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Potential Daylight and Sunlight impact of Proposed Strategic Housing Development on Lands at Dunshaughlin East

Applicant: Rockture 1 Limited.

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1. Introduction

The proposed development consists of a residential development comprising of 913 no. residential units, a neighborhood centre, including 2 no. retail units, a café / restaurant unit, a primary healthcare / gym, a community facility and a childcare facility, all associated open space, a section of the Dunshaughlin Outer Relief Road, internal roads, cycle and pedestrian infrastructure, services and all other associated development on a site of c. 28.3 hectares.

The development consists mainly of 2-3 storey housing, 3/4 storey duplex blocks with 3 apartment blocks up to 5 storeys in height. There is a mixture of open green spaces and linear parks which give a variety of desirable public amenities.

An analysis was carried out for the sunlight to the gardens and private amenity areas and the daylight availability to the rooms of the existing dwellings. The results find that there will be no impact as a result of the proposed development to either sunlight or daylight availability to the surrounding properties. An analysis was also carried out on the proposed units within the development and finds that they meet the recommendations of the BRE guidelines.

2. Methodology

Loss of light to existing dwellings

For loss of daylight and sunlight to existing buildings BRE guidance document (2011) “Site layout planning for daylight and sunlight” is used and BS8208 Part 2:2008 Lighting for Buildings, Code of Practice for Daylighting.

For loss of light the report recommends calculation of the Vertical Sky Component. This is the ratio of direct sky illuminance falling on the outside window, to the simultaneous horizontal illuminance under an unobstructed sky. The standard CIE Overcast Sky is used and the ratio is usually expressed as a percentage. The maximum value is just under 40% for a completely unobstructed vertical wall. The vertical sky component on a window is a good measure of the amount of daylight entering it.

The BRE guidelines set out a two stage guide for the vertical sky component.

a) Where the Vertical Sky component at the centre of the existing window exceeds 27% with the new development in place then enough sky light should still be reached by the existing window.

b) Where the vertical sky component with the new development in place is both less than 27% and less than 0.8 times its former value, then the area lit by the window is likely to appear more gloomy, and electric light will be needed more of the time.

Sunlight to gardens and open spaces

For calculations of sunlight analysis it is general practice to use March 21 and the recommendations of the BRE guidance document (2011) “Site layout planning for daylight and sunlight”. P.J Littlefair, in relation to Gardens and open spaces section 3.3.17 state:

“It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March.”

The BRE Guidance document recommends “To assess loss of sunlight to an existing building, it is suggested that all main living rooms of dwellings, and conservatories, should be checked if they have a window facing within 90º of due south.”

Notes on the use of BS 8026-2 2008 and BRE guidance document (2011) "Site layout planning for daylight and sunlight".

To date, it is understood that no standards or guidance documents (statutory or otherwise) on the subject of sunlight access to buildings or open spaces or daylight access to buildings have been prepared or published in Ireland. In the absence of guidance on the matter of sunlight and daylight access tailored to Irish climatic conditions, Irish practitioners tend to refer to the relevant British Standard, BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting. The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in the British Standard have been referenced in this Sunlight and Daylight Access Analysis.

Neither the British Standard nor the BRE Guide set out rigid standards or limits. The BRE Guide is preceded by the following very clear warning as to how the design advice contained therein should be used:

"The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aims is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."

That the recommendations of the BRE Guide are not suitable for rigid application to all developments in all contexts is of particular importance in the context of national and local policies for the consolidation and densification of urban areas. Given that the British Standard and the BRE Guide was drafted in the UK in the context of UK strategic planning policy, recommendations or advices provided in either document that have the potential to conflict with Irish statutory planning policy have been disregarded for the purposes of this analysis.

3. Daylight

Daylight to the existing dwellings

BRE guideline recommends that: “Loss of light to existing windows need not be assessed if the distance of each part of the new development from the existing window is three or more times its height above the center of the existing window.”

“To check for this if part of a new building measured in a vertical section perpendicular to the main window wall of an existing building, from the center of the lowest window, subtends and angle of more than 25º to the horizontal, then the diffuse light of the existing building may be adversely affected.”

If a window falls within a 45° angle both in plan and elevation with a new perpendicular development in place then the window may be affected and should be assessed.

For the preliminary analysis residential properties are identified to the North of the site in Figure 2 and to the South of the site in Figure 3 that may be potentially impacted and section planes A-E are indicated on the site plan in Figure 2 and 3. Figure 4 shows the section planes perpendicular to the main window wall with a line at 25º to the horizontal indicated at 1.6m above ground level. The exact window layout of each house is not known so the guidelines recommend a height of 1.6 to represent the center of the ground floor window.

There are some apartments to the East of the site and a preliminary assessment is carried out on these to check if the adjacent houses have good availability of light in sections F,G and H.

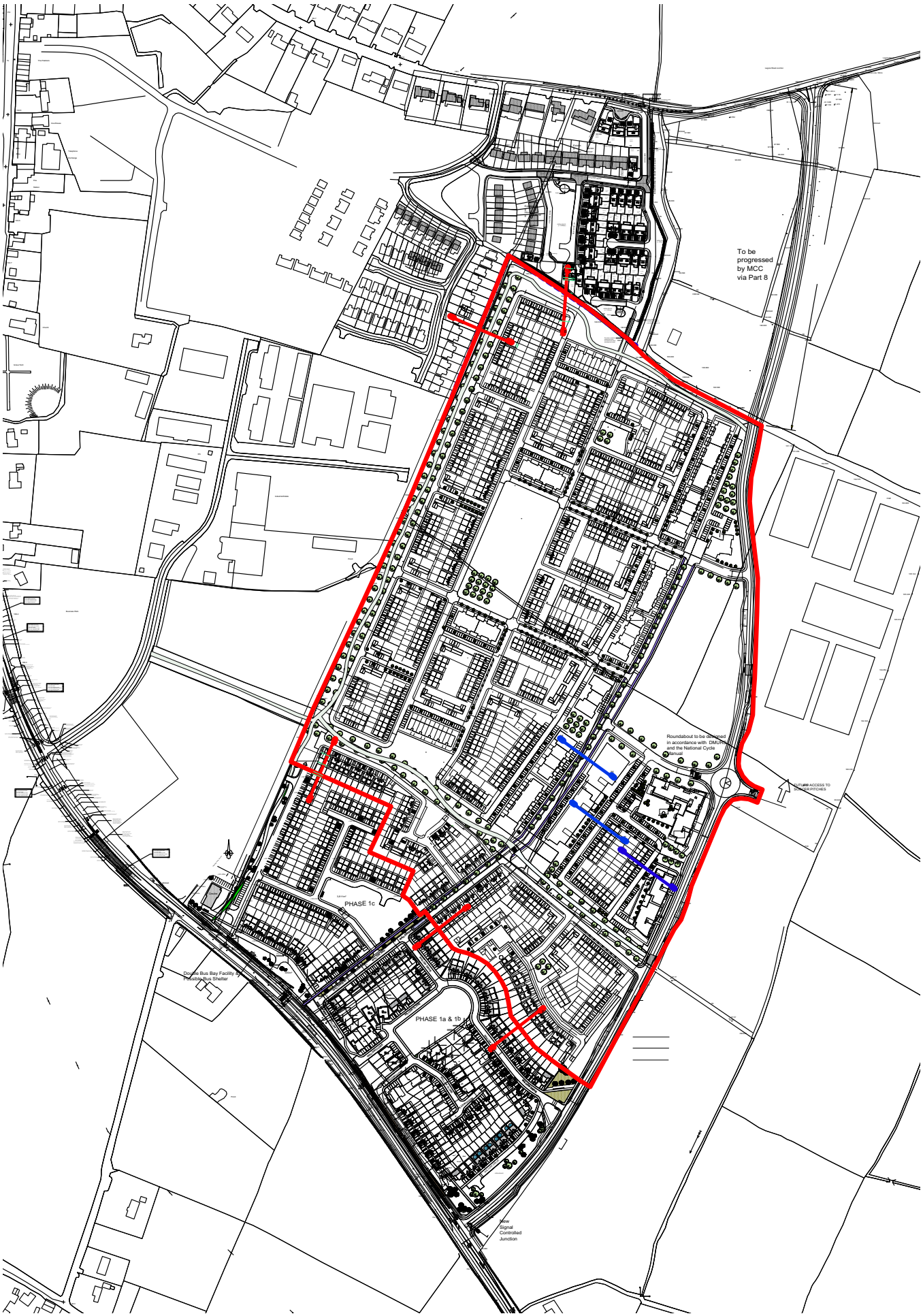


Figure 1. Site plan of proposed development.

