Daylight, Sunlight and Overshadowing study

Proposed Residential Development at Horgan's Quay, Cork

Report for: O'Mahony Pike Architects

Report by: Integrated Environmental Solutions Limited
International Sustainability Consulting Developers of the IES <Virtual Environment>

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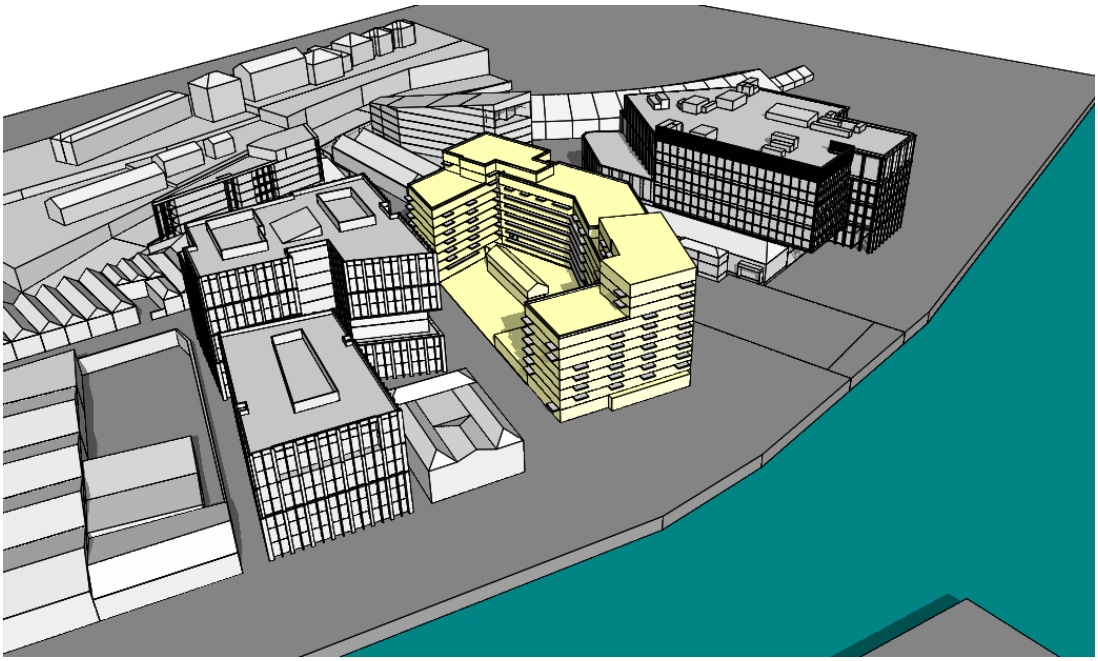


Version:	Date:	Prepared by:	Checked by:	Notes:
0	14/02/2019	Seán O'Riordan Project Consultant	John Gleeson Business Development Manager	New Residential Scheme

Contents

Executive Summary

The proposed scheme was assessed with respect to the amenity area's access to sunlight and the living areas' access to daylight. The amenity area's access to sunlight was quantified by hours of direct solar exposure. Average Daylight Factor (ADF) was used to quantify the daylight levels in the living rooms.

The analysis showed that over 50% of the amenity area will receive at least two hours of sunlight on March 21st meaning that it should appear adequately sunlit throughout the year.

A representative sample of 10 apartments was selected for the ADF analysis. The ADF analysis showed that all living rooms tested on the lowest occupied level (Level 1) are expected to have an ADF greater than 1.5% and therefore are in line with the best practice guidance provided in BR-209 *Site Layout Planning for Daylight & Sunlight* and BS 8206-2 *Code of practice for daylighting*. The sample is representative of the majority of living areas in the development in terms of geometry, percentage glazing and orientation and therefore it can be concluded that the overall scheme provides good levels of daylight to the majority of apartments. Furthermore, as the level one apartments are expected to be some of the worst performing spaces in terms of access to daylight, it is anticipated that the living areas on the upper floors will perform better than the level 1 apartments. The analysis performed on the two sample apartments on level five confirms this, with a significant improvement seen in the ADFs in the living areas on this level.

The kitchen and dining areas in the apartments are internal spaces. The BRE guide recognises that internal kitchens are often unavoidable due to the many layout considerations but recommends that these are "directly linked to a well daylight living rooms" as is the case with the proposed design.

The impact by the proposed development on neighbouring properties is limited given the location, use, orientation and separation distances and the public area around the proposed development has an adequate sunlight access, offering a great aspect on the quay and Waterfront Square. Furthermore, the private amenity spaces and balconies offer great views, with the few north-facing balconies to overlook either the shared open space or the expansive public realm with views towards St Luke's area.

Overall, the scheme provides good access to sunlight for the amenity areas and the majority of apartments can expect to have well daylit living areas.

1 Introduction

Integrated Environmental Solutions (IES) were commissioned to undertake a daylight and sunlight assessment for the proposed residential development at Horgan's Quay, Cork. The purpose of this report is to quantify the availability of daylight and sunlight to the proposed development. There are no existing neighbouring residential properties in close enough proximity to be affected by the proposed development.

All daylight/sunlight analysis was completed using the IES <Virtual environment>. The analysis and assessments have been carried out in line with the recommendations and methods outlined in the BRE guide 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice' (2011, Second Edition) in conjunction with the British Standard 'Code of practice for daylighting, BS 8206-2. (The BRE's guide 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice' will simply be referred to as the 'BRE guide' hereafter.)

The study assesses proposed scheme by means of:

- Shadow Plots,
- Availability of sunlight to outdoor spaces, and
- Daylight Factor Analysis.

A detailed description of the methods used in the analysis can be found in the following sections of this report.

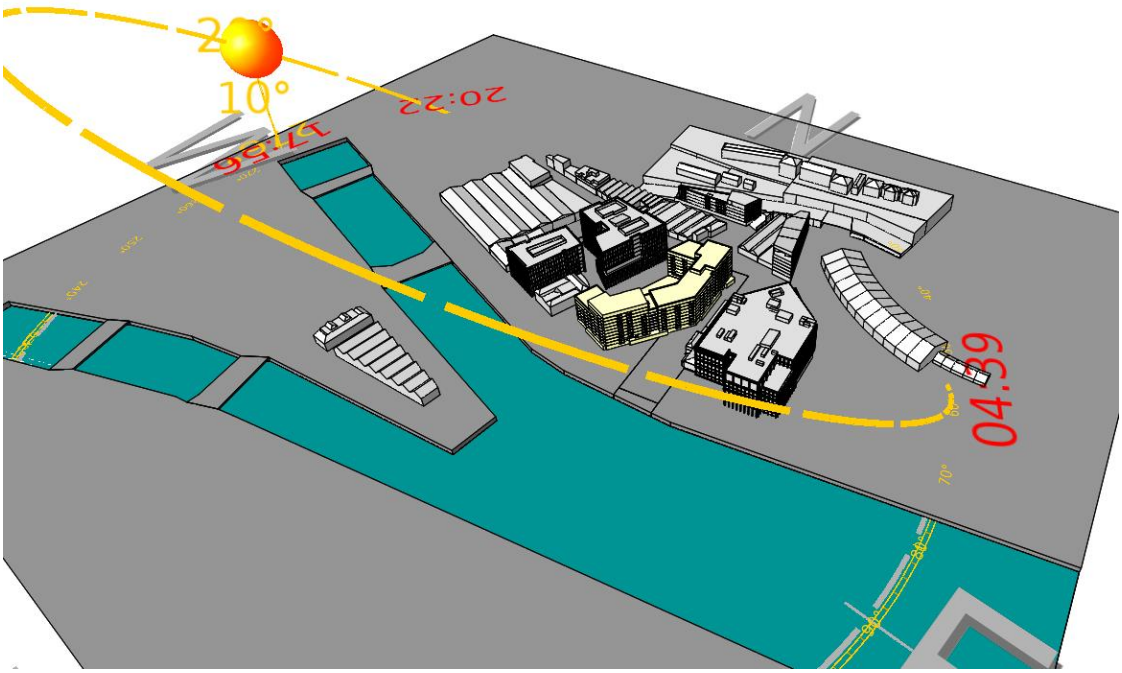
The analysis has been carried out based on the latest architectural drawings received and information provided at the time of issue.

