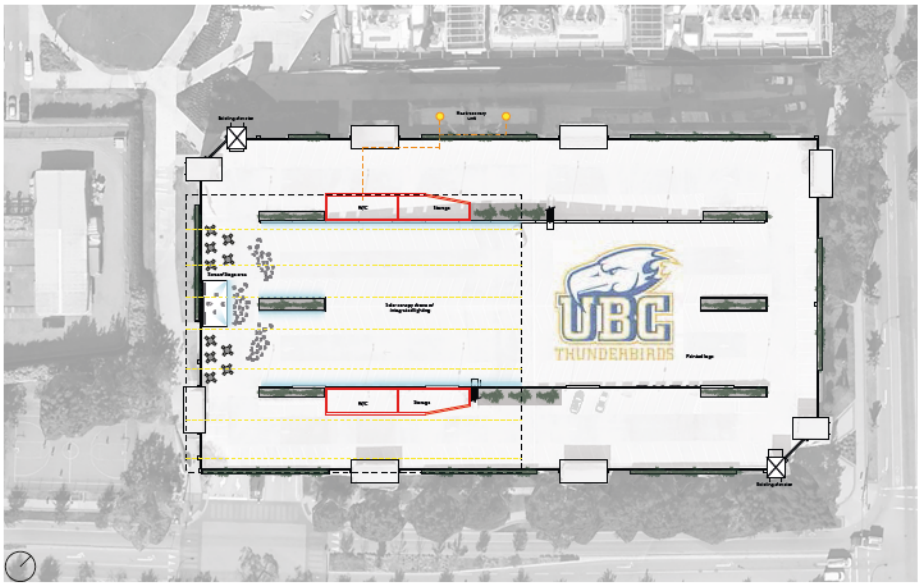
Economic, Environmental and Social maps

3.3.1 | FUTURE SCENARIOS: THURNDERBIRD PARKADE

Thunderbird Parkade is envisioned as an energy generation and storage facility, as well as student lounge space.