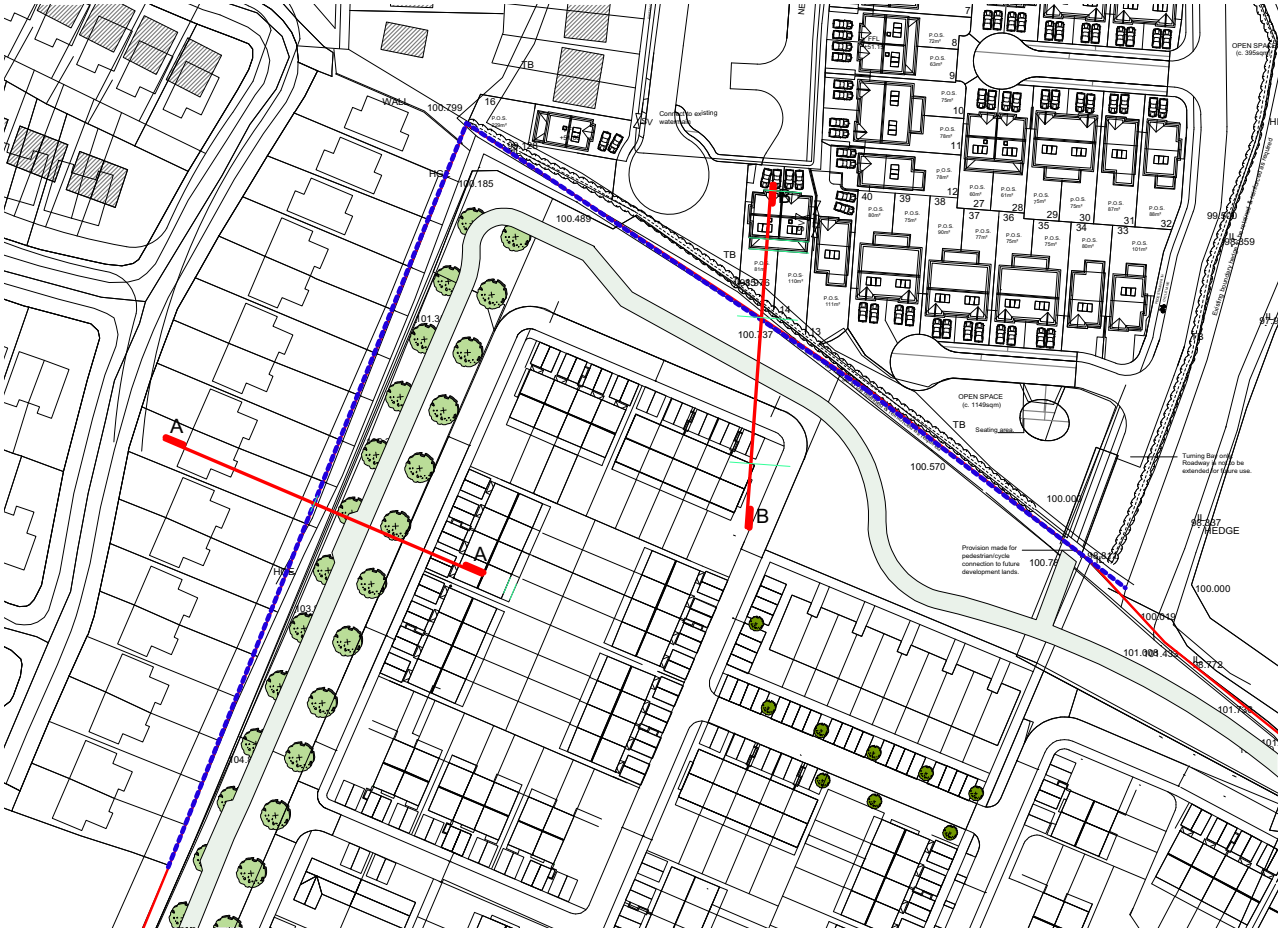


Figure 2. Plan of Northern section of site with sections indicated

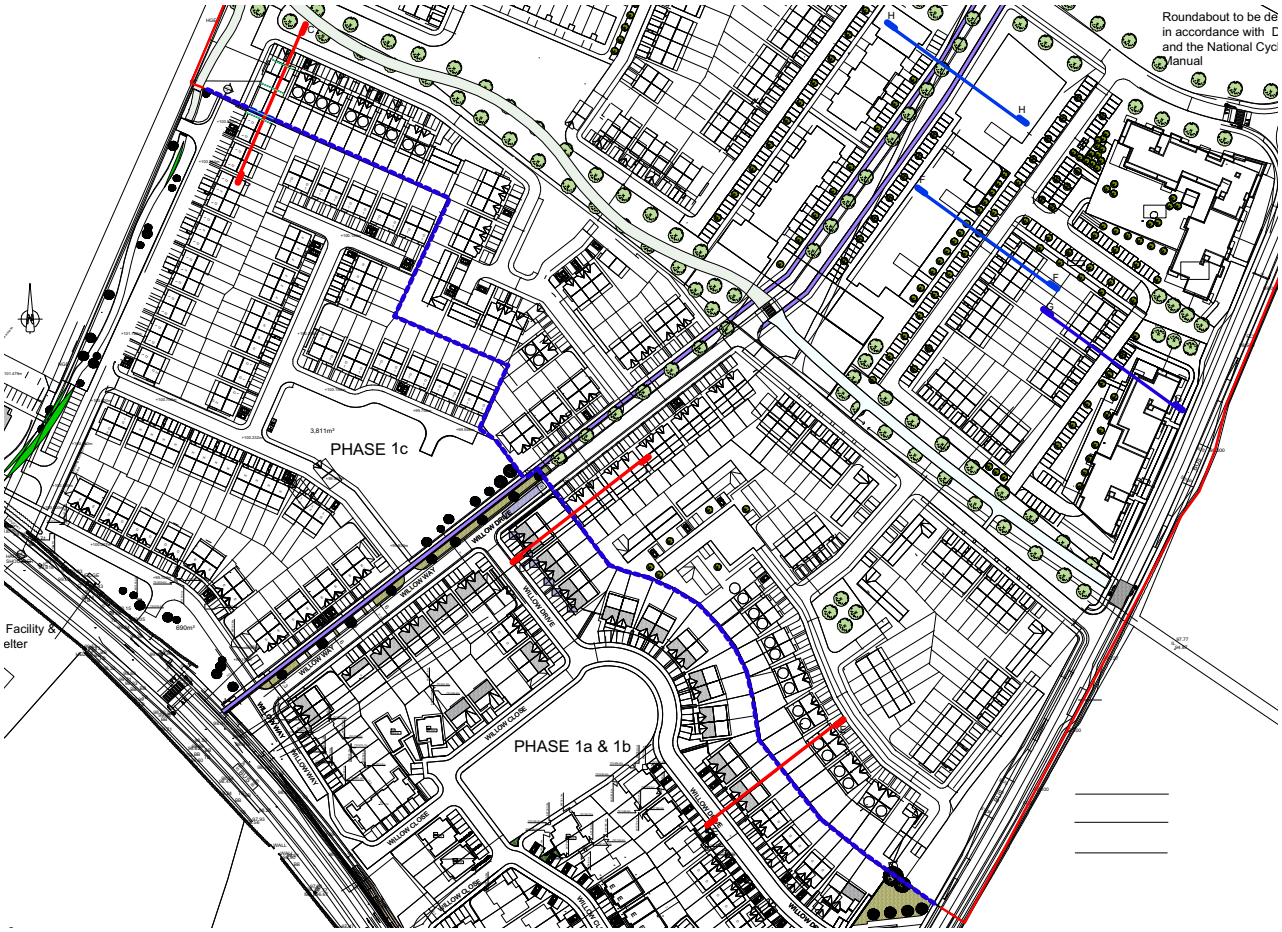
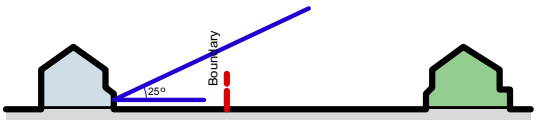
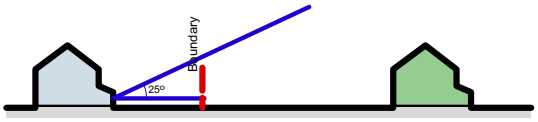


