Potential Daylight and Sunlight Impact of Proposed Alterations to Blocks C, D and E of Approved Strategic Housing Development on lands at Palmerstown Retail Park, Kennelsfort Road Lower, Palmerstown, Dublin 20

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1. Introduction

This additional report has been prepared in response to the request for additional information from An Bord Pleanála under planning ABP-310753-21's regarding daylight/ sunlight analysis i.e. Item 1 of the request, which reads as follows:

> *1. Having regard to the provisions of section 146B(3)(b)(i) of the Planning and Development Act 2000, as amended, the requester is required to submit to the Board the information specified in Schedule 7A of the Planning and Development Regulations 2001, as amended, in respect of the proposed alterations and a planning report which sets out any changes to the daylight and sunlight on the existing residential properties between the permitted scheme and the proposed alterations.*

This report assesses the potential impact of the proposed alterations to Blocks C, D and E of the approved Strategic Housing Development (permitted under Ref. ABP-307092-20) on lands at Palmerstown Retail Park, Kennelsfort Road Lower, Palmerstown, Dublin 20. The report sets out any changes to the daylight and sunlight on the existing residential properties between the permitted scheme and the proposed alterations.

1.1 Executive Summary

The report assesses the impact of the proposed development for Daylight and Sunlight on the neighbouring buildings and the quality of daylight and sunlight to within the proposed development. The calculations are based on the drawings prepared by Downey Planning & Architecture. The results find that there will be minimal impact on the daylight and sunlight to neighbouring properties and there will be good quality light in the apartments analysed and sunlight in the amenity areas proposed. The proposed development meets the recommendations of the BRE guidelines.

Impact on adjacent properties

There will be minimal impact to the daylight and sunlight to the adjacent dwellings with no perceivable reduction in either daylight or sunlight. All areas assessed continue to meet or exceed the recommendations of the BRE guidelines.

2. Methodology

2.1 Notes on the use of BS 8206-2 2008 and BRE guidance document (2011) Site layout planning for daylight and sunlight.

Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities 2020 directs Planning authorities to have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or 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 both of these documents 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.

2.2 Daylight to the existing dwellings

The site is analysed in plan & section, and building use. Windows and amenity area are selected to test for impact from the proposed development. Window locations are represented as accurately as possible and are determined based on available information from architectural and survey drawings, local authority planning records, Google Earth and on site observation. Access to private rear gardens was not possible and any omissions or inaccurate window locations are unintentional.

BRE guideline recommend 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 centre 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 centre of the lowest window, subtends an 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 development in place, then the window may be affected and should be assessed.

For loss of daylight and sunlight to existing buildings, BRE guidance document (2011) "Site layout planning for daylight and sunlight" is used and BS 8206 Part 2 *Code of Practice for Daylighting*.

For loss of light, the report recommends a 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 assessment 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 80% of 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.

2.3 Sunlight

The BRE guidelines recommend assessing the loss of sunlight to the main living rooms and conservatories if they have a window wall facing within 90° of due south. Kitchens and bedrooms are less important but care should be taken not to block too much sun. If the proposed development is fully north then sunlight need not be assessed.

The Annual Probable Sunlight Hours (APSH) is used to assess the quantity of sunlight for a given location. This is the total amount sunshine for a given location on an unobstructed horizontal surface taking cloud cover into account. Statistical data from the Irish Meteorological Service is used to assess the APSH and the Probable Sunlight Hours for the winter period. Table 1 shows the average sunlight hours for each month and the maximum possible without any cloud cover. This gives the factor of possible sunlight hours for each month.

Met Eireann Sunlight Hours Data Set 1981-2010													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Sunlight Hours/ Day	1:54	2:45	3:36	5:32	6:44	6:40	5:17	5:13	4:16	3:17	2:10	1:44	
Average Sunlight Hours/ Month	58:54	77:00	111:36	166:00	208:44	200:00	163:47	161:43	128:00	101:47	65:00	53:44	1496.25
Total Available Sunlight Hours	252	265	358	412	488	485	496	451	375	320	250	248	4383
Probable Sunlight Hours Ratio	23.37%	29.06%	31.17%	40.29%	42.77%	41.24%	33.02%	35.86%	34.13%	31.81%	26.00%	21.67%	34.14%

Table 1: Average monthly sunlight hours recorded at Dublin Airport - Data set 1981-2010

The BRE guidelines recommend that the centre of a window or 1.6m above ground for a door be assessed and receive at least 25% of the APSH and at least 5% during the period of 21st September to 21st March. If the available APSH is less than this then it should not be reduced below 80% of its former value or noticeable loss of sunlight may occur.