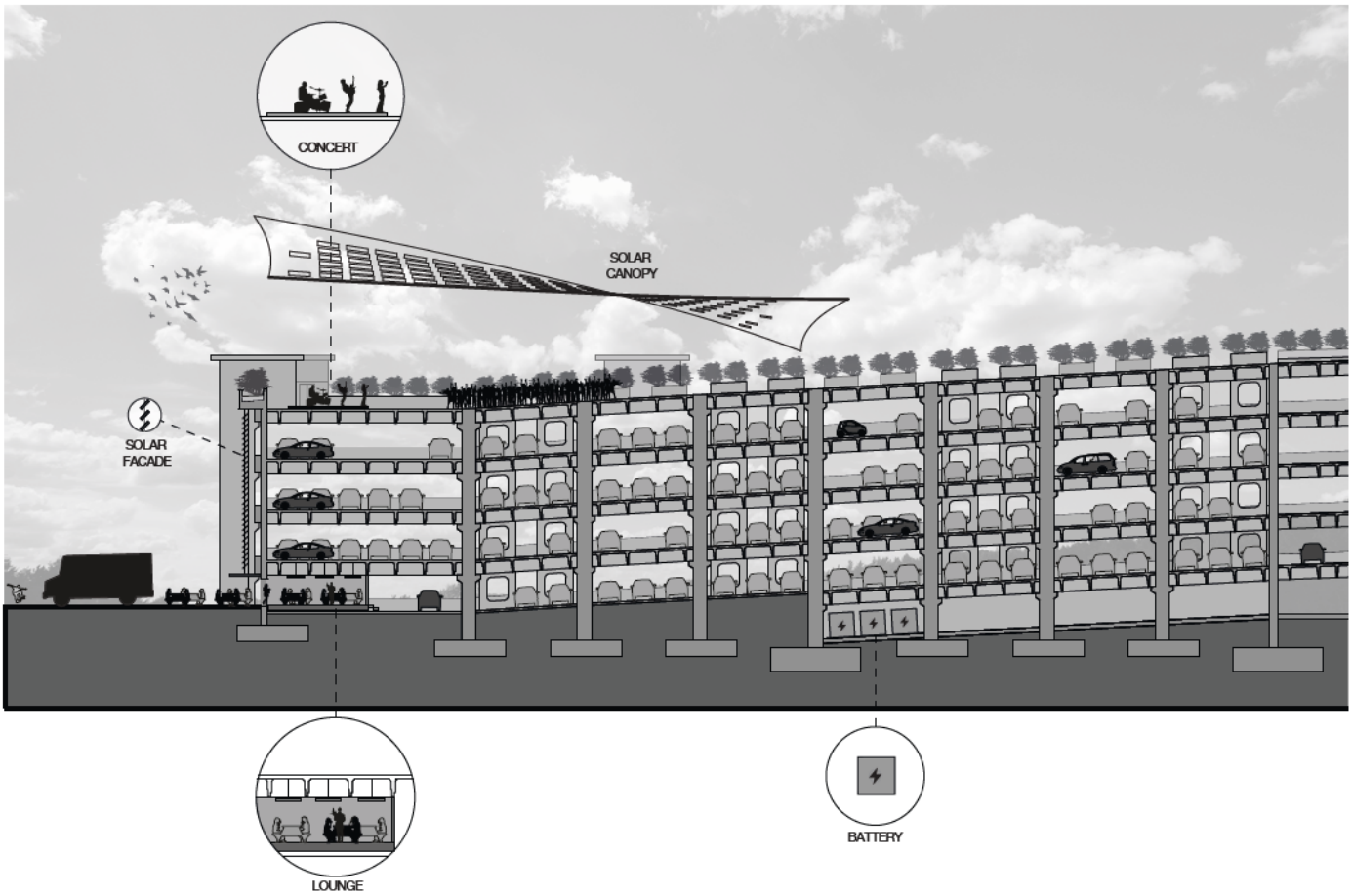
Thunderbird Parkade Main floor plan



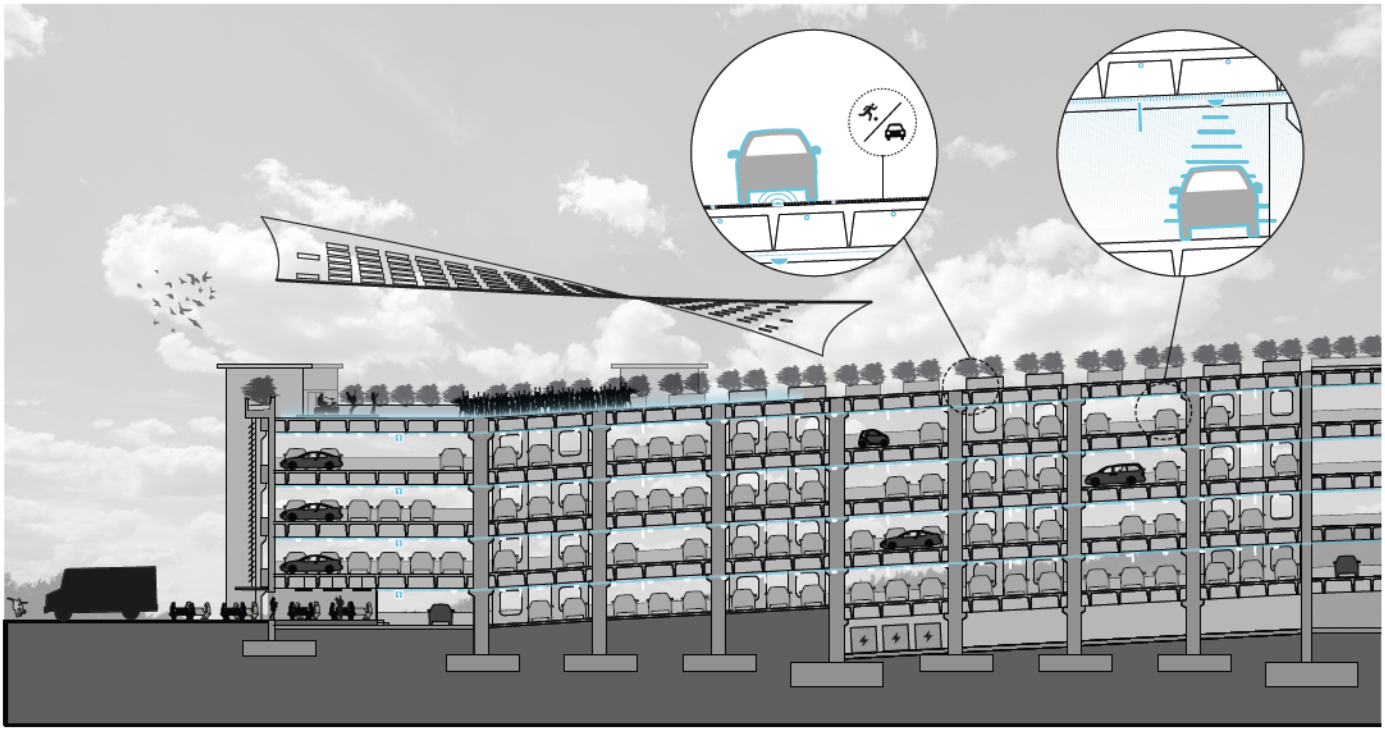
Thunderbird Parkade Roof plan

THUNDERBIRD PARKADE: PROGRAM ADDITION OVERVIEW

The close proximity to various sporting facilities presents the opportunity for Thunderbird parkade to take on student lounge and cool-down spaces. The roofscape houses a solar canopy to provide energy for new program and can contain temporary event space with great views out to the water and surrounding campus. The addition of retail on the Western side of the parkade, adjacent to the basketball court and skatepark, which opens directly to a busy walkway, presents opportunities for food and drink as well as student gathering spaces before/after sporting events. The addition of washrooms and energy conversion and storage facilities will better allow Thunderbird to take on its additional program.



