UBC Bicycle Parking Requirement: Residential Assessment

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UBC Bicycle Parking Requirements: Residential Assessment

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TABLE OF CONTENT ————————————————————

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Background

The University of British Columbia ("UBC") promotes cycling as a way to "*enjoy more fresh air, improved health, and a lower carbon footprint*"[1]. It is committed to upgrade and expand its cycling infrastructure across campus with the aim to promote cycling as one of the sustainable transportation options for the university community. The provision of bicycle parking is an important factor in convincing people to consider cycling as a viable transportation option.

Given the amount of Class I bicycle parking[2] required for any new development on UBC Campus as per the UBC Development Handbook and the Residential Environmental Assessment Program ("REAP"), UBC Properties Trust would like to revisit the requirements, and to ascertain that they are meeting the needs of the community while still supporting UBC's interests and priorities.

This project, **UBC Bicycle Parking Requirements: Residential Assessment**, is a student-led university collaboration with the SEEDS Sustainability Program, Campus and Community Planning, and UBC Properties Trust. The E3 Eco Group also participated in this project on behalf of UBC Properties Trust.

Objectives

The objectives of the Project are to:

o Assess the current demand for Class I bicycle parking at residential properties on UBC Campus;

o Gather user experience feedback for Class I bicycle parking at residential properties on UBC Campus; and

o Propose updates to the current Class I bicycle parking requirements set out in the UBC Development Handbook and REAP with the aim to better meet the needs of the university community for bicycle parking spaces.

Methodology

To meet these objectives, the Project follows the following methodology:

o Conduct a literature review of the requirements of long-term bicycle parking (Class I) for residential properties within Canada and globally;

o Survey existing Class I bicycle parking facilities at six selected residential properties in Wesbrook Place (namely Mundell House, Pine House, Cypress House, Nobel House, Magnolia House and Dahlia House);

o Administer a resident survey at selected residential properties to understand current user experience and gather feedback on issues; and
o Develop recommendations based on the findings from the above.

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[1] Cycling (ubc.ca)
[2] At UBC, Class I bicycle parking refers to parking intended for residents and is typically located inside buildings and may consist of inside bicycle lockers, or restricted access bicycle storage rooms.

Key Findings

- o UBC guidelines (2020) on the design and standards of Class I Bicycle Parking are highly comprehensive compared to other local and international standards.

- o Capacity provision at three out of the six buildings studied (Dahlia House, Pine House and Cypress House) is less than the previously set standard of 1.5 bike parking spaces per unit (0.6-0.8 spaces per unit instead), leading to their overcrowded facilities. An ideal ratio of bike parking spaces per unit based on a linear estimation is 1.49.

- o While the facilities at Mundell House are well designed from the Convenience, Safety & Security and Accessibility's perspectives, facilities at other buildings clearly have various drawbacks.

- o Residents' satisfaction is highly correlated with the utilization rates, as well as security and accessibility of the facilities.

- o The current standards set out in the UBC Development Handbook and REAP should sufficiently meet the needs of the university community.

Recommendations

Ongoing monitoring and review of the Class I bicycle parking capacity provision standards

It is recommended that ongoing monitoring and review of the standards should be conducted to ensure that the UBC Development Handbook and REAP updated in September 2020 and December 2020 respectively would meet the needs of the community, in particular the capacity provision requirements for the three or four -bedroom units.

Design Standards – Best Practices

Mundell House demonstrates the best design standards of Class I bicycle parking from the perspectives of "Convenience", "Safety & Security" and "Accessibility". The following key features at Mundell House should serve as best practices for the reference of future developments:

- o Ground level access
- o Automatic doors
- o Dedicated pathways for bicycle access
- o CCTV installed in all bicycle storage rooms
- o Security windows

Other suggestions

Given the UBC Development Handbook and REAP are applicable to all new developments on UBC Campus, further studies on bike storage requirements of different property types (student, staff & faculty, market rental strata condos) should be conducted. Additionally, it is also recommended that bike audits should be conducted regularly to ensure that bicycles stored in the facilities do belong to current residents.

1. BACKGROUND

The University of British Columbia ("UBC") promotes cycling as a way to "*enjoy more fresh air, improved health, and a lower carbon footprint*"[3]. It is committed to upgrade and expand its cycling infrastructure across campus with the aim to promote cycling as one of the sustainable transportation options for the university community.

The provision of bicycle parking is an important factor in convincing people to consider cycling as a viable transportation option. Well-designed, high quality and convenient bicycle parking is essential as it decreases the likelihood of a bicycle being stolen or damaged and can influence someone's decision on their choice of mode of transport. Essentially and wherever possible, enough secured bicycle parking in well-placed and accessible locations should be provided at all residential properties.

As per the UBC Development Handbook and the Residential Environmental Assessment Program ("REAP"), any new development at UBC must provide and maintain on-site bicycle parking spaces. Specifically, two types of on-site bicycle parking spaces are required:

- o **Class I bicycle parking (or long term bicycle parking):** parking intended for residents and is typically located inside buildings and may consist of inside bicycle lockers, or restricted access bicycle storage rooms; and

- o **Class II bicycle parking (or short term bicycle parking):** parking intended for residents or visitors for shorter durations, and consists of bicycle racks located with natural surveillance in an accessible outside location.

Over the years, UBC has regularly reviewed and updated the on-site bicycles parking requirements for new development to ensure that the standards set out in the UBC Development Handbook and REAP are meeting the needs of the university community. The UBC Development Handbook and REAP were last updated in September 2020 and December 2020 respectively.

2. OBJECTIVES

Against this background, a project charter for this research project **UBC Bicycle Parking Requirements: Residential Assessment**, "the Project", was developed and approved (see Appendix A). The objectives of the Project are to:

- o Assess the current demand for Class I bicycle parking at residential properties on UBC Campus;

- o Gather user experience feedback for Class I bicycle parking at residential properties on UBC Campus; and

- o Propose updates to the current Class I bicycle parking requirements set out in the UBC Development Handbook and REAP with the aim to better meet the needs of the university community on bicycle parking spaces.

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[3] Cycling (ubc.ca)

3. METHODOLOGY

To meet these objectives, the Project follows the following methodology:

- o Conduct a literature review of the requirements of long-term bicycle parking (Class I) for residential properties within Canada and globally;

- o Survey existing Class I bicycle parking facilities at selected residential properties in Wesbrook Place;

- o Administer a resident survey at selected residential properties to understand current user experience and gather feedback on issues; and

- o Develop recommendations based on the findings from the above.

4. LIMITATIONS

Due to time and resource constraints, this Project has a number of limitations:

Scope limitation

While the initial intent of the research was to review bicycle storage requirements at residential properties on UBC Campus, the scope of this Project has been limited to studying the demand and usage of Class I bicycle parking at staff and faculty housing at UBC Wesbrook Village only. Staff and faculty housing outside UBC Wesbrook Village, Class II bicycle parking as well as bicycle storage requirements at other types residential properties such as student housing, rental housing or strata condos on UBC Campus are not covered in this Project.

Data limitation

Only a limited set of primary data had been gathered:

- o a sample size of six residential properties for site surveys (Mundell House, Pine House, Cypress House, Nobel House, Magnolia House and Dahlia House) (collectively "the Selected Properties"); and

- o a limited number of responds received for the resident survey.

Limitation of site surveys

Only one visit had been made to each of the Selected Properties on 5th March 2021, variations in demand and usage of Class I bicycle parking due to different time horizons may not be captured in the site surveys.

While there is a possibility that some residents store their bicycles in storage or within their units, the project team was only able to conduct visual assessment of those bicycles parked at the Class I bicycle parking facilities at the Selected Properties.

Bike audit

It is uncertain if bike audits are conducted at the Selected Properties. The project team had assumed that all on-site bicycles observed during the site visits belong to current residents.

Effect of the pandemic

Although the Covid-19 pandemic may have an impact on people's travel behaviours and subsequently their demand for Class I bicycle parking, the project team had assumed that the primary data gathered is not skewed due to the pandemic.

Limitation of resident survey

Only a limited number of responds had been received for the resident survey. Additionally, almost all of the respondents participated in the resident survey own bicycles. The resident survey had not captured those population who live at the Selected Properties and who do not own/use bikes. This may have an impact of "inflating" the actual demand when we used the resident survey data to project demand for Class I bicycle parking.

5. KEY TERMS

According to UBC Development Handbook (2020) and Moskovitz & Wheeler (2011), the key terms are defined in the following table.

Table 5.1: Key term

Key terms	Definitions
Class I Bicycle Parking (Long Term Bicycle Parking) [UBC Development Handbook (2020)]	Parking intended for residents and is typically located inside buildings and may consist of inside bicycle lockers, or restricted access bicycle storage rooms.
Class II Bicycle Parking (Short Term Bicycle Parking) [UBC Development Handbook (2020)]	Parking intended for residents or visitors for shorter durations, and consists of bicycle racks located with natural surveillance in an accessible outside location.
Capacity [Moskovitz & Wheeler (2011)]	Maximum number of parked bicycles a facility is designed to accommodate at any given time.
Occupancy [Moskovitz & Wheeler (2011)]	Ratio of accumulation to capacity for a facility, expressed as ratio or percentage: Occupancy = Accumulation/Capacity

6. LITERATURE REVIEW

6.1 General Considerations

A literature review was undertaken with the aim to inform the Project on the latest development on long term bike parking requirements at residential properties. Heinen and Buehler (2019) noted that bicycle parking has received relatively little attention in academic research and it was highlighted in their paper that the lack of safe parking at home was a key factor that reduced the likelihood of people being more inclined towards more cycling.

The literature review shows that there are usually requirements (for instance in the US it is the Zoning Regulation Bylaw) for the quantity of both short-term and long-term bicycle parking spaces to be provided for new developments. There is also a need to ensure that these bicycle storage facilities are appropriately designed in order to ensure that they meet the needs of cyclists and that they support increased bicycle use.

Based on the findings of the literature review, the following considerations with respect to the provision of bicycle storage facilities should be taken into account[4][5][6][7]:

Safety and Security

Long-term use of bicycle parking facilities requires a high level of safety and security both for the cyclist themselves and their bicycles as well. There are a number of ways to ensure the safety and security of a bicycle parking facility, including:

- o **Access:** dedicated bicycle-only secured access points be provided through the use of security cards, non-duplicable keys or passcode access

- o **Lighting:** the bicycle room must be well-lit

- o **Monitoring:** bicycle parking facilities should be located in a monitored area (e.g. bicycle parking areas with security cameras installed)

- o **Emergency**: a panic button shall be installed in bicycle parking areas so as to provide a direct line to security in the event of an emergency

Accessibility and Convenience

Accessibility is one of the basic requirements of good bicycle parking.

- o Bicycle storage should be placed at ground level or accessible from ground level (i.e. by ramps, elevators) for easy access if possible.

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[4] Seattle Bicycle Parking Guidelines (DRAFT), Seattle Department of Transportation (2018)
[5] Bicycle Parking Strategy, The City of Victoria (2011)
[6] Guidelines for the Design and Management to Bicycle Parking Facilities (DRAFT), City of Toronto (2008)
[7] Parking and Sustainable Urban Mobility Planning – How to make parking policies more strategic, effective and sustainable", The European Commission (2020).

- o In order to encourage bicycle use, bicycle parking must be convenient. The facilities should be located in close proximity to building entrances and elevators, no more than 50 meters from an elevator or building entrance. It should also allow 24-hour secure access.

- o There is a need to minimize potential conflicts between bicycles and motor vehicles. If possible, separate and dedicated bicycle ramps into the bicycle parking areas would be preferred.

- o If a dedicated access route for bicycles is not possible, then a ramp or a small channel for bicycle wheels on the edge of a stairway should be provided. This will prevent cyclists from having to carry bicycles up and down stairs.

- o Providing a dedicated bicycle ramp allows cyclists to easily roll their bicycles up and down. Handrails should be provided and located so as to avoid obstructing cyclists rolling their bicycles up and down the ramp.

- o Clear, simple and visible signage will help cyclists locate bicycle parking. Integrated, high-quality and simple signage with well-placed symbols and directional arrows can be very effective.

Stall and aisle dimensions

Stall and aisle dimensions must be carefully considered to ensure adequate spaces are provided to maneuver the bicycles in the storage facilities (see below and Figure 6.1 for an example).

Spacing between obstructions

- o For bicycle racks located perpendicular to a wall, at least 0.6m clearance should be provided if the rack has single-side access. 2.5m clearance should be provided if the rack has double-sided access.

- o For bicycle racks located parallel to a wall, at least 0.45m clearance should be provided.

Spacing between bicycle racks

- o For bicycle racks parallel to each other, a minimum of 1.8m must be provided between racks.

- o A clear aisle width of at least 1.8m must be provided between bicycle racks that hold more than two bicycles. Normally this means 4.2m between bicycle racks.

Spacing between rack ends

- o A clear width of 0.9m should be provided between rack ends to balance maximum bicycle parking capacity with adequate bicycle maneuverability.
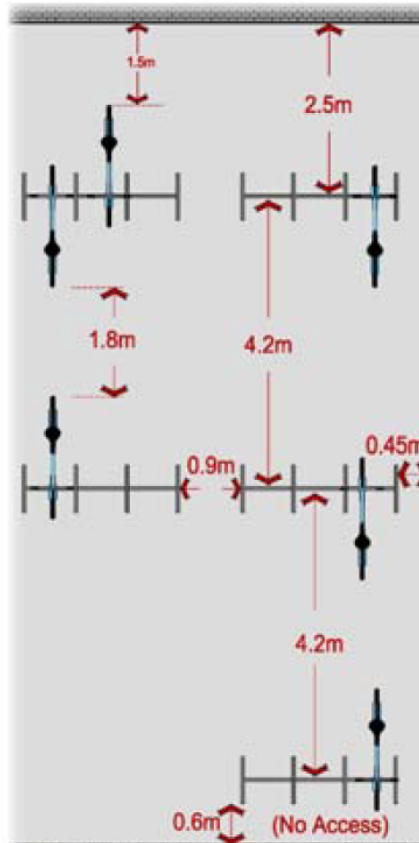
Figure 6.1: Example of Spacing Requirements in a Bicycle Storage Room[8]

Long-term Bicycle Parking Enhancements

In addition to the above, the following enhancements for bicycle storage facilities at residential properties have also been highlighted in the literature review:

- o Additional electrical outlets for e-bike charging

- o Automated doors

- o Reserving an area in the bike room for self-serve bicycle repair and maintenance and including features such as bike stands, basic tools such as an air pump, would add an additional level of service to the facility

6.2 Long term Bike Storage Design Standards For Residential Properties

The long term bike storage design standards of both UBC, municipalities in Canada, and other countries/regions are considered.