2.4 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*."

2.5 Calculations of Trees & Hedges

Trees are not usually included in the assessments of impact, unless specified otherwise. In relation to the effects of trees and hedges the BRE guidelines states,

> *"It is generally more difficult to calculate the effects of trees on daylight because of their irregular shape and because some light will generally penetrate through the crown. Where the effects of a new building on existing buildings nearby is being analysed, it is usual to ignore the effects of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."*

2.6 Daylight in the proposed development.

The proposed project is analysed in plan & section, and building use. The rooms are assessed for Average Daylight Factor (ADF). Input values for the assessment of the Average Daylight Factor below in Table 2.

Surface Reflectance			
Element	Reflectance	Transmissivity	
Internal walls	84%	0%	White Painted Walls
Internal ceiling	88%	0%	White Painted Ceiling
Floor	52%	0%	Light wood Flooring
External walls - proposed development	58.3%	0%	Light yellow Brick
External walls - outside site	20%	0%	CIBSE
External ground	20%	0%	CIBSE
Glass	20.1	68.8	Triple glazed clear glass

Table 2: Surface reflectance parameters for ADF calculation

Sensor Grid spacing 0.6m, inset 0.45m, minimum inset 0.3m, Work plane offset 0.85.

2.7 Environmental impact assessment

The BRE guidelines sets out criteria for classification for assessment of impact where a new development affects a number of existing buildings or open spaces. The guide does not give a specific range or percentages but sets out parameters set out below.

> *"Where the loss of skylight or sunlight fully meets the guidelines in this book, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a larger number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space.*
>
> *Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:*
> - *only a small number of windows or limited area of open space are affected*
> - *the loss of light is only marginally outside the guidelines*
> - *an affected room has other sources of skylight or sunlight*
> - *the affected building or open space only has a low level requirement for skylight or sunlight*
> - *there are particular reasons why an alternative, less stringent, guideline should be applied.*
>
> *Factors tending towards a major adverse impact include:*
> - *a large number of windows or large area of open space are affected*
> - *the loss of light is substantially outside the guidelines*
> - *all the windows in a particular property are affected*
> - *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight, eg a living room in a dwelling or a children's playground.*
>
> *Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space.*
>
> *Beneficial impacts should be worked out using the same principles as adverse impacts. Thus a tiny increase in light would be classified as a negligible impact, not a minor beneficial impact."*

A flexible approach should be taken when assessing the impact with daylight and sunlight being one of many factors that influence the environment when planning a new development.

2.8 Assessment model

Neighbouring property model development is based on information available from Architectural and survey drawings, Local Authority planning records, Google Earth and on site observation. Window locations are represented as accurately as possible and are determined based on available information. Access to private rear gardens was not possible and any omissions or inaccurate window locations are unintentional.

3. Daylight to Existing Dwellings

The site is bounded by the Chapelizod Bypass dual carriageway to the South, an elevated walkway and Palmerstown Lodge public house to the East, residences to the north and industrial units to the West.

The residential properties, relevant to this proposed alteration have been assessed in this report. The closest of these are 4a & 5a Rose View.