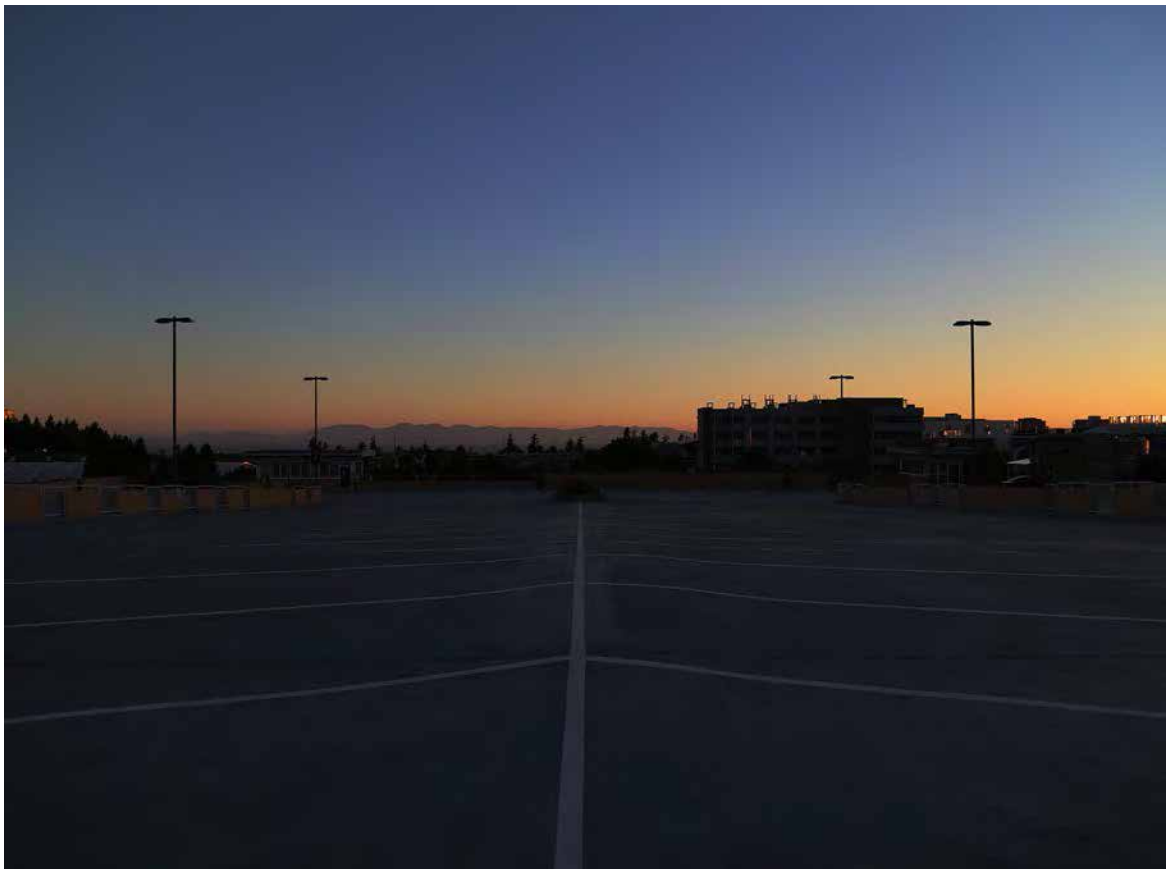
Thunderbird Parkade Section showing social activation



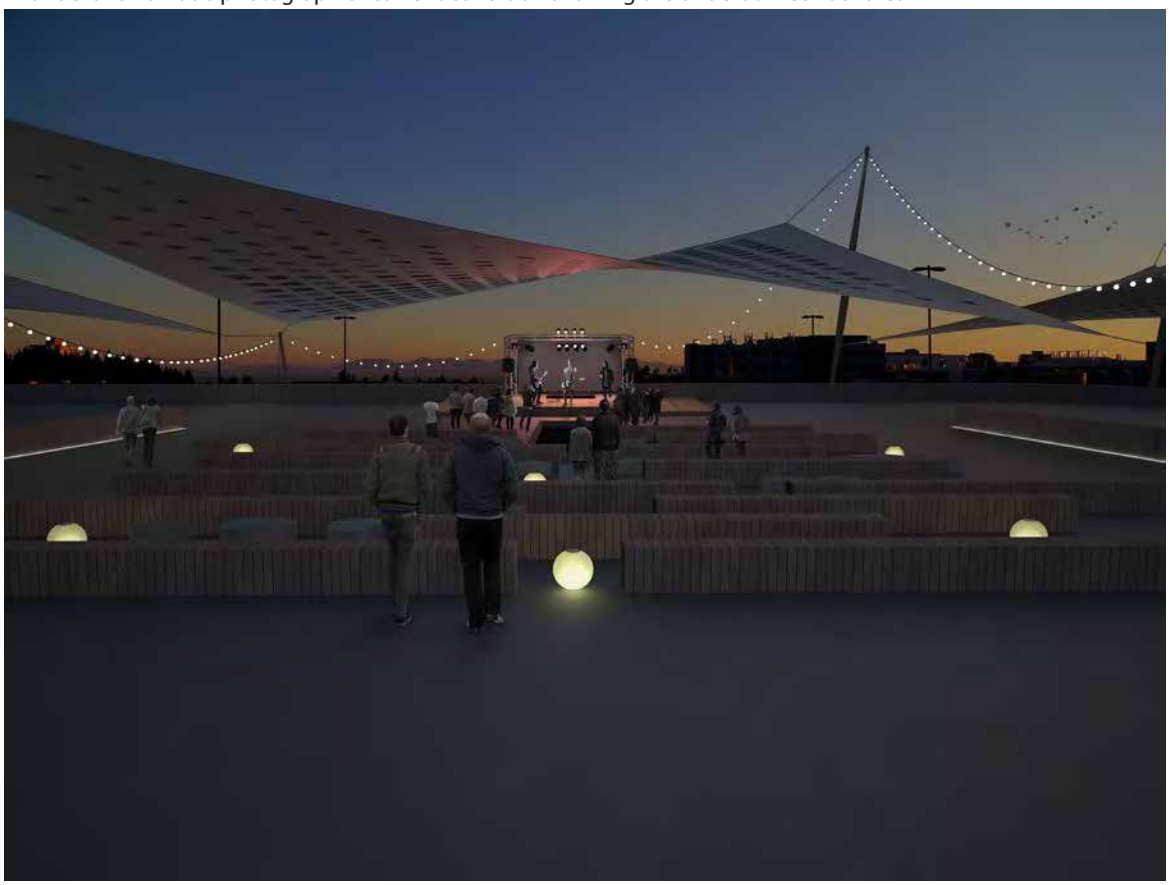
Thunderbird Parkade Section showing new technology

Thunderbird Parkade photograph of current condition showing the underutilized main floor area

Thunderbird Parkade rendering depicting the main floor retail activation cafe/lounge space



Thunderbird Parkade photograph of current condition showing the underutilized roof area



Thunderbird Parkade rendering depicting the roof solar canopy and event space

Main floor retail activation: cafe/lounge space


Roof activation: solar canopy and event space

3.3.2 | THUNDERBIRD PARKADE: SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The changes to Thunderbird parkade deal with the generation and storage of energy for use within the new inserted program of lounge space on the main floor, and rooftop partially covered event space.