2 Geometry/Location

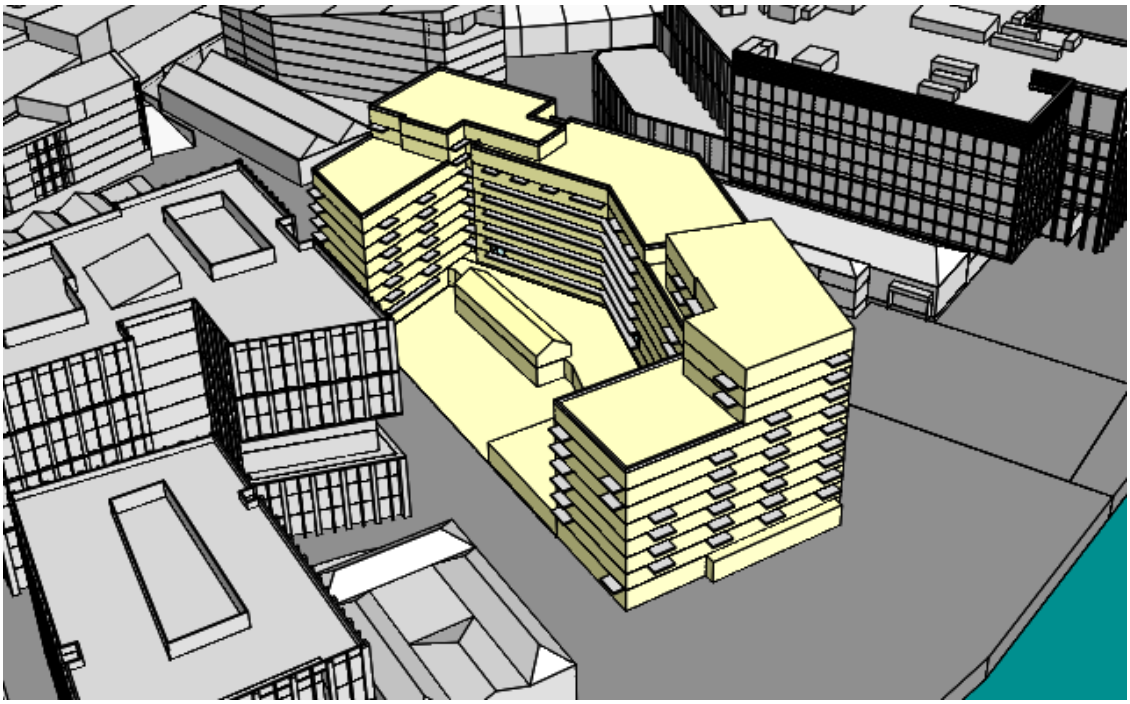
2.1 Orientation

2.2 Model Geometry

Site 3D View



Proposed Residential Development 3D View



3 Daylight Analysis Methods and Metrics

3.1 Shadow Analysis

The 'Shadow Analysis' section looks at the shadows cast by the proposed scheme for the following dates;

- Solar shading images - 21st March
- Solar shading images - 21st June
- Solar shading images - 21st December

3.2 Sunlight to Outdoor Space

The BRE guide states, "for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on March 21st."

The solar exposure (in hours) was tested using the SunCast module in the IES <VE>.

3.3 Average Daylight Factor (ADF)

The Average Daylight Factor (ADF) is the "Ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky" *(BRE Guide)*, or expressed in another way it is the average illuminance on the working plane in a room, divided by the illuminance on an unobstructed horizontal surface outdoors. Thus a 1% ADF would mean that the average indoor illuminance would be one hundredth the outdoor unobstructed illuminance.

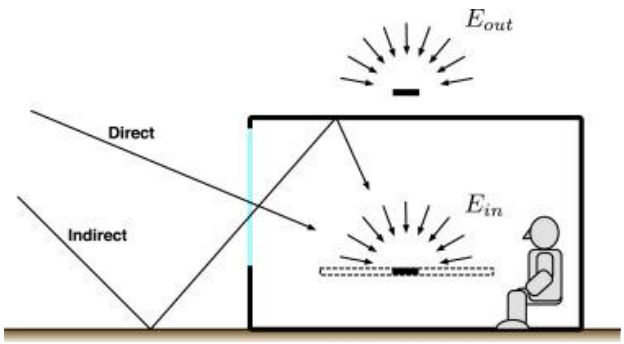


FIGURE 1: DAYLIGHT FACTOR (POINT)

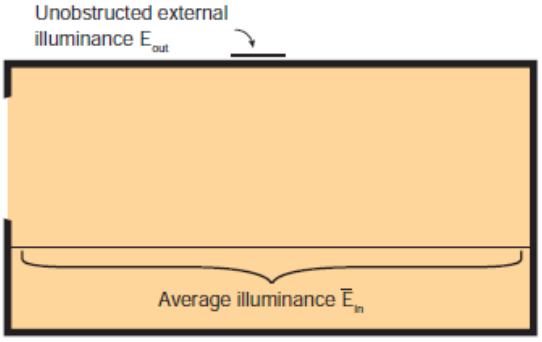


FIGURE 2: AVERAGE DAYLIGHT FACTOR

$$ADF = \frac{\bar{E}_{in}}{E_{out}} \times 100\%$$

The BRE Guide states "Daylight provision in new rooms may be checked using the average daylight factor (ADF)." BS 8206-2 *Code of practice for daylighting*, recommends an ADF of 1.5% for living rooms.

The ADF was tested using the 'RadianceIES' module within the IES <Virtual Environment>.

4 Shadow Analysis

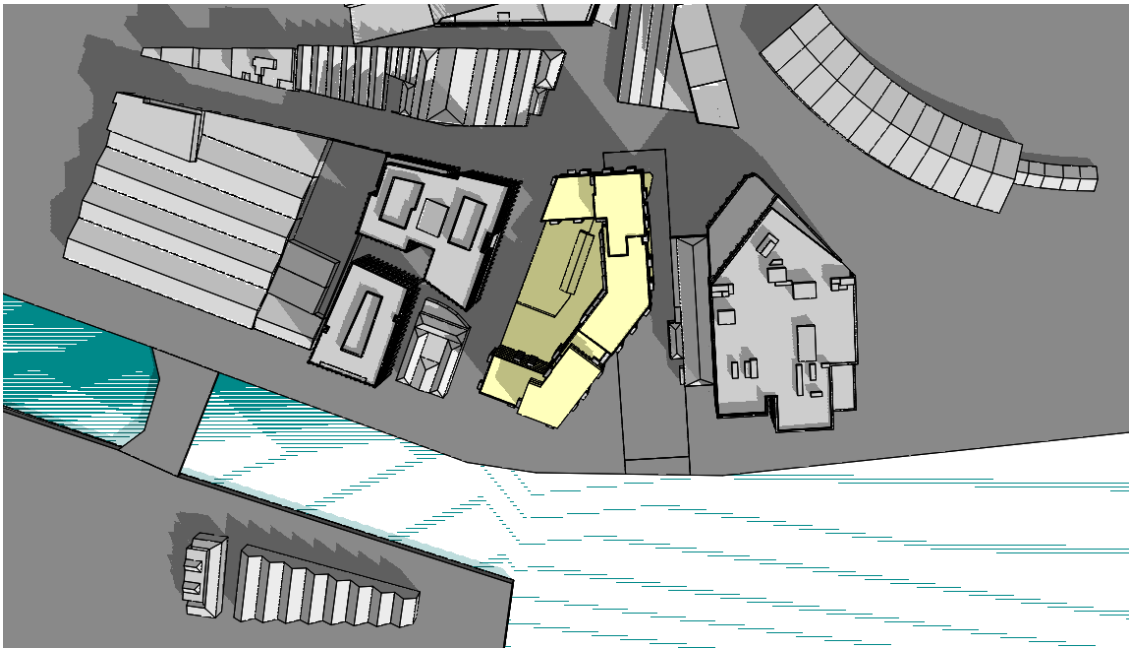
This section illustrates the shadows cast by the proposed building for the following dates;

- Solar shading images - 21st March
- Solar shading images - 21st June
- Solar shading images - 21st December

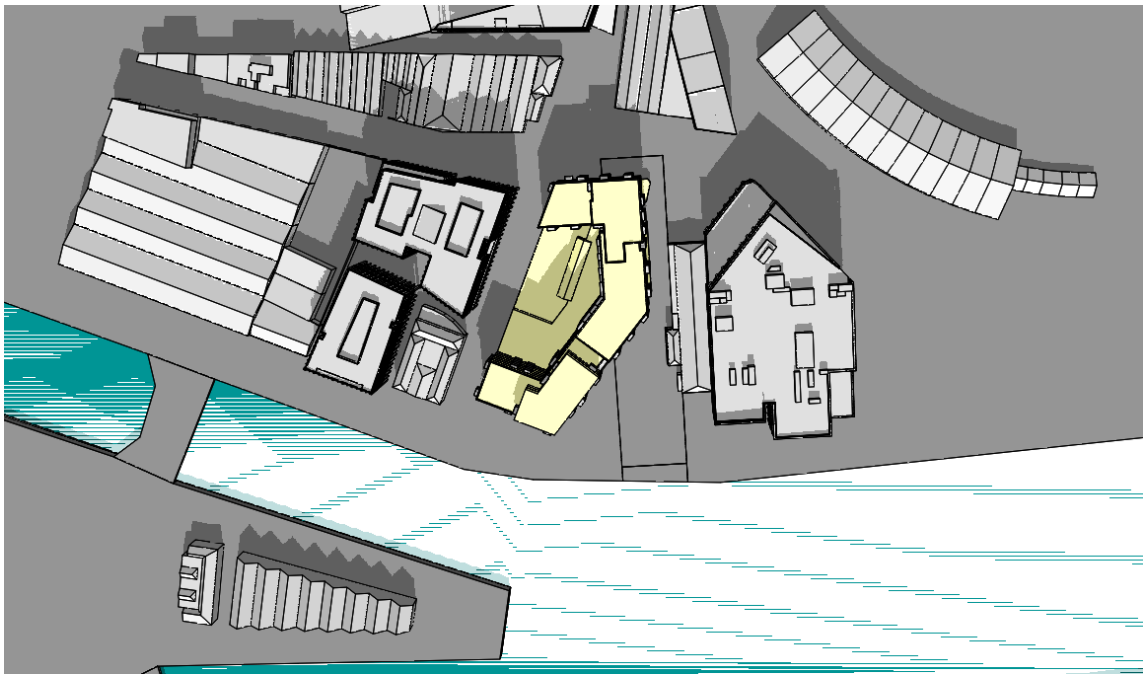
Images are provided on a bi-hourly basis from 10am to 4pm on each of the above dates.