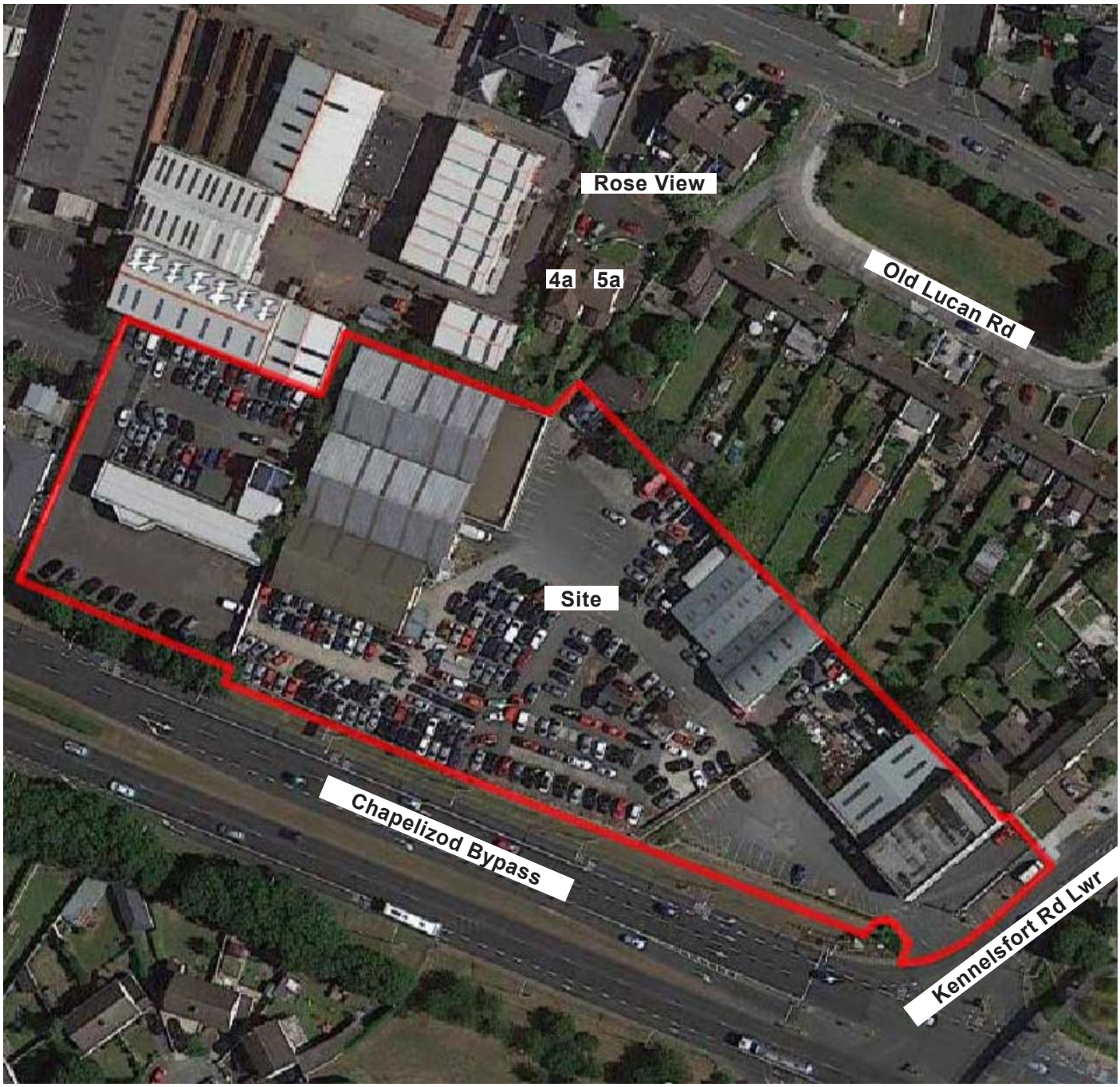


Figure 1: Ariel view of site.

3.1 Preliminary assessment of adjoining dwellings

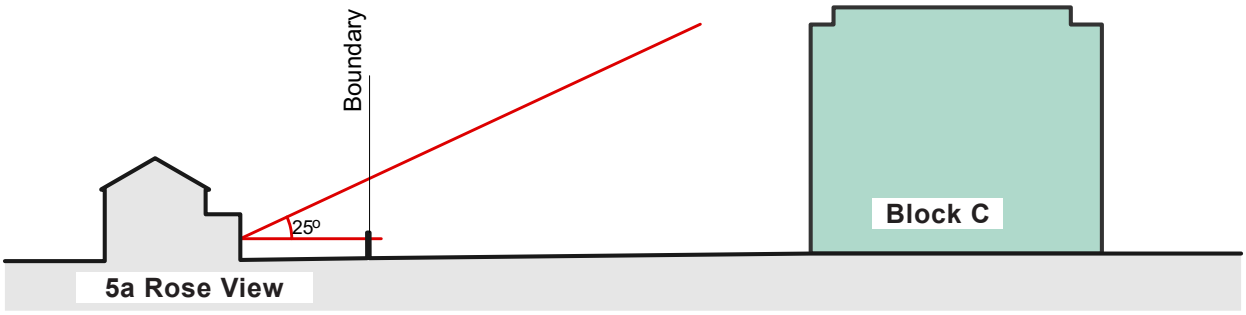
BRE guideline recommends that: *"Loss of light to existing windows need not be analysed if the distance if the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window."*

"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 centre of the lowest window, subtends and angle of more than 25° to the horizontal, then the diffuse light of the existing building may be adversely affected."