Social impact

- By allowing the roof of the parkade to act as a social host, it becomes a catalyst for events as it attracts people to the partially covered roof area.
- Providing a partially covered roof allows events to occur on a seasonal basis, protecting visitors from weather while providing an opportunity for lighting, and having a tensile solar canopy produced energy.
- Inserting lounge space along the Western facade has the ability to interact with the existing busy pathway, meaning that social space can spill out onto the green area adjacent to the walkway, and food trucks or various temporary vendors, can be situated there.
- Creating a lounge space (with the potential to serve locally made drinks and food, produced on the UBC farm) adjacent to the various sporting facilities will add lounge space to the area, which is currently lacking.

Environmental impact

- LED lighting should replace all existing lighting throughout, resulting in bulbs which last longer over time reducing maintenance costs and are more energy efficient.
- The rooftop solar canopy provides shelter while allowing views to the ocean to remain from the sloping surface, and simultaneously captures solar energy, converting it, storing it, and using it on-site.
- Recovering lost heat from the adjacent pharmaceutical building, and/or arena, are also important components of the energy harvesting system.
- The addition of solar facades on the parkade will also aid in energy generation and could respond to the surrounding areas with various screen, perforation and louver configurations.

Economic impact

- Technology additions include: vehicular sensors, LED display screen relaying campus information, rooftop events, and parking availability. These all have economic repercussions.

- The addition of lighting on the ground of the roof as well as integrated into the tensile solar canopy would also have an economic impact on the space.
- By utilizing the rooftop, which is currently underused for parking, for other social and student events the hope is that money spent on parking on the roof would not be lost, and the roof could be rented for a fee which would allow the parkade to potentially make money in ways which it currently does not. (See the Lincoln Road precedent study for more information on renting out areas of a parkade for events.)
- The potential for single stall retail along the Eastern facade facing the busy road is also a potential economic generator within this scheme. This could be temporary, or pop up space which could sell event related merchandise.

3.3.3 | THUNDERBIRD PARKADE: MEASURES OF SUCCESS

The success of the scheme for Thunderbird parkade lies in its harvesting energy from its surroundings and the environment in order to allow any new inserted program to remain energy efficient. The close proximity of various new and old energy generation and storage facilities has been at the core of this scheme. The ability to capture heat from adjacent buildings, which is currently released into the atmosphere, is a smart and relatively invisible proceedure, while solar panels and facades represent a more visible and intensive approach to energy generation/storage.

Integrating the energy storage and generation with social acitivies, such as lounge space on the main floor or partially covered event space on the roof, is an important element of the success of this scheme. Providing a social space for gathering after sporting events is also something which is lacking in the area and would greatly contribute to the leisure and sporting atmosphere of the area.

Providing retail space along the Western facade, adjacent to heavy foot traffic and close to the basketball court and skatepark, will activate the adjacent green space which is currently left underutilized (see image above). Providing overhead shelter and temporary or permanent furniture will allow this space to actively participate in its surrounding social and activity landscape.

Providing main floor and rooftop space for people to gather in close proximity to the playing fields and arena will add to the social connectivity of the area, filling a gap in the amenities which currently exist in proximity to these spaces and important campus sporting events.

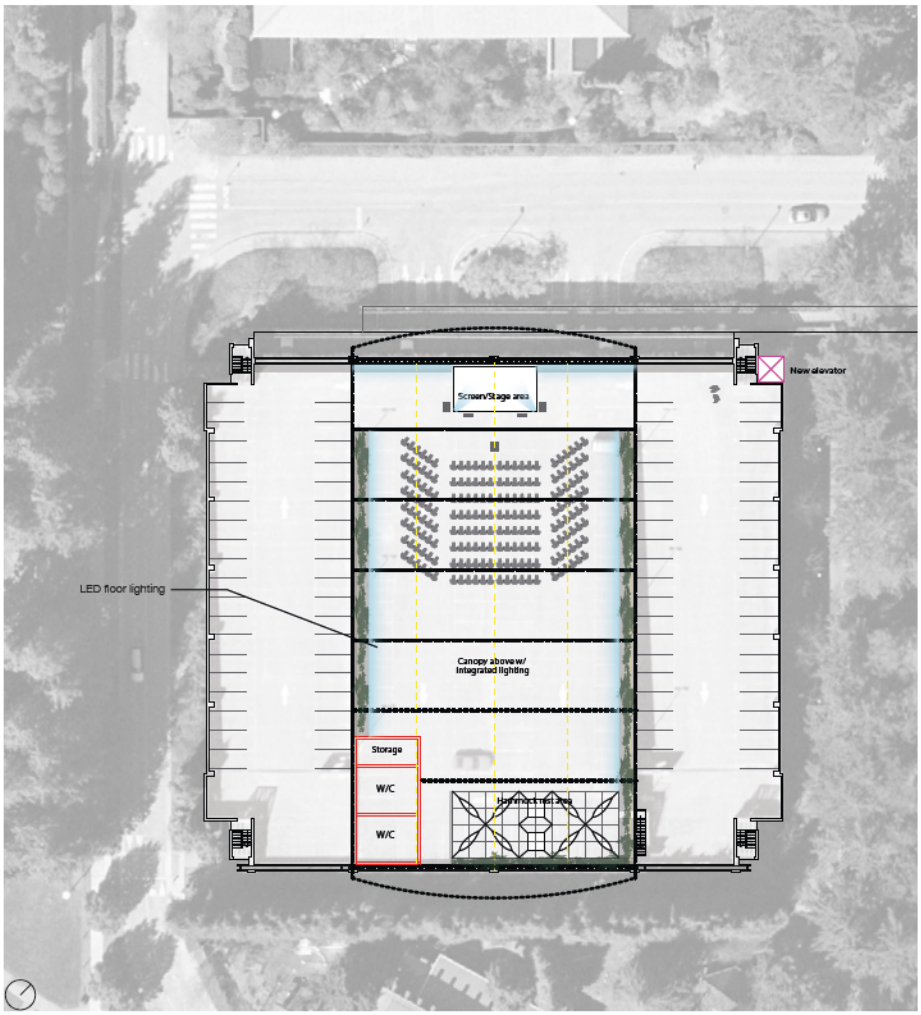
Energy generation, storage, conversion, collection, and transmission are the main goals of the changes to Thunderbird parkade. Various levels of energy integration include: solar panels on the roof canopy and facades, heat recovery, and planted vegetation on the roof.