Bicycle Parking Space Requirements

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[8] Bicycle Parking Strategy, The City of Victoria (2011)

Table 6.1 provides a summary of UBC's current design standards from the UBC Development Handbook (2020) and the REAP Guidelines (2020).

Table 6.1: Class I bicycle parking requirements at UBC

References	Class I Storage
UBC Development Handbook (2020)	1.5 bicycle parking spaces per studio or one bedroom unit, 2.5 spaces per 2 bedroom unit, and 3 spaces per 3 or 4 bedroom.
REAP (2020)	

Table 6.2 provides a summary of the design standards/by-laws in relation to the requirements for the provision of indoor long-term bicycle storage in residential properties.

Table 6.2: Residential bicycle parking requirements globally

Country / Region / Municipality	Regulation
Canada	
City of Vancouver (2019)	1.5-3.0 per unit
City of Surrey (2017)	1.2 per unit (for developments with over 30 motor vehicle parking spaces)
Victoria (2011)	1 per unit
United States	
Portland (2017)	1.5 per unit
Seattle (2018)	1 per unit
Europe[9]	
Bulgaria	1.5 spaces per apartment (minimum 6 spaces total)
France	bike parking space per apt: - 1 or 2 rooms: 0.75 m^2 - >2 rooms: 1.5 m^2
Berlin	2 spaces per apt
Hamburg	- <50 m^2: 1 space per apt - <75 m^2: 2 spaces per apt - <100 m^2: 3 spaces per apt - <125 m^2: 4 spaces per apt - >125 m^2: 5 spaces per apt
Copenhagen	4 spaces per 100 m^2 of residential parking space
London	- 1 bedroom: 1 space per unit - > 1 bedroom: 2 spaces per unit
Asia	
Singapore (2018)	For developments located within Zone 1 and Zone 2: 1 space per every 4 dwelling units For developments located within Zone 3: 1 space per every 6 dwelling units

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[9] Parking and Sustainable Urban Mobility Planning – How to make parking policies more strategic, effective and sustainable", The European Commission (2020)

The findings of the literature review show that, with respect to bicycle parking, the minimum requirements in almost all cases vary between 1 to 2 parking spaces per apartment. In Europe, cities with a higher cycle mode share tend to require a higher number of minimum bicycle parking spaces in apartment buildings[10].

In general, it is observed that UBC's requirement is on par with most of the researched cities.

UBC Bicycle Parking Space Design Standards

In addition to the number of parking spaces required, UBC Development Handbook (2020) also sets out explicitly the requirements on the Space Design, Storage Security and Storage Amenities of Class I Bicycle Parking.

Class I Space Design

Each Class I bicycle parking space must conform to the following provisions:

- Floor mounted racks must be Model UB100-USX in a hot-dipped galvanized finish or stainless steel finish; constructed of theft-resistant material;
- For floor mounted Model UB100-USX bicycle racks, bicycle racks are to be installed at a minimum of 815mm on centers and a maximum of 915mm (to fit the space). For all other bicycle racks, floor mounted racks must be installed to provide at least a 0.6 m wide and 1.8 m long space for bikes and vertical racks must be installed to provide at least 0.6m wide, 1m long and 1.9m high space for bicycles;
- Installed on a hard surface;
- Spaces may allow vertical bicycle storage racks that enable u-locking to bicycle frame at two points of contact;
- Spaces may include vertically stacked spaces (two-tier racks) with pneumatic workings that enable U-locking to bicycle frame at two points of contact;
- 10% of spaces must be oversized with a minimum of 0.9 m in width and a minimum of 2.5 m in length and must be floor mounted (neither vertical nor stacked);
- 40% of spaces must be floor mounted (neither vertical nor stacked), plus the 10% requirement for oversized spaces (i.e. 50% of spaces to be floor mounted);
- Provide one electrical outlet for every two spaces, adjacent to the spaces;
- Class I bicycle storage space must be in addition to each unit's storage locker space;
- All racks must be securely anchored with at least one anti-theft nut per leg of the rack; support the bicycle frame above the centre of gravity; and enable the bicycle frame and front wheel to be locked with a U-lock that is CSA compliant.

Class I Bicycle Storage Design and Security

The following provisions are required for secure bicycle storage in the form of a room.

If bicycle lockers are the preferred option to provide Class I bicycle parking, the lockers must exhibit comparable security measures as those identified below.

Bicycle storage rooms on site must conform to the following provisions:
- Doors must be hinged on the inside unless hinges are tamper-proof;

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[10] Parking and Sustainable Urban Mobility Planning – How to make parking policies more strategic, effective and sustainable", The European Commission (2020)

- o Both door and door frame must be made of steel;
- o Door to the bicycle room shall have a security window constructed of a laminate of tempered glass and polycarbonate in a steel frame for permanent visual access;
- o The entry door shall have a lock and key or programmed entry system, and the locks shall be high-security in nature;
- o Bicycle room(s) and the access route must have tamper-proof motion-activated security lights;
- o Bicycle room(s) may be industrial chain-link (min 7 gauge) enclosures if they are reinforced with metal bars minimum 13 mm in diameter and 150 mm apart;
- o Aisles between parked bicycles should be a minimum 1.2 m in width except in front of oversized spots, where they should be a minimum 1.5 m wide; and
- o Rooms must have a minimum vertical clearance of 1.9 m.

Class I Bicycle Storage Amenities

Bicycle storage required on site must conform to the following provisions:

- o Each building to have a bicycle repair station including tools for repairs, a bicycle stand secured to the ground or a wall, and a tire pump secured to the ground that is compatible with Presta and Schrader valves with at least 2 m by 2 m of clear space around the stand.

With respect to the space design standards, as mentioned in Section 6.1, considerations must be given to the minimum space requirements with respect to spacing between bicycle racks, access corridors, spacing between racks and walls etc. in order to ensure adequate bicycle maneuverability.

As shown above, the current UBC guidelines on Class I Bicycle Parking covers thoroughly on Space Design, Storage Security and Storage Amenities of Class I Bicycle Parking which have more than adequately address the considerations of spacing between bicycle racks, access corridors, spacing between racks and walls, security and amenities required at bike storage facilities. In general, it is in our view that the current UBC guidelines on Class I Bicycle Parking are highly comprehensive compared to the international standards.

6.3 Previous Relevant SEEDS Study

A previous SEED study (Smith (2017)) was conducted in 2017 to review the Class I and Class II bicycle storage of UBC residential properties. Its major findings were that demand for bicycle parking exceeded supply and that the provision of bicycle storage was not meeting residents' needs. The occupancy study and resident survey showed that the Class I bicycle storage rooms were overcrowded, and that residents had to park their bikes elsewhere. Smith (2017) recommended that the minimal bicycle parking requirement for Class I to be amended to a number reflective on the number of residents instead of the number of units, and that where possible retrofits should be carried out with the aim to provide additional bicycle parking spaces.

7. SITE SURVEY

On March 5, 2021, two team members attended a physical review of the existing bicycle storage facilities. Due to scope limitations, six buildings were selected based on its context similarity, built-year variety, and staff and faculty only tenure. The Selected Properties include:

- o   Mundell House
- o   Pine House
- o   Cypress House
- o   Nobel House
- o   Magnolia House; and
- o   Dahlia House

Based on the best practices from the literature review, we categorized our findings into convenience, safety and security, accessibility, and capacity to best analyze the current state of selected buildings. These categorizes are ranked from high, moderate, and low.

7.1 Mundell House
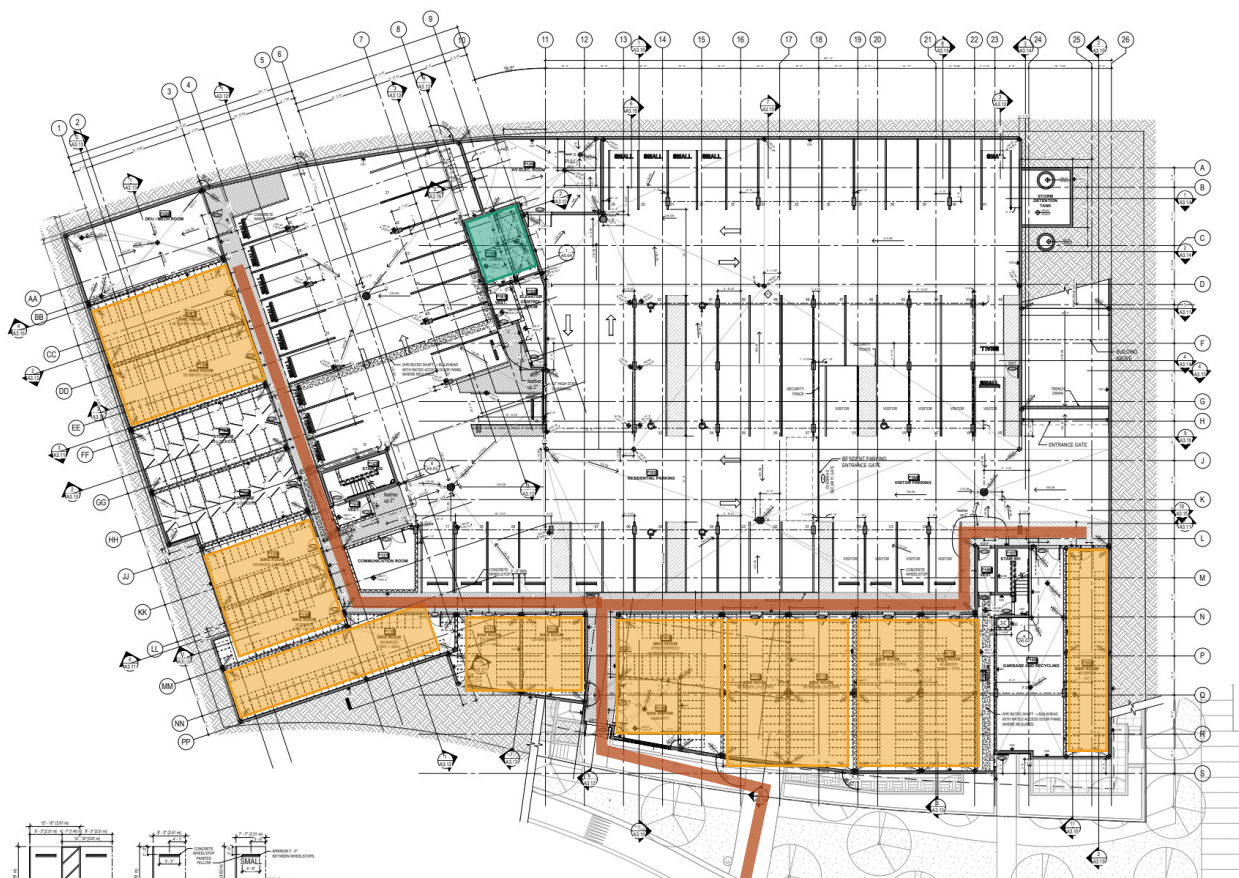
Figure 7.1: Mundell House - Layout

Mundell House is one of the recently completed projects that our team surveyed. Since its occupancy in September 2020, its units are close to being 100% occupied. With thoughtful planning and design, Mundell House is ranked best in class relative to the other five houses we surveyed.

- o **Convenience** - The bicycle storage facilities are grouped in proximity and are all relatively close to building entrances and elevators. There are dedicated entrances and paths for bicycles to travel in the parkade.

Figure 7.2: Mundell House - Path and building entrance for bicycle owners

- o **Safety & Security**- All 13 Mundell House bicycle storage rooms are FOB key accessed and have 24 hours CCTV monitoring in every room. Most of the security doors have transparent safety glass where patrons can view inside. The lighting is excellent both inside the parkade and within each storage room. All bicycle rooms are well-positioned with minimal blind spots, making the experience highly comfortable.
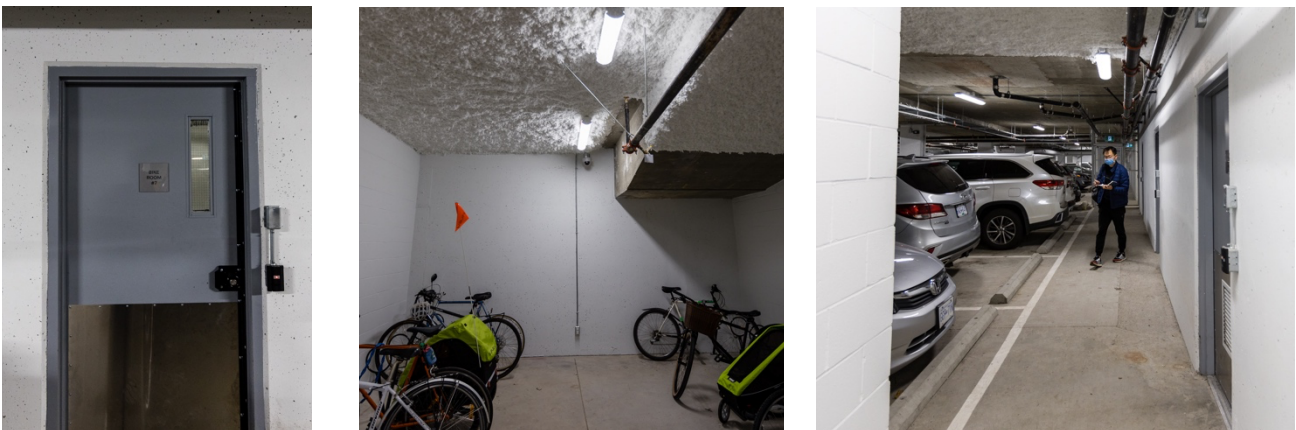
Figure 7.3: Mundell House - Bike door, CCTV & dedicated path for bikes

- o **Accessibility** - Motor vehicle and bicycle traffic are distinguished and separated. Bicycle access and paths are apparent within the parkade and are free of obstacles and corners. Aside from the individual bike room doors, the main entrance doors have automatic openers for easy accessibility. The bicycle rooms have sufficient space to comfortably maneuver, and the V-shaped bike racks allow room and separation between each bike.