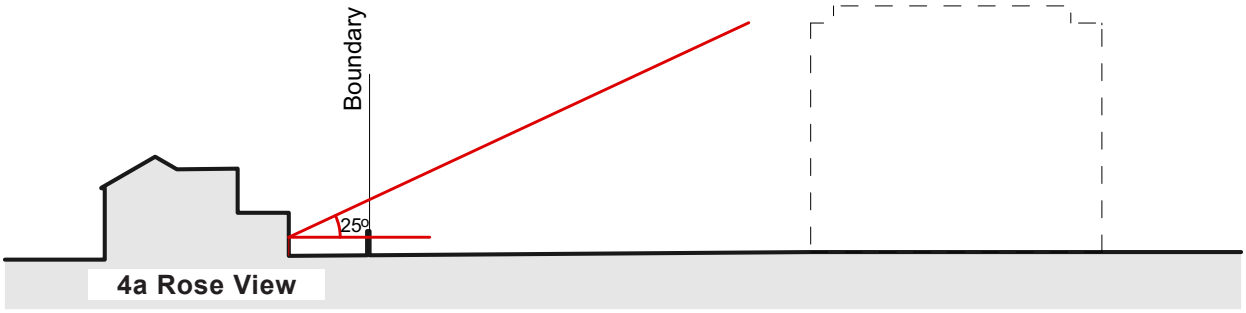
If a window falls within a 45° angle both in plan and elevation with a new perpendicular development in place then the window may be affected and should be assessed.

Preliminary analysis identified residential properties that may potentially be impacted by the proposed development. Figure 2 indicates the position of windows on the closest dwellings. A section is generated through these window walls. The exact layout of each house is not known so the guidelines recommend a height of 1.6 from floor level to represent the centre of the window. See Figure 3 below.

Figure 2: Proposed Site Plan indicating Blocks C, D & E and noting properties with the closest windows facing onto the development.



Section through window wall at location A



Section through window wall at location B

Figure 3: Sections through the window wall of the adjacent residential properties.

3.2 Discussion

4a & 5a are semi-detached houses, with rear elevation facing towards the proposed development. Location A, in a section through the windows on rear extension of 5a, the 25º angle will not subtend Block C.

Location B, a section through the rear windows of 4a cuts through the space between Blocks C & D. The proposed development will not subtend the 25º angle.

3.3 Conclusion

While preliminary analysis indicates that a significant impact is unlikely the windows in 4a & 5a have been assessed by quantifying their Vertical Sky Component (VSC) in the existing and proposed scenarios. Figure 5 below indicates test points locations of the windows assessed for VSC.

