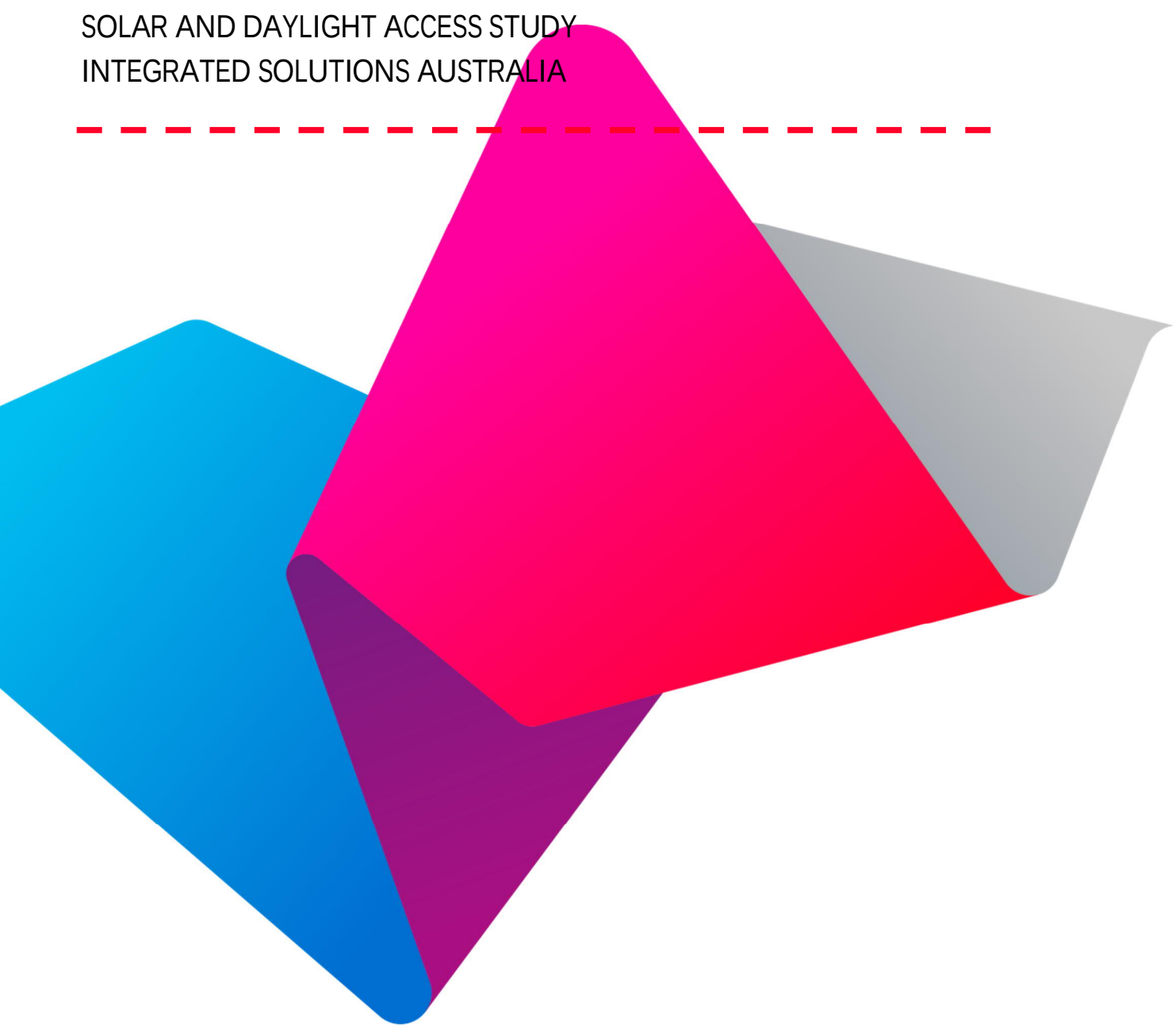
ONE SYDNEY HARBOUR, BUILDING R4B BARANGAROO SOUTH - AMENDING SSD DEVELOPMENT APPLICATION SSD 8892218

SOLAR AND DAYLIGHT ACCESS STUDY
INTEGRATED SOLUTIONS AUSTRALIA



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Executive Summary

This report has been prepared to support an amending SSD Development Application for State Significant Development SSD-8892218 to the Department of Planning regarding Building R4B located within the One Sydney Harbour development at Barangaroo South. This report has been updated to include the changes as per the Development Application (DA) SSD-8892218, which includes the additional 8 floors. This provides additional explanatory information regarding performance against the Apartment Design Guide Part 4A Solar and daylight access design criteria and the solar access guidance of Part 3D Communal and public open space.

The total development achieves reasonable solar access for a site located within the density of the Sydney Metropolitan Area with excellent daylight access due to the highly transparent façade and north-east and west facing façades.

Analysis undertaken confirms that 62% of R4B apartments receive a minimum of 2 hours of direct sunlight between 9am and 3pm to the finished floor level of living rooms and private open spaces on the winter solstice. If extending the analysis period to between 9am and 5pm, 79% of apartments receive direct sunlight for 2 hours.

While only 2% of the podium level P2 communal open space will receive more than two hours of direct sunlight between 9am and 3pm in mid-winter, 30% of the space will receive one hour of direct sunlight and the space will naturally have good access to diffuse skylight, and receive significant sunlight at other times of the year.

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1.0 Introduction

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Department of Planning, Infrastructure and Environment (DPIE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The 'amending' SSD DA seeks approval for eight additional storeys and 5,650sqm of gross floor area (GFA), amongst other items, to Residential Building R4B approved under SSD 6965. This SSD DA proposes to amend the 60-storey Residential Building R4B development approved under SSD 6965, which in turn necessitates the inclusion of condition(s) of consent to this SSD DA that require the modification of SSD 6965.

1.1 Site Description

Barangaroo is located on the north western edge of the Sydney Central Business District (CBD), bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development containing large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Central and Barangaroo South. The Residential Building R4B site is located within Barangaroo South. The site of this proposed DA is located on land generally known and identified in the approved Concept Plan (as modified) as Block 4A, as shown in **Figure 1** below.

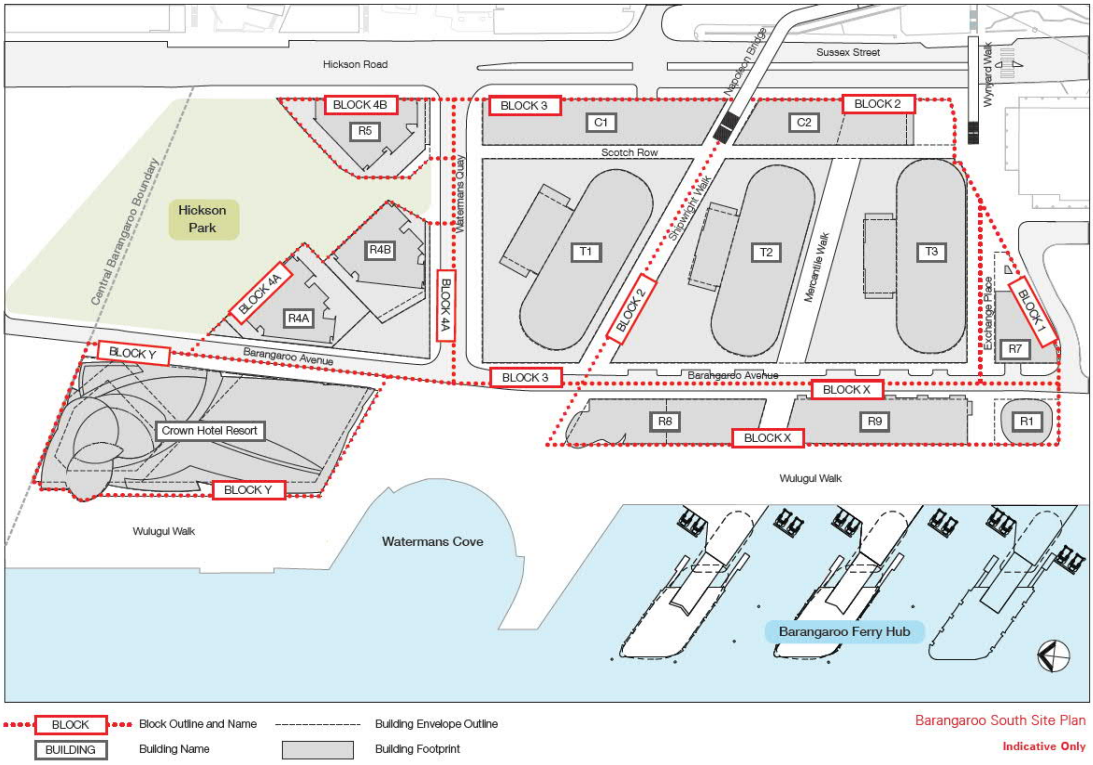


Figure 1 Block 4A in relation to Barangaroo South

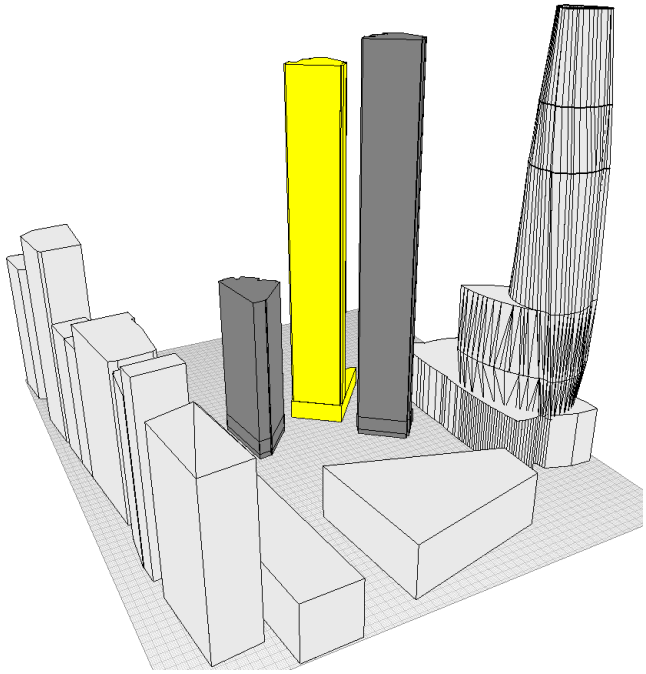


Figure 2 Image of R4B (in yellow) and surrounding buildings from the north east perspective.

1.2 Background

1.2.1 Barangaroo South Concept Plan (as modified)

The approved Barangaroo South Concept Plan (MP06_0162) (as modified), includes approval for the following:

- A mixed use development involving a maximum of 602,354 sqm gross floor area (GFA), comprised of:
  - a maximum of 191,031 sqm of residential GFA of which a maximum of 162,031 sqm will be in Barangaroo South;
  - a maximum of 76,000 sqm of GFA for tourist uses of which a maximum of 59,000 sqm will be in Barangaroo South;
  - a maximum of 34,000sqm of GFA for retail uses of which a maximum of 30,000 sqm will be in Barangaroo South;
  - a maximum of 5,000 sqm of GFA for active uses in the Public Recreation zone of which 3,500 will be in Barangaroo South; and
  - a minimum of 12,000sqm GFA for community uses.
- Approximately 11 hectares of new public open space/public domain, with a range of formal and informal open spaces serving separate recreational functions and including an approximate 2.2km public foreshore promenade.
- Built form design principles, maximum building heights and GFA for each development block within the mixed use zone.
- Public domain landscape concept, including parks, streets and pedestrian connections.
- Alteration of the existing seawalls and creation of a partial new shoreline to the harbour.
- Construction, operation and maintenance of a concrete batching plant to supply concrete for construction of future development under this Concept Plan at Barangaroo South.
- No approval is granted or implied for the future use of a heliport and/or a helipad.

This ‘amending’ SSD DA seeks to achieve the maximum permissible GFA and height for Residential Building R4B that was approved as part of the latest modification to the Concept Plan (modification 10). Any consent that is granted to this SSD DA will be generally consistent with the terms of approval of the Concept Plan (as modified).

1.2.2 Residential Building R4B - Development consent SSD 6965

Development consent SSD 6965 was granted by the NSW Minister for Planning on 7 September 2017 for Residential Building R4B, comprising of a 60-storey mixed use building, with 297 residential units and retail floor space at ground level. This included a total gross floor area (GFA) of 38,896sqm, 38,602sqm of which was approved for residential floor space, and the remaining 294sqm was approved for retail floorspace.

Consent was also provided for associated building public domain works, fit-out and use of the basement, a link bridge connecting to Building R4A and associated building identification signage.

On 7 February, 2020, development consent SSD 6965 was amended to account for a range of design changes, including an increase in total GFA from 38,896sqm to 38,911sqm, comprised of

an increase in retail GFA from 294sqm to 309sqm, and a reduction in the number of apartments to 283.