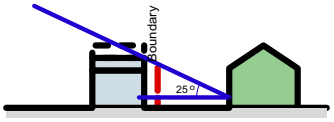
Figure 3. Plan to southern section of site with sections indicated



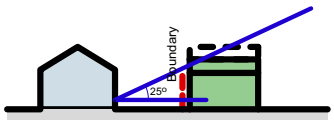
Section AA



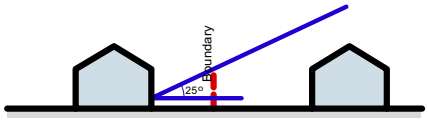
Section BB



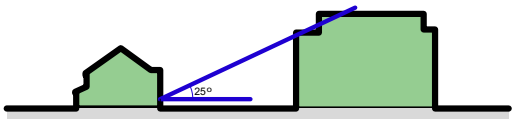
Section CC



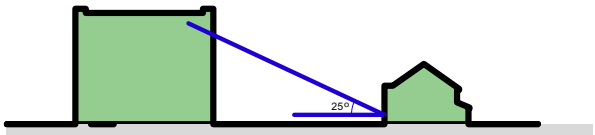
Section DD



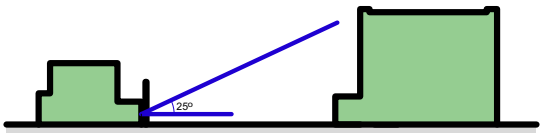
Section EE



Section FF



Section GG



Section HH

Figure 4. Site sections at locations on plan.

Discussion

Figure 4 shows the results of the preliminary assessment. The sections indicate that the proposed development will not subtend the 25º angle at any of the locations tested to the northern section of the site. Section CC, Fig. 4 is taken where the gable of the existing adjoining development is close to the boundary. In this case the proposed development is assessed to see if there will be enough daylight. Where there is a sloping obstruction like a gable the guidelines recommends taking a point half way along sloping obstructions. This is the case for sections CC and DD.

A detailed assessment is carried out where any of the sections subtend the obstructing angle and the results are displayed in Table 1. C1 and C2 represent the two houses facing the proposed development at this location. The section planes for the 3 locations tested at F,G and H are marginal and a detailed assessment is carried out. A detailed analysis is not required for the locations at section planes E as the initial assessment meets the guidelines and there should be no impact.

Available daylight to selected windows					
	Vertical Sky Component (VSK)			Available daylight Ratio as a % of existing value	
Location	Existing VSK	Proposed VSK	Recommended	Ratio	
C1	*	28.5	27	*	Meets Criteria
C2	*	29.5	27	*	Meets Criteria
D	37.5	28.5	27	76	Meets Criteria
F	*	27	27	*	Meets Criteria
G	*	31	27	*	Meets Criteria
H	*	29	27	*	Meets Criteria

Table 1 Vertical sky component for windows as per test points indicated in Figures 4. See Appendix B for stereographic diagrams.

The Astrix (*) indicates there is no existing condition at this test point as it relates to a window in the proposed development. There would be no ratio of the existing and proposed so the 27% VSK criteria is the target in this case.

The results in Table 1 indicated that all the windows tested will have a Vertical Sky Component in excess of 27% and should have good daylight availability. There is a reduction of available daylight to the rear ground floor window of the existing house in section D but the VSK is still in excess of 27% so there should be no noticeable loss of light.

Conclusion

The proposed development meets the BRE guidelines in the urban context. There should be no noticeable loss of available light to the surrounding residential houses and any impact will be negligible. The available daylight to the proposed development from the existing development meets the recommendations of the BRE Guidelines.

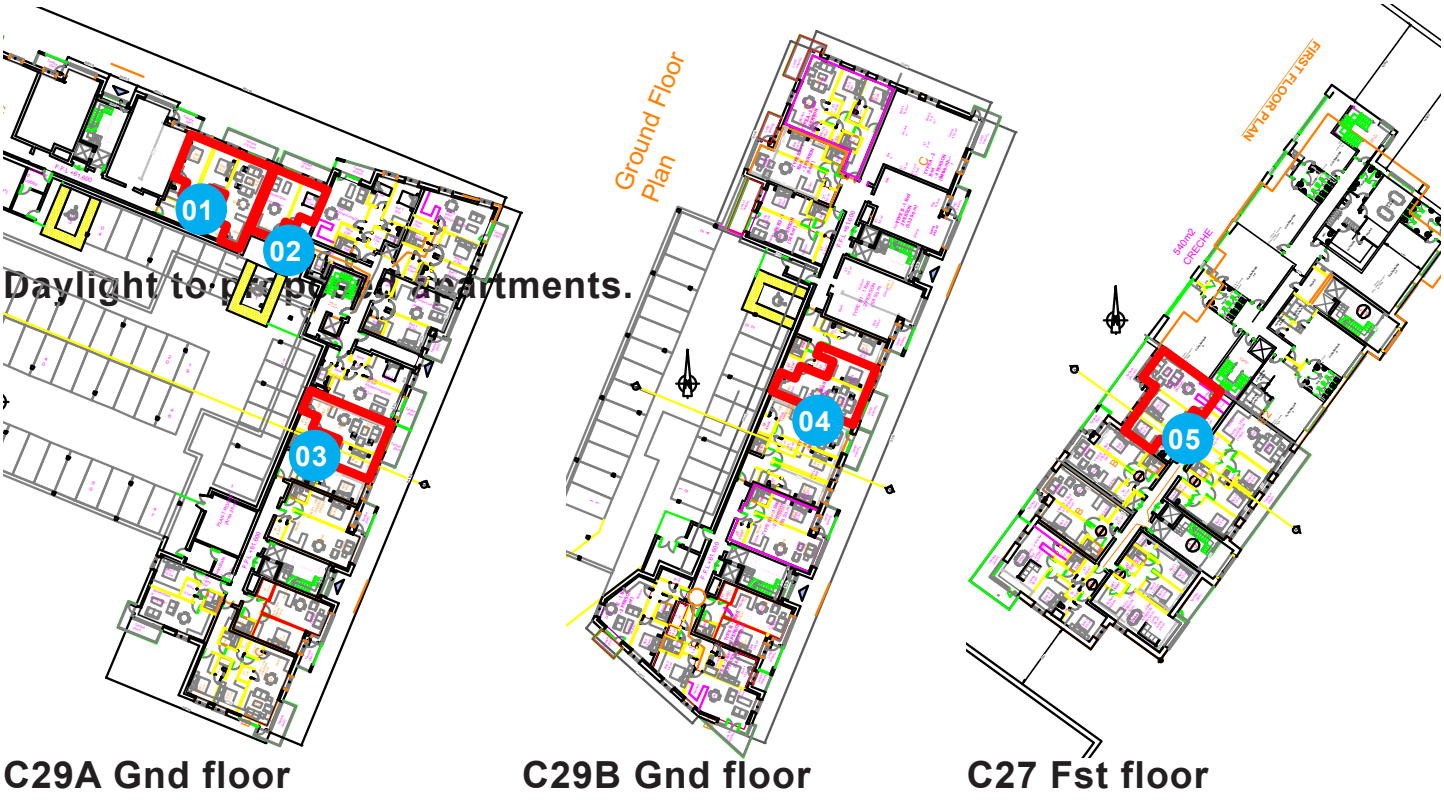


Figure 5. Plan of proposed Blocks C27, C29 A and B indicating apartments to be assessed for Daylight.

Assessment of proposed units within the proposed development.
The apartment block layouts are assessed and several units are identified that would be worst case for availability of daylight. Some factors that influence the selection would be a single window, deep narrow layout, overhead balcony or adjacency to a mass projection from the window wall like a stair core. 5 number apartments are identified in Figure 5 to be the most challenging for good daylighting and have varying layouts that would represent the majority of the units. The Living room and bedrooms to the selected apartments are tested and the results for the Daylight Factor are set out in Table 2.

The Daylight Factor (DF) guidelines in housing BS 8206-2 gives minimum values of ADF of 2% for Kitchens, 1.5% for Living rooms and 1% for Bedrooms. Table 1 gives the ADF for the living rooms and the Kitchen area. The guidelines recommend that “Non-daylit internal Kitchens should be avoided where possible, especially if a kitchen is used as a dining area too. If the layout means that a small internal galley-type kitchen is inevitable, it should be directly linked to a well daylit living room.” The kitchens to the apartments fall into this description and are at the rear of the space from the window wall.