The ability to lease or rent the roof or retail spaces during sporting events could also contribute to the economic feasibility of the parkade.

Economic, Environmental and Social maps

3.3.1 | FUTURE SCENARIOS: FRASER PARKADE

Fraser Parkade is envisioned as a student study and relaxation hub.



Fraser Parkade Roof Plan

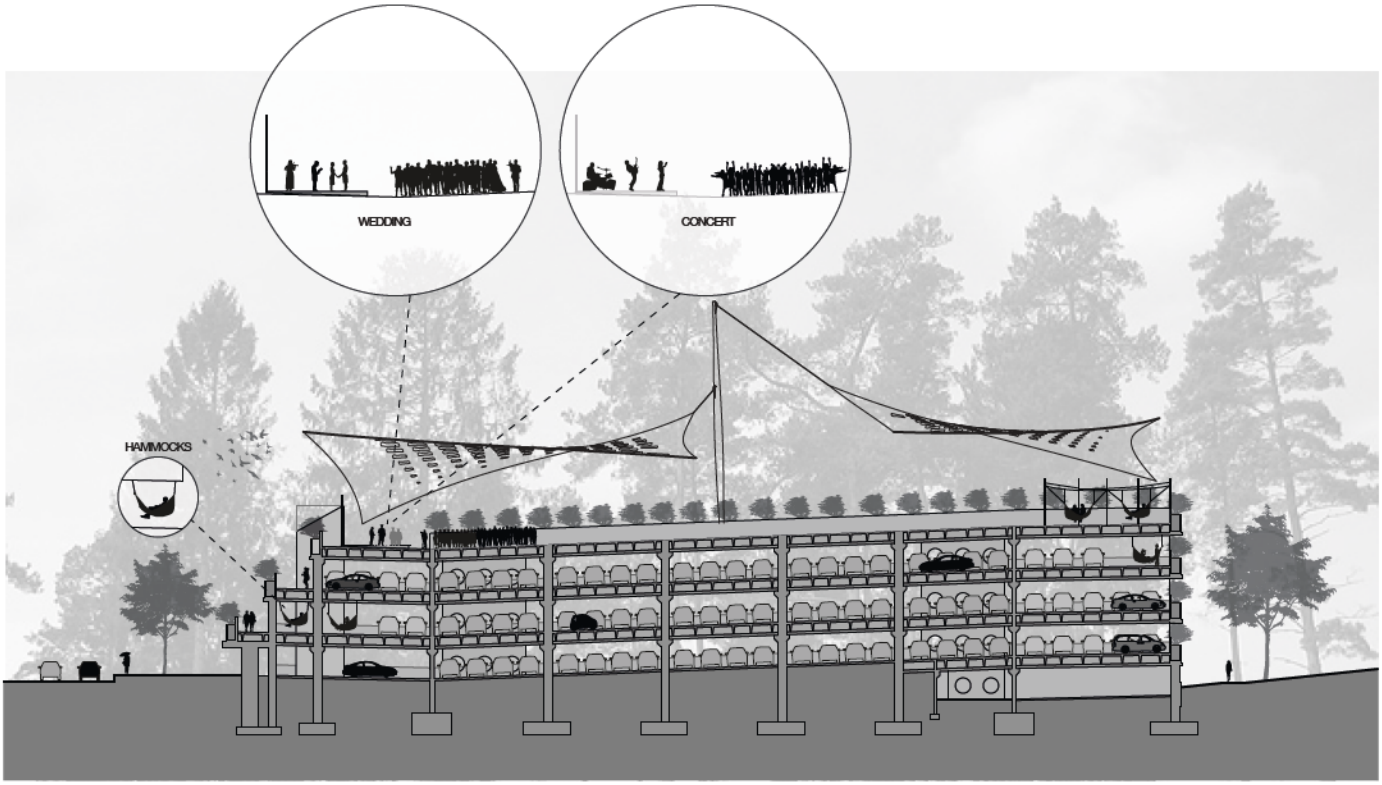
FRASER PARKADE: PROGRAM ADDITION OVERVIEW

The close proximity of diverse student cultural buildings as well as a dense, tall, lush forest canopy means Fraser Parkade has a quite and peaceful roofscape.