A second application to modify development consent SSD 6965 has been submitted to the DPIE. The amendments contained within the modification application broadly relate to the following changes:

- increase the number of apartments from 283 to 290;
- revised dwelling mix and internal layout changes;
- changes to the landscaped podium layout; and
- changes to the number of car spaces from 320 to 324.

It is anticipated that this modification application to development consent SSD 6965 will be determined prior to the determination of this SSD DA. As such, this SSD DA is made with the above changes in mind.

Overview of Proposed Development

This 'amending' SSD DA seeks consent for eight additional storeys with 5,650sqm of GFA and containing 32 additional apartments, and an allocation of 7 additional car parking spaces to Residential Building R4B. More specifically, this SSD DA proposes to amend Residential Building R4B, through:

- an increase to the overall building height from RL208.23 up to RL235 (an additional 8 levels)
- increase the overall number of apartments from to 290 to 322
- revise the dwelling mix and apartment relocations within the building envelope; and
- change to the number of car spaces from 324 to 331.

1.3 Purpose of this Report

The One Sydney Harbour Residential Buildings have been studied in relation to the SEPP65 solar and daylight access guidance associated with apartments and communal open spaces. The 'Design Criteria' included in the Apartment Design Guide (July 2015) relevant to this guidance recommends that:

- *Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9am and 3pm at mid-winter in the Sydney Metropolitan Area.*
- *A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid-winter.*
- *The development achieves a minimum of 50% direct sunlight to the principal usable part of the communal open space for a minimum of 2 hours between 9 am and 3 pm on 21 June (mid-winter).*

The total development achieves reasonable solar access for a site located within the density of the site context with excellent daylight access due to the highly transparent façade. This analysis has

been updated to include the changes as per the Development Application (DA) SSD-8892218, which includes the inclusion of an additional 8 floors.

In 2017 when planning approval was granted, it was noted that a reduction in the Solar Access criteria within the Apartment Design Guide was acceptable, with 64% of apartments receiving 2 hours direct sunlight to living rooms and private open spaces between 9am and 3pm mid-winter.

2.0 Methodology

The R4B building consists of a typical low rise, mid-rise, high-rise and skyhome floor plates. This study has analysed the solar access for the following floors which provides representative results for every apartment within the development, as well as accessible communal open terraces.

Solar access varies by level given the site context of the project. Each level with a different apartment mix and/or receiving different solar access due to the site context has been analysed. While only typical floors are modelled, these are sufficient to confirm solar access to all apartments given that they are representative of all floors and apartments within the project. The table below summarises the floors modelled together with the floors that they represent. While the modelled floors are representative, the lower floor is always taken as the modelled floor to ensure that the analysis can be considered conservative.

Table 1 - Floors included in model and the floors they represent

Modelled Floor	Representative Floors
L01 (Low Rise)	L01 – L03
L04 (Low Rise)	L04 – L05
L07	L07 - L19, L21 - L32
L33	L33 - L46
L48	L48 – L63
Skyhomes	L64 – L65

Autodesk's Ecotect software was used to visually determine solar access in 15-minute time steps. Direct sunlight to the areas of analysis was determined at finished floor level. We have interpreted mid-winter as being the winter solstice, June 21st, which provides conservative results as it is the shortest day of the year.

The modelled apartments have been based on the latest drawings – Amending SSD DA Revision 1 Issued 31/08/2020. The façade elevations (north-east and west) all have high light transmittance glazing with a minimum glazing height of 2.7m.

3.0 Results

The results presented in the tables below have been presented for R4B against the Apartment Design Guide criteria.

3.1 Apartment Results

The apartment results tables show the current proposed SDD-8892218 results and previously submitted and approved 2017 and 2020 results. This analysis has been updated to include the changes as per the Development Application (DA) SSD-8892218, which includes the inclusion of an additional 8 floors.

Table 2: Solar access greater than 2 hours in residential building R4B on 21 June

	Approved 2017 SSD 6965		Approved 2020 SSD 6965 MOD 1		Current Proposed SSD 6965 MOD 2		Current Proposed SSD-8892218	
	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments
Living Rooms and Private Open Spaces (9AM – 3PM)[1]	64%	191	65%	184	63%	184	62%	200
Living Rooms and Private Open Spaces (9AM – 5PM)[1]	80%	237	82%	231	80%	231	79%	255

[1] Results indicate the percentage of apartments receiving as least 2 hours of solar access in the living rooms and balconies/wintergardens.

Table 3: Apartments receiving no direct solar access in residential building R4B on 21 June

	Approved 2017 SSD 6965		Approved 2020 SSD 6965 MOD 1		Current Proposed SSD 6965 MOD 2		Current Proposed SSD-8892218	
	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments
Living Rooms, Bedrooms, and Private Open Spaces[2] (9AM – 3PM)	9%	28	16%	45	18%	53	19%	61
Living Rooms, Bedrooms and Private Open Spaces[2] (9AM – 5PM)	0%	0	0%	0	1%	3	1%	3

[2] Results indicate the percentage of apartments receiving no direct solar access in the living rooms, bedrooms and/or balconies/wintergardens.

3.2 Communal Open Spaces Results

Podium level 2 consists of an outdoor communal open space which is accessible to all R4B residential tenants. During mid-winter, the podium level P2 communal open space receives some access to direct sunlight between 9am and 3pm. Note, these results have not changed since the section 4.55(2) modification application SSD 6965.

Table 4: Percentage of area receiving more than 1 or 2 hours of direct solar access in Open Terrace of residential R4B on 21 June between 9am and 3pm

	Period	Podium Open Space
2 Hours of Direct Sunlight	Winter: 9am – 3pm	2%
1 Hour of Direct Sunlight	Winter: 9am – 3pm	30%

The table below details the area and percentage of communal open space that receives direct sunlight between 9am and 3pm in 15-minute increments.

Table 5: Percentage and area of Open Terrace receiving direct solar access from 9AM to 3PM in 15-minute increments

Time	Podium P2 Open Space	
	Area (m^2)	% of Area
9:00 AM	-	0%
9:15 AM	-	0%
9:30 AM	42	7%
9:45 AM	88	14%
10:00 AM	148	23%
10:15 AM	161	25%
10:30 AM	157	25%
10:45 AM	98	15%
11:00 AM	49	8%
11:15 AM	2	0%
11:30 AM	-	0%
11:45 AM	-	0%
12:00 PM	-	0%
12:15 PM	4	1%
12:30 PM	20	3%
12:45 PM	37	6%
1:00 PM	17	3%
1:15 PM	-	0%
1:30 PM	-	0%
1:45 PM	-	0%
2:00 PM	3	0%
2:15 PM	31	5%
2:30 PM	87	14%
2:45 PM	47	7%
3:00 PM	2	0%
3:15 PM	-	0%

Although only a small area will receive sunlight for more than two hours, the space will still receive plenty of diffuse sunlight, as further detailed in the discussion (Section 4).

Table 6: Percentage of area receiving more than 1 or 2 hours of direct solar access in Open Terraces of residential R4B on 21 December

	Period	Podium Open Space
2 Hours of Direct Sunlight	Summer: 9am – 3pm	75%
1 Hour of Direct Sunlight	Summer: 9am – 3pm	83%

During mid-summer, 75% of the podium communal open space receives more than two hours of direct sunlight between 9am to 3pm; this increases to 83% when considering a 1-hour threshold.

4.0 Discussion

The Apartment Design Guide design criteria addresses both Solar and Daylight Access to habitable rooms and private open space where 62% of apartments receive the minimum of 2 hours direct sun to living rooms and private open spaces. The main factors leading to 62% solar access for the apartments for the 9am to 3pm criteria include:

- North-east and West facing façade of R4B building
- Shading from the existing CBD to the east to lower levels of the building in the morning
- Shading from Crown resort and the R4A building onto R4B building in the afternoon.

This is believed to be further enhanced by the following building attributes that enhance daylight and views:

- **High Light Transmission Façade** – The main façade elevations (the north-east and west for R4B) all have high light transmittance glazing with a minimum glazing height of 2.7m. Where the open cavity façade typology is proposed automated cavity blinds will also be provided to enable solar control when needed.

- **Daylight versus Sunlight** – The Apartment Design Guide quantifies a recommended amount of direct sunlight access, which does not fully characterise daylight (diffuse natural light) access. The One Sydney Harbour towers are positioned with parkland to the north and the harbour to the west, therefore the access to diffuse natural light to all apartments as well as the private and communal open spaces will be high.

- **Outlook** – The views to the northeast are primary resulting in views of Sydney Harbour to the north of the hotel. With the high performance façade typologies proposed, high daylight levels and amenity under diffuse sky conditions will be provided for the northwest facing apartments.

These considerations mean that the One Sydney Harbour living areas, open space and bedrooms will experience higher daylight levels year-round than many other residential buildings within the Sydney CBD. Therefore, we believe the proposed One Sydney Harbour exceeds the intent of SEPP65's Daylight Access principle.

5.0 Conclusion

The intent of the Apartment Design Guide 4A Solar and daylight access criteria, which recommends minimum levels of direct sunlight at mid-winter, is achieved for the R4B development through optimisation of the orientation and aspect of the buildings and use of a high-performance façade. 62% of apartments receive a minimum of 2 hours of direct solar access between 9am and 3pm to the finished floor level of living rooms and private open spaces on the winter solstice, however, 79% of apartments receive direct solar access when considering an extended time frame between 9am and 5pm. Also, 99% of apartments receive some direct sunlight between 9am and 5pm on the winter solstice. These results are inclusive of the additional 8 floors and are considered reasonable given this development is located in a dense urban environment.

It has been found that 2% of the area of the accessible podium level P2 open space will receive more than two hours of direct sunlight between 9am and 3pm in mid-winter. However, 30% of the space will receive one hour of direct sunlight and the space will naturally have good access to diffuse skylight and receive significant sunlight at other times of the year.

When planning approval was granted in 2017, it was noted that a reduction against the solar access criteria of the Apartment Design Guide was acceptable. The proposed Modification largely maintains solar access as approved, with minor adjustments

Appendix A – Sun Path Diagrams

To further demonstrate solar access to the apartments, sun patch diagrams are provided below. These sun path diagrams have been modelled on the following typical floor plates:

Modelled Floor	Representative Floors
R4B Low Rise L01	L01 – L03
R4B Low Rise L04	L04 – L05
R4B Low Rise L07	L07 - L19, L21 - L32
R4B Mid Rise L33	L33 - L46
R4B High Rise L48	L48 – L63
R4B Skyhomes L64	L64 – L65
R4B Open Terraces on Podium Level P2	R4B Open Terraces on Podium Level P2

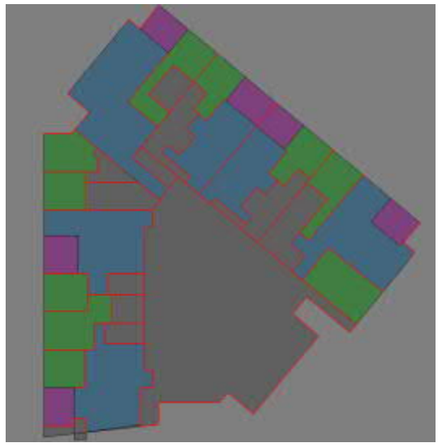
The additional 8 levels included as part of this amending SSD Development Application are represented by the R4B High Rise L48 images.

These diagrams show the direct sunlight on the apartment floor plates and overshadowing as a result of local shades and surrounding buildings. It is important to note that these diagrams do not illustrate the daylight level that will be experienced due to the high light transmission facade and unobstructed views, which increase the overall amenity in the apartments. The time increments have been selected to clearly show when the criteria for 2 hours of access have been achieved.

- Living areas have been highlighted in blue, wintergardens/balconies in pink and bedrooms in green
- Communal areas have been shaded in Dark Green
- Shading from the surrounding CBD, Crown resort or the One Sydney Harbour buildings is shown in light grey.

Diagrams from the suns positions have also been included to provide an overall view of the level of solar access and overshading from external buildings on the development.