The apartments assessed meet the BS 8206-2 guidelines for room depth. It would be considered that a bedroom has a lesser requirement for good daylight than the living area so the layout of the apartments were organised that the living space was given priority for access to the sky where possible over the bedroom spaces.

The design was optimised to give preferential access to the living rooms by orientation the layouts with the bedroom space closer to the inner corner where these occur.

Average Daylight Factor (ADF)		
	ADF	Recommended ADF
01 Apartment		
Living / kitchen	4.39	1.5/2
Bedroom 1	3.5	1
Bedroom 2	4.5	1
02 Apartment		
Living / kitchen	5.65	1.5/2
Bedroom	3.8	1
03 Apartment		
Living Room	4	1.5/2
Bedroom		1
04 Apartment		
Living Room	2.7	1.5/2
Bedroom	4.2	1
05 Apartment		
Living Room	4.4	1.5/2
Bedroom 1	3.6	1
Bedroom 2	3.9	1

Table 2 Daylight factor

The BRE guidelines recommend that the Average Daylight factor be assessed to new developments and the results for the test units are set out in Table 2. All the units exceed the recommended ADF and should be well daylit during the year.

Conclusion

All the living spaces and bedrooms exceed the recommendations of the BRE Guidelines and BS8208 Part 2:2008 Lighting for Buildings, Code of Practice for Daylighting.

Discussion

Under the current regulations there is a requirement for large balconies and this has a significant effect on the availability of daylight and sunlight to the apartments.

The BRE Guidelines state that: “Balconies and overhangs significantly reduce the light entering windows below them. This is a particular problem if there are large obstructions opposite; with the combined effect of the overhang and the obstruction, it may be impossible to see the sky from inside the room, and hence to receive any direct skylight or sunlight at all.” The guidelines also recommend to assess the impact the balcony has on the available VSC it can be useful to assess the window with and without. “One way to demonstrate this would be to carry out an additional calculation of the VSC and area receiving direct sunlight for both the existing and proposed situations, without the balconies in place.

The BRE Guidelines set out alternative criteria to meet if measures are taken to mitigate for poor availability of access to the sky:

“Between 15% and 27% special measures (Larger windows, changes to room layout) are usually needed to provide adequate daylight.

“VSC between 5% and 15% it is very difficult to provide adequate daylight unless very large windows are used”

“VSC less than 5% it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed.”

Available daylight to selected windows for the test apartments				
Unit from Fig. 5	Vertical Sky Component (VSK)	VSK without balcony	Alternative value for VSK	Comments
01 Apartment				
Living room	38.5	No balcony over	5-15%	Meets Criteria
Bedroom 1	39.5	No balcony over	15-27%	Meets Criteria
Bedroom 2	39	No balcony over	15-27%	Meets Criteria
02 Apartment				
Living Room	24	38	5-15%	Meets Criteria
Bedroom 1	15	29	15-27%	Meets Criteria
03 Apartment				
Living Room	20	40	5-15%	
Bedroom 1	35	35	5-15%	Meets Criteria
04 Apartment				
Living Room	20	20	5-15%	Meets Criteria
Bedroom 1	32	No balcony over	5-15%	Meets Criteria
05 Apartment				
Living Room W1	22	36.5	5-15%	Meets Criteria in addition to W2
Living Room W2	5.5	25	5-15%	Meets Criteria in addition to W1
Bedroom 1	11	35	5-15%	Meets Criteria
Bedroom 2	11	34.5	5-15%	Meets Criteria

Table 3 Vertical sky component for windows as per test points indicated in Figures 2. See Appendix B for stereographic diagrams.

The wall to the living room in all the apartments have a large patio / window which covers the majority of the window wall in most cases and would be considered very large. The windows to the bedrooms are either a large patio door or window which would be considered large to very large. Using the alternative values for the large windows to the bedrooms 15-27% VSK and the alternative value for very large window / patio windows to the living rooms 5-15% then all the windows would receive substantially more daylight and with the very large glazed area would meet the recommendations of the guidelines.

Conclusion

The Living rooms assessed meet the recommendations of the BRE guidelines. The lower value of 15-27% available VSK can be used because the windows would be considered very large. While bedrooms do require daylight they would have a lesser requirement than the main living space and the inclusion of large glazed windows helps to maximise the available daylight. All the other units should have equal or greater access to daylight and sunlight.

4. Sunlight to gardens and open spaces

The BRE guidelines recommend that 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 21. There is a residential development to the North of the proposed development. The distance at its closest point from the proposed development to the rear wall of the closest houses is in excess of 30m. It can be seen from the shadow diagrams in appendix A that there will be no impact.

There is a housing development under construction to the South of the site will not be impacted as these houses are directly South of the proposed development.

There are some industrial units to the west but these do not have a particular requirement for sunlight.

There are a number of public open spaces and linear parks. Due the nature of the development and the generous size of these spaces they should receive large amounts of sunlight throughout the day and provide attractive sunlit spaces. This can be seen from the shadow diagrams in Appendix A

Conclusion
There will be no impact to the surrounding sites from the proposed development. The new public open spaces should provide attractive sunlit spaces.

5. Shadow Diagrams

The BRE guidelines recommend using the 21st March for plotting shadow diagrams. The optional addition of June 21st and December 21st may be plotted but it should be noted that the summer solstice is the best case scenario with shadows at their shortest. Also even low buildings will cast long shadows in the winter and it is common for large areas of the ground to be in shadow.

Shadow diagrams are predicted in Appendix A (fig 6-22) for the Equinox 21 March at intervals during the day.

6. Conclusion

Good daylight and sunlight practice was followed with regard to the BRE guidelines.

The proposed development leaves generous space to the North, East and West and there will be no loss of sunlight or daylight to the adjacent properties. There are large open spaces and amenities that should receive lots of sunlight throughout the year and be pleasant spaces for recreation.

Within the proposed development the design was optimised to priorities living spaces by placing them away from internal corners and projections, providing large windows with multiple aspects. Single aspect apartments are kept to a minimum and the window to the living space cover almost the entire window wall with unit depth kept as shallow as possible.

The proposed development meets the recommendations of the BRE Guidelines.