Figure 7.4: V-shaped bike racks in bike room #3

- o **Capacity** - As of this survey dated in March 2021, 99% of Mundell House's 136 units are currently occupied. There are currently 436 bicycle racks provided. This gives Mundell House a high bike rack per unit ratio of 3.2. During our team's visit, there were 168 bicycles stored on-site, concluding with an estimated utilization rate of 39%.

Figure 7.5: Inside bike room #10 (L) and #12 (R)

7.2 Pine House

Pine House is the sister building of Cypress House. Both buildings are located on the same block as Magnolia and Dahlia House. They are all in proximity to nearby parks and pathways, all four houses have a shared courtyard. Pine House was completed in the spring of 2018, currently, it is 96% occupied. In comparison to other projects surveyed in this study, Pine House has a moderate rank in its bicycle storage.

- o **Convenience** - As Pine House shares a parkade entrance with the existing Magnolia and Dahlia projects, its entrances are moderately far from its two bicycle storage rooms. The

two bike rooms are relatively close to the elevators and can allow residents convenient access.
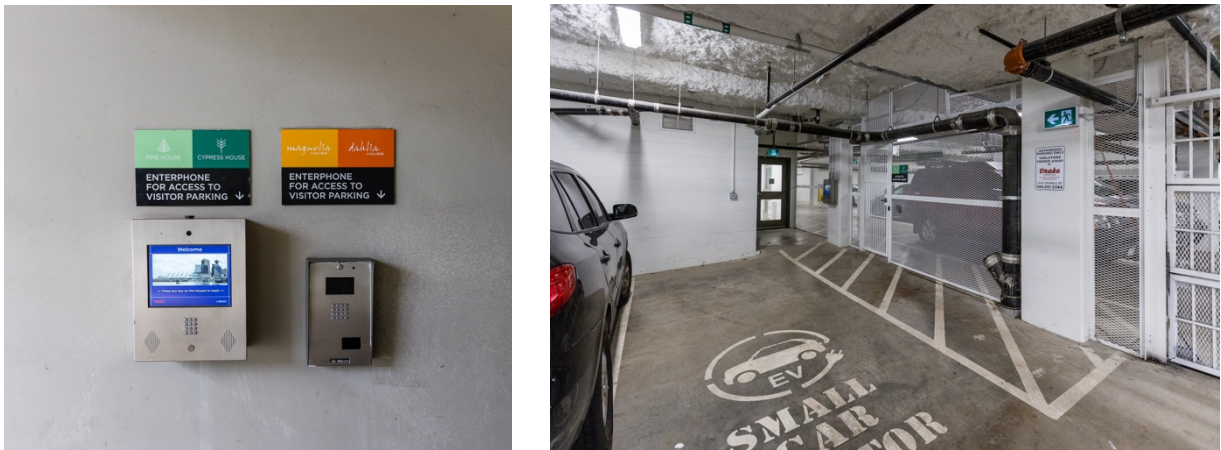
Figure 7.6: Main entrance for vehicle and bicycles of Pine, Cypress, Dahlia & Magnolia houses

Figure 7.7: Pine House - Layout

Figure 7.8: Pine House - Door of first bike room & its inside condition

- o Safety & Security - While both rooms are FOB key accessed only, only one bike room has CCTV monitoring. This is because the bicycle storage shares a room with the common storage room. The doors do not have safety glass, therefore, cannot be seen through. Both storage rooms and the parkade are well lit, and both rooms' entrances are in relatively high traffic areas.

- o Accessibility - Due to the nature of the shared parkade, Pine House patrons will have to travel a moderate distance between reaching their bike rooms. Motor vehicles and bicycles do have to share the same ramp for entry and exit, however, bicycles can use a separate side door. An additional dedicated bike ramp is available for Pine and Cypress House residents, however, the residents will need to push their bikes up a steep set of stairs and the location of the bike ramp is distant from the bike rooms. although, the single rack design is inconvenient and causes bikes to cram when stored.

Figure 7.9: Pine House - Inside condition of bike room

- o Capacity - As of this survey dated in March 2021, 96% of Pine House's 93 units are currently occupied. There are currently 53 bicycle racks provided. This gives Pine House the lowest bike rack per unit of only 0.6. During our team's visit, there were 67 bicycles stored on-site, concluding with an estimated utilization rate of 134%
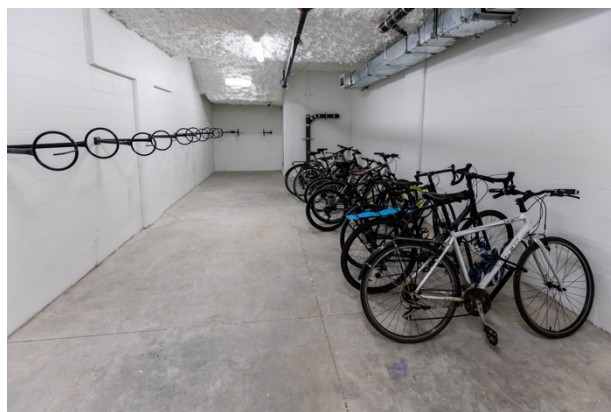
7.3 Cypress House

Cypress House is Pine House's little sister. It shares many amenities with the existing Magnolia and Dahlia House, including courtyard and parkade entrances. It was also completed in the Spring of 2018, with a current occupancy rate of 96%.
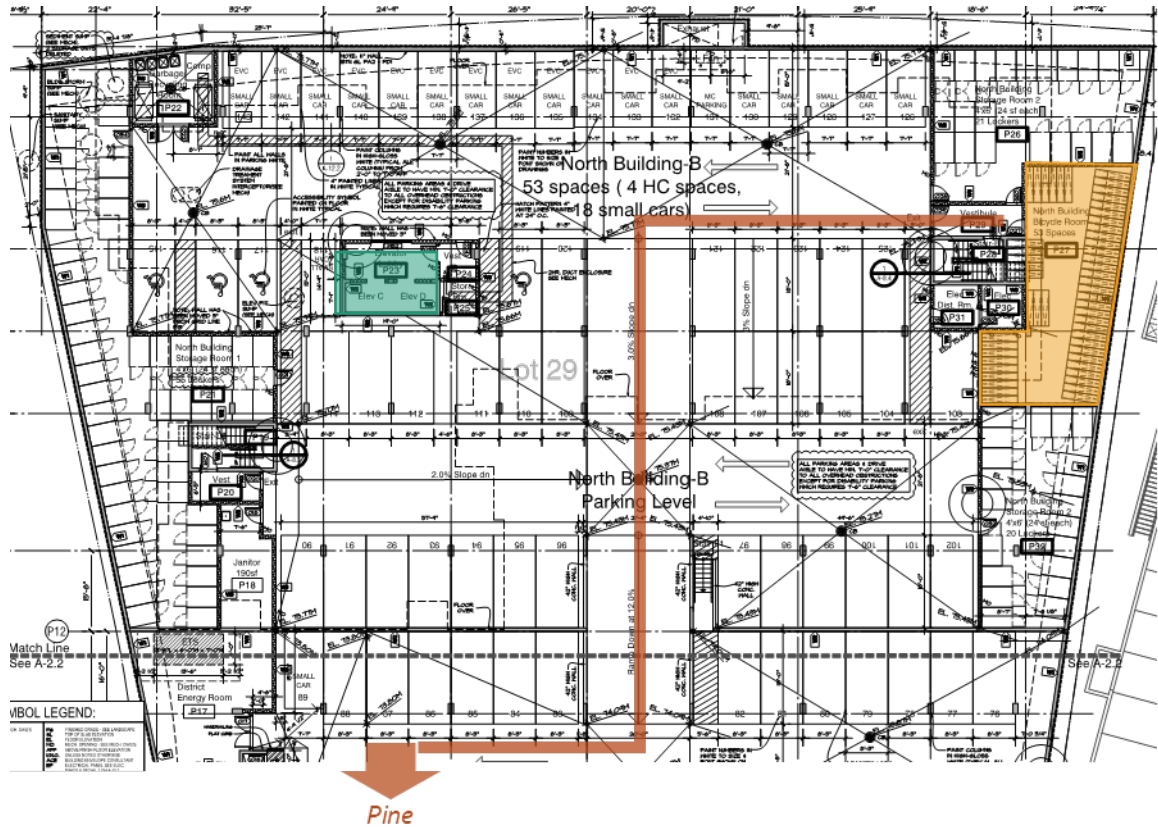
Figure 7.10: Cypress House - Layout

o   Convenience - Similar to Pine House, Cypress House shares a parkade entrance with the existing Magnolia and Dahlia Houses. Since Cypress House parkade is located on the opposite side of the entrance, bike users have low convenience when entering and leaving the parkade.

Figure 7.11: Cypress House - Condition of Cypress parkade, no dedicated pathway for bicycles

- o **Safety & Security** - The only bike room is secured with FOB key access, with no CCTV monitoring available. Similarly, the door does not have safety glass and therefore cannot be seen through. The parkade and bike room are well lit, but its location is in a low-traffic area.
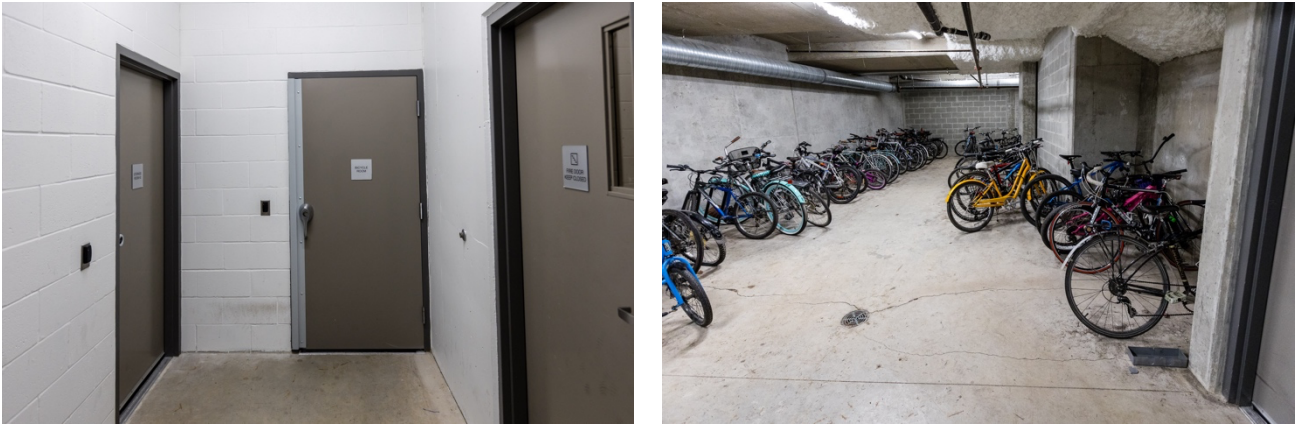
Figure 7.12: Cypress House - Outside bike room and inside condition

- o **Accessibility** - Similar to Pine House users, Cypress House residents will have to travel a long distance before reaching their bike rooms. Bicycles will have to travel alongside motor vehicles entering and exiting the parkade. Similar to Pine, an additional dedicated bike ramp is available to residents, again, the residents will need to push their bikes up a steep set of stairs and the location of the bike ramp is distant from the bike room. Similarly, the bike rooms have an acceptable amount of space for maneuvering, but the single rack design is inconvenient and causes bikes to cram when stored.
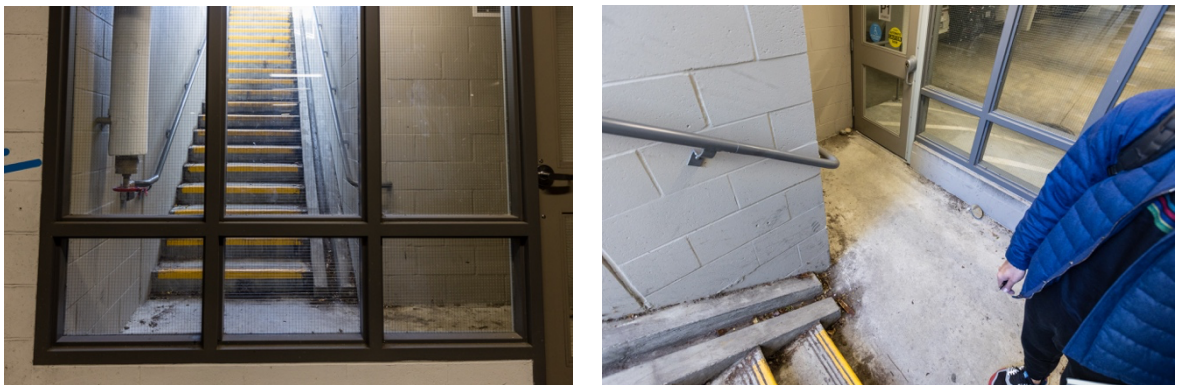
Figure 7.13: Cypress House - Dedicated bike ramp for Pine & Cypress House

- o Capacity - As of this survey dated in March 2021, 96% of Cypress House's 82 units are currently occupied. There are currently 50 bicycle racks provided. This gives Cypress House the other lowest bike rack per unit of 0.6. During our team's visit, there were 113 bicycles stored on-site, concluding with an estimated utilization rate of 213%.