A.1 **Level 01**



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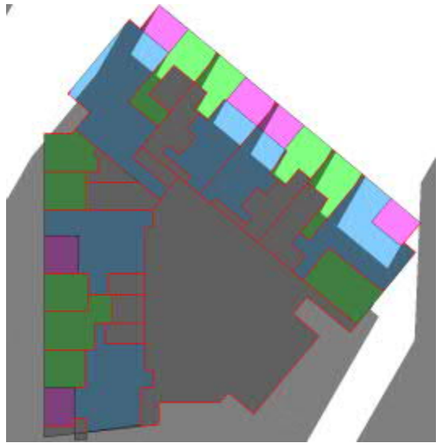

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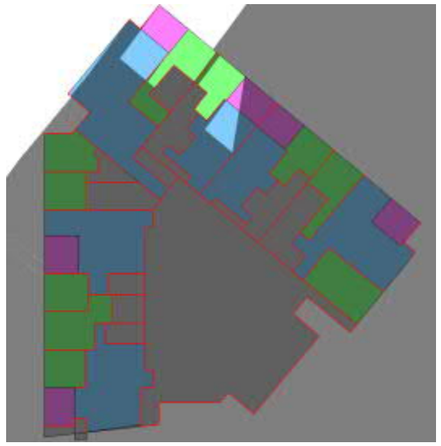

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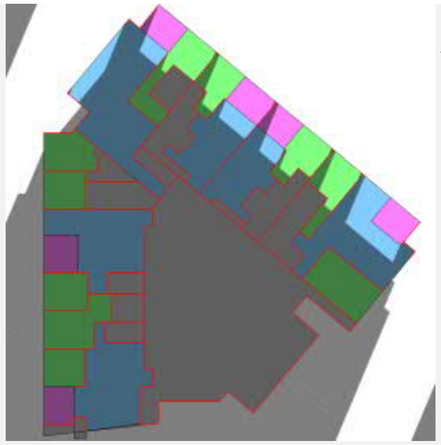

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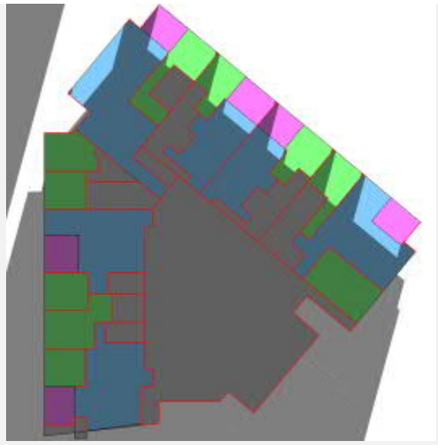

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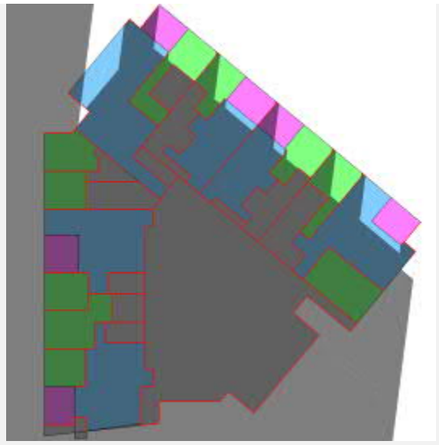

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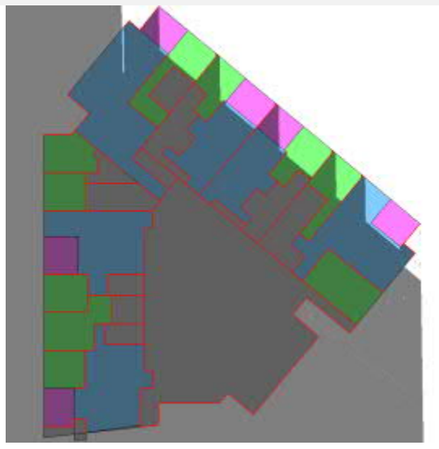

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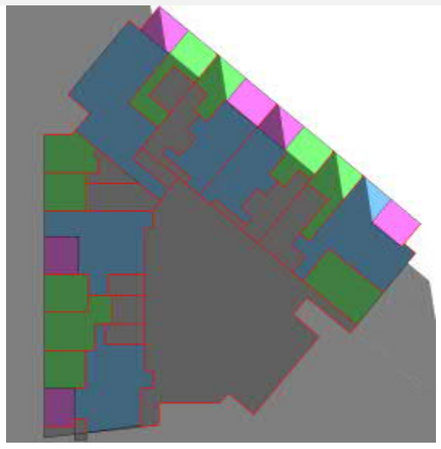

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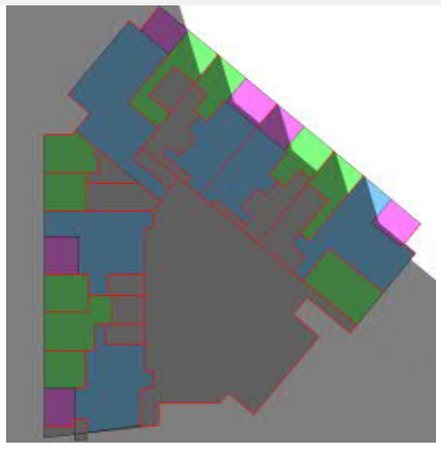

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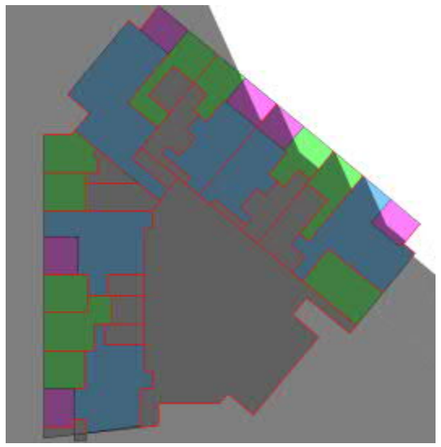

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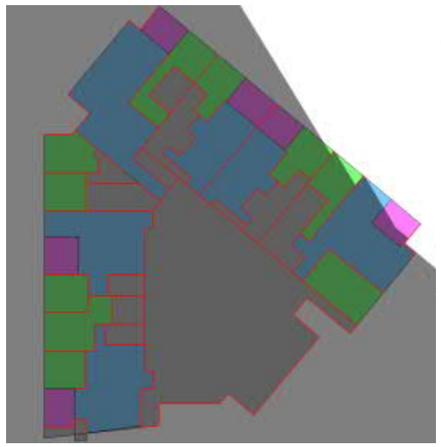

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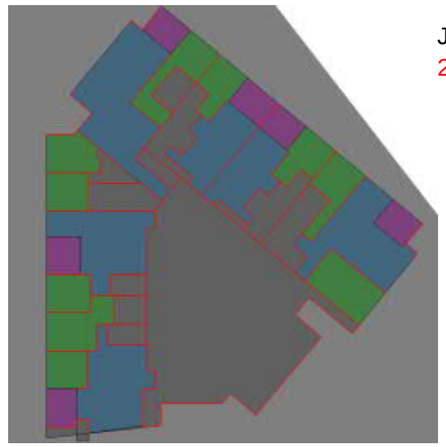

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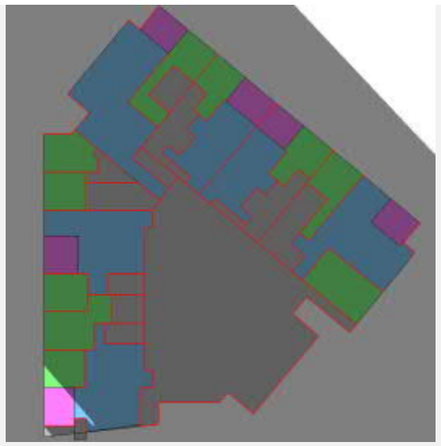

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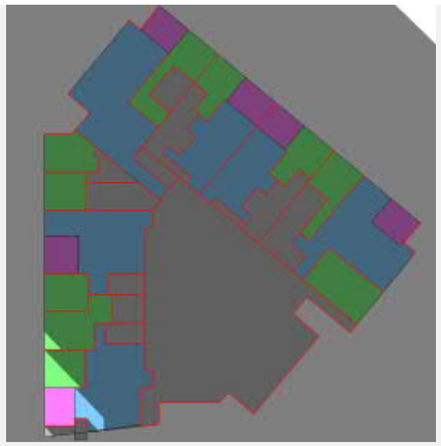

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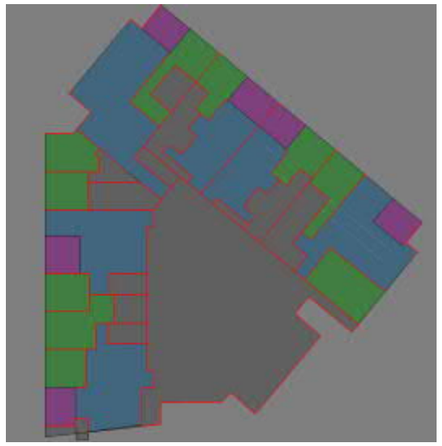

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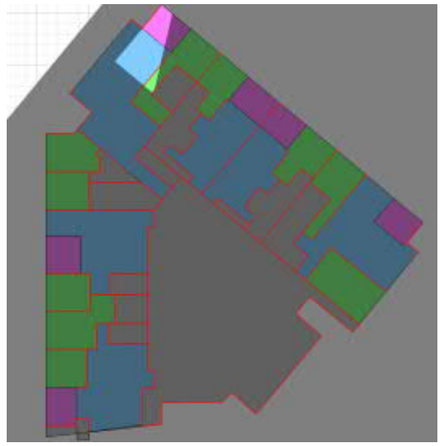

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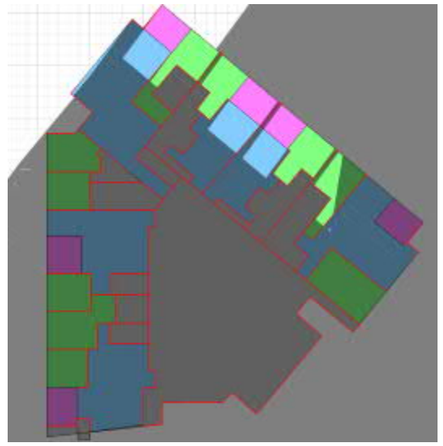

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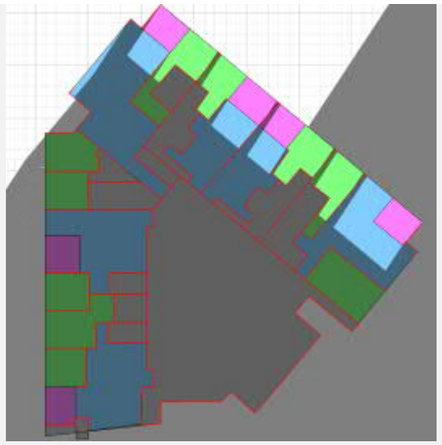

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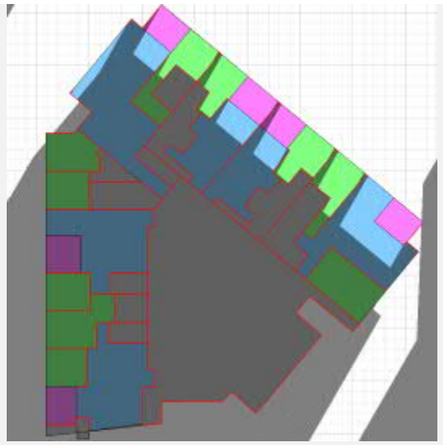

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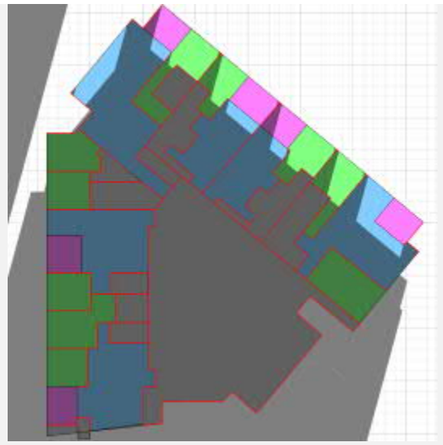
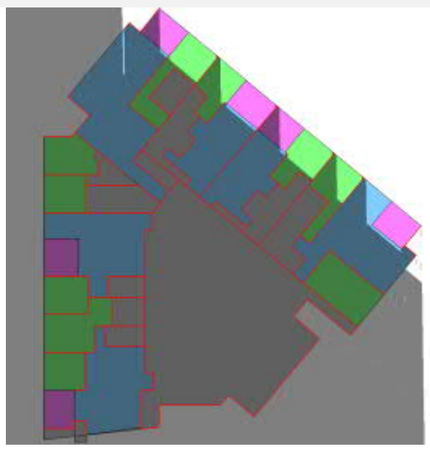
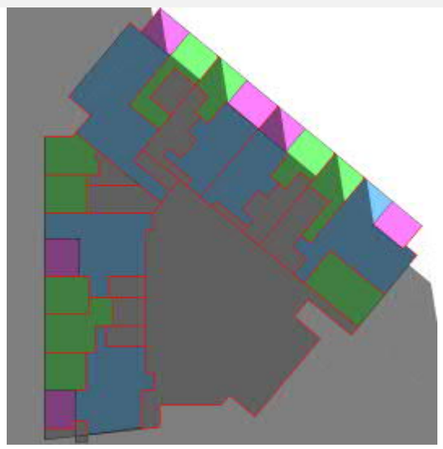