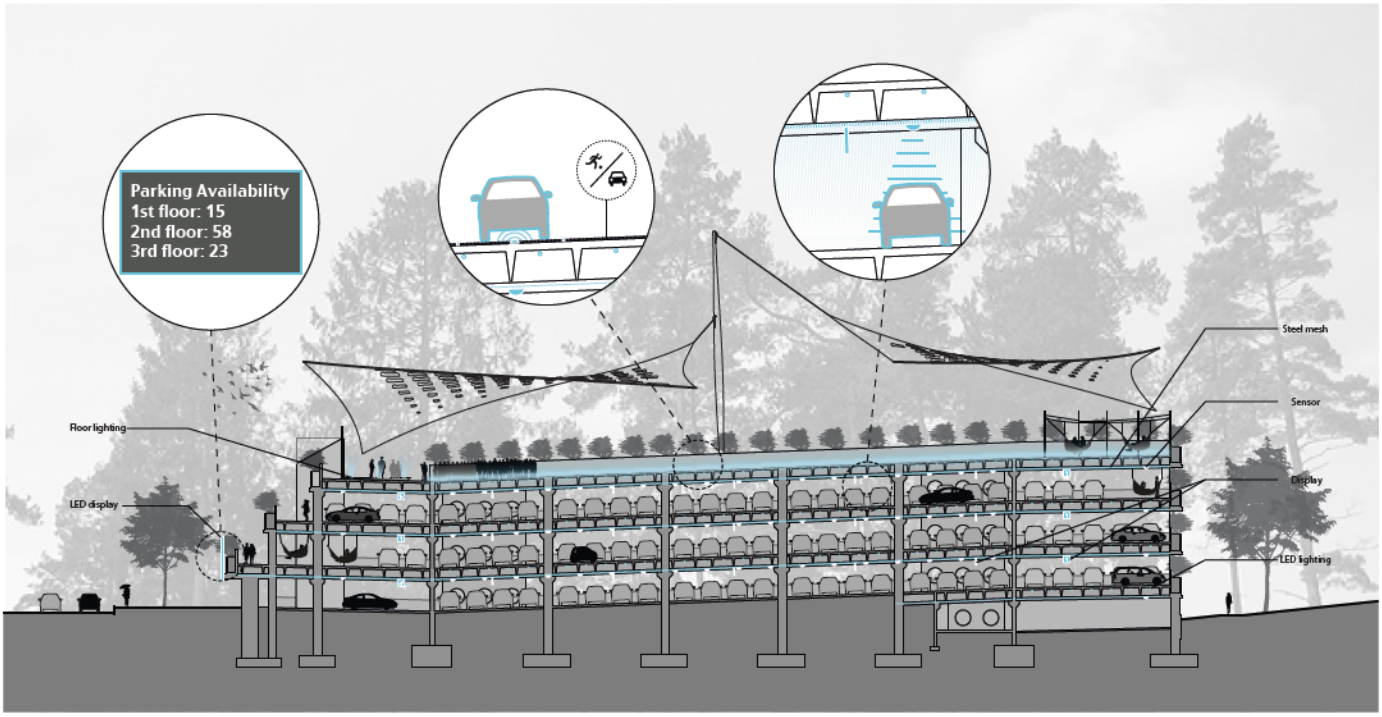
Hammocks are inserted into the parkade at various areas and include close proximity to views, sunlight and quiet. They are also located on the roof in a covered, grouped condition.

The roof is transformed into a public space, with a sweeping tensile solar roof canopy with integrated lighting for events, ceremonies and student organized shows/movie nights.

A proposed elevator, washroom and lockable storage space are necessary to maintain the roofscape as a pleasant public space for students, faculty and visitors. Temporary comfortable furniture and surfaces represent one way students could be encouraged to use this space.



Fraser Parkade Section showing social activation



Fraser Parkade Section showing new technology

Fraser Parkade photograph of current condition showing the underutilized roof area

Fraser Parkade rendering depicting the roof canopy and event student relaxation/event space

Fraser Parkade photograph of current condition showing the underutilized roof area

Fraser Parkade rendering depicting the roof canopy and event student movie screening at night

Roof activation: hammocks and lounge space

Roof activation: movie night

3.3.2 | FRASER PARKADE: SOCIAL, ENVIRONMENTAL & ECONOMIC IMPACT

The changes to Fraser parkade primarily result in increased social space for students, staff, faculty and visitors on the roof.

Social impact

- By allowing the roof of the parkade to act as a social host, it becomes a catalyst for events as it attracts people to the roof space.
- By allowing hammocks to be placed throughout the interior of the parkade, quiet student study areas which are protected from the elements but still outside exist which allow students from nearby buildings to use the space for gathering or individual study.
- Providing a partially covered roof allows events to occur on a seasonal basis, protecting visitors from weather while providing an opportunity for lighting.

Environmental impact

- LED lighting should replace all existing lighting throughout, resulting in bulbs which last longer over time reducing maintenance costs and are more energy efficient.
- Increasing planting on the roof will also allow for greater biodiversity while absorbing sounds and creating a more humane gathering space which takes cues from its surrounding landscape of tall trees.

Economic impact

- Technology additions include: vehicular sensors, LED display screen relaying campus information, rooftop events, and parking availability. These all have economic repercussions.
- The addition of lighting on the ground of the roof as well as integrated into the tensile solar canopy would also have an economic impact on the space.
- By utilizing the rooftop, which is currently underused for parking, for other social and student events the hope is that money spent on parking on the roof would not be lost, and the roof could be rented for a fee which would allow the parkade to potentially make money in ways which it currently does not. (See the Lincoln Road precedent study for more information on renting out areas of a parkade for events.)

3.3.3 | FRASER PARKADE: MEASURES OF SUCCESS

Fraser parkade attempts to utilize the roof as a social space for student-led events.

The proximity of various cultural buildings and the feeling of being surrounded by the forest lends itself to a quiet, relaxing student space. The addition of study areas, flexible furniture and hammocks will enhance the atmosphere of a quite space. As such, various electrical receptacles will need to be placed strategically throughout the area in order to facilitate laptop use. This could be coupled with the introduction of LED floor lighting which are more energy efficient and will allow the roof space to be used at night.