4.1 21st March- Solar Shading Plan Images

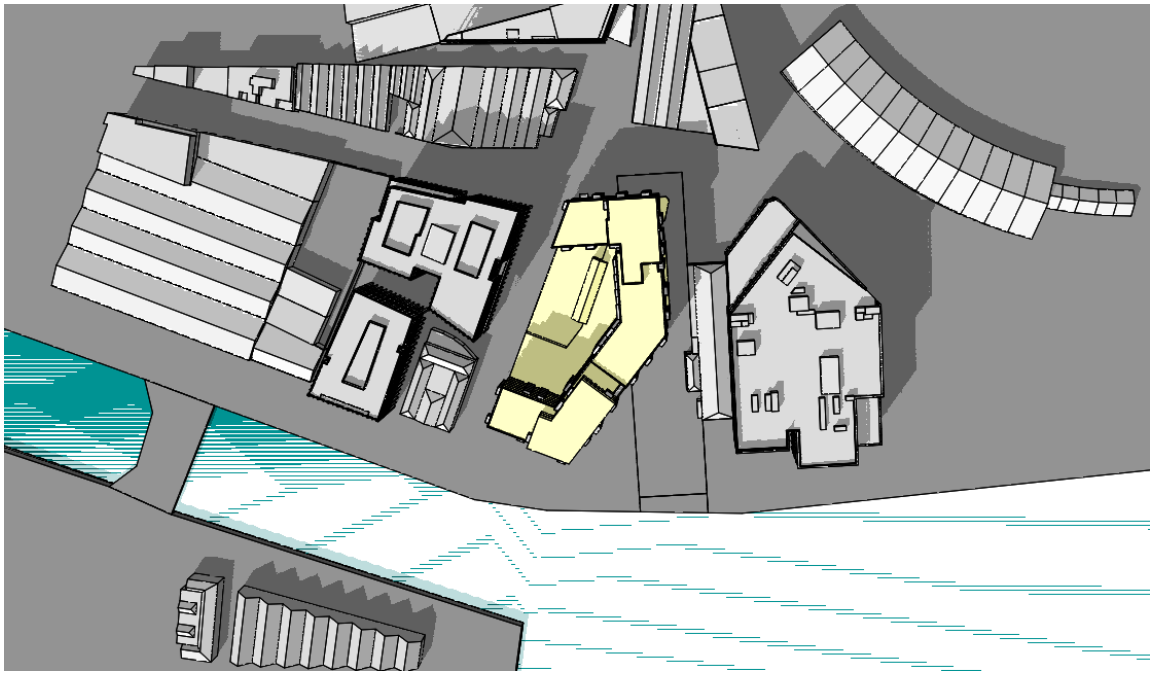
March 21 - 10h00



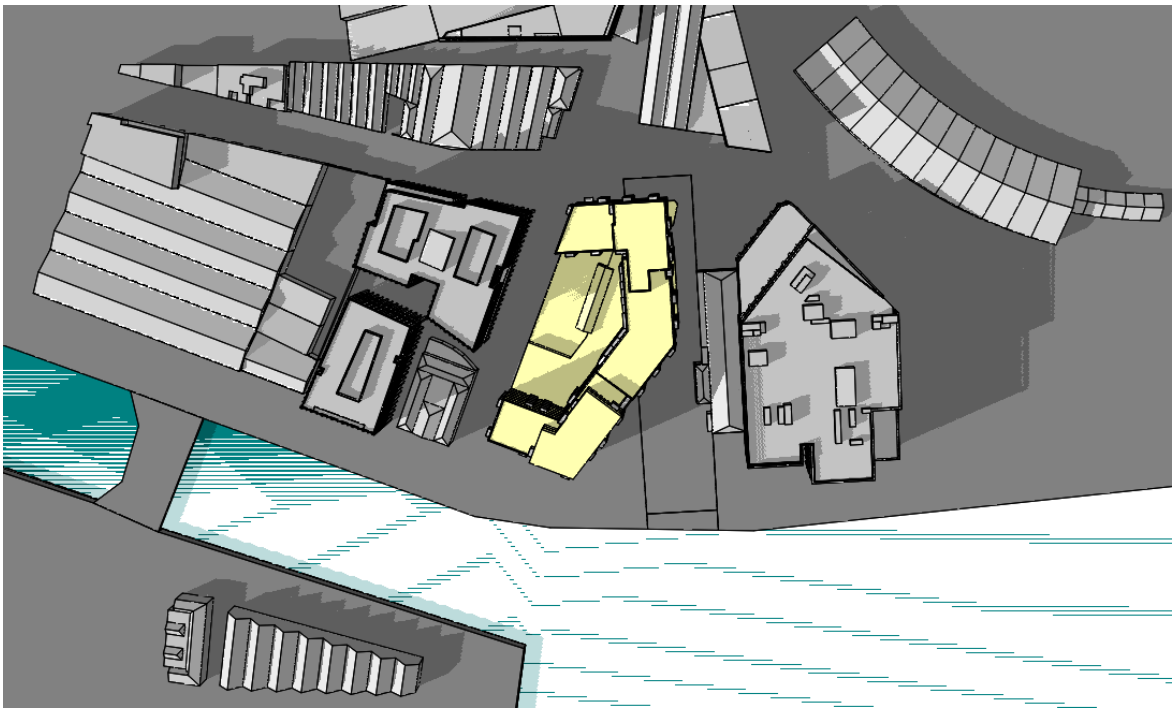
March 21 - 12h00



March 21 - 14h00

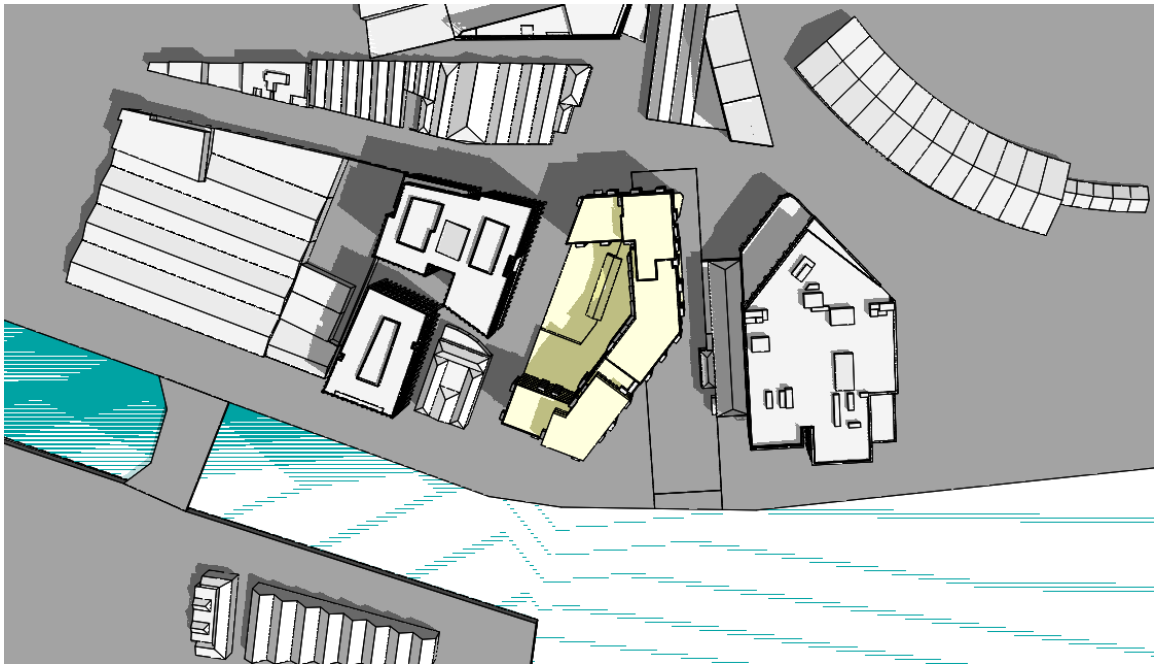


March 21 - 16h00

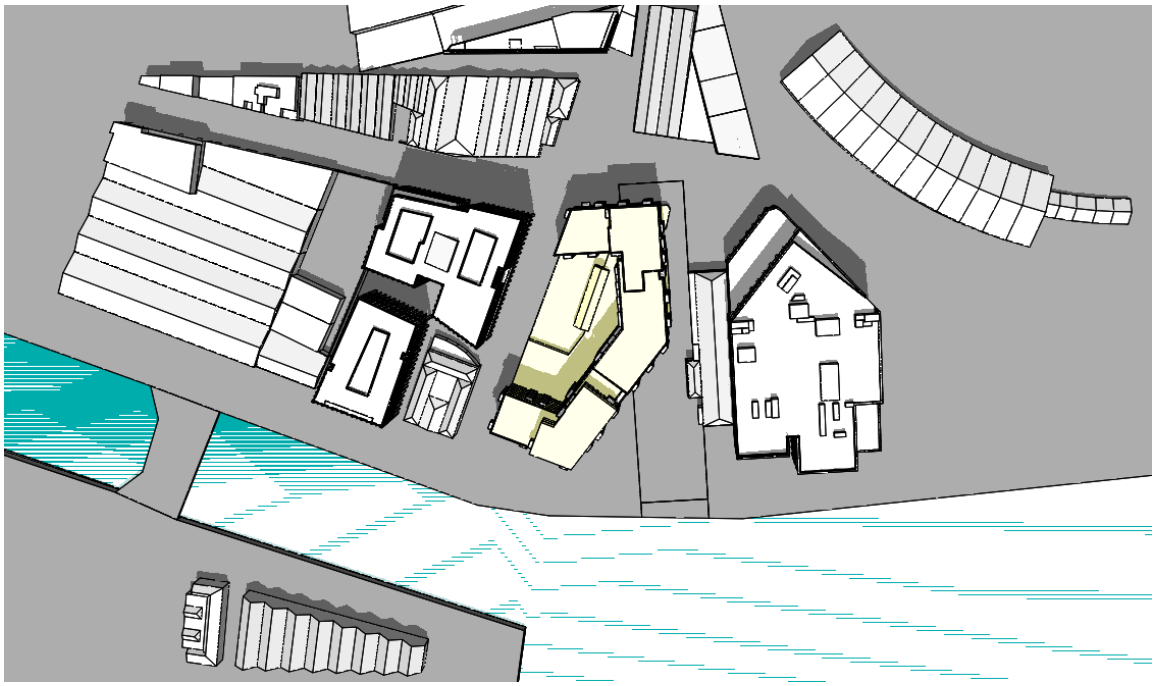


4.2 21st June- Solar Shading Plan Images

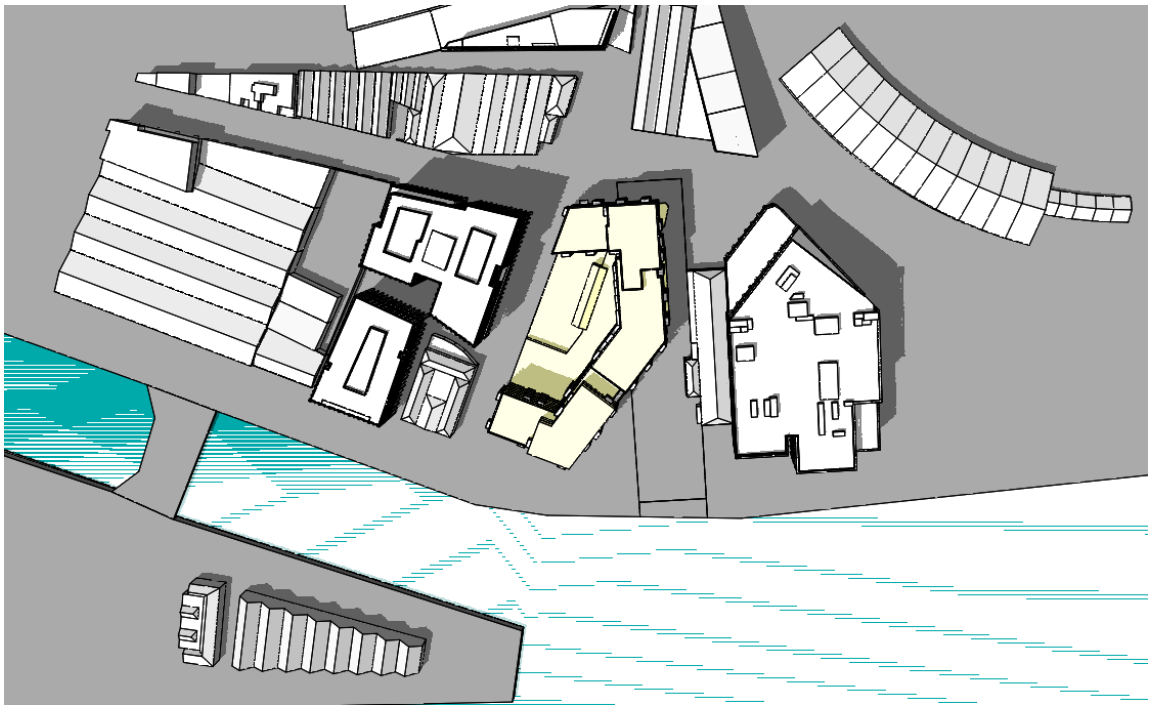
June 21 - 10h00



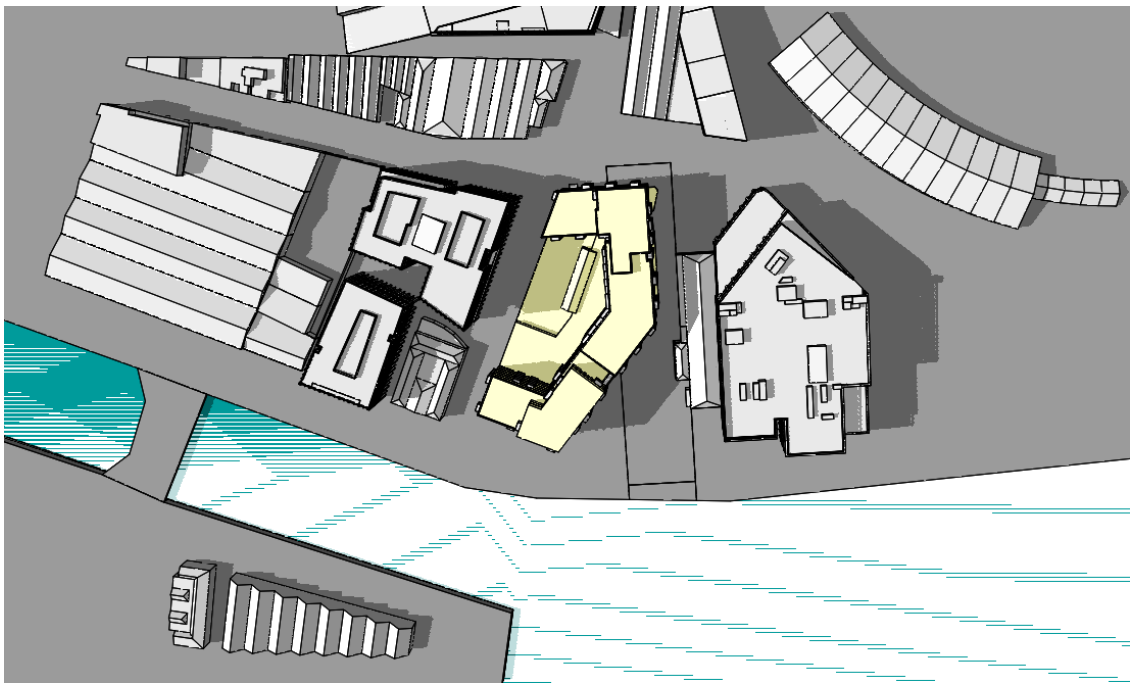
June 21 - 12h00



June 21 - 14h00