6. Appendix A

Shadow Casting diagrams March Equinox

Figure 06: Shadow diagram 21march 10:00 GMT

Shadow Casting diagrams March Equinox

Figure 07: Shadow diagram 21march 11:00 GMT

Shadow Casting diagrams March Equinox

Figure 08: Shadow diagram 21march 12:00 GMT

Shadow Casting diagrams March Equinox

Figure 09: Shadow diagram 21march 13:00 GMT

Shadow Casting diagrams March Equinox

Figure 10: Shadow diagram 21march 14:00 GMT

Shadow Casting diagrams March Equinox

Figure 11: Shadow diagram 21march 15:00 GMT

Shadow Casting diagrams March Equinox

Figure 12: Shadow diagram 21march 16:00 GMT

Shadow Casting diagrams June Solstice

Figure 13: Shadow diagram 21June 10:00 GMT

Shadow Casting diagrams June Solstice

Figure 14: Shadow diagram 21June 12:00 GMT

Shadow Casting diagrams June Solstice

Figure 15: Shadow diagram 21June 14:00 GMT

Shadow Casting diagrams June Solstice

Figure 16: Shadow diagram 21June 16:00 GMT

Shadow Casting diagrams June Solstice

Figure 17: Shadow diagram 21June 18:00 GMT