Figure 7.14: Cypress House - Bicycles locked at I-shape racks

7.4 Nobel House

Noble House was completed in the spring of 2015. It is located opposite to Magnolia House. Its current occupancy rate is 91%.
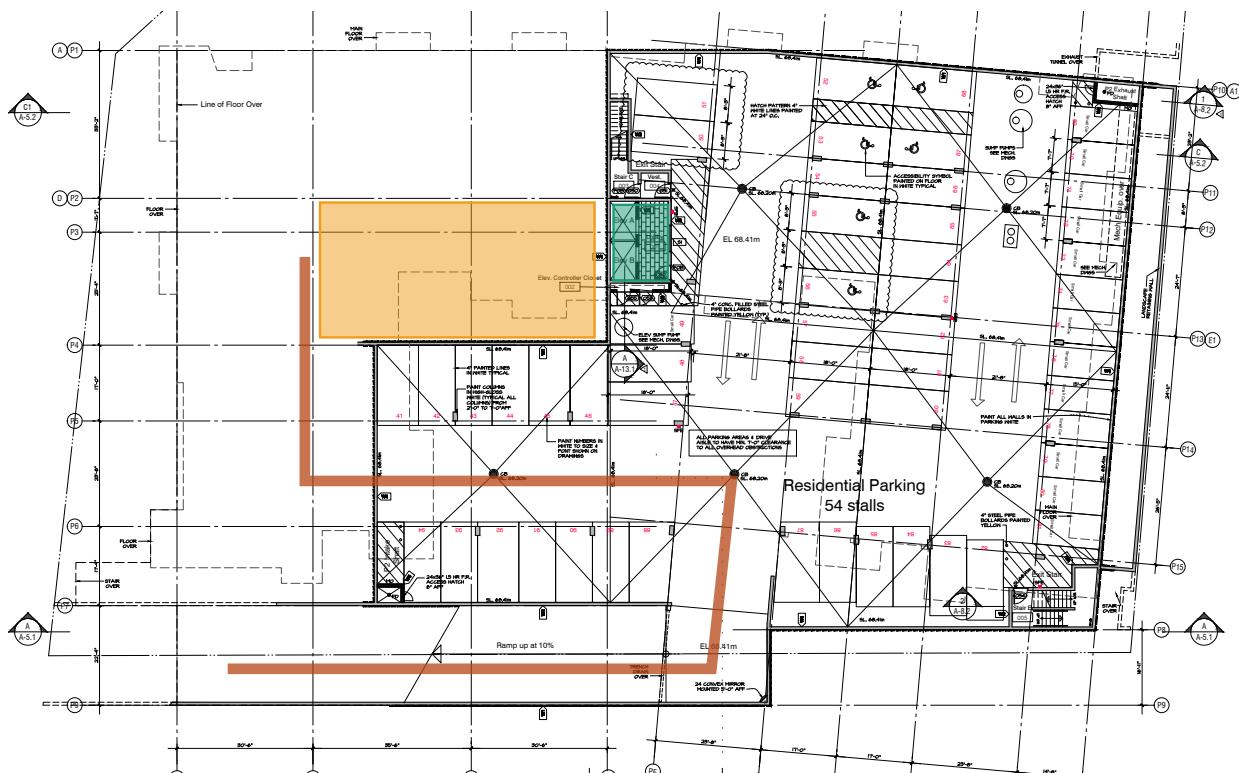
Figure 7.15: Noble House - Layout

Figure 7.16: Noble House - Vehicle & bicycle ramp of Noble House (L), dedicated entrance for bicycles

- o Convenience - Bicycles and vehicles share the same ramp to the entrance. A dedicated entrance is provided to the bicycle but there is no marked pathway for bicycles. The storage locations are located far away from the entrance and the elevators. The provision of a well-facilitated dog & bike wash station elevates the overall convenience.
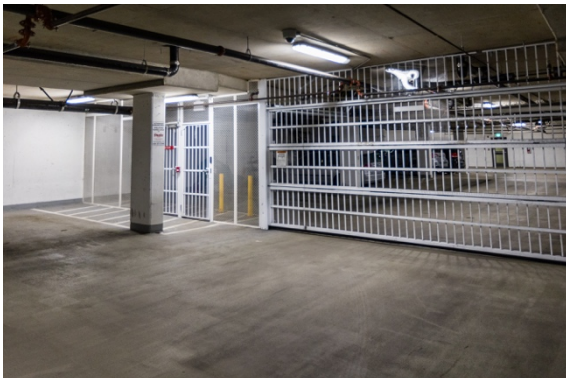
Figure 7.17: Noble House - No dedicated bicycle path inside parkade (L), dog & bike wash room (R)

- o Safety & Security - The only bike room is at moderate level of security with FOB access but no CCTV is installed. The door does not have glass so it is not able to see inside. The room is moderately well lit but the location is not easily seen.
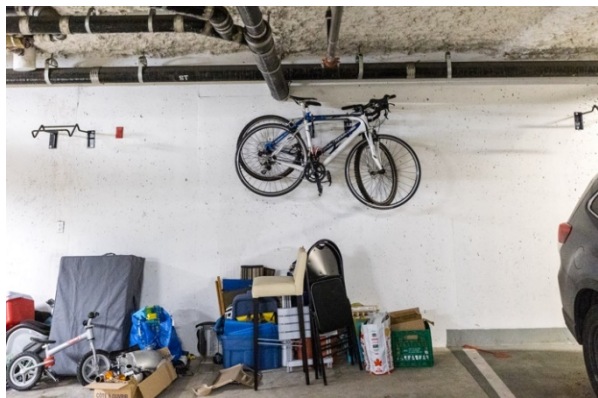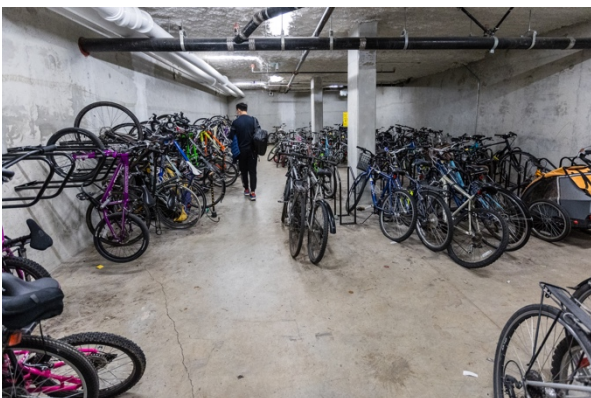
Figure 7.18: Noble House - Inside condition of bike room (L), wall bike racks behind parking lots (R)

- o **Accessibility** - The entrance door is difficult to maneuver and the bicycle room is distant from the entrance. Additional wall bike racks are presumed to be installed post-occupancy. However, these racks are located roughly 6 ft overhead and require the bikes to be lifted in place. This may be the reason some bicycles are stored in vehicle parking spaces.

- o **Capacity** - There is no storage capacity mentioned in the layout. The physical storage capacity counted on site is 142. This gives the ratio of bike storage per unit as 1.5 which is at the medium level of this study. On the day of our team's visit, there were 111 bicycles stored on site which gave a utilization rate of 78%.

Figure 7.19: Noble House - Door condition of bike room (L), bicycles are locked onto I-shape racks (R)

7.5 Magnolia House
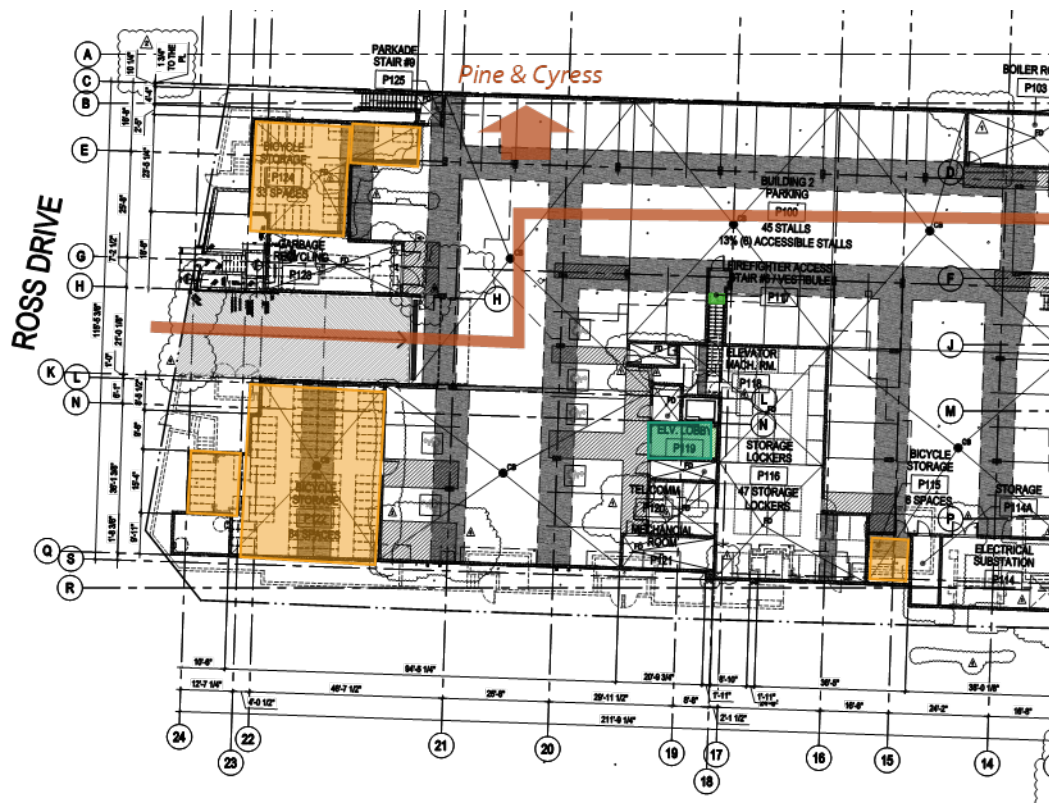
Figure 7.20: Magnolia House - Layout

Magnolia House comprises 47 units and is adjacent to Dahlia House. They were both built-in 2012. They share the same vehicle and bicycle ramp with Cypress House and Magnolia House. The current property occupancy is 84%.

- o Convenience - The bicycle storage facilities are at a moderate level of convenience as two out of three bicycle rooms are in proximity to entrances and elevators. There is a dedicated entrance for bicycles but no dedicated path is assigned for bicycles from the entrance to the storage area.

Figure 7.21: Magnolia House - Vehicle & bicycle entrance

- o Safety & Security - The overall security is acceptable since all 3 bike rooms are locked and only accessible with a key FOB but there is no CCTV inside any room. All doors have metal mesh windows but are difficult to see through. Generally, the condition of all rooms was moderately well lit and open to the line of sight.
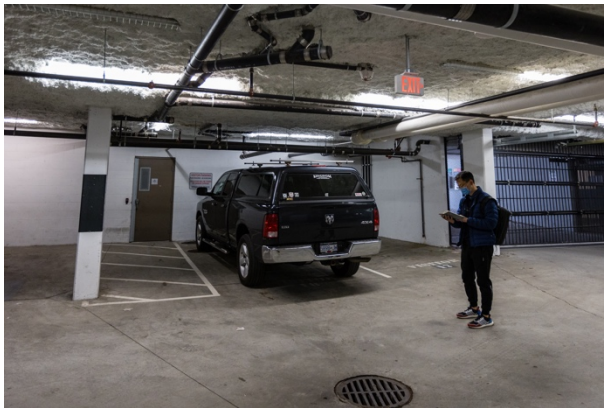
Figure 7.22: Magnolia House - No dedicated path for bicycles inside parkade and door condition of bike room

- o **Accessibility** - There is no automatic opener on the main gate for assisting the owner to move the bike in or out of the storage area. In addition, there is no dedicated pathway for bicycles but two out of three bicycle rooms are close to the entrance and the elevators. The bicycle rooms have sufficient space to comfortably maneuver, and the V-shaped bike racks allow room and separation between each bike.
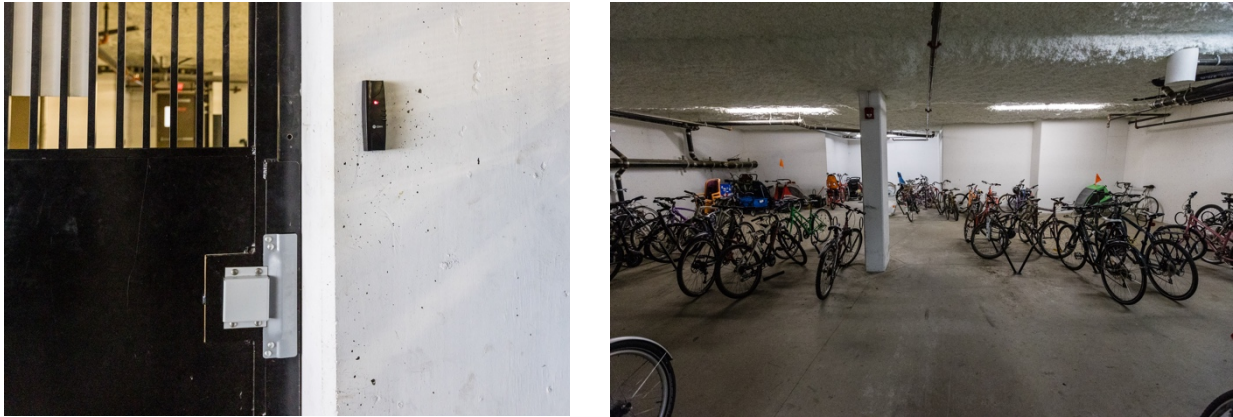
Figure 7.23: Magnolia House - Dedicated entrance for bicycle and bike room inside condition