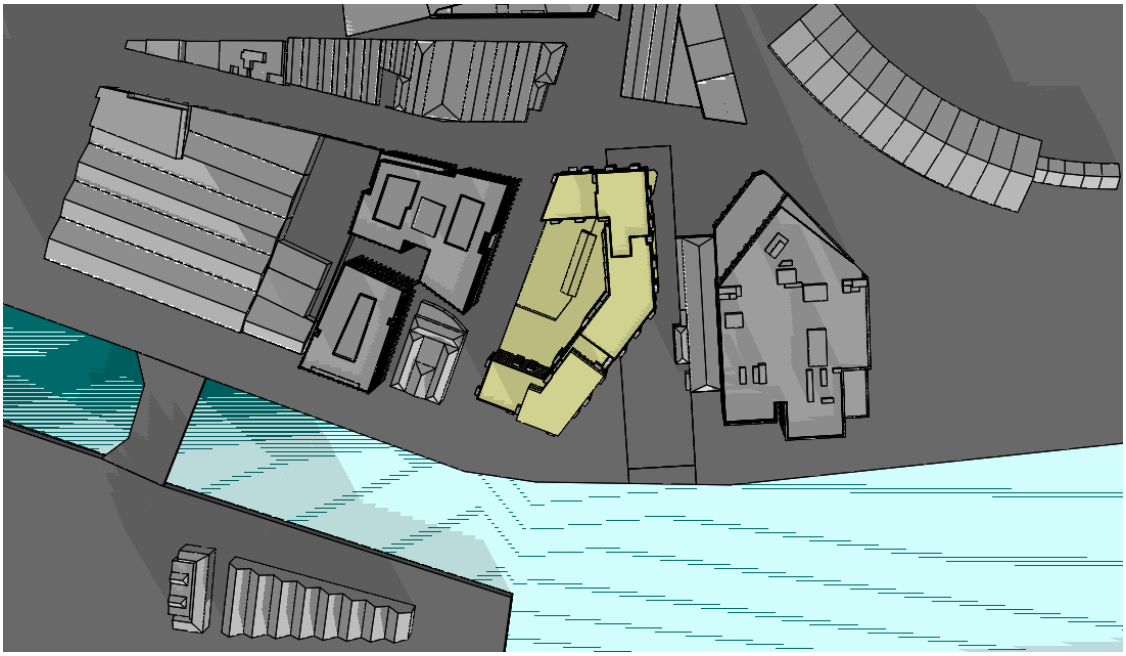


June 21 - 16h00

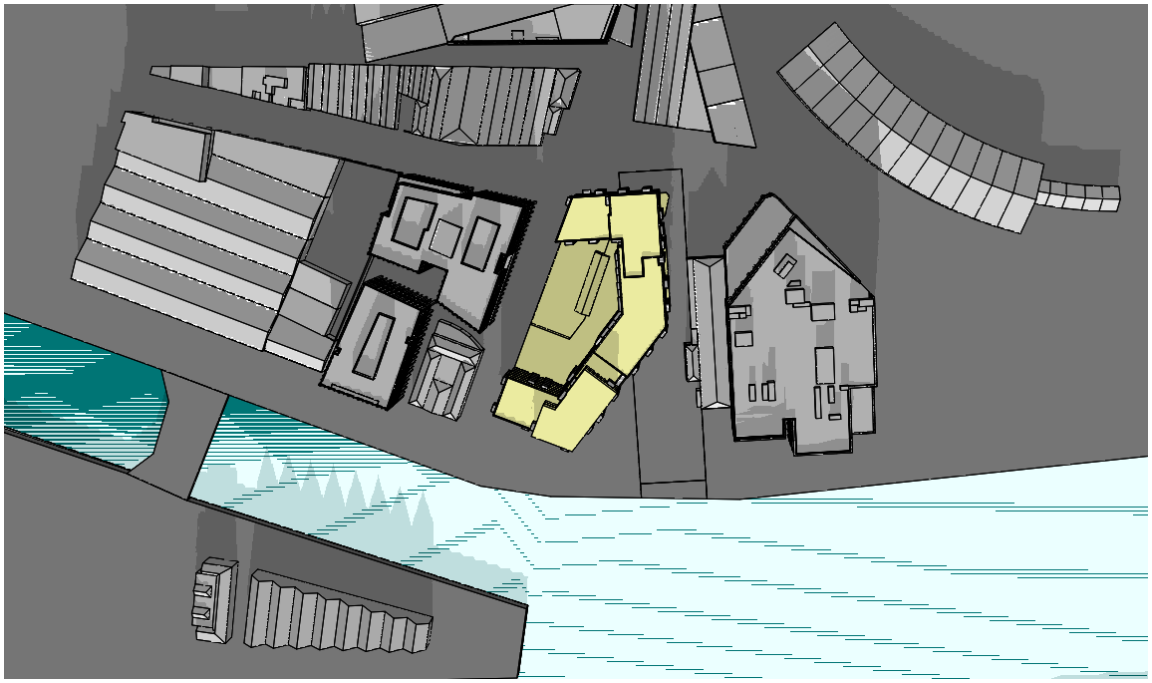


4.3 21st Dec- Solar Shading Plan Images

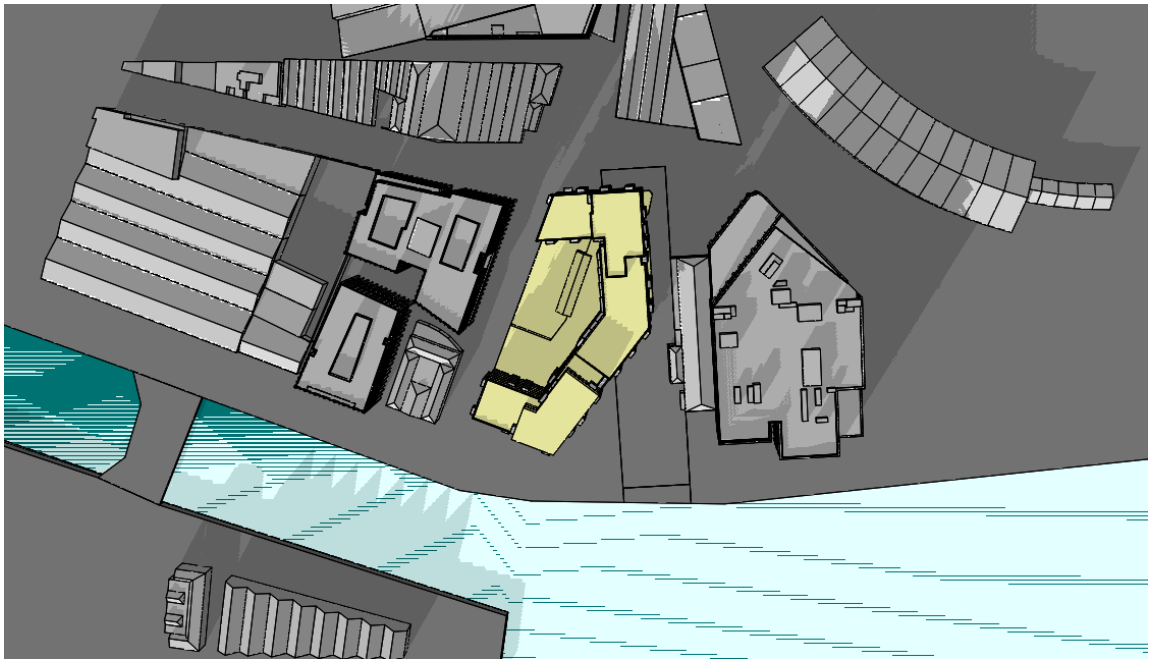
Dec 21 - 10h00



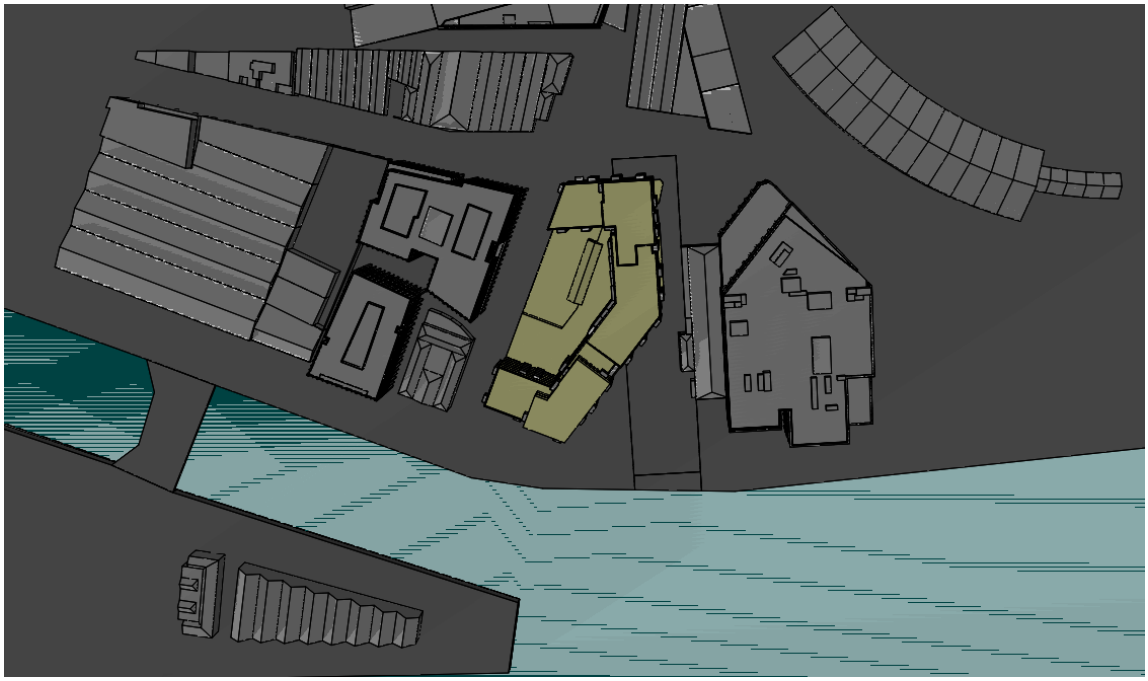
Dec 21 - 12h00



Dec 21 - 14h00



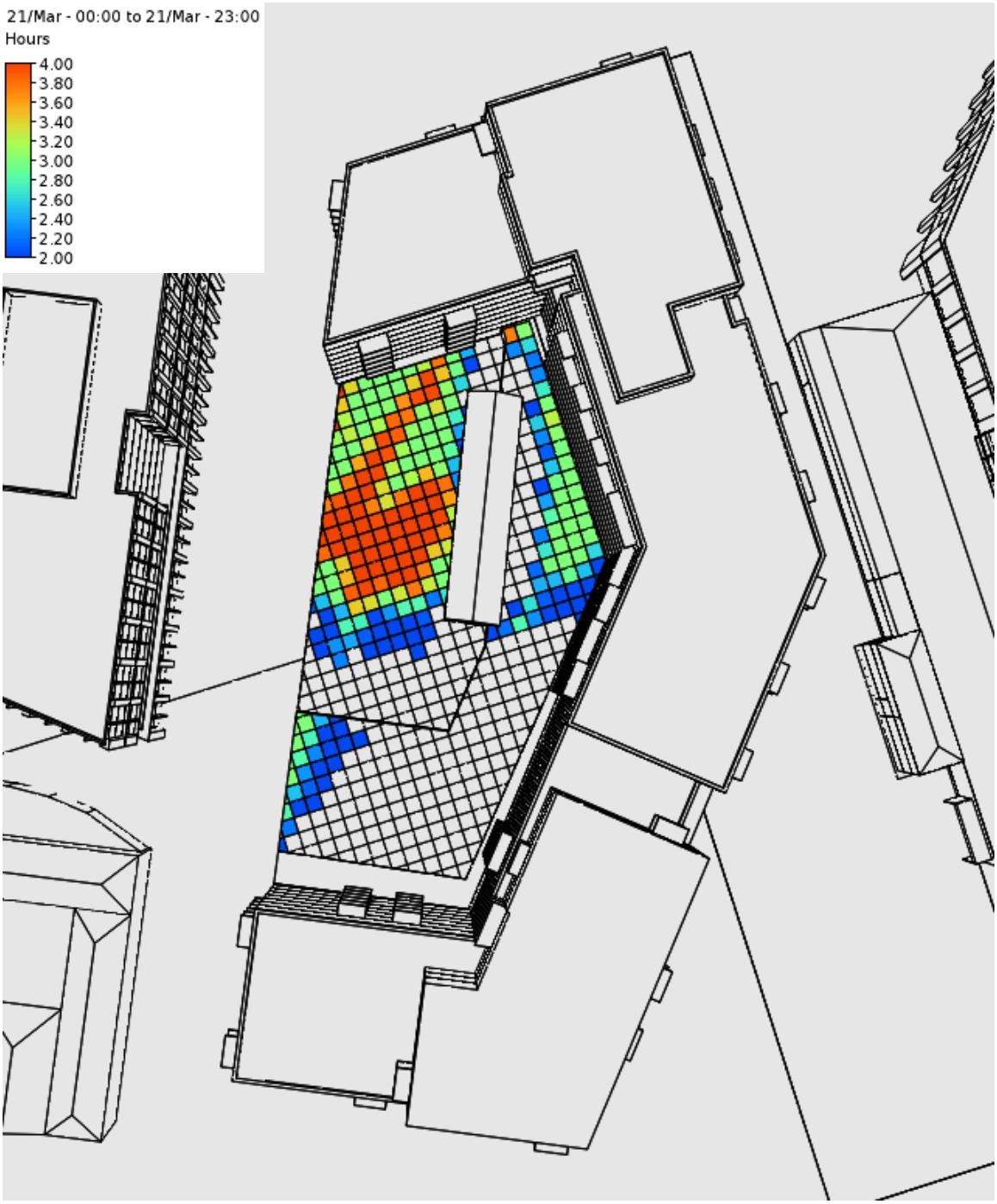
Dec 21 - 16h00



5 Sunlight to Amenity Space

The sunlight exposure on the private amenity area on March 21st can be seen in the image below. The space is divided into a