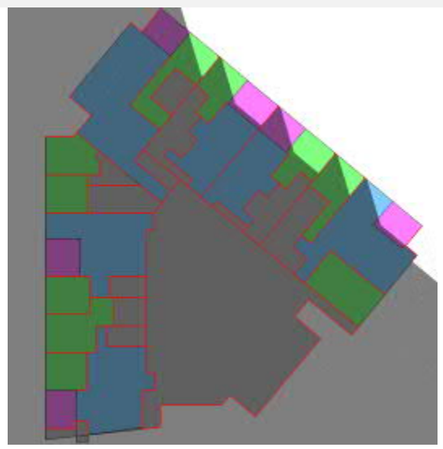
June 21
11:00 AM



June 21
12:00 PM

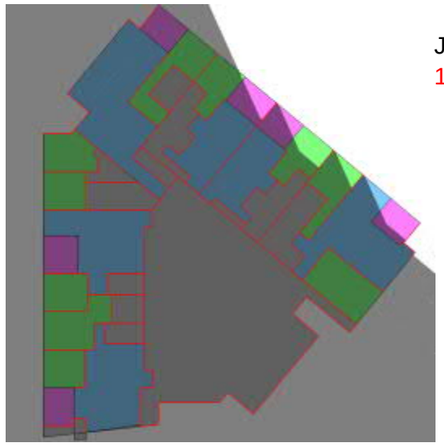


June 21
12:30 PM

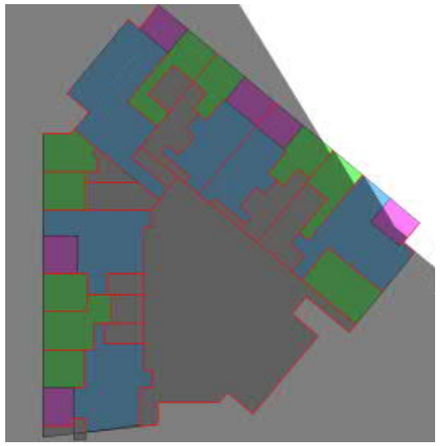


June 21
1:00 PM

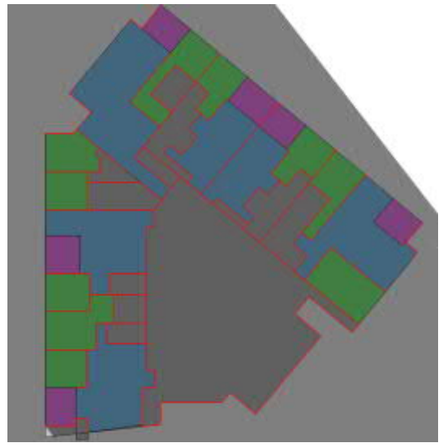
A.4 **Level 04 (Continued)**



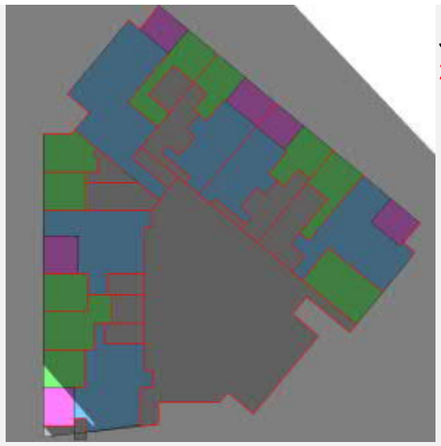
June 21
1:30 PM



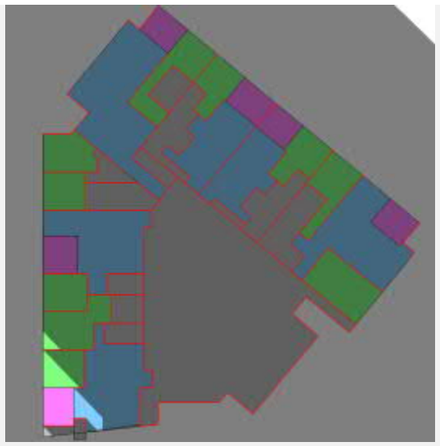
June 21
2:00 PM



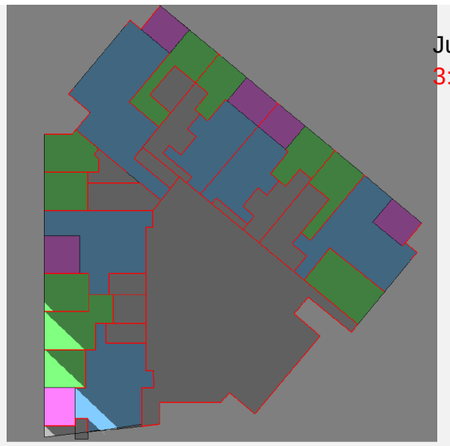
June 21
2:30 PM



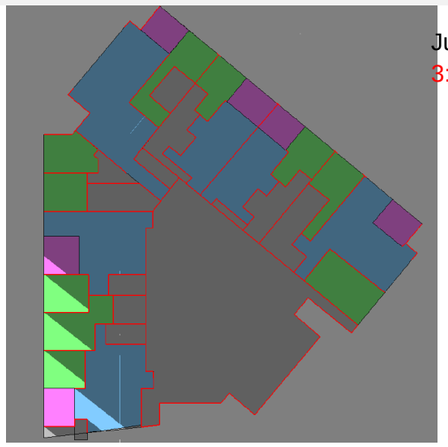
June 21
2:45 PM



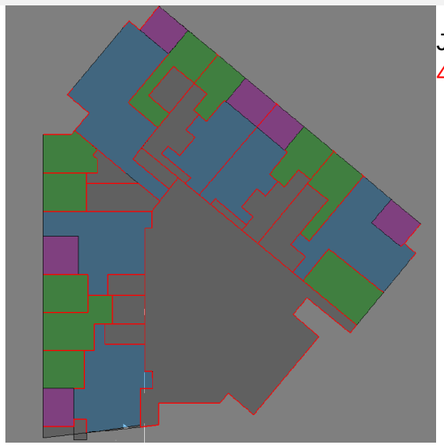
June 21
3:00 PM



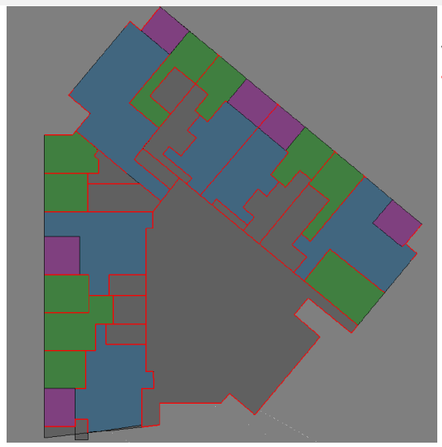
June 21
3:15 PM



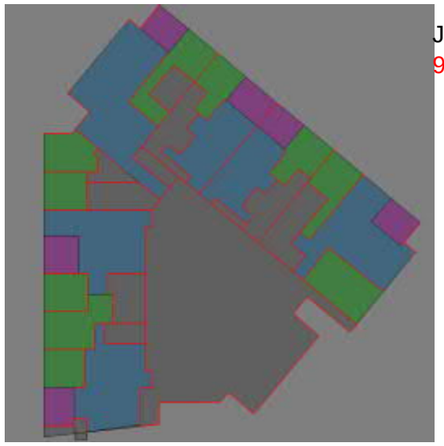
June 21
3:45 PM



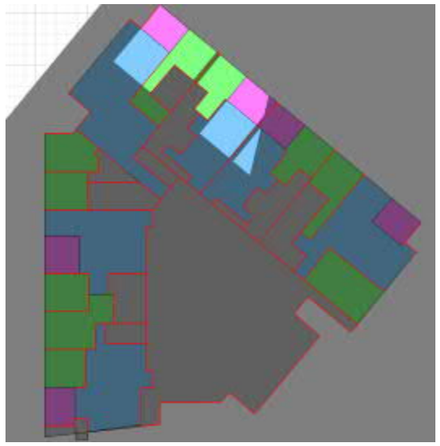
June 21
4:00 PM



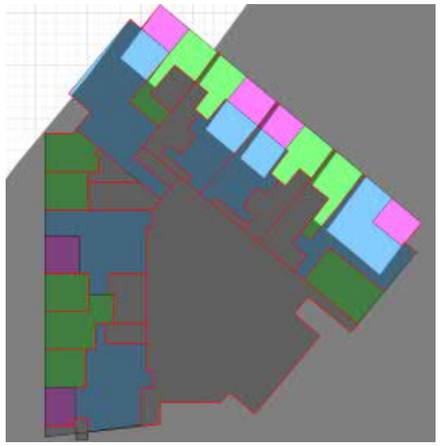
June 21
4:45 PM



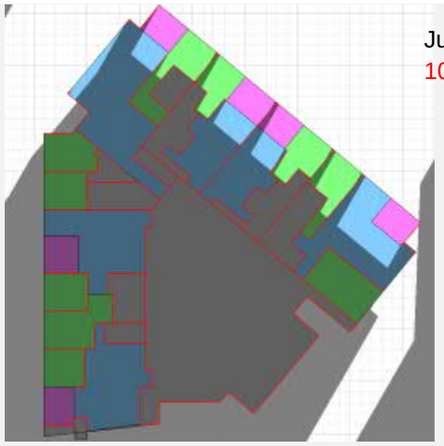
June 21
9:00 AM



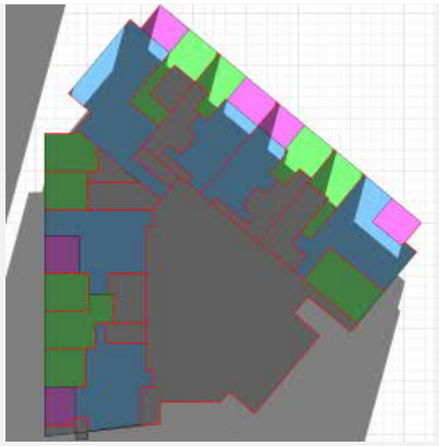
June 21
9:15 AM



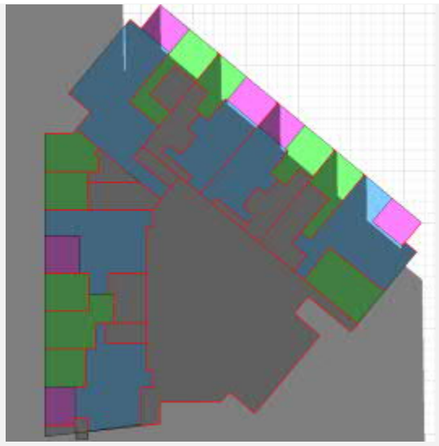
June 21
9:30 AM



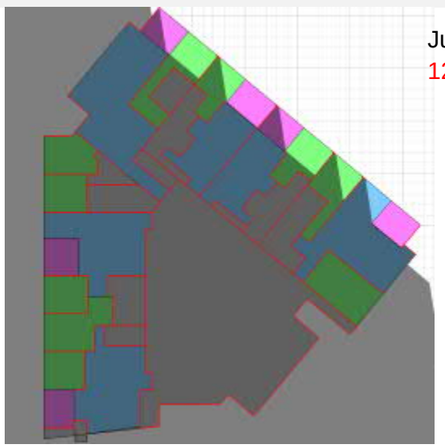
June 21
10:00 AM



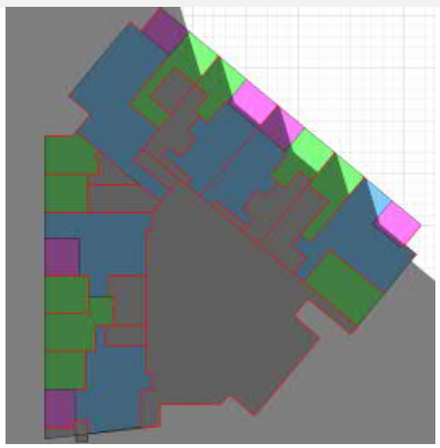
June 21
11:00 AM



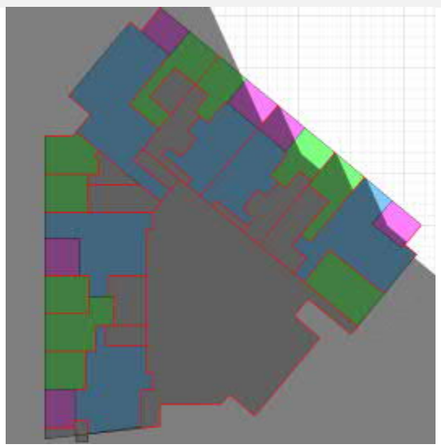
June 21
12:00 PM



June 21
12:30 PM

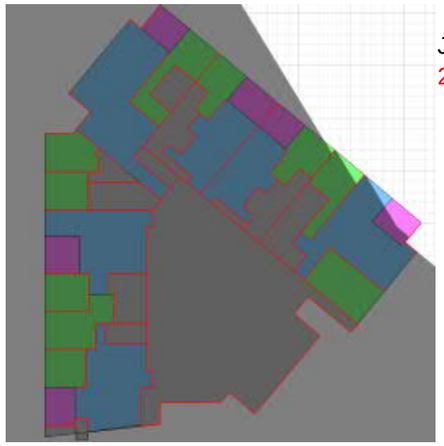