The addition of a covered area on the roof can protect against the harsher elements and give an indication from the ground below that something is happening above The roof could be rented for various campus related events, where people can come and park in the parkade below and make their way up to the event on the roof. A temporary stage could be installed for such events, with lighting, electrical, screens, etc.

Inserting hammocks, which are placed on hooks strategically located throughout the parkade, allow for individual or small group study space protected from the elements. The roof becomes a major social space with an elevated stage for events or movies, protected by an overhead sweeping tensile roof, which helps draw people up to the area.

Increasing planting on the roof allows the space to fit in with its context and become softer and more welcoming while enhancing the feeling of calm serenity to aid in studying.

The possibility of renting the roof for events can be an economic generator for the parkade.

Figure B.1
Early parking at UBC

PROJECT CONCLUSION

Throughout this project the aim has been to develop various architectural intervention strategies for intensifying the use of parking structures socially, environmentally and economically. Throughout this process, close contact with UBC Parking has been established in order to ensure design solutions and owner expectations have been aligned.

A METHOD FOR PARKADES OF THE FUTURE

Initially several existing parkade and adaptive reuse projects were investigated and mined for creative ideas and approaches to improving the functionality of parking structures. These projects provided several valuable insights into how these spaces can further perform to provide social amenity, environmental responsibility and economic security. Additionally, these projects provided guidance towards systems thinking strategies that serve to integrate parkade functionality with the surrounding human and natural environment.

In approaching the specific parkades at the University of British Columbia Vancouver campus we undertook analysis of existing sites of social, environmental and economic activity. This information became important in establishing themes for each set of interventions which we felt fit most appropriately with their surroundings. Rather than simply attempting to insert new infrastructure onto each parkade we looked to build upon existing patterns, adjacencies and broader networks in order to create symbiotic relationships which could have the greatest benefit with minimal change to the parking structure itself, in most instances allowing parking to remain.

Figure B.2
Perspective wayfinding, Eureka car park

Additionally, the intentional infusion of flexibility in programming and structure allows spaces to fulfill multiple functions and uses. For example, a solar canopy fulfills environmental requirements while also providing a shaded space for social activity and in the long run saves money on energy costs. This dynamic nature of the new spaces proposed also allows UBC Parking to test the popularity and effectiveness of each intervention and adapt them over time under the Living Lab principals instilled within campus project into the future.

STRENGTHS OF THE SCHEMES DEVELOPED

Some of the strengths we discovered in deploying ideas to the UBC parkades specifically include intensifying the roof space for social events by providing a partially covered space. Allowing the roof to be rented for events is an economic generator for the parkades, especially since the roof space is the most underutilized for parking. Another strength we found is the ability to rent parking stalls to be temporarily converted for retail use. This uses minimal space within the parkade and is most effective when easy access to retail is provided from the outside (preferably along a busy street or walkway, as in the case of Thunderbird parkade). We also found that the ability to activate an otherwise passive facade and roof of each parkade for energy production, storage and use further represents a positive symbiotic opportunity to allow each structure to be a net-neutral or net-positive energy hub that can serve itself and the surrounding community.

Figure B.3
'Five Windows' art projection, Ross Ashton, Dartmouth College, Hanover, New Hampshire

Also suggested is the inclusion of other small yet important interventions which could

Figure B.4
Colors and natural lighting can enliven a space, Edmonton parkade library entrance

greatly improve the efficiency and human perception of each parkade structure. The inclusion of warm coloured and bright paint, LED lighting, vegetation, and easy access to electrical outlets as well as toilets and elevators represent basic interventions which we suggest be deployed globally across all parkades.

DESIGN CUES FOR NEW PARKADES

While much of our speculative work focused on adaptive-reuse of existing parking structures, the potential to develop new structures where needed with some improved basic features can better serve the evolution of these spaces into the future. Higher ceilings and all of the appropriate infrastructures mentioned above as a minimum are necessary, as well as other design attributes found in our research. If implemented in the original design phase of the parkade, this would result in a space which, from its origin, is meant to better take on additional intensification of program and use over time.

IN THE FAR FUTURE

The schemes developed in this report are representative of a relatively stable future, which does not heavily anticipate future changes in vehicle type, ownership, car sharing or fuel source. It is important to note, however, that these issues have been discussed amongst the project team and represented best in the individual ideas for Parkades of the Future (section 3.1), where smaller smart car type vehicles, perhaps associated with car share programs, can be stacked vertically or parked bumper to bumper in order to increase parking efficiency. This would free up other areas of the parkade for programming to serve alternative social, environmental and economic needs. The importance of CO_2 emissions elimination by the storage and operation of electric vehicles could also change the future of parkade use, as adjacent program would not have to worry about emissions from vehicles or the sound generated by gasoline engines. Electrical vehicle parkades of the future bring many opportunities, some of which have been discussed in the Thunderbird parkade modifications. The ability for parkades to generate electricity, convert it and store it on-site for use in powering vehicles seems to be the logical next step for electrical powered cars and their appropriate spaces.

Together these ideas and explorations represent a hopeful and positive future for parkades which anticipate future development and are able to adapt and maintain their ability to be used and enjoyed by all.

Thank you for taking the time to read this report.

Parkades of the Future Design team:

AnnaLisa Meyboom, Geoff Cox, Stephanie Matkaluk & Daichi Yamashita.