- o **Capacity** - As of this survey dated in March 2021, there are currently 123 bicycle racks provided and the bike storage per unit ratio is 2.6 which is among the highest in this study. On the day of our team's visit, there were 119 bicycles stored on site which gave a utilization rate of 97%.
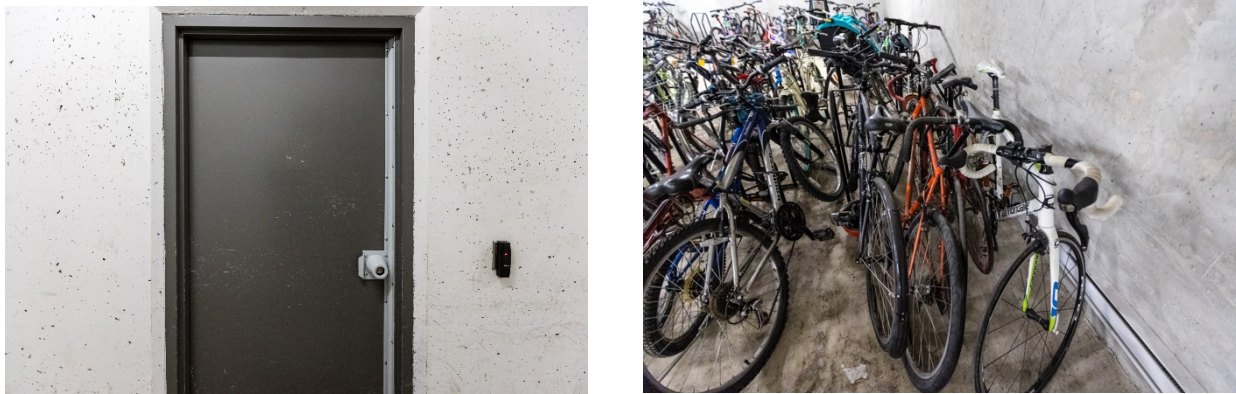
7.6 Dahlia House
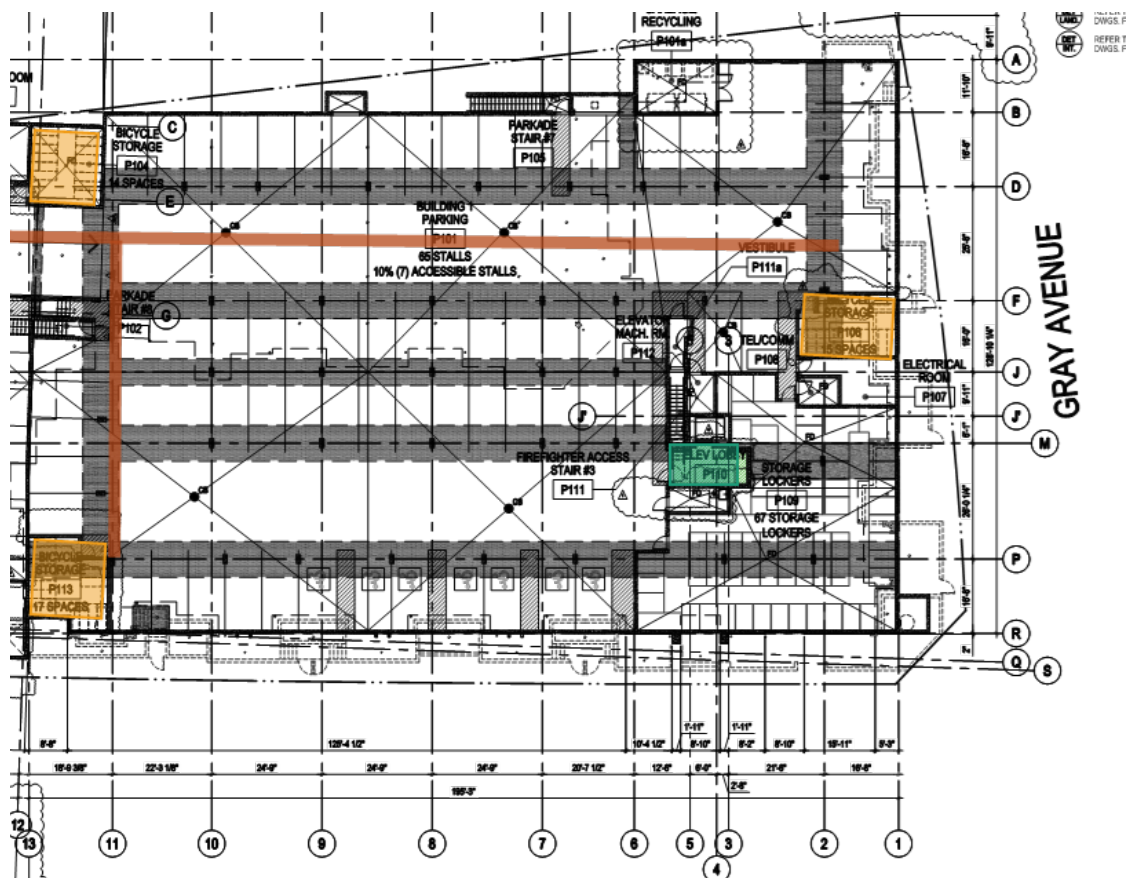
Figure 7.24: Dahlia House - Layout

Dahlia House was built together with Magnolia House in 2012. It shares the same vehicle and bicycle ramp with Cypress House and Magnolia House.

- o Convenience - Same as Magnolia, no automatic opener on the main gate is facilitated. All bicycle rooms are distant from the building entrance and are not close to the elevators. Therefore a large effort from the bicycle owner is required for moving their bicycle to and from the bike room.
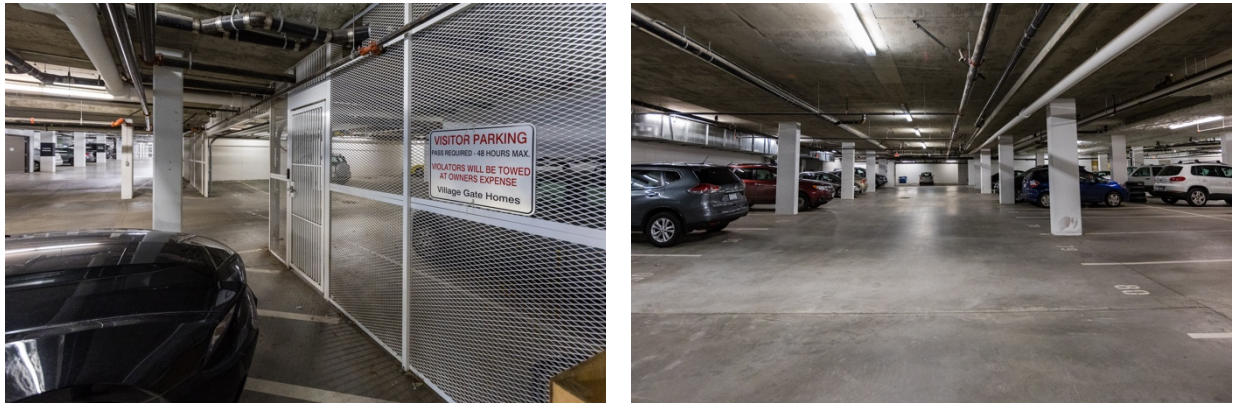
Figure 7.25: Dahlia House - Dedicated gate for bicycle owners

- o Safety & Security - All 3 bike rooms in Dahlia House have the same security level as Magnolia House. They are locked and only accessible with a key FOB but there is no CCTV inside any room. All doors have metal mesh windows but are difficult to see through. All doors have metal mesh windows but are not easy to see through. The condition of the rooms is generally well with adequate lighting.
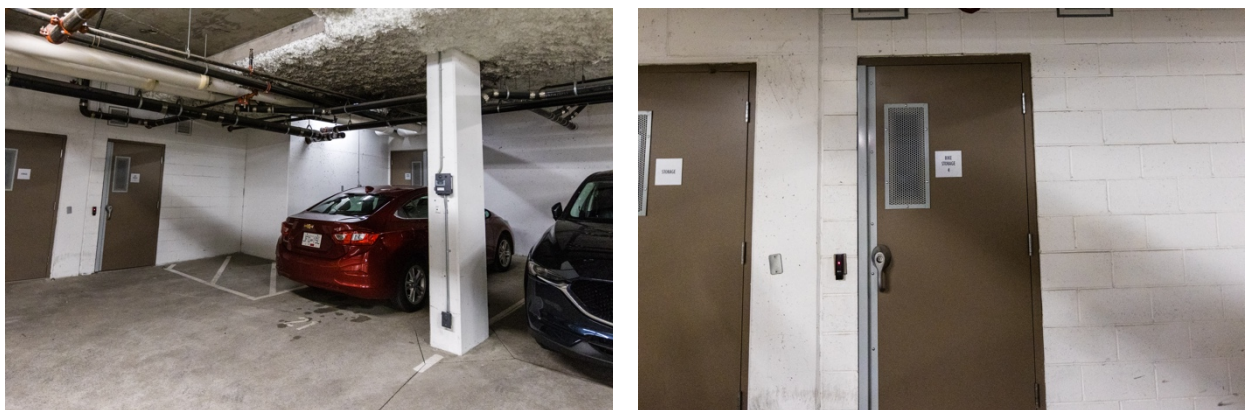
Figure 7.26: Dahlia House - Door condition of bike room

- o Accessibility - There is no dedicated path for bicycles to travel in the parkade. And since storage rooms are not close to the entrance, some owners just locked their bicycles in the car parking area.
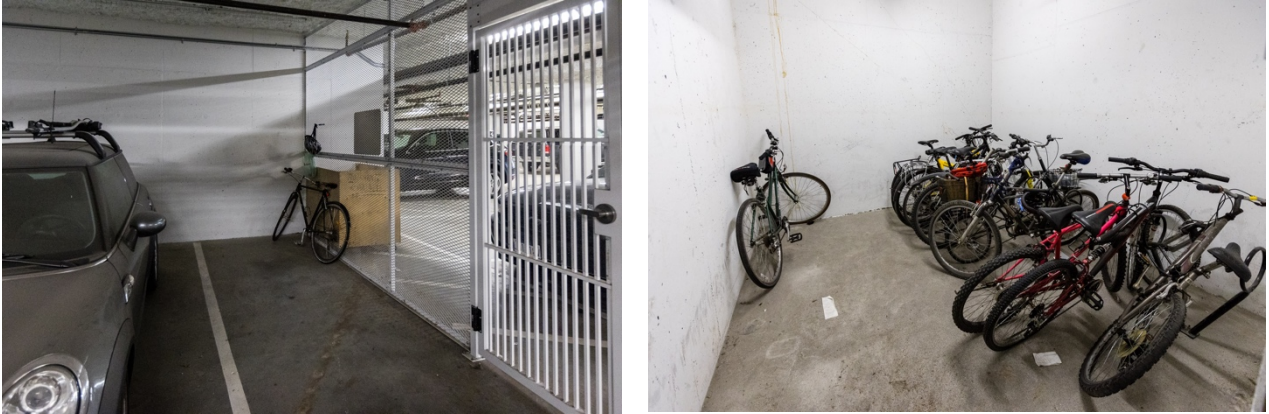
Figure 7.27: Dahlia House - Bicycle parked near car parking lot or in bike room without mounted to racks

- o Capacity - The occupancy of Dahlia House was 77% out of the 60 units on the day of the survey. There are currently 46 bicycle racks provided and the storage per dwelling unit ratio is 0.8 which is among the lowest levels in this study. During our team's visit, there were 119 bicycles which gave a utilization rate of 120%.

7.7 Summary

The summary of our findings are listed in the table below.

Table 7.1 Summary of site survey findings

Building (Year)	Convenience	Safety & Security	Accessibility	Capacity
Mundell House (2020)	High level of convenience. Bicycle storage rooms are well in proximity to building entrances and elevators	High level of safety. CCTV cameras are in all 13 storage rooms. All rooms are FOB access only. Most doors have safety glass for transparency. Rooms are well lit and are in public sightlines	High level of accessibility. Separate motor vehicle and bicycle entrances. Bicycle access clearly defined with visual and physical separations. Main access points have automatic door openers	Best level of capacity. As of March 2021, current bicycle storage utilization rate is at 39%. It has a high storage per dwelling unit ratio of 3.2
Pine House (2018)	Moderate level of convenience. Bicycle storage rooms are distant from building entrances but are close to elevators	Moderate level of security. CCTV camera only available in mixed-use bike and storage room. Doors do not have safety glass and cannot see inside. Rooms are well lit and its locations are moderately visible from public areas.	Moderate level of accessibility. Motor vehicles and bicycle use the same ramp. Moderate distance from storage room to exit. Separate bike access available but difficult to use	Low level of capacity. As of March 2021, current bicycle storage utilization rate is at 134%. It has low storage per dwelling unit ratio of 0.6

Cypress House (2018)	Low level of convenience. Bicycle storage room is distant from building entrances and elevators.	Moderate level of security. No CCTV in bicycle storage room. Room is FOB access only. Door does not have safety class and cannot see inside. Room is well lit but the location is not in easily seen	Low level of accessibility. Motor vehicles and bicycle use the same ramp. Long distance from storage room to exit. Separate bike access available but difficult to use	Low level of capacity. As of March 2021, current bicycle storage utilization rate is at 213%. It has low storage per dwelling unit ratio of 0.6
Nobel House (2015)	Moderate level of convenience. Bicycle storage room is distant from building entrances and elevators.	Moderate level of security. No CCTV camera in bicycle storage room. Room is FOB access only. Door does not have safety class and cannot see inside. Room is moderately well lit but location is not easily seen	Low level of accessibility. Motor vehicles and bicycle use the same ramp. Moderate distance from storage room to exit. Entrance door difficult for bicycles to maneuver.	Moderate level of capacity. As of March 2021, current bicycle storage utilization rate is at 78%. It has moderate storage per dwelling unit ratio of 1.5
Magnolia House (2012)	Moderate level of convenience. Two out of three bicycle rooms are in proximity to entrances and elevator	Moderate level of security. No CCTV camera in bicycle storage room. Room is FOB access only. Doors have metal mesh windows but are difficult to see through. Rooms are moderately well lit and are moderately open to line of sight	Moderate level of accessibility. Motor vehicles and bicycle use the same ramp. Two of the three rooms have close distance from storage room to exit.	Moderate level of capacity, As of March 2021, current bicycle storage utilization is at 97%. It has high storage per dwelling unit ratio of 2.6
Dahlia House (2012)	Low level of convenience. Bicycle rooms are distant from building entrance but are in moderate proximity of elevators	Moderate level of security. No CCTV camera in bicycle storage room. Room is FOB access only. Doors have metal mesh windows but are difficult to see through. Rooms are moderately well lit and are moderately open to line of sight	Low level of accessibility. Motor vehicles and bicycle use the same ramp. Far distance from storage room to exit.	Low level of capacity, As of March 2021, current bicycle storage utilization is at 120%. It has low storage per dwelling unit ratio of 0.8

7.8 Utilization Summary

As summarized in Table 7.1, Mundell House has excessive capacity with its high bike storage per unit ratio. Its bike storage utilization is at healthy level. As for the Magnolia and Nobel House, their utilization are at 96% and 78% respectively therefore both are at acceptable level under the current occupancy rate. However, for Dahlia, Pine and Cypress House, the current bike storage quantity already exceed their capacity given that their occupancies have

yet to reached 100%. The utilization of Cypress House even achieved 213% on the day the survey was conducted.