June 21
1:00 PM

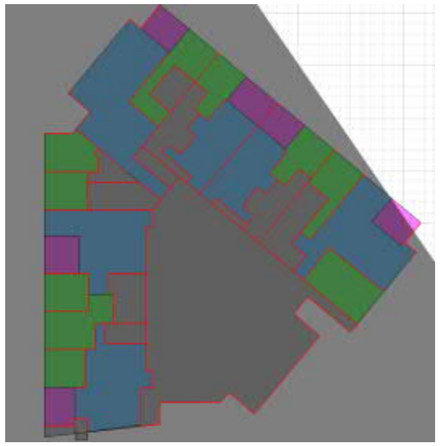


June 21
1:30 PM

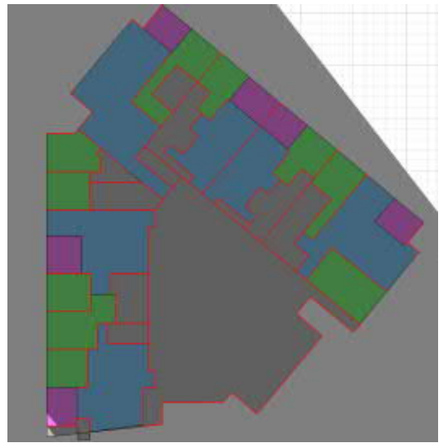
A.6 **Level 07 (Continued)**



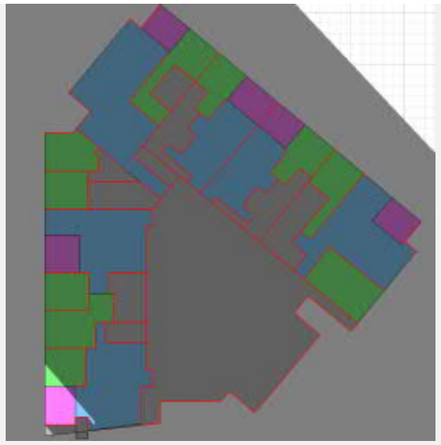
June 21
2:00 PM



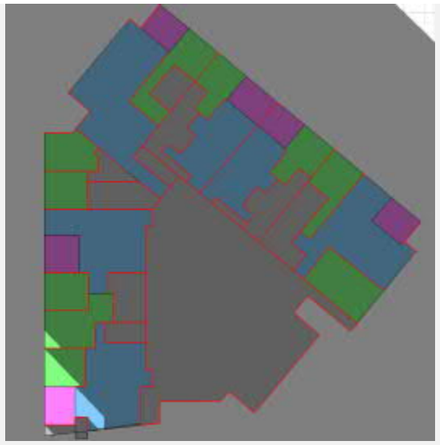
June 21
2:15 PM



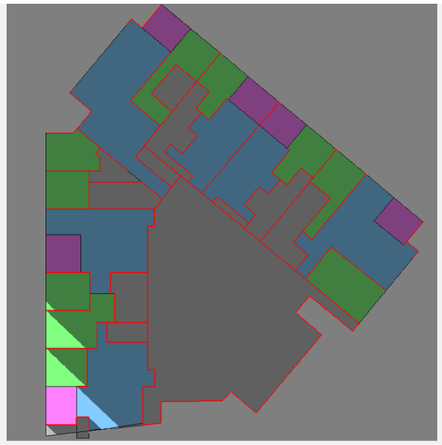
June 21
2:30 PM



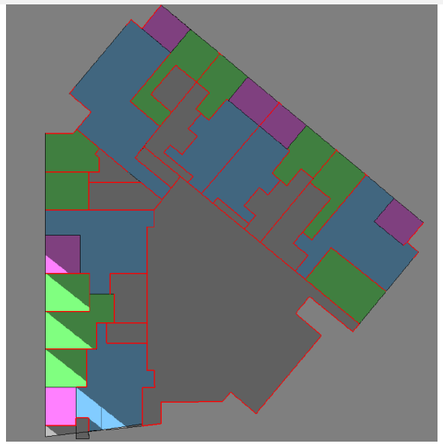
June 21
2:45 PM



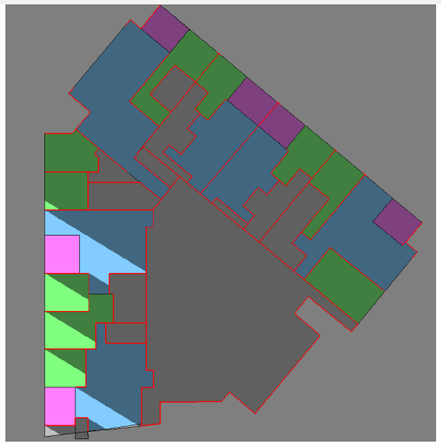
June 21
3:00 PM



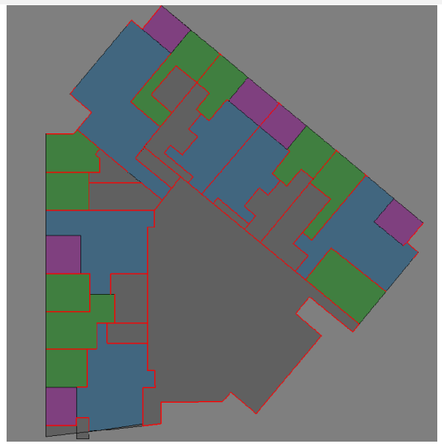
June 21
3:15 PM



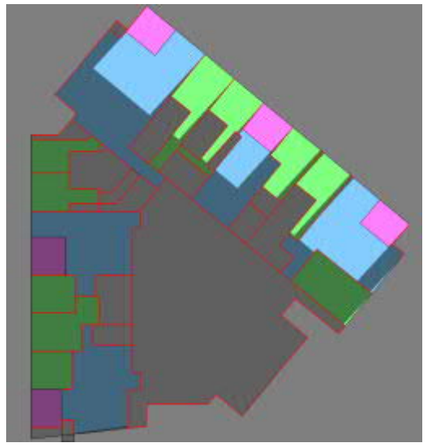
June 21
3:45 PM



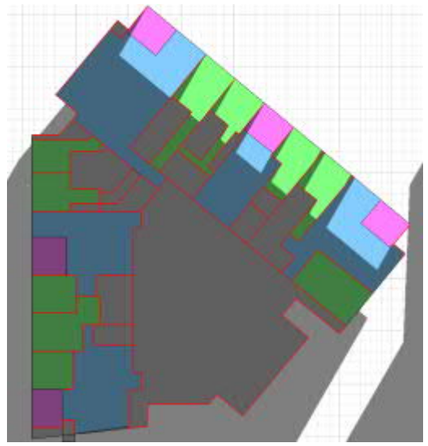
June 21
4:30 PM



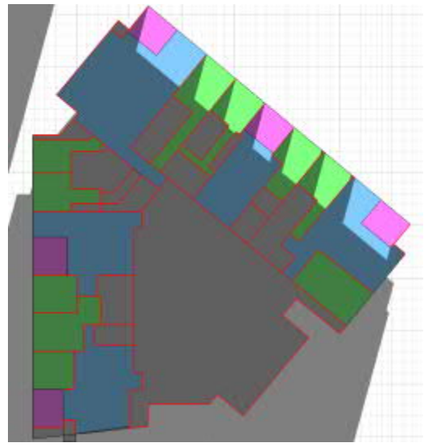
June 21
4:45 PM



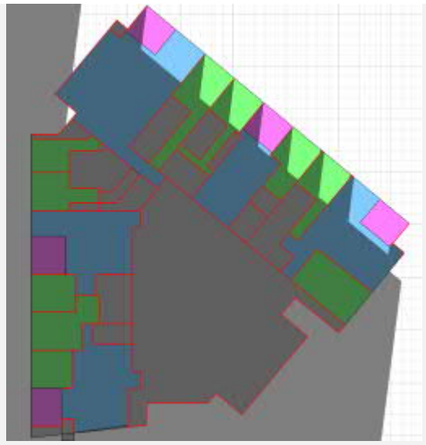
June 21
9:00 AM



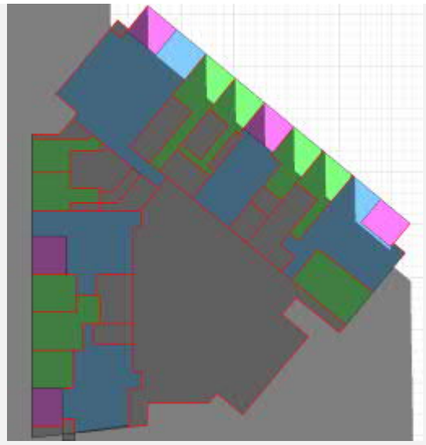
June 21
10:00 AM



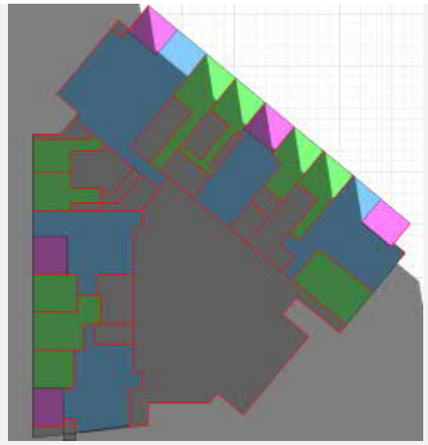
June 21
11:00 AM



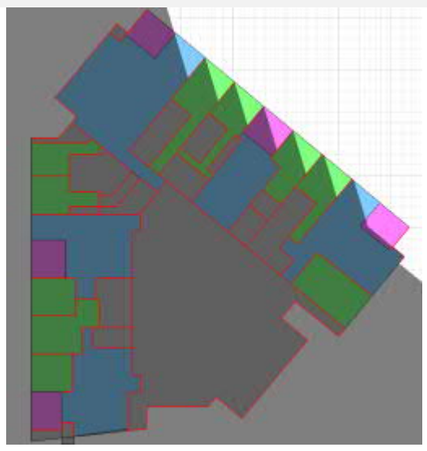
June 21
11:30 AM



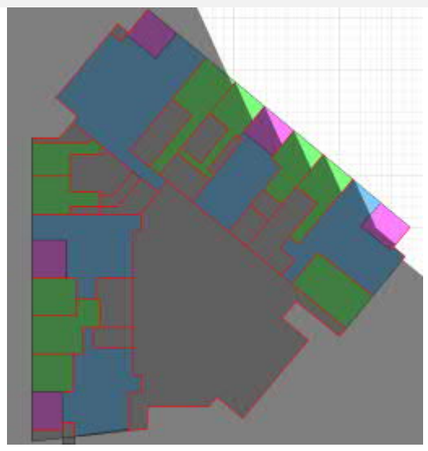
June 21
12:00 PM



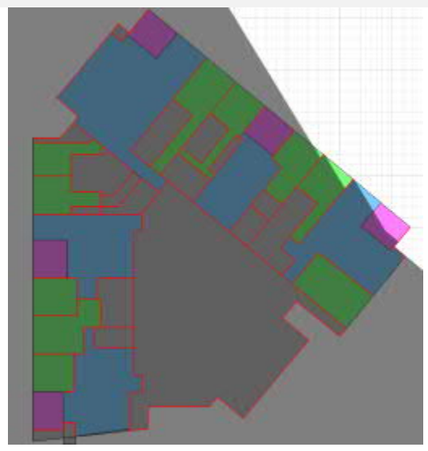
June 21
12:30 PM



June 21
1:00 PM

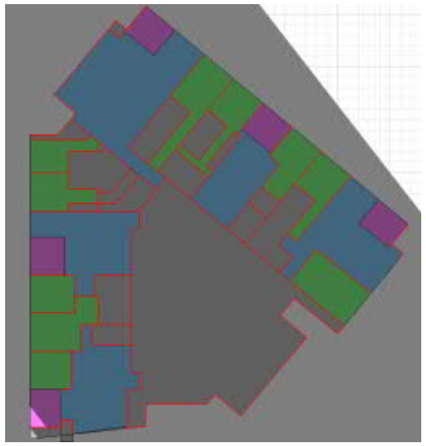


June 21
1:30 PM

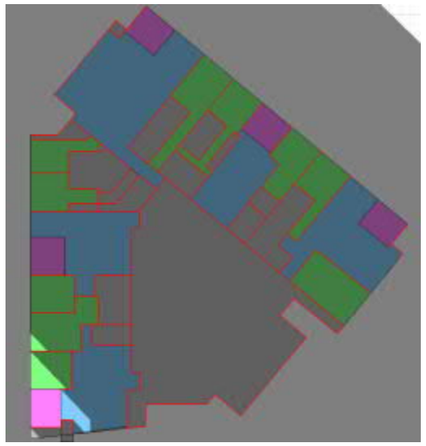


June 21
2:00 PM

A.8 Level 33 (Continued)