Figure 4.0.1
Charles St. Car Park, Sheffield, Allies & Morrison, Completed 2008

4.0 APPENDIX

4.1 | LIST OF FIGURES

Cover Page image: Image courtesy of Vancouver Archives

Figure A.1: http://pricetags.wordpress.com/2008/01/29/revising-the-revision/

Figure A.2: Vancouver Public Library Special Collections Historical Photographs

Figure A.3 - A.6: UBC Library Digital Collections

Figure A.7: UBC Fall 2011 Transportation Status Report

Figure 1.0.1: http://www.dezeen.com/2014/02/07/car-park-with-apartments-on-its-roof-by-brisac-gonzalez/

Figure 1.1.1: http://www.dailymail.co.uk/news/article-2388626/Watch-spaces-We-spin-worlds-coolest-car-park-including-Britain-voted-10.html

Figure 1.1.2: http://www.dowkimbrell.com/2010/07/28/41-four-views-of-1111-lincoln-road/

Figure 1.1.3: http://aasarchitecture.com/2013/04/1111-lincoln-road-by-herzog-de-meuron.html

Figure 1.1.4: http://www.archdaily.com/59266/1111-lincoln-road-herzog-de-meuron/

Figure 1.1.5: http://forum.skyscraperpage.com/showthread.php?t=179879&page=5

Figure 1.1.6: http://inhabitat.com/first-leed-certified-parking-garage/

Figure 1.1.7: http://www.smgov.net/Departments/OSE/Categories/Green_Building/Civic_Center_Parking_Structure.aspx

Figure 1.1.8: http://archrecord.construction.com/news/daily/archives/070827parking.asp

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Figure 1.1.20: http://www.canada.com/vancouversun/Photos+Volkswagen+futuristic+storage+tower+Germany/4417214/story.html

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Figure 1.2.1: http://weburbanist.com/2014/07/21/scadpads-parking-garage-turned-tiny-house-village/

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Figures 1.2.3, 1.2.5, 1.2.6: http://inhabitat.com/scad-students-transform-an-atlanta-parking-garage-into-ecologically-responsible-micro-housing/

Figure 1.2.4: http://www.scad.edu/blog/designing-furniture-micro-house-micro-timeline

Figure 1.2.7: http://ericgreensite.com/padlearn

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Figure 2.0.1: Image courtesy of Google Maps.

Figure 3.0.1: http://www.dezeen.com/2010/10/06/les-yeux-verts-by-jacques-ferrier-architecture/

Figure 3.2.1, 3.2.2: http://w3.siemens.com/market-specific/global/en/hospitality/related_content/Documents/LPR.pdf

Figure 3.2.3, 3.2.4, 3.2.5: http://w3.siemens.com/market-specific/global/en/hospitality/related_content/Documents/SIPARK-SSD.pdf

Figure 3.3.1: http://scoutmagazine.ca/2013/04/29/seen-in-vancouver-442-pedal-power-coming-soon-to-strathconas-wilder-snail/

Figure B.1: Image courtesy of Vancouver Archives.

Figure B.2: http://www.revistacliche.com.br/2013/03/wayfinding-voce-sabe-o-que-e/wayfinding_all/

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Figure 4.0.1: http://www.alliesandmorrison.com/projects/selected/2008/charles-street-car-park/

Note: All maps, diagrams, photographs, renderings and sections completed by TIPSlab team unless otherwise noted.

4.2 | FURTHER PRECEDENTS

Tata Tower, Seth Ellsworth & Jayoung Kim
Mumbai, India.
930 residences, 4050 parking spaces with encouragement of Tata EV's, alternative energy generation.

http://inhabitat.com/tata-tower-has-4050-vertical-ev-parking-spots-and-powers-itself/tata-tower-5/?extend=1

Hong Kong Alternative Car Park Tower, Chris Y. H. Chan + Stephanie M. L. Tan (Atelier CASA).
Hong Kong, China.
Theoretical project, Honorable Mention.

http://www.archdaily.com/215559/hong-kong-alternative-car-park-tower-chris-y-h-chan-stephanie-m-l-tan/

Green facade parkade, Seasons Natural Engineering.
Irvine, California.
4000 sq. ft. green walled parkade.

http://inhabitat.com/lush-living-wall-breathes-life-into-an-otherwise-dull-parking-garage-in-california/

Spring Street Park, Lehrer Architects.
LA, California.
Downtown LA parking lot is converted into a park.

http://inhabitat.com/spring-street-park-parking-lot-transformed-into-public-park-in-downtown-la/spring-street-park-lehrerarchitects-2/?extend=1

UpLIFT, Lawrence Zeroth, Jack Phillips, Brian Schulman and Eugene Lubomir.
New York City, NYC.
$30,000 single occupancy home within an urban area as part of the HOME competition run by Building Trust International, which uses car lifts as housing pods.

http://inhabitat.com/uplift-transforms-elevated-parking-spaces-into-a-hive-of-prefabricated-tiny-homes/

Parking + Housing, Aaron Cheng.
New York City, NYC.
Theoretical pneumatic shelter project, which envisions the easy transformation from a living space into a parking space and visa versa.

http://inhabitat.com/aaron-cheng-parking-housing-is-a-parking-garage-that-converts-to-housing-at-night/

UPGarden P-Patch, Kistler Higbee Cahoot.
Seattle, WA.
Underutilized rooftop of parkade is converted into a garden.

http://inhabitat.com/parking-garage-rooftop-upgarden-p-patch-almost-complete-in-seattle/upgarden-p-patch-2/?extend=1

Greenbriar Rooftop Garden, Intexture Architects.
Houston, Texas.
Rooftop parkade is converted into a zen garden.

http://inhabitat.com/intexure-architects-transform-parking-garage-into-a-rooftop-zen-garden/greenbriar-rooftop-garden-2/?extend=1

BIKE Center, Annie Scheel.
Philadelphia, Pennsylvania.
Parking lot is converted into urban cyclist haven.

http://inhabitat.com/philadelphia-parking-lot-transformed-into-cycling-oasis/