Table 7.2: Summary of utilization ratio

Location	Occupancy	Number of Units	Bike storage provided	Ratio (Bike storage / unit)	Current bike storage utilization	Property move in date
Mundell	99%	136	436	3.2	39%	September 1, 2020
Magnolia	84%	47	123	2.6	96%	July 1, 2012
Dahlia	77%	60	46	0.8	134%	July 1, 2012
Pine	96%	93	53	0.6	134%	Spring 2018
Cypress	96%	82	50	0.6	213%	Spring 2018
Nobel	91%	94	142	1.5	78%	Spring 2015

7.9 Projection on idea ratio of bike storage per dwelling unit

Based on the given information and the data from site survey, an linear extrapolation was generated to determine the projected bike quantity when the occupancy is assumed to reach 100%. Table 7.3 shows the projected utilization of Mundell and Nobel House will still be in healthy level. In contrast, Magnolia, Dahlia, Pine and Cypress will further exceed their capacity with the projected utilization from 115% to 235%. In addition, based on the projected bike quantity, the ideal ratio of bike storage per unit for each house can be calculated. Table 7.3 shows the average ratio for the six house is 1.49.

Table 7.3: Projected bike quantity, utilization and ratio of bike storage per unit based on 100% occupancy

	Current bike storage utilization	Ratio (Bike storage / unit)	Property occupancy	Current Bike Qty	Projected Bike Qty (Occupancy =100%)	Projected utilization	Ideal Ratio of Bike storage per unit
Mundell	39%	3.2	99%	168	170	39%	1.2
Magnolia	96%	2.6	84%	119	142	115%	3.0
Dahlia	134%	0.8	77%	55	71	155%	1.2
Pine	134%	0.6	96%	67	70	132%	0.8
Cypress	213%	0.6	96%	113	118	235%	1.4
Nobel	78%	1.5	91%	111	122	86%	1.3

Average: 1.49

8. RESIDENT SURVEY

In order to understand current user experience and gather feedback on issues, a resident survey was administered at the Selected Properties.

An online survey "**Tell us about the bicycle storage experience**" with 14 questions [**see Appendix C**] was circulated to the residents between 19th March 2021 and 5th April 2021.

The aim of the resident survey was to understand the usage of Class I bicycle parking and the number of bicycles owned at the Selected Properties. Through the resident survey, the residents' comments and experience in using bicycle storage facilities were also collected.

The results from the resident survey are presented in the following order:
- o Respondents' profiles
- o Importance of Class I bicycle storage to residents
- o Residential satisfaction of the current Class I bicycle storage conditions
- o Residential satisfaction of the current Class I bicycle storage conditions in relation to "easy to access", "good security", "sufficient amenity" and "easy to use racks"
- o Improvement Focus – More Bicycle Racks
- o Number of additional racks required
- o Bike ownership
- o Potential improvements
- o General Comments

8.1 Respondents' profiles
- o A total of 38 responses were received by Monday 5 April 2021.
- o Out of these responses, 9 were received from Cypress House, 5 were received from Dahlia House, 4 were from Magnolia House, 8 were from Mundell House, 6 were from Nobel House and 6 were from Pine House [see Figure 8.1].
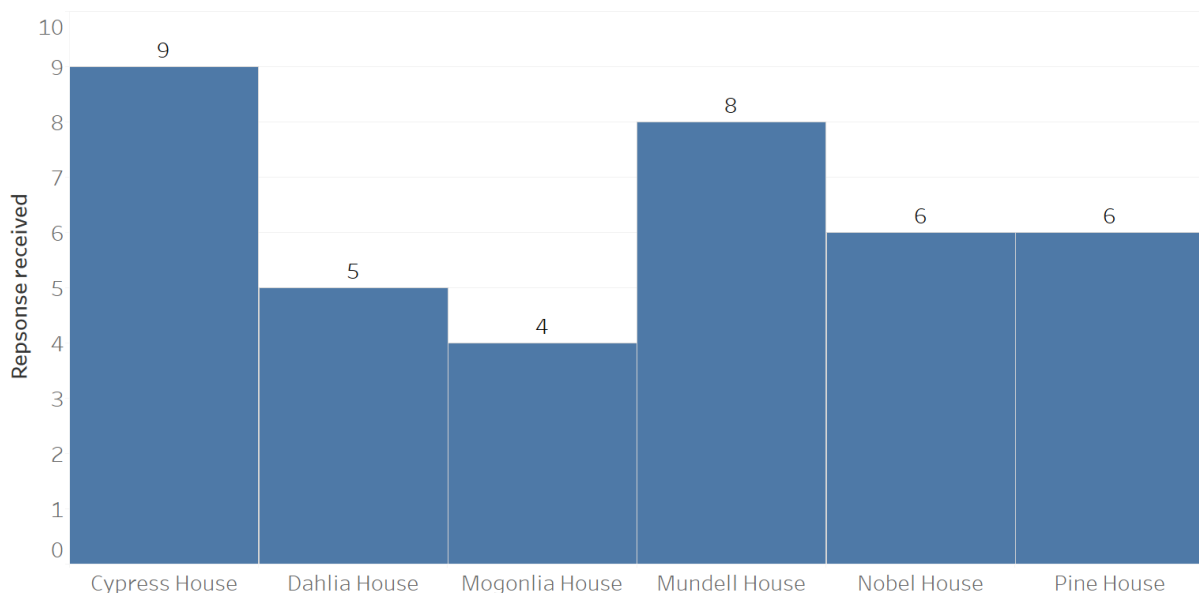
Sum of Repsonse received for each Location. The marks are labelled by sum of Repsonse received. Details are shown for Location.

Figure 8.1: Respondents' Profile

8.2 Importance of Class I bicycle storage to residents

- Figure 8.2 shows the importance of Class I bicycle storage to residents, with a scale of "Very important" to "Not important".
- Overall, 79% of respondents were in the view that "Class I bicycle storage is very important".
- Among the six buildings, 100% of respondents from Cypress House and Nobel House indicated that "Class I bicycle storage is very important", this is followed by Pine House (81%) and Dahlia House (80%).
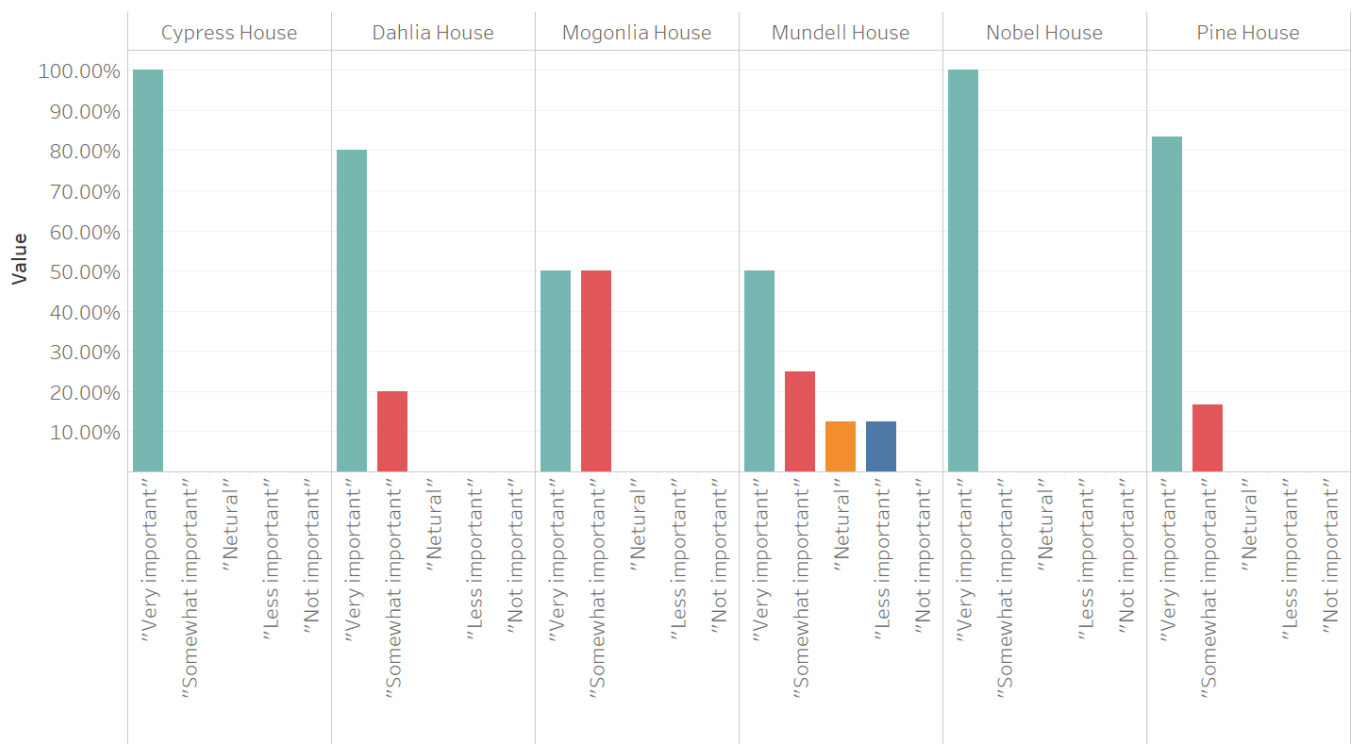- In comparison, only half of the respondents from Magnolia House and Mundell House indicated that "Class I bicycle storage is very important".

"Very important", "Somewhat important", "Netural", "Less important" and "Not important" for each Location. Colour shows details about "Very important", "Somewhat important", "Netural", "Less important" and "Not important".

Figure 8.2: Importance of Class I bicycle storage to residents

8.3 Residential satisfaction of the current Class I bicycle storage conditions

- Figure 8.3 shows the extent to which residents were satisfied with the current Class I bicycle parking conditions at their buildings when compared with the utilization of Class I bicycle parking, with a scale of 4 being "Very satisfied" to 1 being "not satisfied".
- In general, there is a trend that residential satisfaction decreases when Class I bicycle parking increases.
- Among the Selected Properties, Cypress House, Pine House and Dahlia House had the utilization rates above 100% and the satisfaction rates from their residents ranged between 1.0 and 2.0. On the other hand, the utilization rates of Magnolia House, Mundell House and Nobel House were 100% or less, and the satisfaction rates from their residents ranged between 1.75 and 3.75.
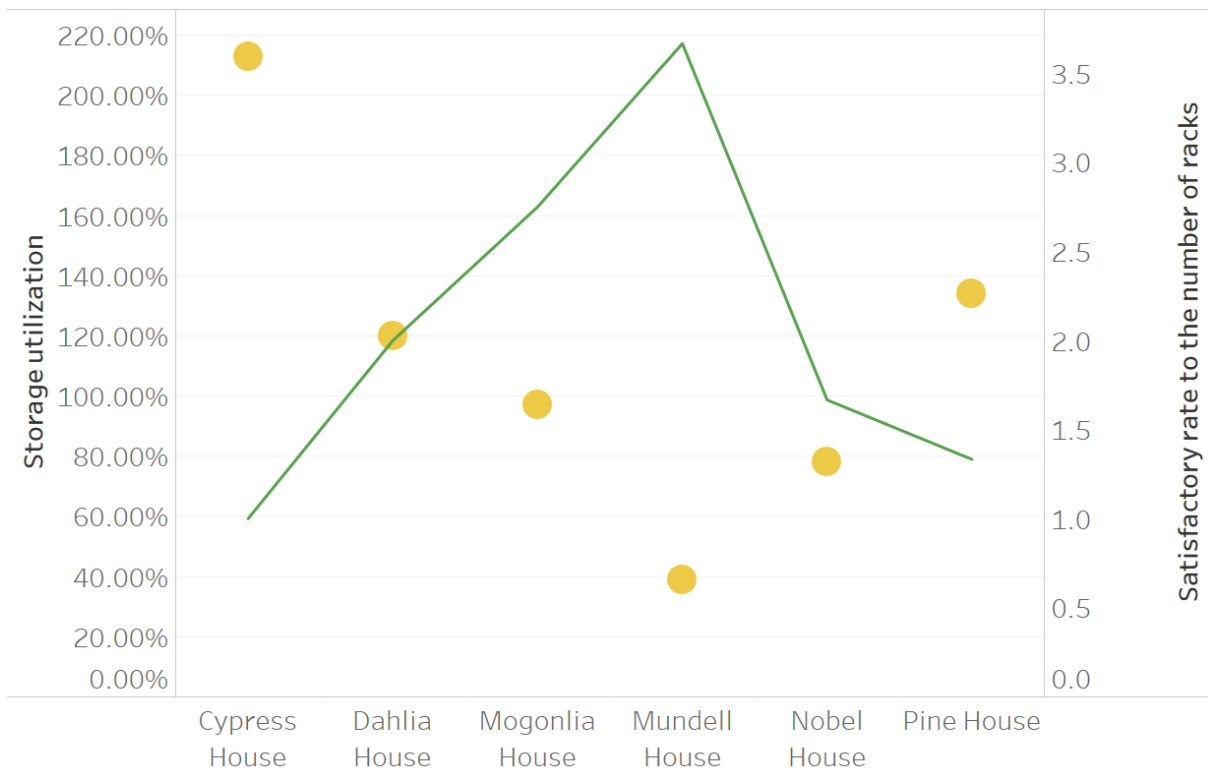
The trends of Storage utilization, Storage utilization and Max. Satisfactory rate for # of bicycle racks for Location. Colour shows details about Storage utilization and Max. Satisfactory rate for # of bicycle racks.

Measure Names
- ■ Max. Satisfactory rate for # of bicycle racks
- ■ Storage utilization

Figure 8.3: Residential satisfaction with the current Class I bicycle parking conditions and the utilization of Class I bicycle parking

8.4 Residential satisfaction of the current Class I bicycle storage conditions in relation to "easy to access", "good security", "sufficient amenity" and "easy to use racks"

- o Figure 8.4 shows the extent to which residents were satisfied with the current Class I bicycle parking conditions at their buildings with respect to "easy to access", "good security", "sufficient amenity" and "easy to use racks", with a scale of 4 being "Very satisfied" to 1 being "Not satisfied".
- o Among the Selected Properties, Mundell House had the highest residential satisfaction rates in all aspects, followed by Magnolia House. On the other hand, Cypress House and Dahlia House had the lowest satisfaction rates. These findings are aligned with the observations gathered from the site surveys.