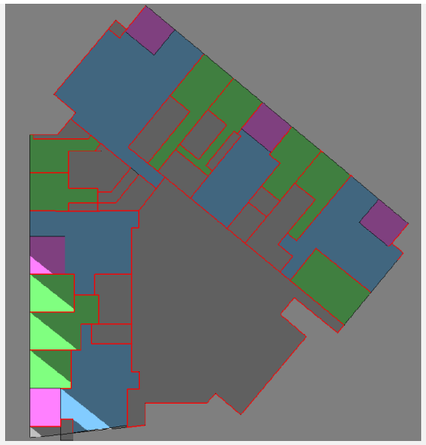


June 21
2:30 PM

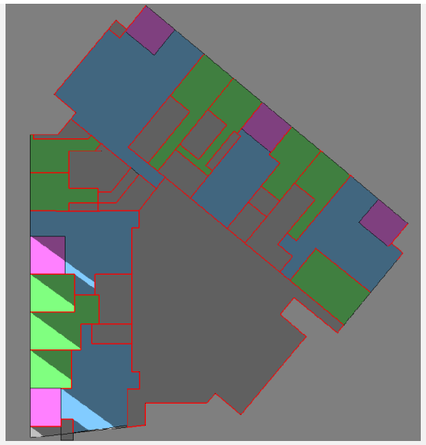


June 21
3:00 PM

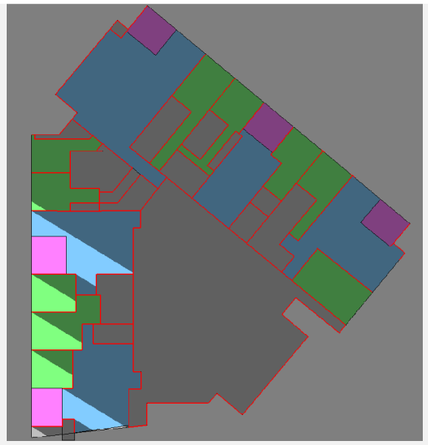
June 21
3:15 PM



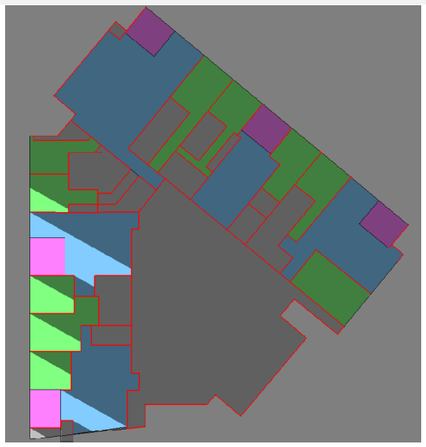
June 21
3:45 PM



June 21
4:00 PM

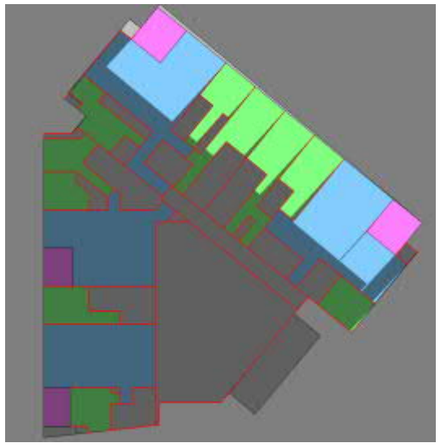


June 21
4:30 PM

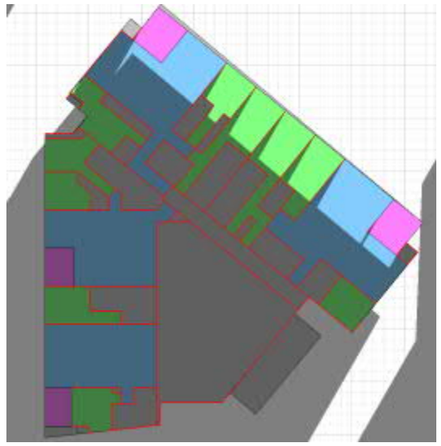


June 21
4:45 PM

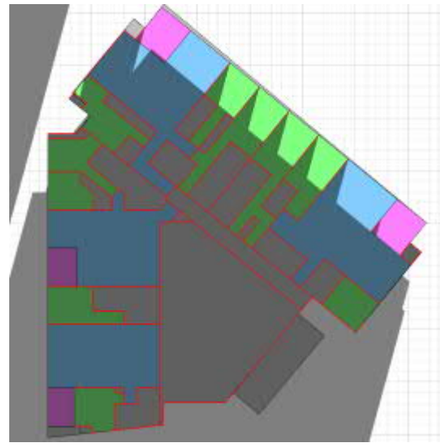
A.9 **Level 48**



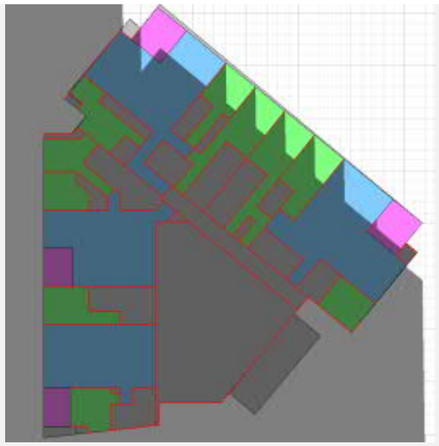
June 21
9:00 AM



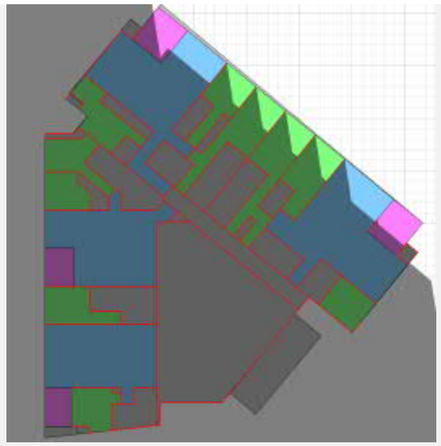
June 21
10:00 AM



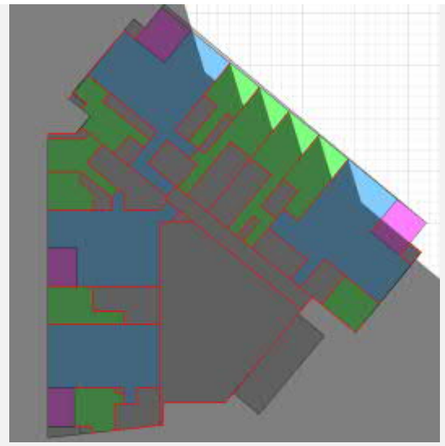
June 21
11:00 AM



June 21
12:00 PM



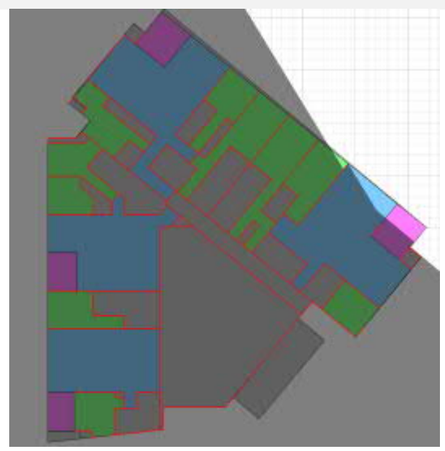
June 21
12:30 PM



June 21
1:00 PM

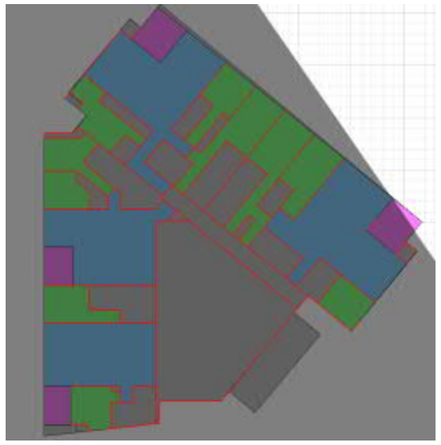
June 21
1:30 PM

June 21
1:45 PM

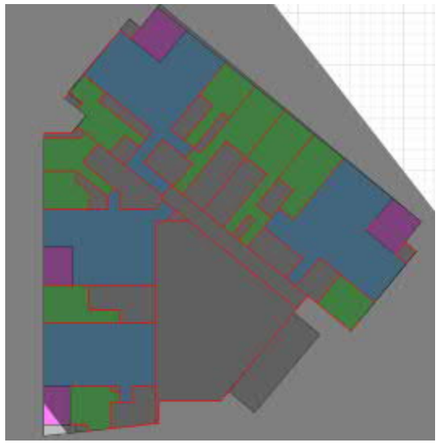


June 21
2:00 PM

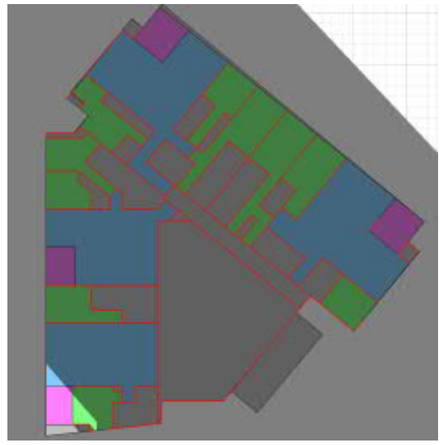
A.10 **Level 48 (Continued)**



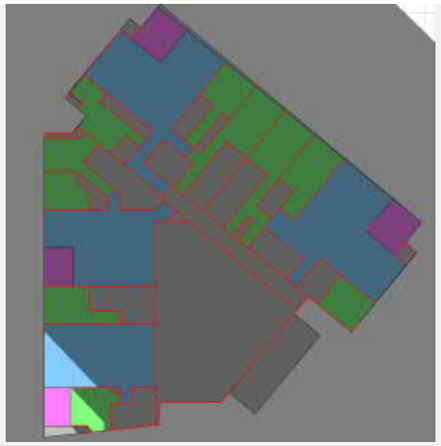
June
2:15 PM



June 21
2:30 PM

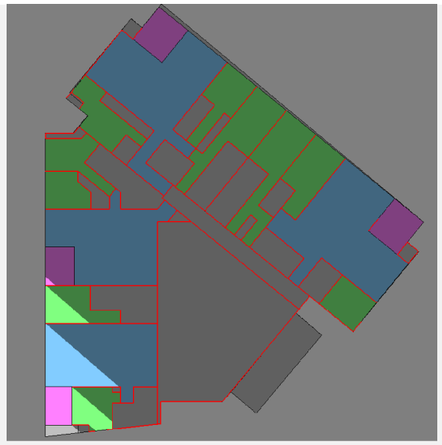


June 21
2:45 PM



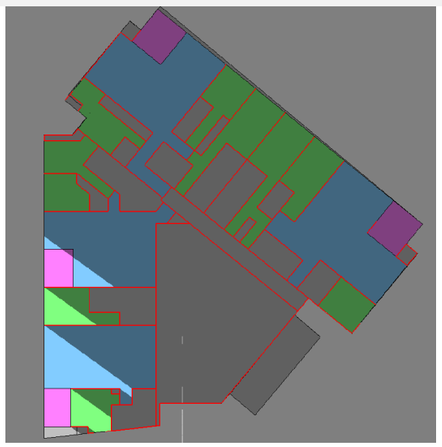
June 21
3:00 PM

June 21
3:15 PM