grid of 2m x 2m ($4m^2$) cells. Any cell within this grid that receives less than two hours of sunlight on March 21st is shown in grey.

Sunlight Exposure on the 21st of March

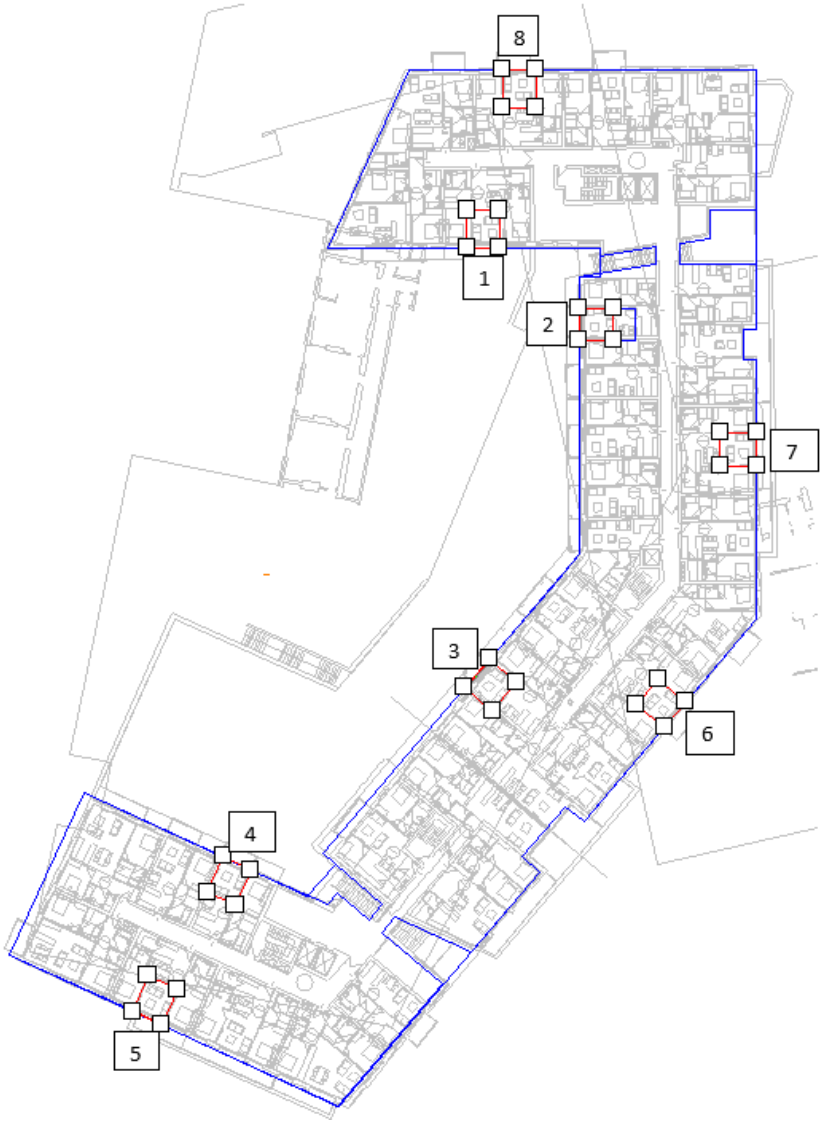


Cells > 2 hours	241
Cells < 2 hours	221
Total % > 2 hours	52.16 %

6 Average Daylight Factor (ADF)

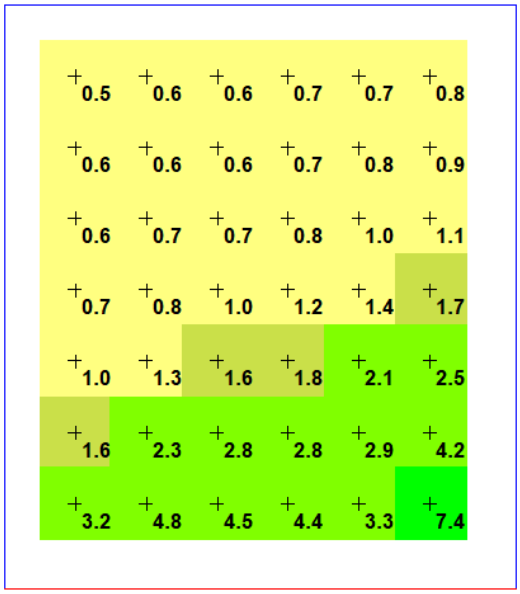
The average daylight factor (ADF) in a sample of 10 living rooms was assessed. The sample has a selection of living rooms on the first floor with various orientations. The lowest apartments are expected to be among the poorest performing locations in the development in terms of access to skylight and therefore represent a "worst case scenario". Apartments on upper floors are expected to perform progressively better with each storey. A sample of living rooms on the upper floors is included to highlight the improvement in daylight access that the apartments in the upper floors will experience.