Shadow Casting diagrams December Solstice

Figure 18: Shadow diagram 21December 10:00

Shadow Casting diagrams December Solstice

Figure 19: Shadow diagram 21December 12:00

Shadow Casting diagrams December Solstice

Figure 20: Shadow diagram 21December 14:00

Shadow Casting diagrams December Solstice

Figure 22: Shadow diagram 21December 16:00

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

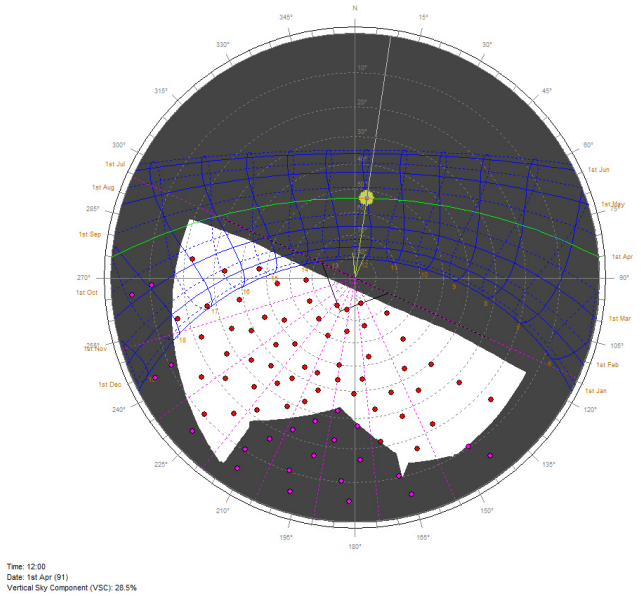


Figure 23: Table 1 C1

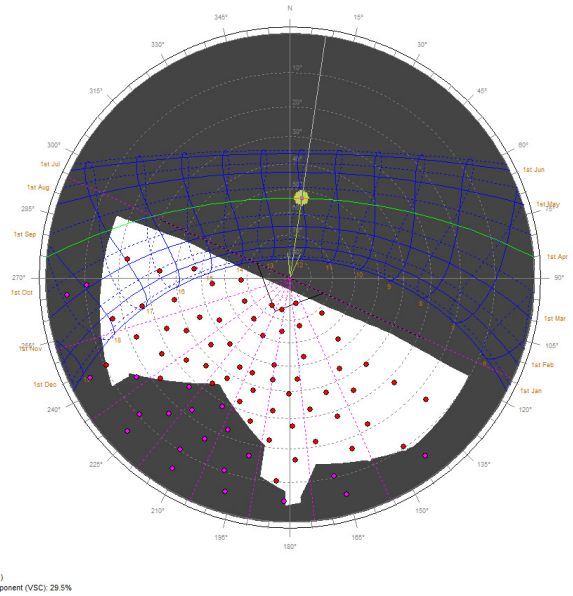


Figure 24: Table 1 C2

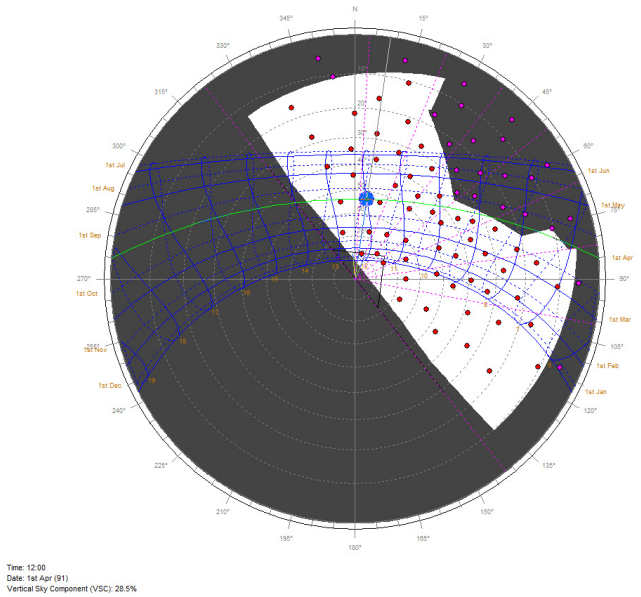


Figure 25: Table 1 D proposed

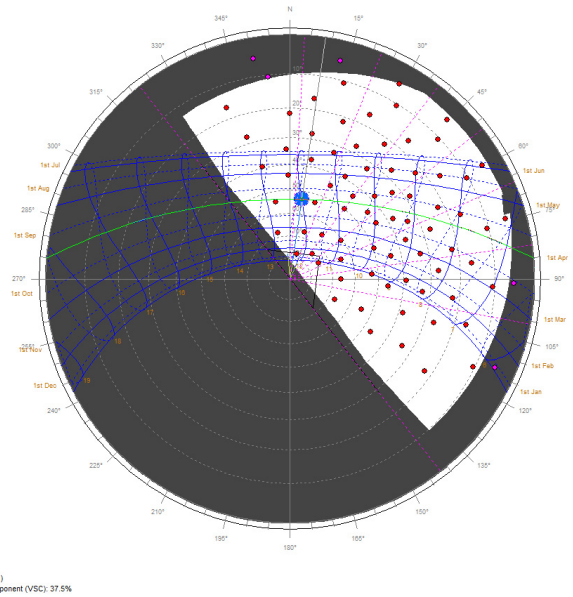


Figure 26: Table 1 D existing

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

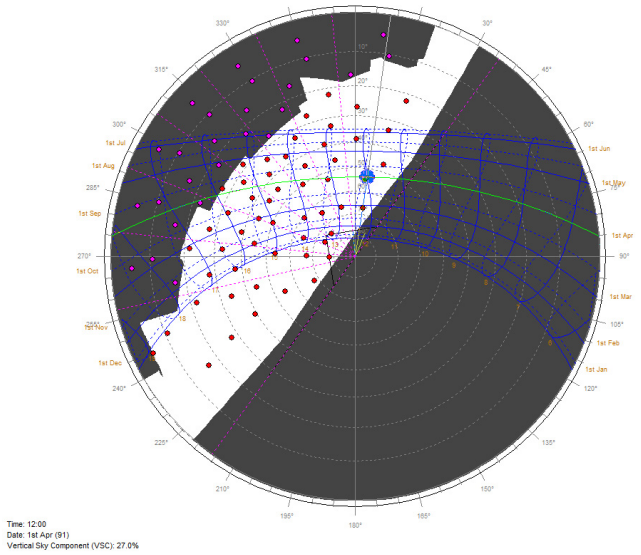


Figure 27: Table 1 F

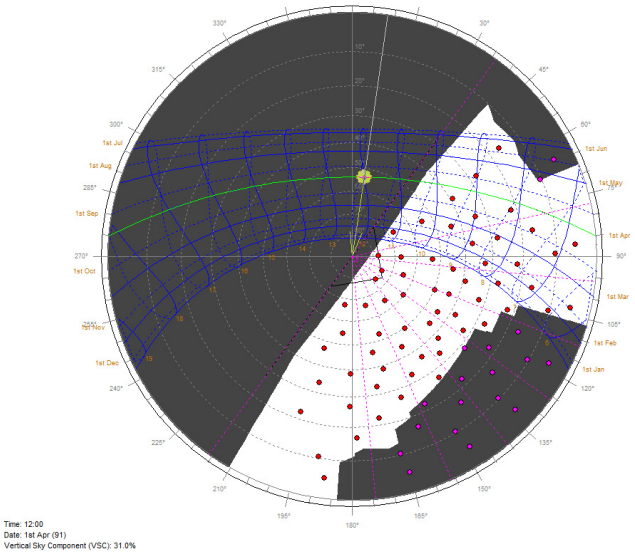


Figure 28: Table 1 G

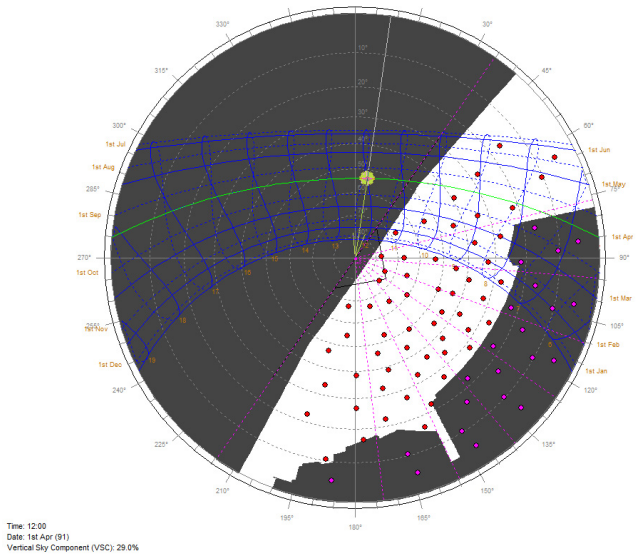


Figure 29: Table 1 H

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

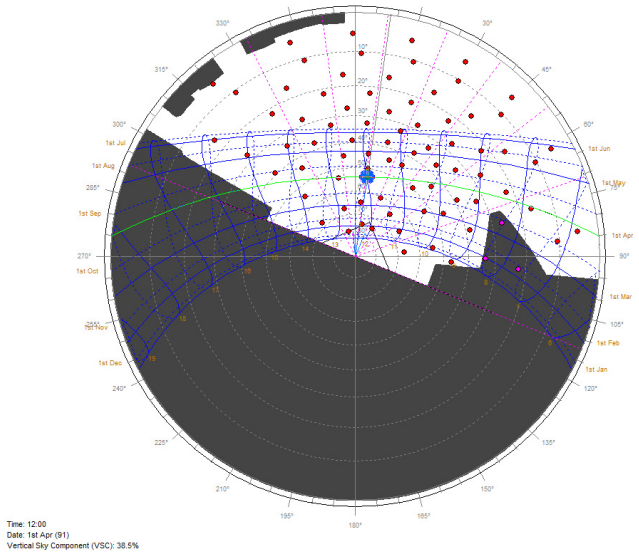