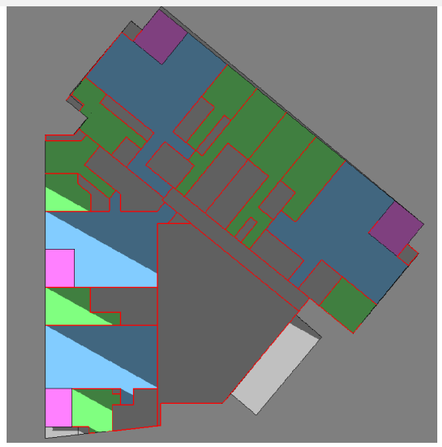


June 21
3:30 PM

June 21
3:45 PM

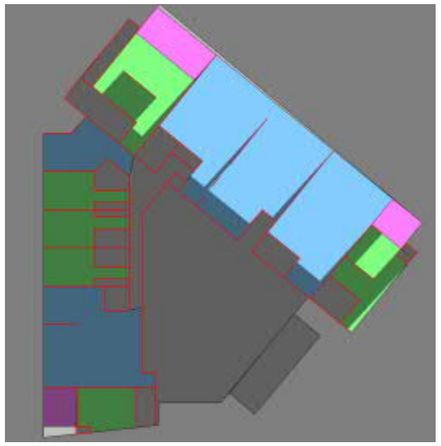


June 21
4:00 PM

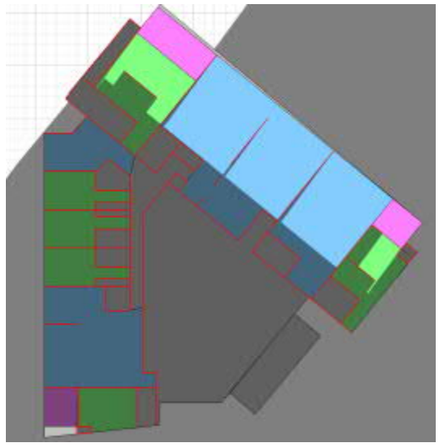


June 21
4:45 PM

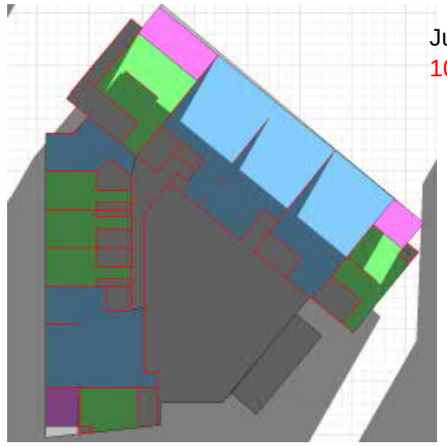
A.11 **Level 64 Skyhomes**



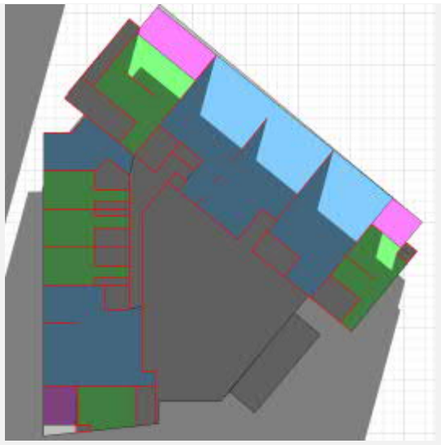
June 21
9:00 AM



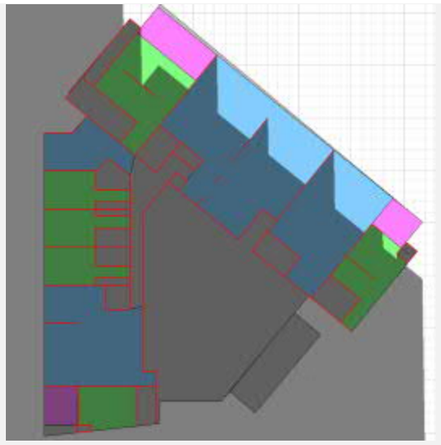
June 21
9:30 AM



June 21
10:00 AM

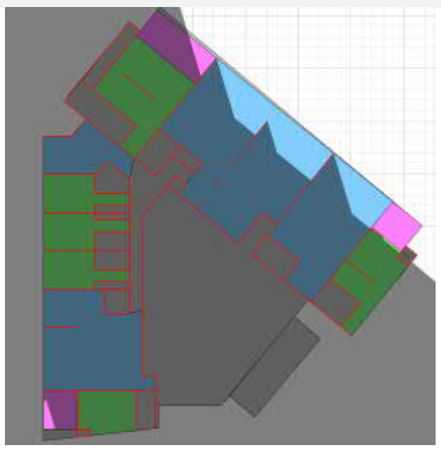


June 21
11:00 AM

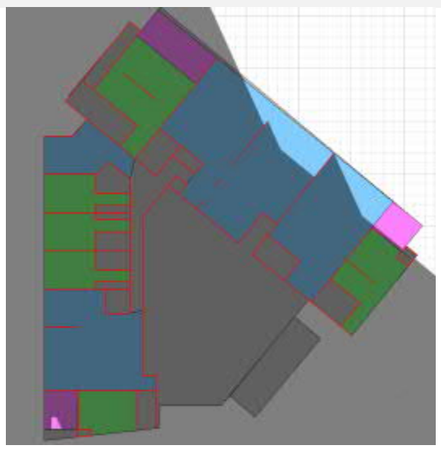


June 21
12:00 PM

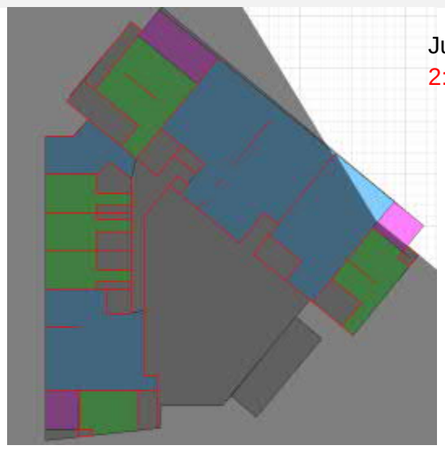
June 21
12:30 PM



June 21
1:00 PM

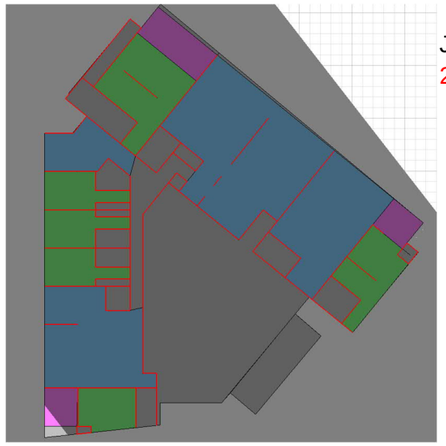


June 21
1:30 PM

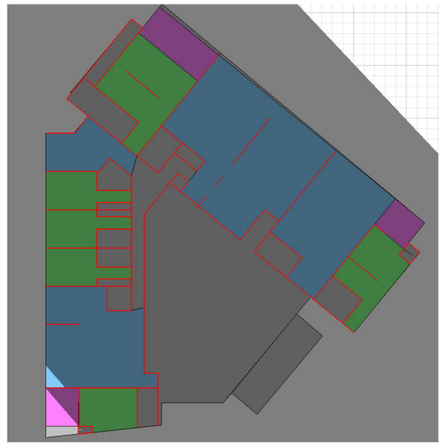


June 21
2:00 PM

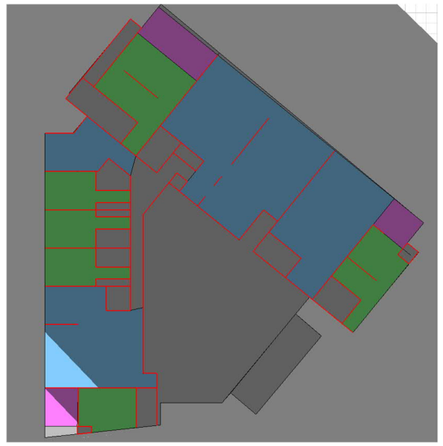
A.12 **Level 64 Skyhomes (Continued)**



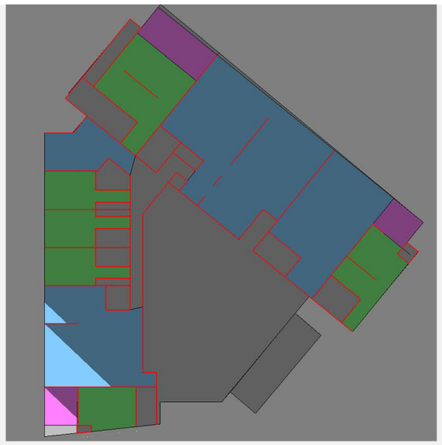
June 21
2:30 PM



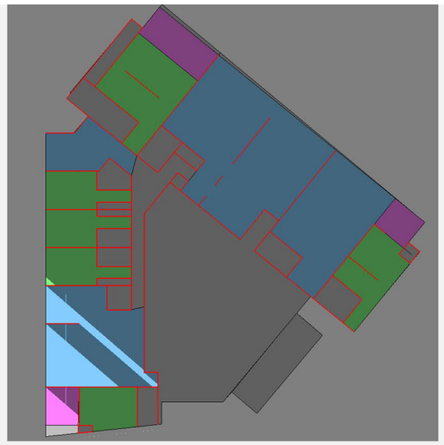
June 21
2:45 PM



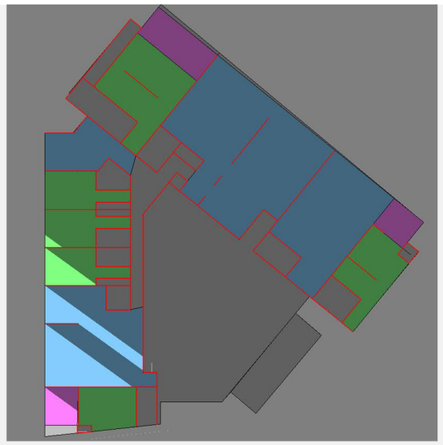
June 21
3:00 PM



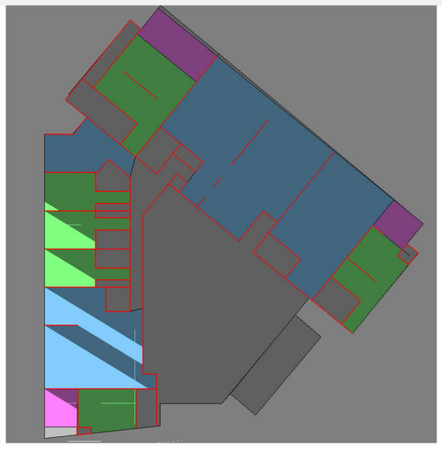
June 21
3:15 PM



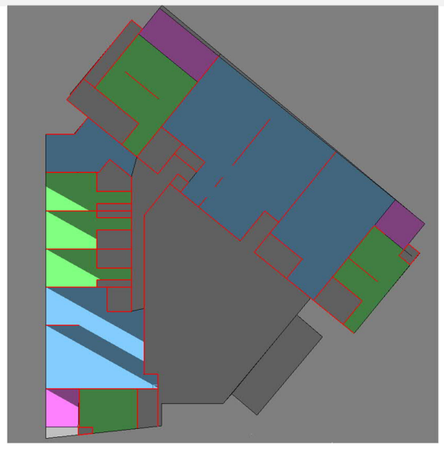
June 21
3:30 PM



June 21
4:00 PM