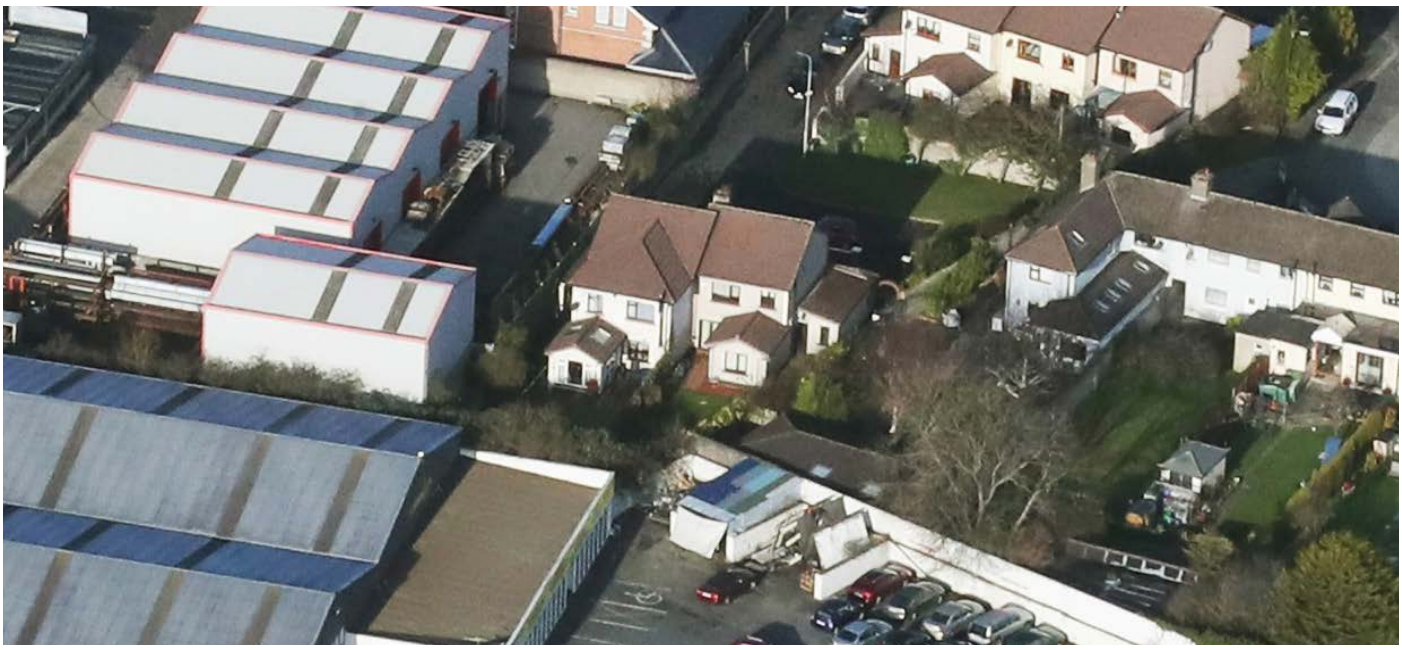


Figure 4: Aerial photo showing the rear of 4a & 5a Rose View.