Figure 30: Table 3 Apt 1 Living

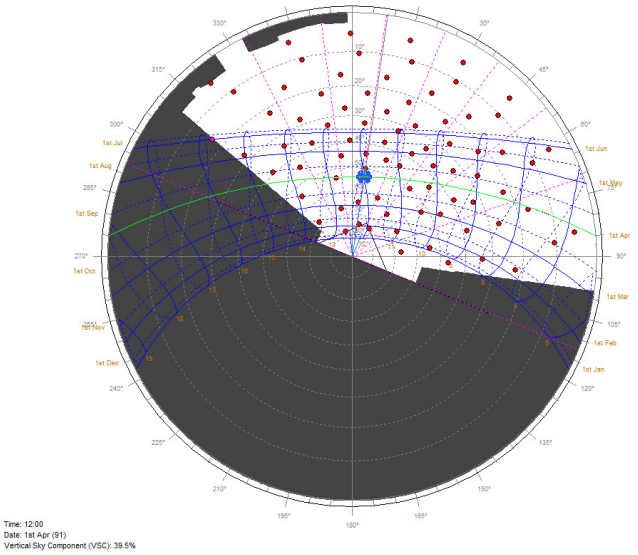


Figure 31: Table 3 Apt 1 Bedroom 1

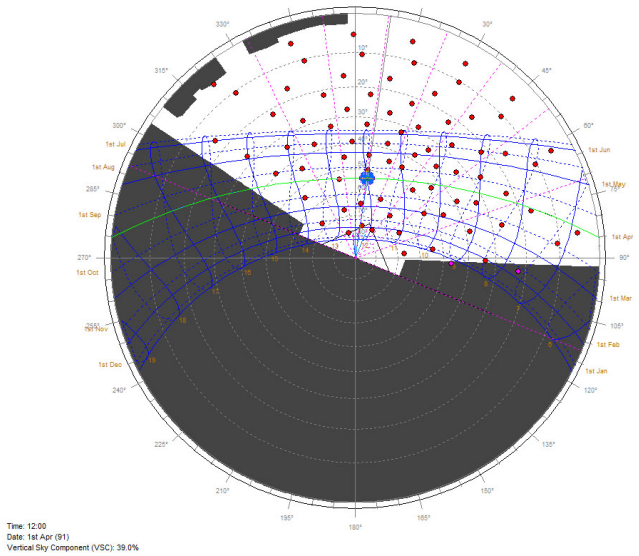


Figure 32: Table 3 Apt 1 Bedroom 2

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

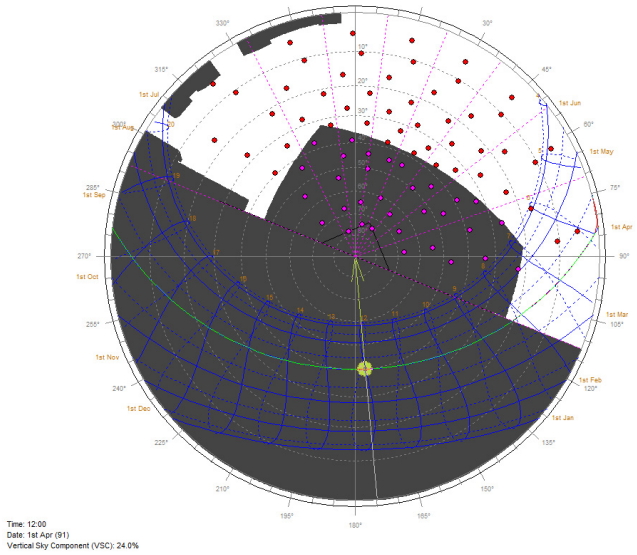


Figure 34: Table 3 Apt 2 Living

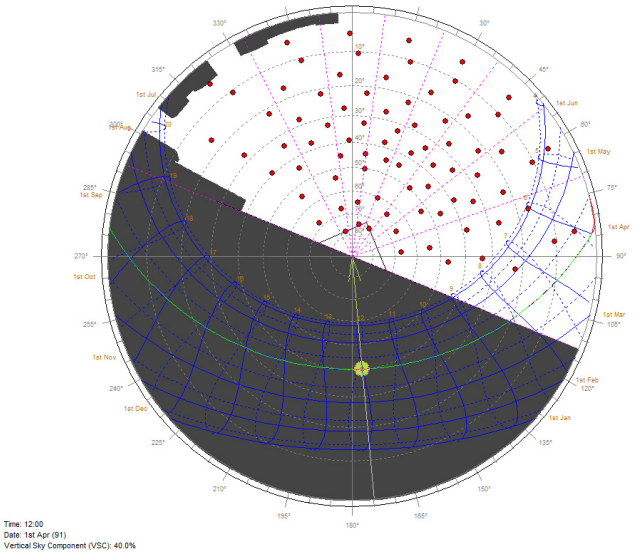


Figure 35: Table 3 Apt 2 Living no Balcony

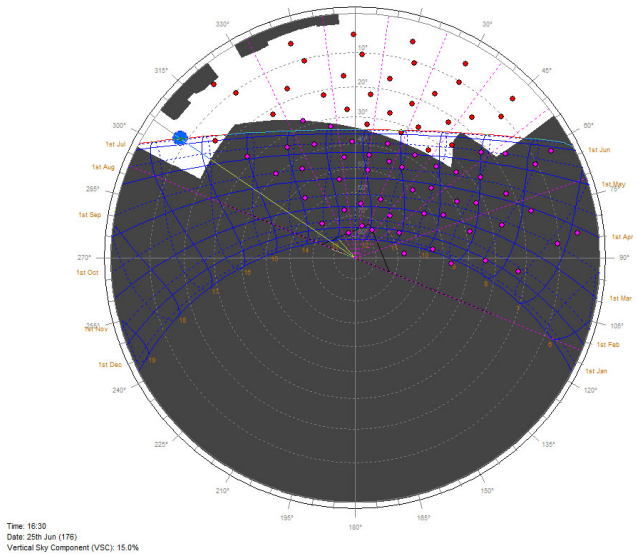


Figure 36: Table 3 Apt 2 Bedroom 1

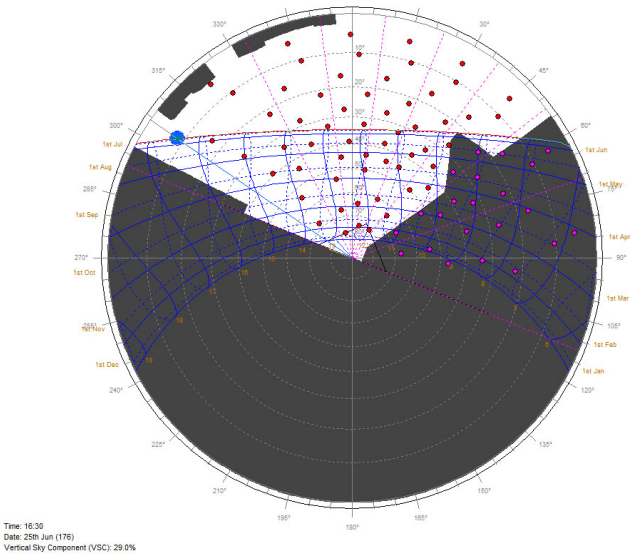


Figure 37: Table 3 Apt 2 Bedroom 1 no Balcony

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

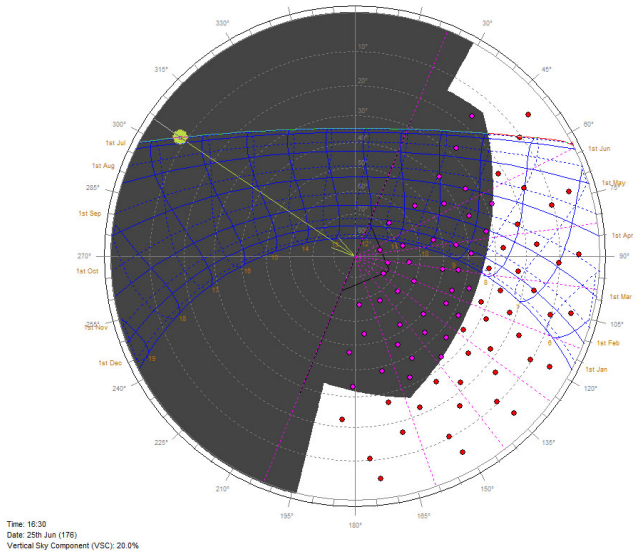


Figure 39: Table 3 Apt 3 Living

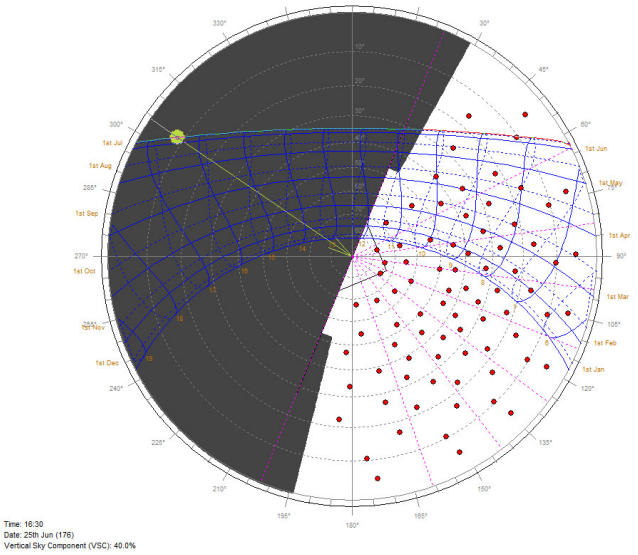


Figure 40: Table 3 Apt 3 Living no Balcony

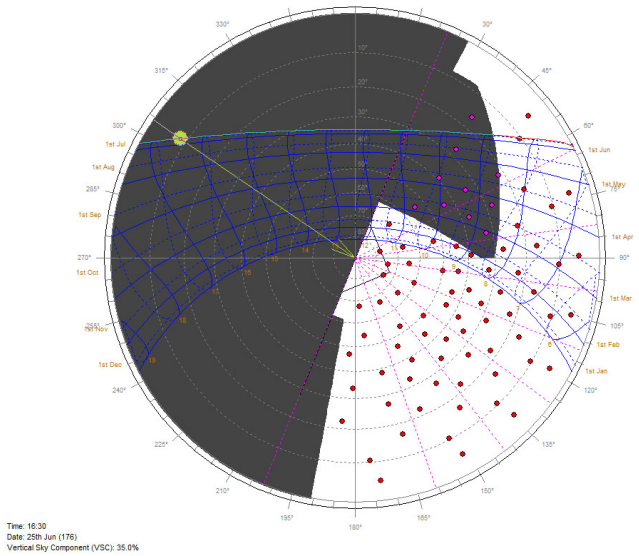


Figure 41: Table 3 Apt 3 Bedroom 1

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

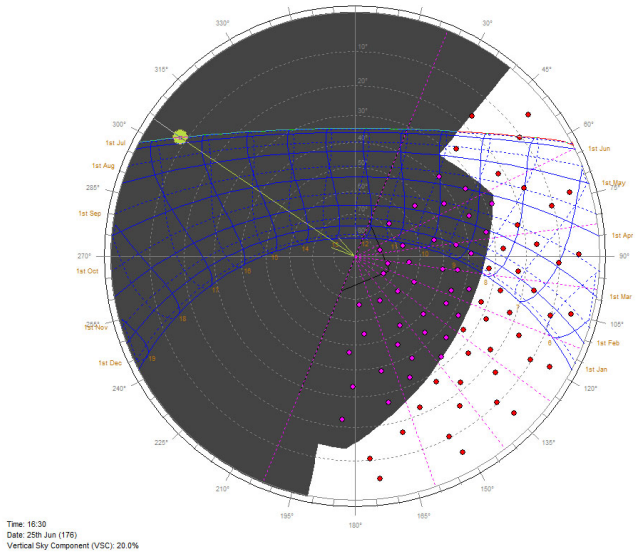


Figure 42: Table 3 Apt 4 Living