Figure 8.4: Residential Satisfaction of Various Aspects of Class I bicycle storage

8.5 Improvement Focus – More Bicycle Racks

- o Figure 8.5 compares the current utilization of Class I bicycle parking with residents' view on how important it is for them "having more racks", with a scale of 4 being "Highly important" to 1 being "Not important".
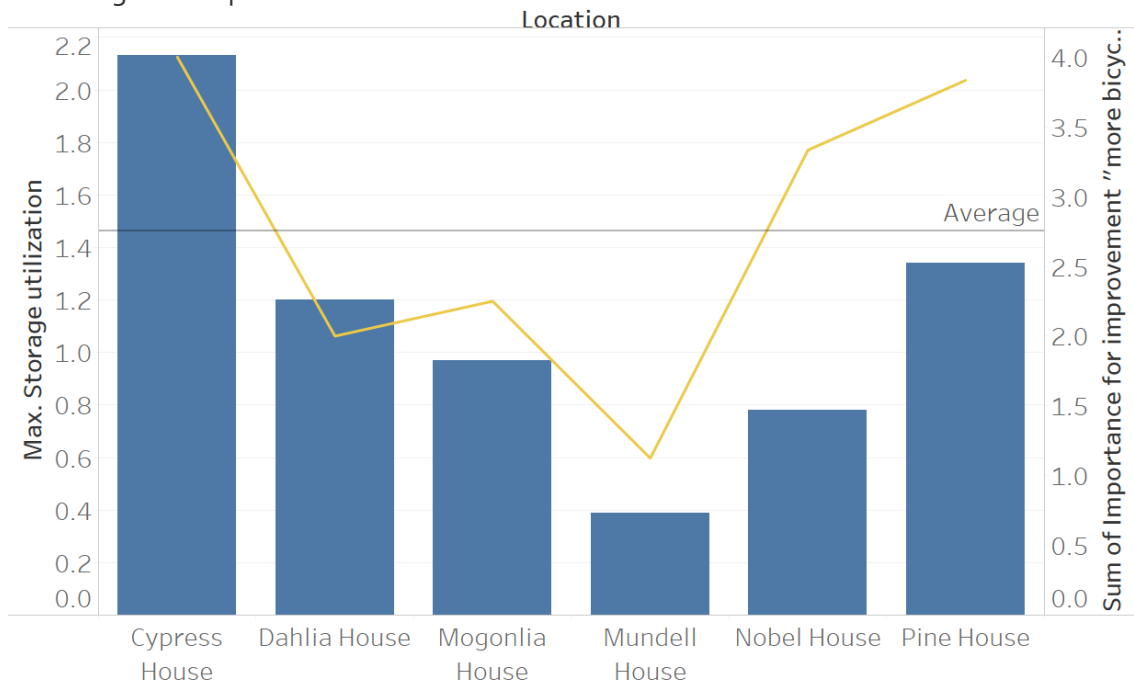
The trends of Max. Storage utilization and Importance for improvement for Location. Colour shows details about Max. Storage utilization and Importance for improvement .

Measure Names
- Importance for improvement
- Max. Storage utilization

Figure 8.5: Utilization vs Importance of "having more racks"

- o In general, the higher the storage utilization, the more important it is for the residents to have more racks.
- o Among the Selected Properties, Cypress House had the highest utilization rate of Class I bicycle parking, followed by Pine House. Residents at both of these properties had expressed that "having more racks" are "Very Important" to them.

8.6 Number of additional racks required

- o Figure 8.6 compares the current utilization of Class I bicycle parking with residents' view on how many more racks would be required.
- o Not surprisingly, the higher the storage utilization, the more additional racks would be required.

- Among the Selected Properties, residents expressed the number of additional racks required ranged between 0.250 (Magnolia House) to 2.444 (Cypress House).
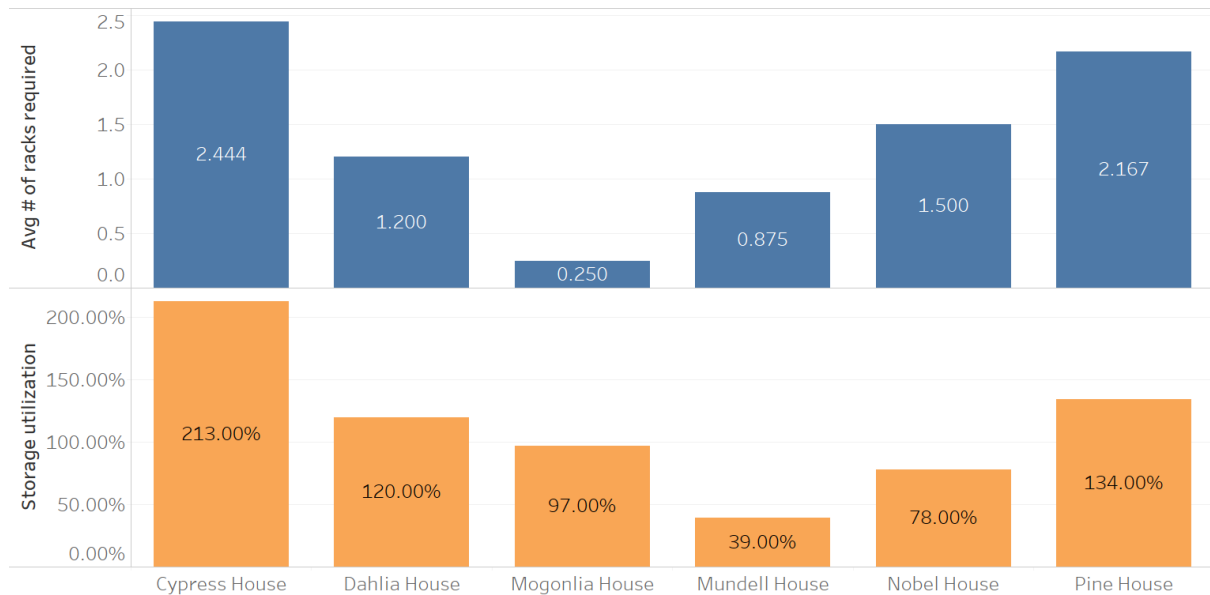
Sum of Avg # of racks required and sum of Storage utilization for each Location. For pane Sum of Avg # of racks required: The marks are labelled by sum of Avg # of racks required. For pane Sum of Storage utilization: The marks are labelled by sum of Storage utilization.

Figure 8.6: Average additional racks required from the respondents

8.7 Bike ownership

Overall

- Figure 8.7 shows the number of bicycles owned by the residents.
- Among the Selected Properties, residents at Nobel House had the highest number of bicycles owned per unit (4.4), followed by Cypress House (3.25) and Dahlia House (3.0) and Pine House (3.0).
- Overall, a total of 112 bikes are owned by 113 residents. On average, each person owns 0.98 bikes.
- Figure 8.8 shows the number of bicycles owned by the residents of different aged groups.
- Among adult, teen and children, 27 children own 33 children bikes and have the highest bike ownership ratio with 1.22 children bikes per child (Table 8.1)

Average number of different age group

Figure 8.7: Average number of bicycles and average number of people per unit

Avg number of bicycle owned and avg #of people for each Location. Colour shows details about Avg number of bicycle owned and avg #of people.

Measure Names
- Avg number of bicycle owned
- avg #of people

Figure 8.8: Number of bicycles owned by the residents of different aged groups

Table 8.1: Average bicycles owned by person and child
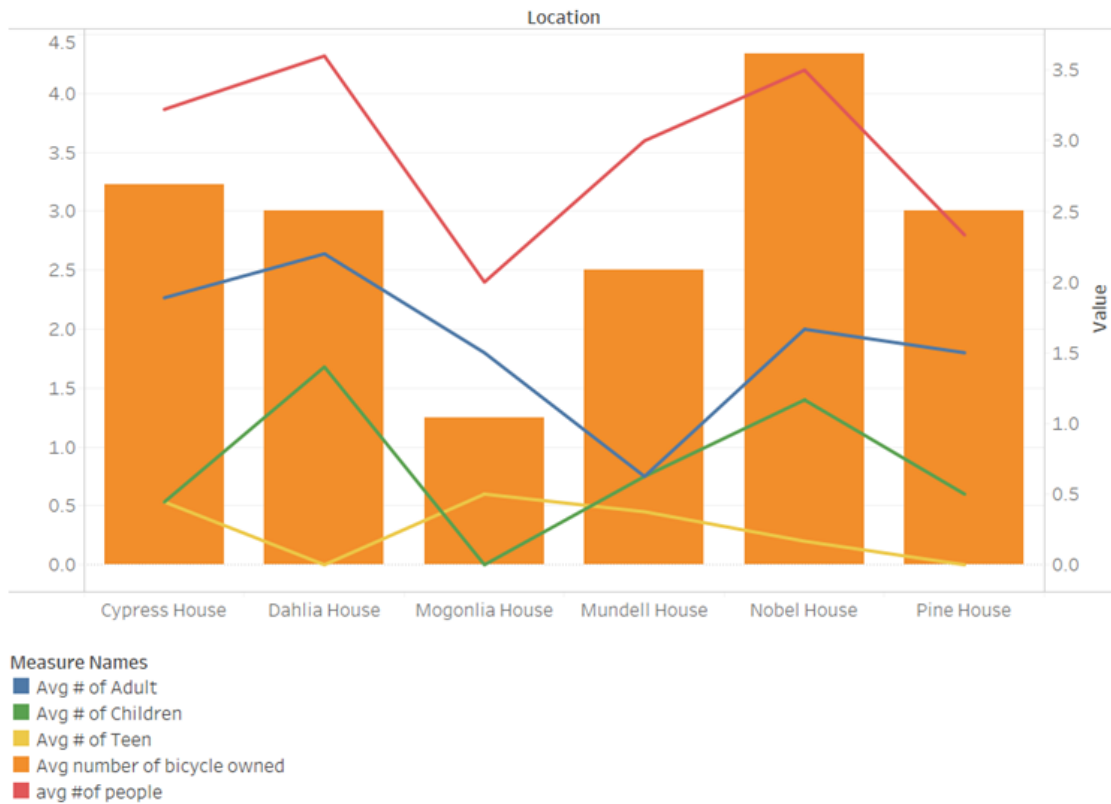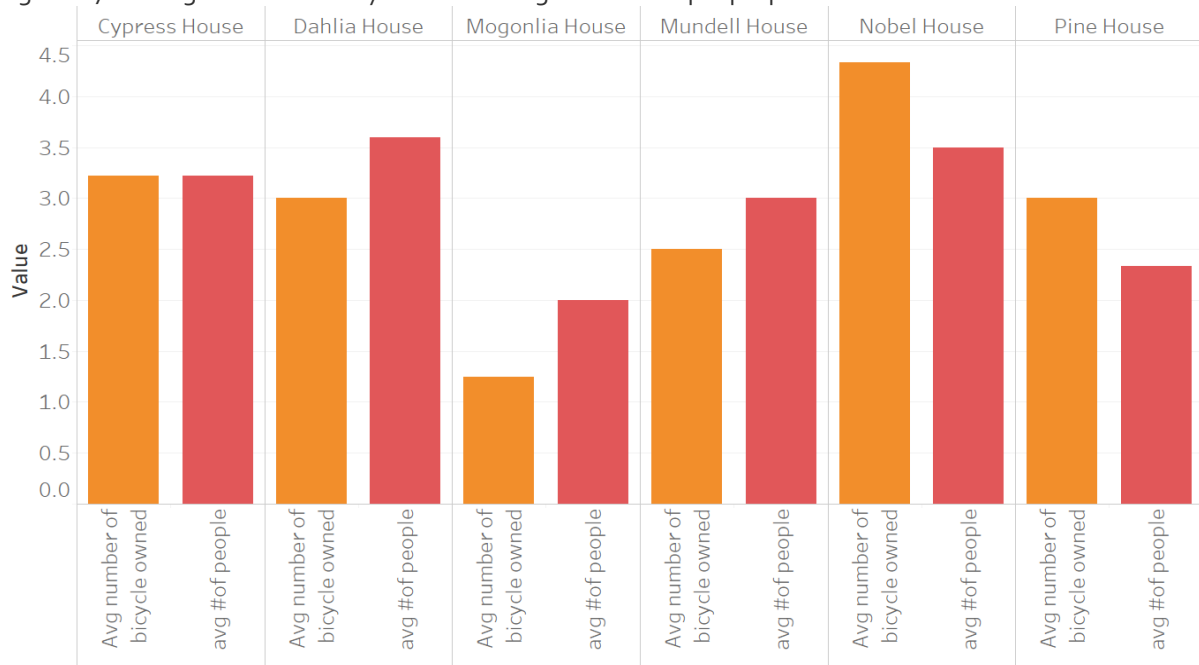
	Ratio
Average bicycles owned per person	0.98
Average children bicycles owned per child	1.22

8.8 Potential improvements

Respondents were asked the areas of improvements that would be most important to them. These include "More bicycle racks", "Bigger storage rooms", "More accessible facilities", "Improved security", "Bicycle repair station" and "Additional bicycle racks for different bicycle types". Results vary across the six selected buildings:

Table 8.2: Potential improvements suggested by the respondents

Building	Most important	2nd most important	3rd most important	3rd least important	2nd least important	Least important
Cypress House	More bicycle racks	Bigger storage rooms	More accessible facilities	Improved security	Bicycle repair station	Additional bicycle racks for different bicycle types
Dahlia House	Bicycle repair station	Improved security	More accessible facilities	More bicycle racks	Bigger storage rooms	Additional bicycle racks for different bicycle types
Mogonila House	Bicycle repair station	More accessible facilities	Improved security; More bicycle racks; Additional bicycle racks for different bicycle types			Bigger storage rooms
Mundell House	Improved security	Bicycle repair station	More accessible facilities, Additional bicycle racks for different bicycle types		Bigger storage rooms, More bicycle racks	
Nobel House	Bigger storage rooms, More bicycle racks		Improved security	More accessible facilities	Bicycle repair station	Additional bicycle racks for different bicycle types
Pine House	More bicycle racks	Bigger storage rooms, Additional bicycle racks for different bicycle types		More accessible facilities	Improved security	Bicycle repair station

8.9 General Comments

In addition to the survey responses, the respondents provided a number of additional comments with respect to the quantity and design of the bike storage facilities, as well as the management of the bike storage facilities.