1st Floor Apartment Location Legend



6.1 ADF Results

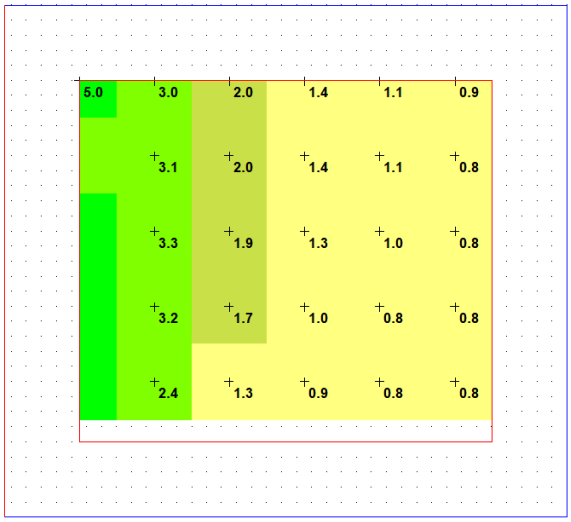
L1: Unit 1



Minimum = 0.54
Maximum = 7.39
Average = 1.77
DF > 1.50 = 40.48 %

Daylight Factor	42
< 1.50	59.5 %
1.50 - 2.00	9.5 %
2.00 - 5.00	28.6 %
> 5.00	2.4 %

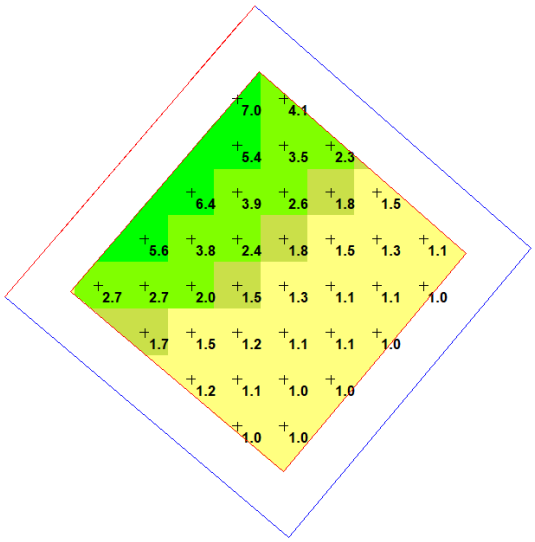
L1: Unit 2



Minimum = 0.75 [AOI]
Maximum = 5.05
Average = 1.68
DF > 1.50 = 38.46 %

Daylight Factor	26
< 1.50	61.5 %
1.50 - 2.00	15.4 %
2.00 - 5.00	19.2 %
> 5.00	3.8 %

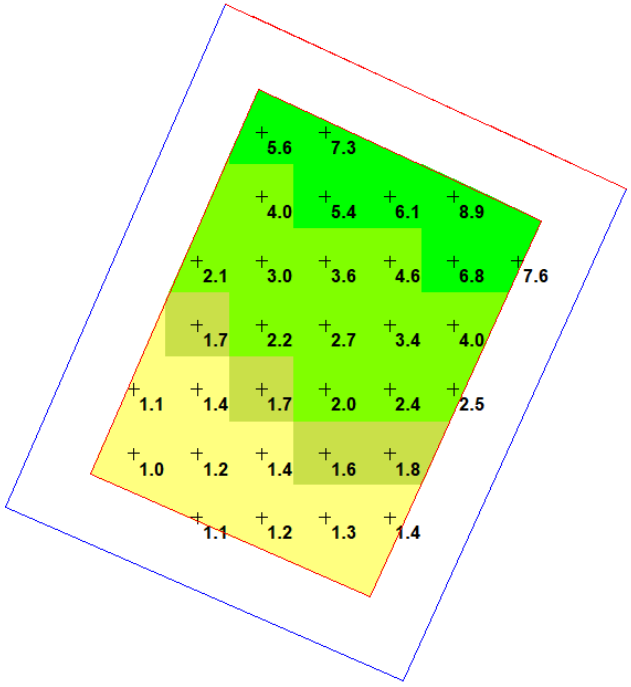
L1: Unit 3



Minimum = 0.99 [AOI]
Maximum = 7.05
Average = 2.25
DF > 1.50 = 48.65 %

Daylight Factor	37
< 1.50	51.4 %
1.50 - 2.00	10.8 %
2.00 - 5.00	27.0 %
> 5.00	10.8 %

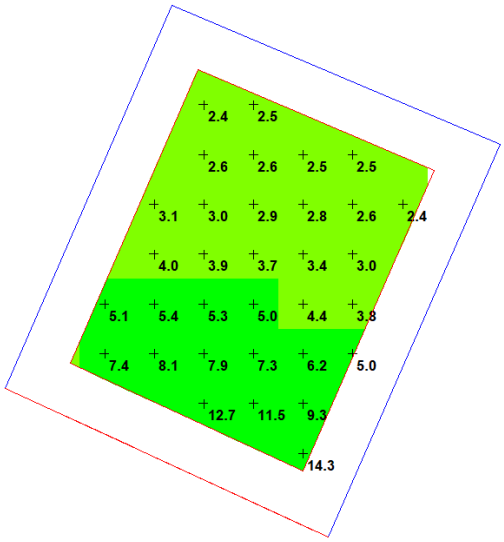
L1: Unit 4



Minimum = 1.02 [AOI]
Maximum = 8.95
Average = 3.20
DF > 1.50 = 71.88 %

Daylight Factor	32
< 1.50	28.1 %
1.50 - 2.00	12.5 %
2.00 - 5.00	37.5 %
> 5.00	21.9 %

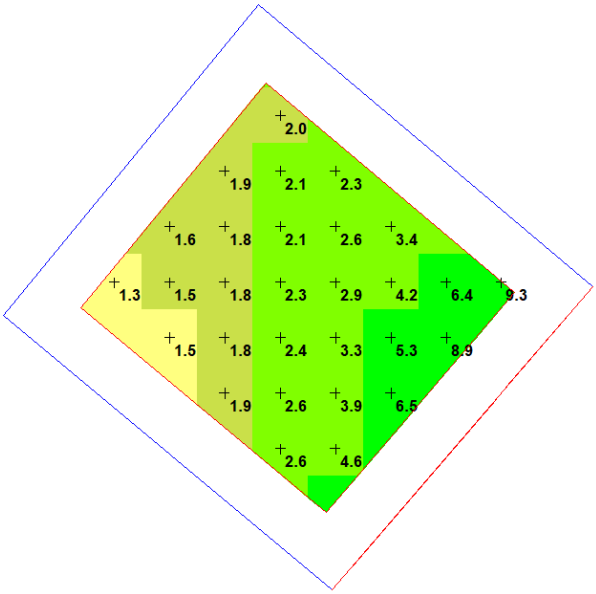
L1: Unit 5



Minimum = 2.43 [AOI]
Maximum = 14.30
Average = 5.11
DF > 1.50 = 100.00 %

Daylight Factor	33
< 1.50	0.0 %
1.50 - 2.00	0.0 %
2.00 - 5.00	57.6 %
> 5.00	42.4 %

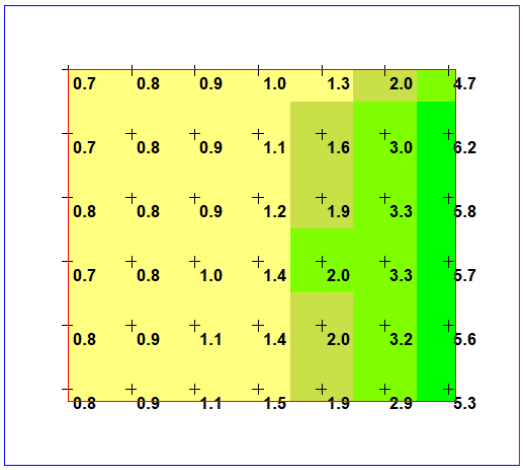
L1: Unit 6



Minimum = 1.34 [AOI]
Maximum = 9.27
Average = 3.27
DF > 1.50 = 93.10 %

Daylight Factor	29
< 1.50	6.9 %
1.50 - 2.00	27.6 %
2.00 - 5.00	48.3 %
> 5.00	17.2 %

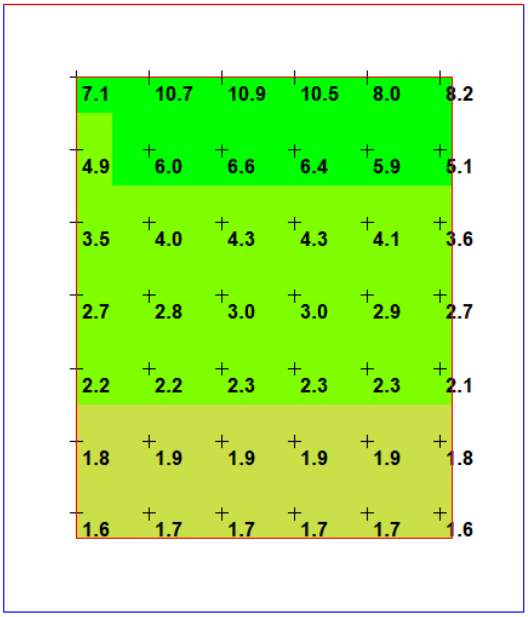
L1: Unit 7



Minimum = 0.72 [AOI]
Maximum = 6.20
Average = 2.01
DF > 1.50 = 40.48 %

Daylight Factor	42
< 1.50	59.5 %
1.50 - 2.00	11.9 %
2.00 - 5.00	16.7 %
> 5.00	11.9 %