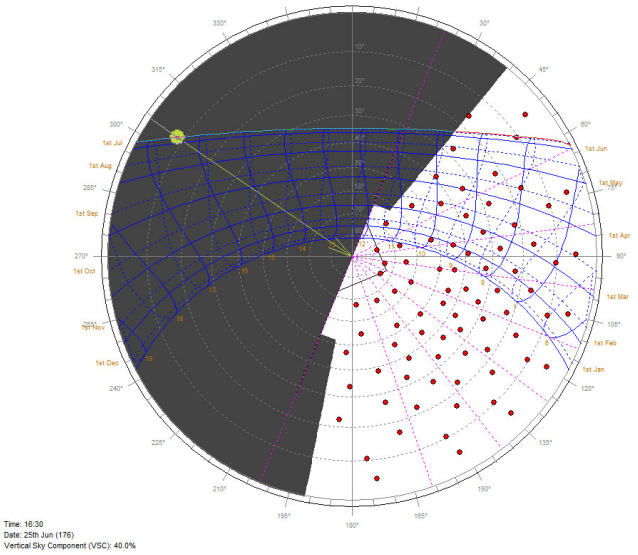


Figure 43: Table 4 Apt 3 Living no Balcony

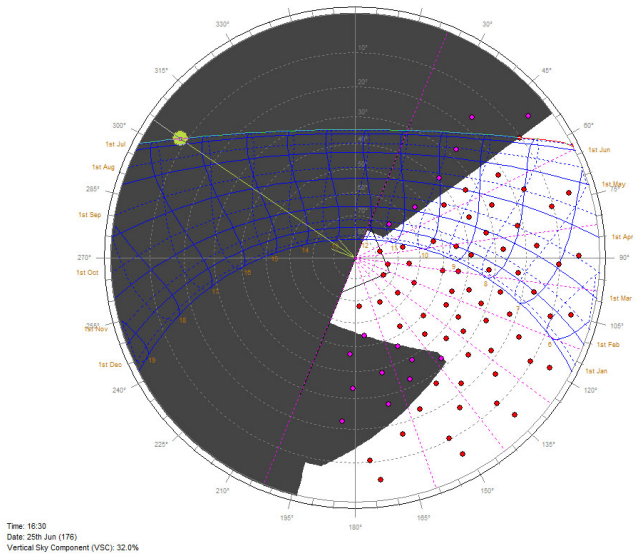


Figure 44: Table 3 Apt 4 Bedroom 1

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

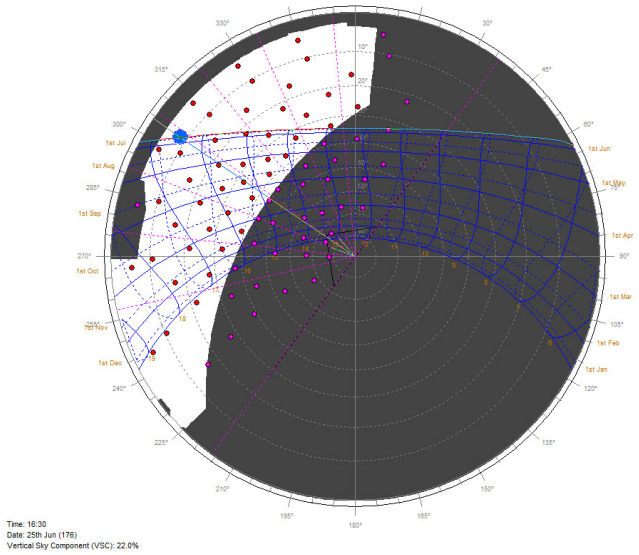


Figure 45: Table 3 Apt 5 Living Window 1

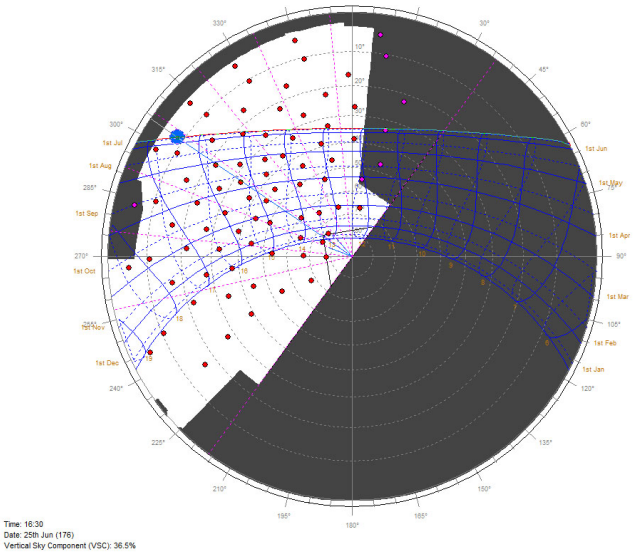


Figure 46: Table 3 Apt 5 Living Window 1 no Balcony

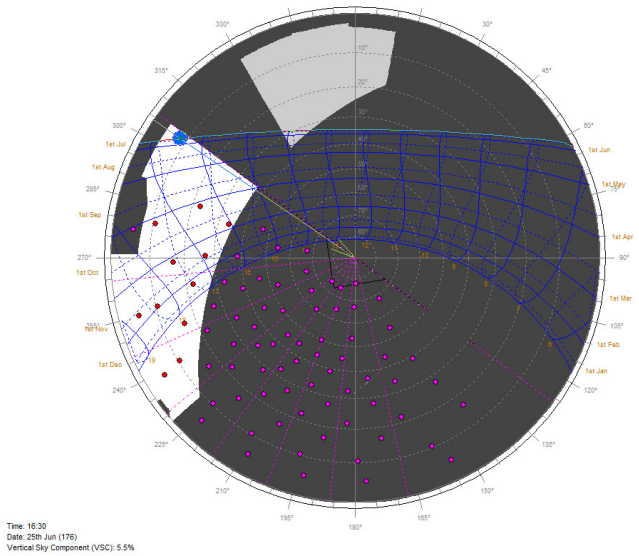


Figure 47: Table 3 Apt 5 Living Window 2

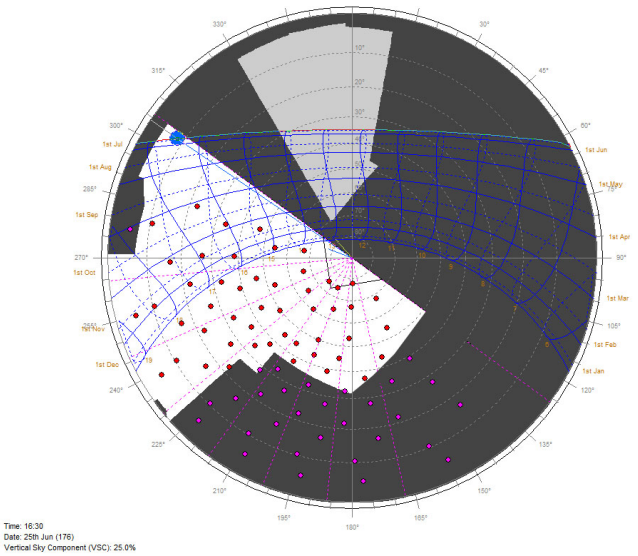


Figure 48: Table 3 Apt 5 Living Window 2 no Balcony

8. Appendix B

Stereographic Projection of the Vertical Sky Component (VSC)

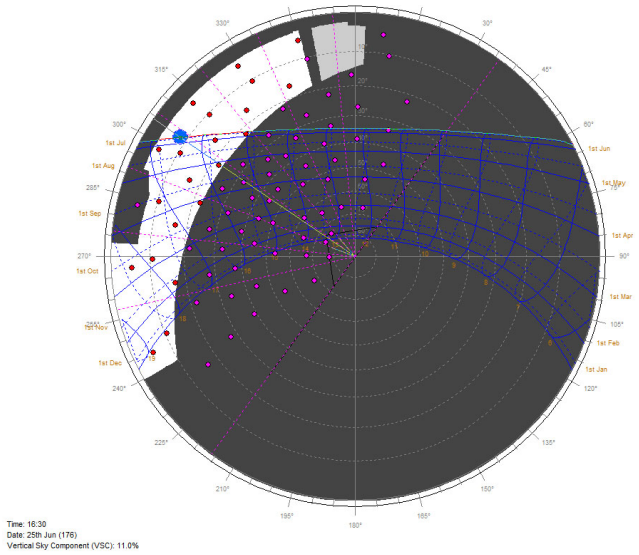


Figure 49: Table 3 Apt 5 Bedroom 1

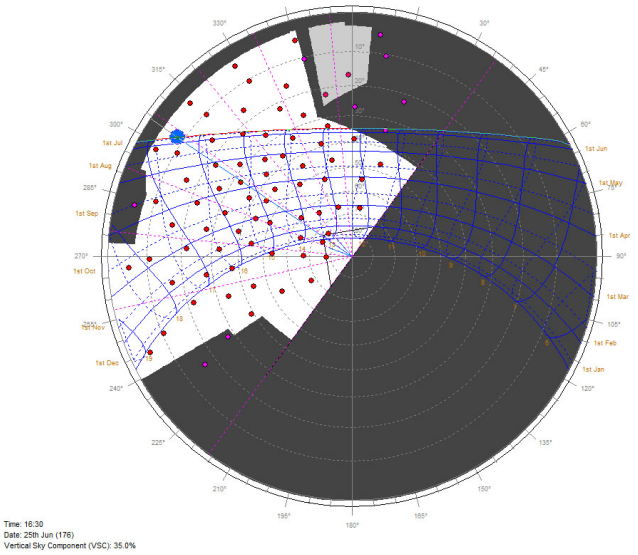


Figure 50: Table 3 Apt 5 Bedroom no Balcony

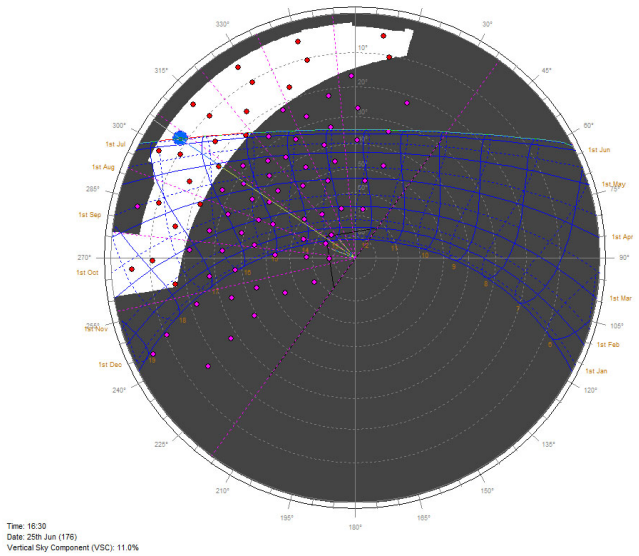


Figure 51: Table 3 Apt 5 Bedroom Window 2

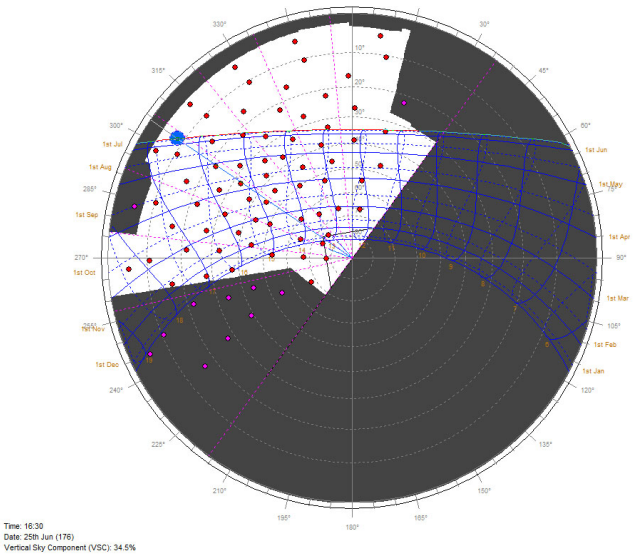


Figure 52: Table 3 Apt 5 Bedroom 2 no Balcony