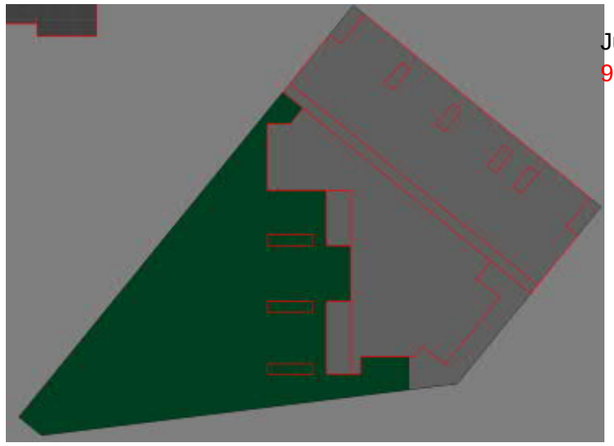


June 21
4:30 PM

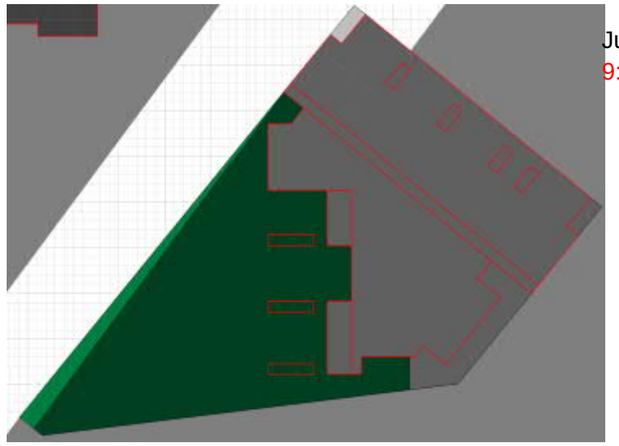


June 21
4:45 PM

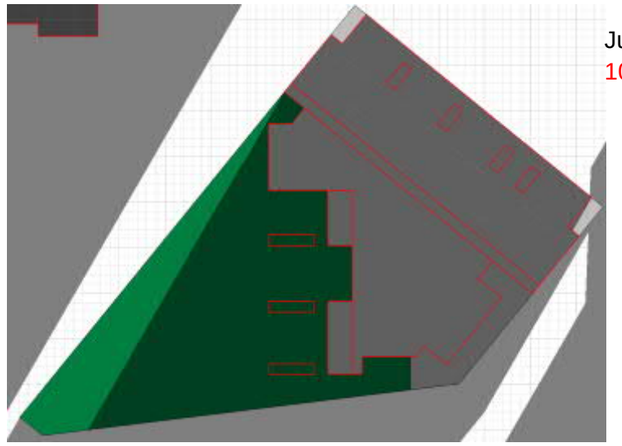
A.13 **Communal Open Spaces – Winter**



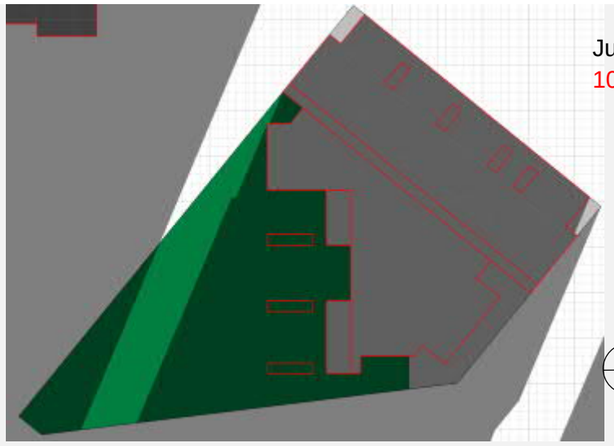
June 21
9:00 AM



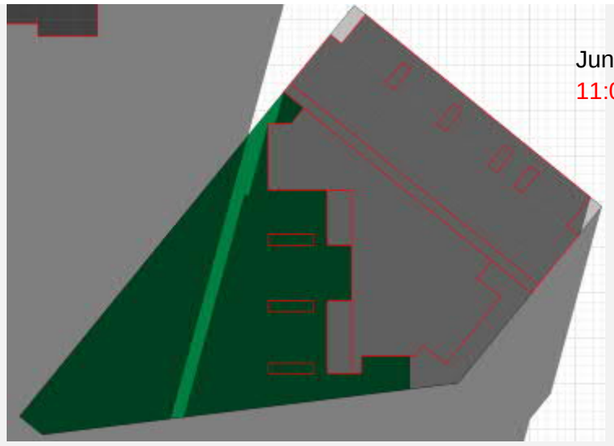
June 21
9:30 AM



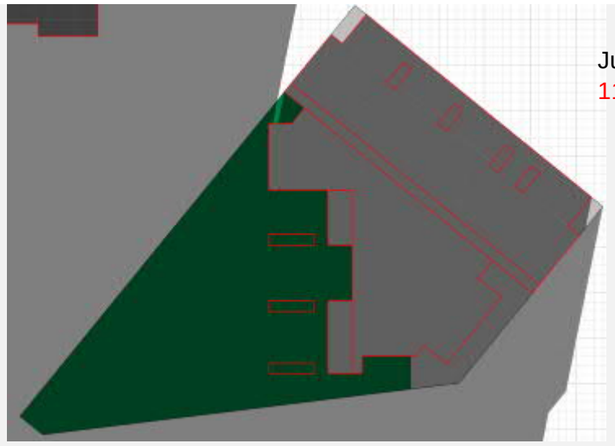
June 21
10:00 AM



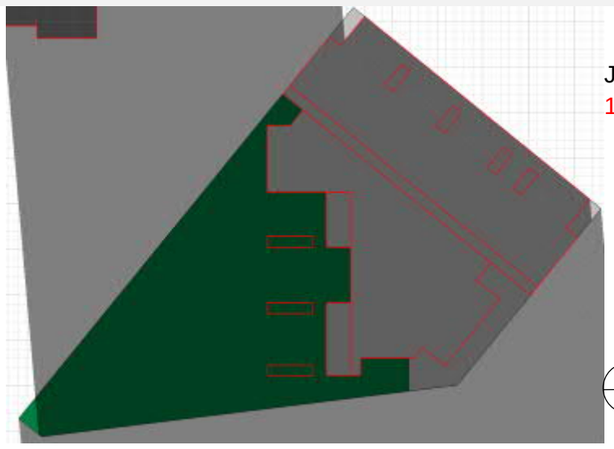
June 21
10:30 AM



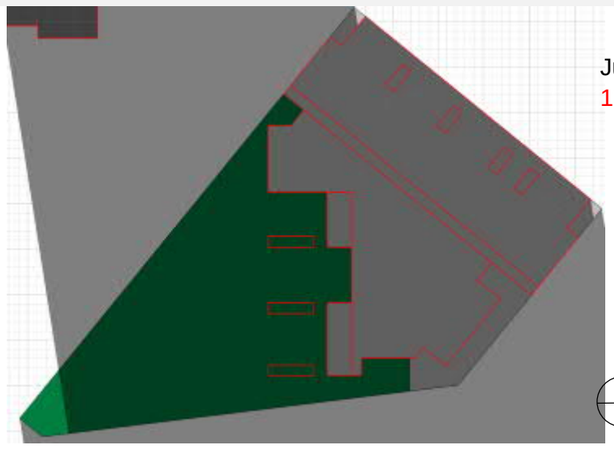
June 21
11:00 AM



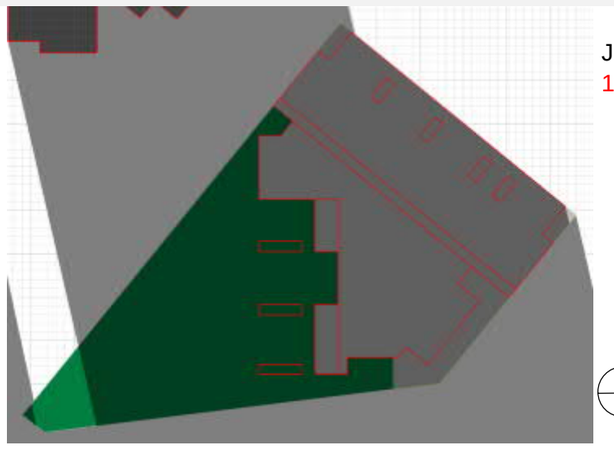
June 21
11:15 AM



June 21
12:15 PM

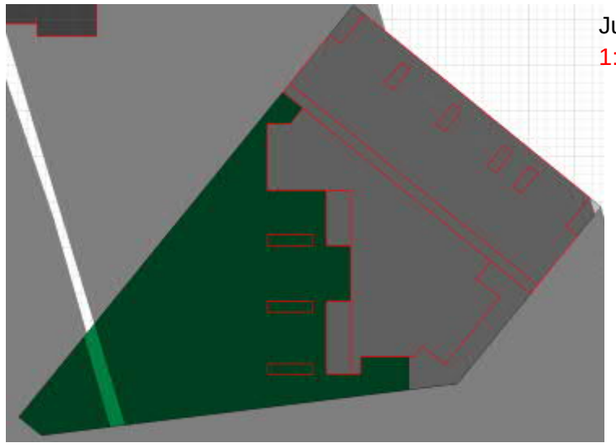


June 21
12:30 PM

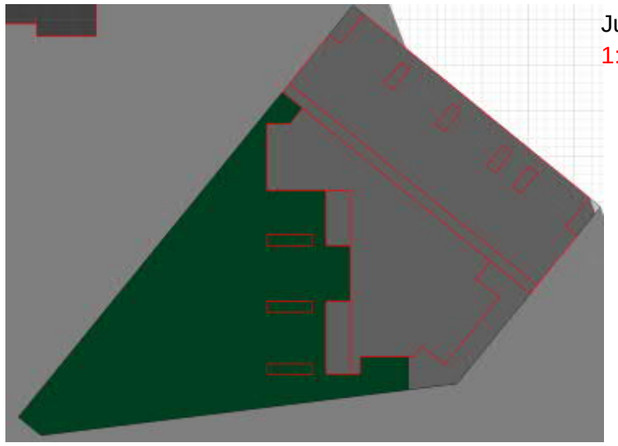


June 21
12:45 PM

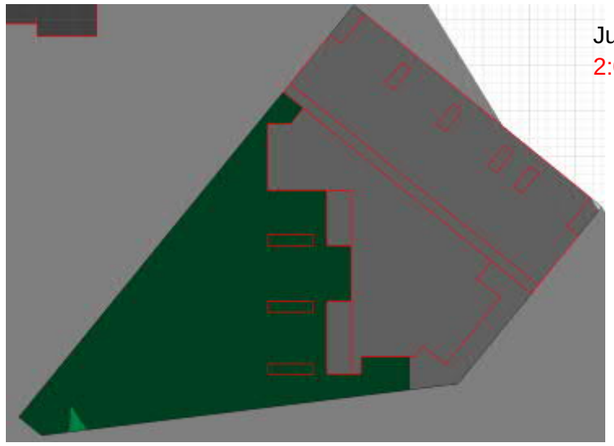
A.14 **Communal Open Spaces – Winter (Continued)**



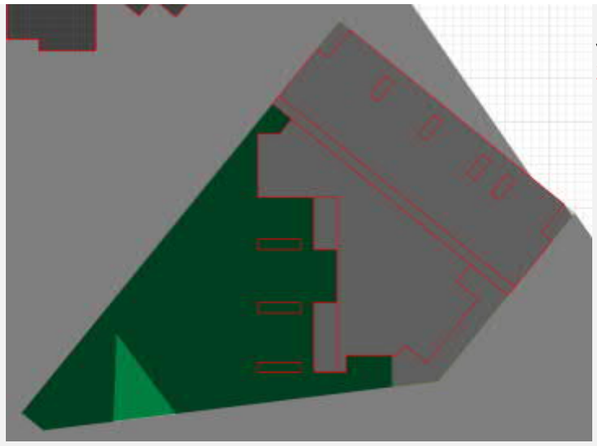
June 21
1:00 PM



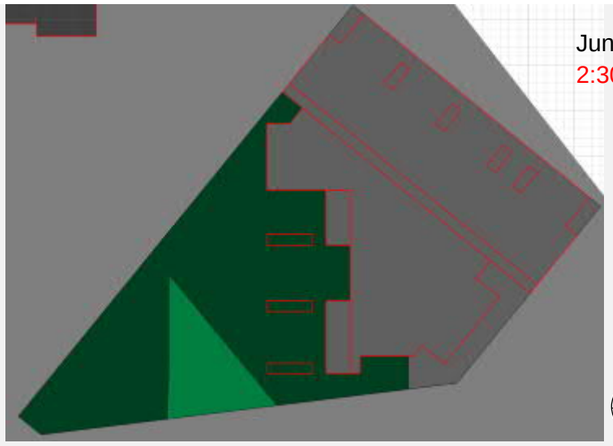
June 21
1:15 PM



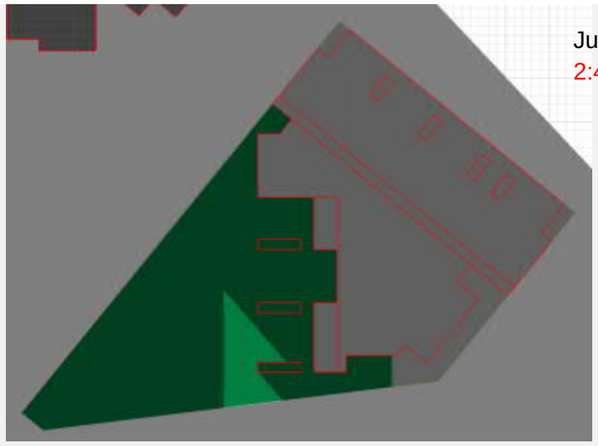
June 21
2:00 PM



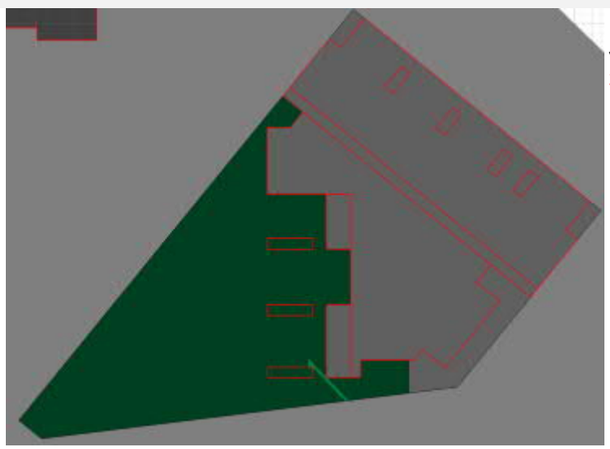
June 21
2:15 PM



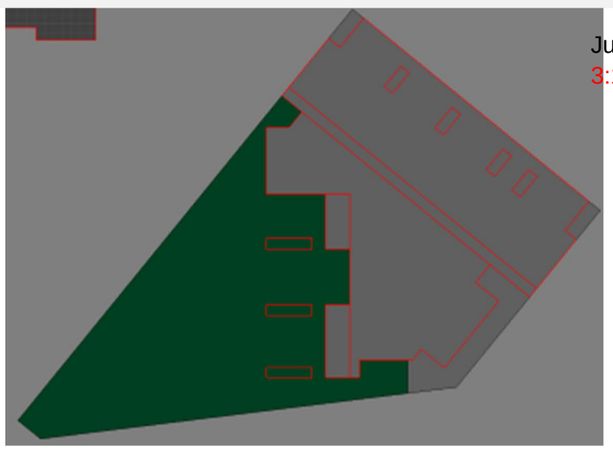
June 21
2:30 PM



June 21
2:45 PM



June 21
3:00 PM



June 21
3:15 PM