L1: Unit 8

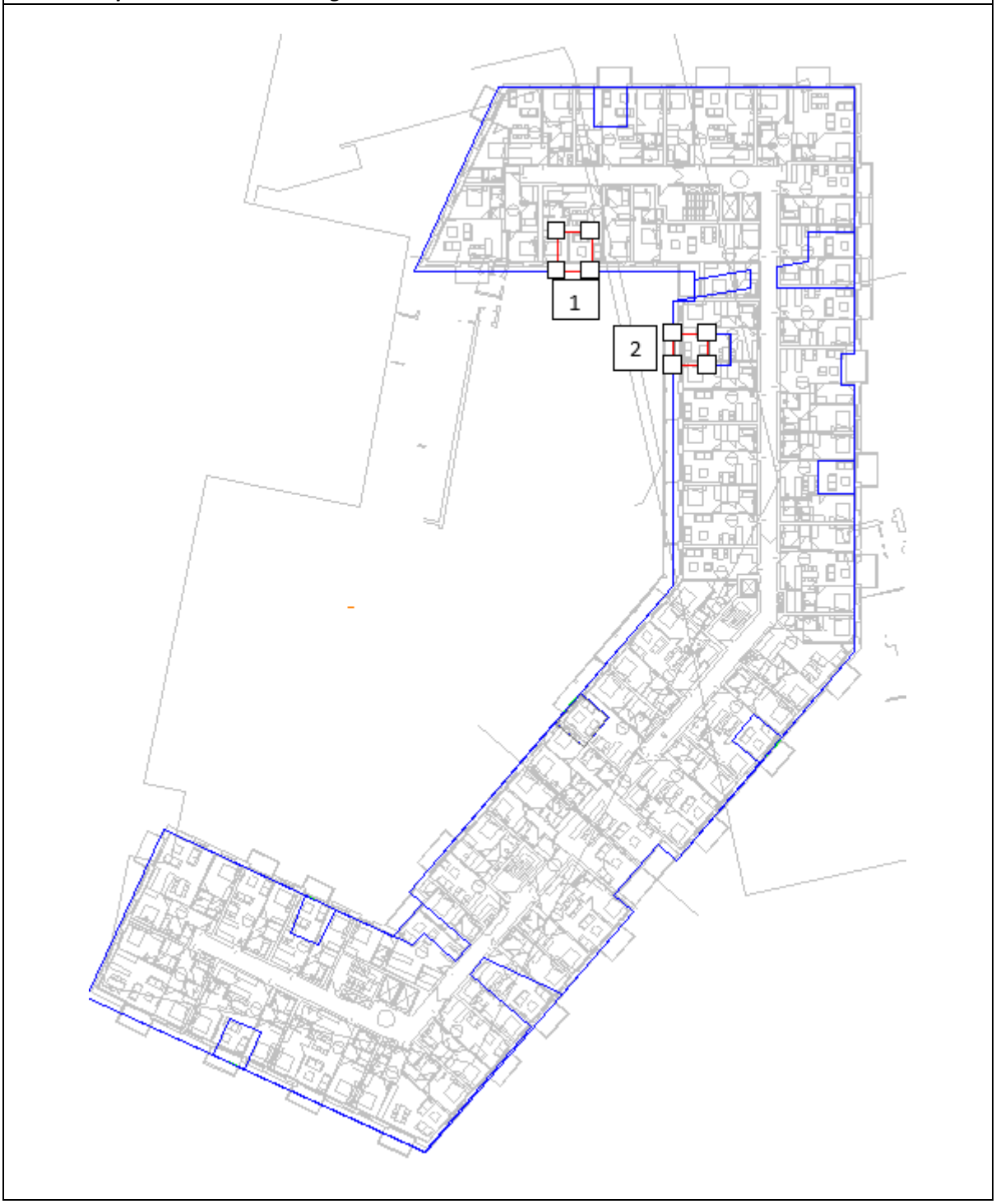


Minimum = 1.60 [AOI]
Maximum = 10.91
Average = 3.95
DF > 1.50 = 100.00 %

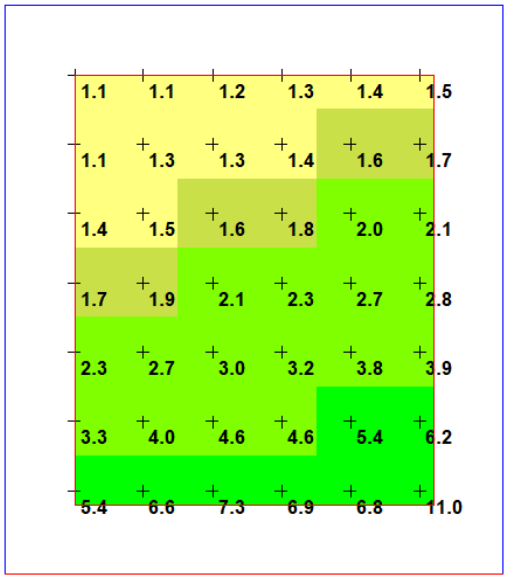
Daylight Factor	42
< 1.50	0.0 %
1.50 - 2.00	28.6 %
2.00 - 5.00	45.2 %
> 5.00	26.2 %

The results show that all living rooms analysed on level 1 are expected to have an average daylight factor above 1.5%. In addition to this, 6 out of the 8 living areas analysed are expected to have a daylight factor ranging from 2% -5.1% meaning that the majority of the level 1 living areas will be well daylit. Living areas on the upper floors will perform better than the level 1 apartments and therefore are also expected to be well daylit. The results of the analysis on two upper floor living areas on level 5 are shown below.

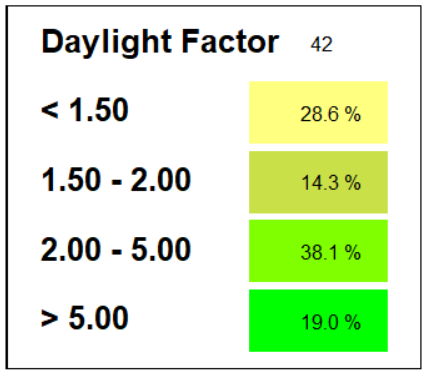
5th Floor Apartment Location Legend



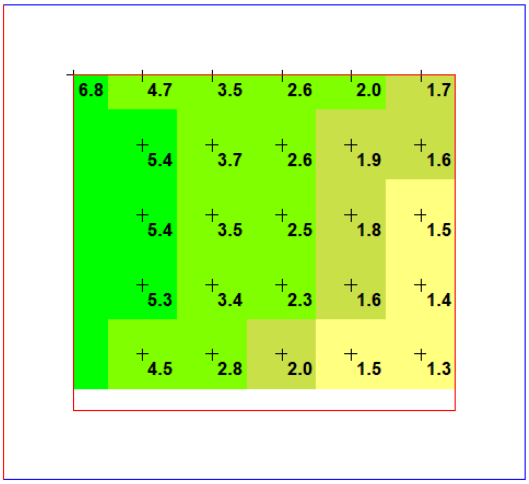
L5: Unit 1



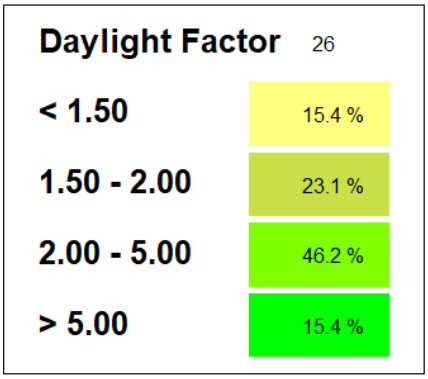
Minimum = 1.07 [AOI]
Maximum = 11.02
Average = 3.11
DF > 1.50 = 71.43 %



L5: Unit 2



Minimum = 1.29 [AOI]
Maximum = 6.83
Average = 2.97
DF > 1.50 = 84.62 %



The living rooms at location '1' and '2' on level one were the worst performing spaces but still had an ADF above 1.5%. The living areas in the same locations on level 5 have a much improved ADF; 3.11% and 2.97% respectively.

7 Conclusion

The analysis shows that over 50% of the amenity area will receive at least two hours of sunlight on March 21st meaning that it should appear adequately sunlit throughout the year.

The ADF analysis showed that all living rooms tested on the lowest occupied level (Level 1) are expected to have an ADF greater than 1.5% and therefore are in line with the best practice guidance provided in BR-209 *Site Layout Planning for Daylight & Sunlight* and BS 8206-2 *Code of practice for daylighting*. As a sample, these living areas are representative of the majority of living areas in the development and therefore it can be concluded that the overall scheme provides good levels of daylight to the majority of apartments. Furthermore, as the level one apartments are expected to be some of the worst performing spaces in terms of access to daylight it can be concluded that the living areas on the upper floors will be an improvement over the level one apartments. The analysis performed on the two sample apartments on level five confirms this, with a significant improvement seen in the ADFs in the living areas on this level.

The kitchens/dining areas in the apartments are internal spaces. The BRE guide recognises that internal kitchens are often unavoidable due to the many apartment layout considerations but recommends that these are "directly linked to a well daylight living rooms" as is the case with the proposed design.

The impact by the proposed development on neighbouring properties is limited given the location, use, orientation and separation distances and the public area around the proposed development has an adequate sunlight access, offering a great aspect on the quay and Waterfront Square. Furthermore, the private amenity spaces and balconies offer great views, with the few north-facing balconies to overlook either the shared open space or the expansive public realm with views towards St Luke's area.

Overall, the scheme provides good access to sunlight for the amenity areas and majority of the living areas in the apartments can expect to be well daylit.


IES