Comments in relation to the quantity and design of the bike storage facilities

- o   Insufficient number of racks
- o   Racks are unable to accommodate non-standard size bikes
- o   Bike rooms are non-accessible with narrow entrance, heavy doors and not well-lit areas

Comments in relation to the management of the bike storage facilities

- o Non-designated racks and a first-come-first-serve basis may not be ideal for active bike users
- o Racks are unable to accommodate non-standard size bikes
- o Lack of security for bike storage areas – bikes got stolen

Notable recommendations

- o For some buildings, more racks with better designs
- o Automatic doors and easier access
- o Better management (e.g. designated spaces instead of current first-come-first-serve mode)
- o Improved security to avoid bikes being damaged or stolen

9. KEY FINDINGS

The key findings of the Project are summarized below:

Literature review

- o UBC guidelines (2020) on Class I Bicycle Storage's design and standards are highly comprehensive compared to other international standards.

Site surveys

- o Capacity provision at three out of the six buildings studied (Dahlia House, Pine House and Cypress House) is less than 1.5 bike parking spaces per unit (0.6-0.8 spaces per unit instead).

- o Facilities at Dahlia House, Pine House and Cypress House are overcrowded with the utilization rates of 134%, 134% and 213% respectively, likely due to their capacity provision of Class I bicycle parking being below previous standards.

- o When normalized with the building occupancy rates, in addition to the above-mentioned buildings, Magnolia House would also experience overcrowding of its facilities with a projected utilization rate of 115%.

- o Facilities at Mundell House which has a provision ratio of 3.2 spaces per unit were observed to be underutilized with a utilization rate of 39%.

- o By considering the utilization figures across the six buildings collectively, an ideal ratio of bike parking spaces per unit would be 1.49.

- o While the facilities at Mundell House are well designed from the Convenience, Safety & Security and Accessibility's perspectives, facilities at other buildings have various drawbacks.

Resident survey:

o Resident survey revealed that a small number of residents choose to store their bicycles in other locations such as on their patio or in storage lockers.

o Residents' satisfaction is highly correlated with the utilization rates, as well as security and accessibility of the facilities.

o The higher the utilization rates, the more important it is the facilities to the residents and the higher number of additional racks requested.

o In relation to bike ownership, it was found that the more the children a unit has, the more bicycles owned by that unit.

o Based on the results from the resident survey, the average number of bikes owned per person is 0.98 while the average number of bikes owned per child is 1.22.

o In addition to the number of bedrooms in a unit, the actual demand for bike storage is also influenced by other factors:
  - the number of individuals living in the unit; and
  - the number of bikes owned per person.

Is the standards set out in the UBC Development Handbook and REAP sufficiently meeting the needs of the university community?

By using the number of bicycle owned per person and assuming the number of persons in different types of unit against the requirement in UBC Handbook, the current provision would provide sufficient bike storage to residents.

Table 9.1: Estimated Demand for Class I Bicycle Parking vs UBC Provision

	Based on estimation*	UBC Provision (2020)	Observation
Studio/one bedroom unit (1-2 persons)	0.98-1.96	1.5	SUFFICIENT
Two-bedroom unit (2-3 persons)	1.96 -2.94	2.5	SUFFICIENT
Three or four -bedroom unit (3-5 persons)	2.94-4.9	3	MERELY ADEQUATE - INSUFFICIENT

* 1 person owns 0.98 bicycle (Resident Survey)

The estimated analysis of 0.98 bicycle per person is based on the assumptions extrapolated from the Online Resident Survey. Given the limited number of responses and possible inflation of ownership, the team suggest that the analysis result should be considered under some caveats.

10. RECOMMENDATION

Based on the findings of this Project, the following recommendations are proposed:

Ongoing monitoring and review of the Class I bicycle parking capacity provision standards

The capacity provision requirement standards of Class I bicycle parking set out in the UBC Development Handbook and REAP should sufficiently meet the needs of the university community, particularly for studio/one bedroom units and two-bedroom units.

It is recommended that ongoing monitoring and review of the standards should be conducted for a number of reasons:

- o The UBC Development Handbook and REAP were last updated in September 2020 and December 2020 respectively, while the move in dates of the Selected Properties were between 2012 and 2020, this means that none of the buildings surveyed in this Project had adopted the latest standards set out in the UBC Development Handbook and REAP.

- o While this Project attempted to deduce whether such standards would meet the needs of the community based on the number of bikes owned by the respondents gathered from the resident survey, given the limited number of responses and possible inflation of ownership, it is suggested that the analysis result should be considered under some caveats. Ongoing review and monitoring of the standards with future developments should be conducted.

- o Our analysis shows that the capacity provision requirements for three or four -bedroom unit may not be sufficient.

Design Standards – Best Practices

Findings from both the site surveys and resident survey indicated that Mundell House demonstrates the best design standards of Class I bicycle parking from the perspectives of "Convenience", "Safety & Security" and "Accessibility". The following key features at Mundell House should serve as best practices for the reference of future developments:

Access to bike room from ground level

Automatic door at main entrance

Dedicated pathways for bicycle access

CCTV installed in all bicycle storage rooms

Security windows for
bike room transparency

Other suggestions

It is recommended further studies be conducted in future:

- o Given the UBC Development Handbook and REAP are applicable to all new developments on UBC Campus, further studies on bike storage requirements of different property types (student, staff & faculty, market rental strata condos) should be conducted.

- o Bike audits should be conducted regularly to ensure that bicycles stored in the facilities do belong to current residents.

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APPENDIX A - SEEDS RESEARCH PROJECT CHARTER

PART 1: SEEDS RESEARCH PROJECT DESCRIPTION

Research Project Working Title: Assessing Bicycle Parking Requirements on South Campus	
Primary Research Priority Area: Accelerating Climate Action	**Secondary Research Priority Area:** Choose an item.
Primary Research Focus Area: Choose an item.	**Secondary Research Focus Area:** Choose an item.

United Nations Sustainable Development Goals (SDGs) research advances: **Goal 11: Sustainable Cities and Communities**

Campus Sustainability & Wellbeing Plans/Policies research informs or implements: *REAP 3.2* *UBC Development Handbook* *UBC Transportation Plan*

Research Purpose:

Assess current demand and gather user experience feedback for Class I bike parking in residential developments in Wesbrook Village on campus and use information to propose updates to UBC's current Class I bike parking requirements that better meet the needs of the faculty and staff users.

Research Objectives

1. Conduct a literature review of other bicycle parking policies in the region, and review UBC's residential development and transportation context.
2. Develop a focus group and / or administer a survey of neighbourhood residents to understand current user experience and gather feedback on issues and recommendations.
3. Survey existing Class I facilities to see demand and substantiate issues heard from user group. Alternatively, because of the COVID-19 limitations and challenges, ask user group participants survey their Class I storage areas and report back on demand.

Please describe project background (no more than 300 words).

As per REAP 3.2 and the UBC Development Handbook, any new development must provide and maintain on-site bicycle parking spaces (this requirement was updated in December 2020).

Pre requisite requirement: Bicycle Parking and Storage Room (s)
Provide the bicycle storage and facilities below:
• Provide Class I bicycle storage facilities at a rate of: 1.5 spaces per studio or one bedroom unit; 2.5 spaces per 2 bedroom unit; and 3 spaces per 3 or 4 bedroom units. (Requirements include 10% oversize spaces, and one electrical outlet per two spaces); and
• An in building bicycle repair station; and
• 0.5 Class 2 bicycle storage spaces per dwelling unit; and
• A 2 x 3 m concrete pad outside the building, close to the building entrance, with a standard outlet or conduit for electrified bike share.
• All bicycle parking and storage to be provided in accordance with the UBC Development Handbook

Given the amount of Class I stalls required, UBC Properties Trust would like to revisit the requirement and have demand inform the requirement and also still support UBC's interests and priorities.

Contribution to Advancing Societal Issues

The findings of this research project may be scalable to other jurisdictions also looking at how to balance competing demands for space and funds in residential development and support modal shifts towards climate mitigation efforts.

Outline of Project Details

1. Conduct background and literature review

Identification of best practices and assess satisfaction of bike parking spaces(from neighbourhood residents and bike users). Specifically, the objectives of the study are:
- Assess the supply and demand of Class I bike storage facilities;
- Examine the reasons why this is the case; and
- Provide recommendations based on the study findings (e.g. whether such provision should be enhanced and/or potential enhancements to be made to Class I bike storage facilities for increased usage and better user experience).

Conduct field research on existing Class I storage facilities in non-market housing developments in the Westbrook Village area.
- Access current visual condition of the Class I facilities;
- Access building permit drawings in relation to as-built conditions.

2. Attend stakeholder meetings

Kick-off meeting with stakeholders (including E3), Neighbourhood Association/ Community members

3. Identify and develop research methods

Interviews to bike users & community members, create a focus group, and share questionnaires around the community.

4. Conduct research and collect data

Target audience/ sample would mainly be people that live around the project and bike users.
It is envisaged that surveys would be used to collect data – due to the current situation of Covid-19, the team will discuss with the client further on the survey methodology, sample size, means of collecting data (e.g. online survey), circulate survey deployment with client and staff, etc.

APPENDIX B - SITE SURVEY STATISTICS

Date of site survey: 5-Mar-2021
Time period: 10:00 – 16:00
Location: Mundell House, Dahlia House, Magnolia House, Pine House, Cypress House and Nobel House

Bike Room	Mundell House Property Occupancy: 99%						
Bike Room	**1**	**2**	**3**	**4**	**5**	**6**	
Adult Bike	1		19	11	22		
Children Bike					5		
E-Bike							
Others			3	1	3		
Sub-Total	1	0	22	12	30	0	
Capacity per room	49	40	40	36	36	33	
Bike Room	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Adult Bike	13	8	18	9	14	6	9
Children Bike	4	2	3	1	7	1	
E-Bike							1
Others	2	3	1		1		
Sub-Total	19	13	22	10	22	7	10
Capacity per room	20	18	56	30	28	36	36
Total bikes counted on site	168						
Total Capacity	436						
Utilization	39%						

Bike Room	Dahlia House Property Occupancy: 77%			Magnolia House Property Occupancy: 84%		
Bike Room	**1**	**2**	**3**	**4**	**5**	**6**
Adult Bike	9	18	10	11	48	27
Children Bike	1	7	5		13	7
E-Bike					1	
Others	2	1	2		10	2
Sub-Total	12	26	17	11	72	36
Capacity per room	14	15	17	6	84	33
Total bikes counted on site	55			119		
Total Capacity	46			123		
Utilization	120%			97%		

Bike Room	Pine House Property Occupancy: 96%	Cypress House Property Occupancy: 96%		Nobel House Property Occupancy: 91%
	Total	Storage #2	Bike room	Total
Adult Bike	62	23	51	81
Children Bike	3	10	19	28
E-Bike		2	3	
Others	2	2	3	2
Sub-Total	67	37	76	111
Capacity per room	50	28	53	142
Total bikes counted on site	67	113		111
Total Capacity	50	53		142
Utilization	134%	213%		78%

Tell us about your bicycle storage experience!

1 Which building do you currently reside in?

Question instructions: *Select one answer*

◯ Mundell House   ◯ Cypress House   ◯ Pine House   ◯ Nobel House   ◯ Dahlia House   ◯ Magnolia House

2 Do you currently use your building's bicycle storage facility?

Question instructions: *Select one answer*

◯ Yes   ◯ No

3 How do you feel about bicycle storage in your building?

Question instructions: *Select one answer*

◯ Not important   ◯ Less important   ◯ Neutral   ◯ Somewhat important   ◯ Very important

4 How many bicycles do you own?

Question instructions: *Select one answer*

◯ 0   ◯ 1   ◯ 2   ◯ 3+

5 What kind of bicycles do you own?

Question instructions: *Select one answer in each row*

	0	1	2	3+
Adult's Bicycle	◯	◯	◯	◯
Electric bicycle	◯	◯	◯	◯
Children's bicycle	◯	◯	◯	◯

Non-standard (cargo/ carrier)	○	○	○	○

6 How do you feel about the current bicycle storage situation?

Question instructions: *Please select one answer*

	Not Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied	N/A
Sufficient bicycle racks	○	○	○	○	○
Easy to use of racks	○	○	○	○	○
Easy to Access	○	○	○	○	○
Good security	○	○	○	○	○
Sufficient amenity (bike repair, etc)	○	○	○	○	○

7 What improvements would be important to you?

Question instructions: *Select one answer in each row*

	Not important	Somewhat Important	Important	Highly Important
More bicycle racks	○	○	○	○
Bigger storage rooms	○	○	○	○
More accessible facilities	○	○	○	○
Improved security	○	○	○	○
Bicycle repair station	○	○	○	○
Additional bicycle racks for different bicycle types	○	○	○	○

8 Do you need more bicycle racks?

Question instructions: *Select one answer*

○ Yes   ○ No

9 How many additional bicycle racks would you need?

Question instructions: *Select one answer*

○ 1　○ 2　○ 3+

10 Do you have any additional comments or suggestions for the existing bicycle storage facility in your building?

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11 What is your current employment?

Question instructions: *Select one answer*

○ Working in UBC　　○ Working outsides UBC　　○ Studying in UBC　　○ Studying outisdes UBC　　○ Retired　　○ Self-employed

○ Other

12 How many residents are in your unit?

Question instructions: *Select one answers in each row*

	0	1	2	3	4	5
Seniors (Over 60)	☐	☐	☐	☐	☐	☐
Adult (Age 18-60)	☐	☐	☐	☐	☐	☐
Teen (Age 12-18)	☐	☐	☐	☐	☐	☐
Children (Age 0-12)	☐	☐	☐	☐	☐	☐

13 Are you interested in participating in a "focus group" to share your personal experience with the students?

Question instructions: *Select one answer*

○ Yes　　○ No

14 Thanks for your participation!

Question instructions: *If you wish to join the lucky draw for a gift card, please leave your name and email below.*