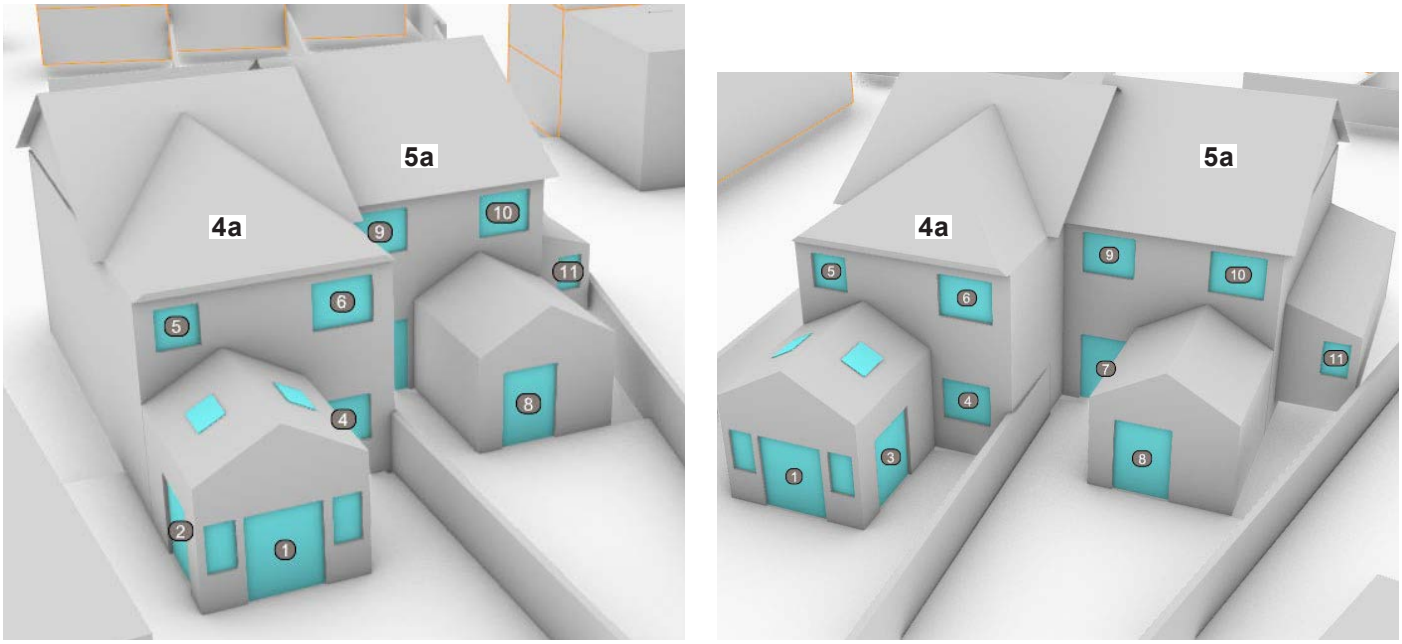


Figure 5: Test point locations on Rose View, 4a & 5a

3.4 Detailed assessment to adjoining dwellings

The BRE guidelines recommends assessing adjacent dwellings for the Vertical Sky Component where there is a potential loss of daylight identified in the preliminary assessment. The BRE guideline recommends that if a window retains a VSC in excess of 27% with the proposed development in place then it will still receive enough daylight. If the existing VSC is below 27% or is reduced below 27% and below 0.8 times its former value then the diffuse light maybe adversely affected.

The Annual Probable Sunlight Hours will also be assessed.

Window locations are represented as accurately as possible and are determined based on available information from Architectural and survey drawings, Local authority planning records, Google earth and on site observation. Access to private rear gardens was not possible and any omissions or inaccurate window locations are unintentional.

Vertical Sky Component							
Location	Use/ Assumed Use	Vertical Sky Component Recommended Value > 27%			Ratio: Approved to Existing Recommended > 80%	Ratio: Proposal to Existing Recommended > 80%	Meets criteria if >27% VSC or <27% but >80% Existing Value
		Existing %	Planning approved	Proposed %			
4a Rose View							
1	Living	27.80	25.83	24.69	92.91%	88.8%	Y
2	Living	24.37	24.26	24.25	99.55%	99.5%	Y
3	Living	27.39	26.54	26.27	96.90%	95.9%	Y
4	Kitchen	27.02	24.82	23.94	91.86%	88.6%	Y
5	Bed	31.61	28.93	28.00	91.52%	88.6%	Y
6	Bed	33.85	30.5	29.26	90.10%	86.4%	Y
5a Rose View							
7	Dining/ Kitchen	14.25	13.6	13.23	95.44%	92.8%	Y
8	Dining/ Kitchen	32.90	30.15	28.86	91.64%	87.7%	Y
9	Bed	27.52	24.91	24.01	90.52%	87.2%	Y
10	Bed	32.65	29	27.76	88.82%	85.0%	Y
11	Utility	31.25	28.03	27.01	89.70%	86.4%	Y

Table 3: Vertical sky component for windows as per test points indicated in Figure 5

3.5 Conclusion

The proposed development meets the recommendations of the BRE guidelines. There is a minor additional reduction in the VSC values compared to the planning approved scheme but the Ratio for the proposed the to existing still exceeds the target values set out in the BRE guidelines. There should be no noticeable loss of available light to the surrounding residential houses. Any impact from the proposed development will be negligible.

4. Sunlight in Adjoining Residential Living Areas

4.1 Annual Probable Sunlight Hours

The BRE guidelines recommends assessing window walls for the APSH that face within 90° of due South. Both 4a & 5a have windows that meet this condition. For a proposed development to have a noticeable impact on the annual Probable Sunlight Hours the value need to be reduced below the recommended 25% annual or 5% in the winter period from September to March. If the value is either below this to begin with or is reduced below this then it should not be reduced below 80% of its former value.

The guidelines states only the main living spaces need to be assessed. Bedrooms do not need to be assessed. The windows identified in the preliminary assessment and indicated in Figure 5 that face within 90° of due South are assessed and the results are set out in Table 3.

Annual Probable Sunlight Hours - Proposed									
		APSH >25% Target			Sept 21 - Mar 21 PSH >5% Target			Meets criteria of >25% APSH and >5% PSH Or <25% or <5% PSH but >80% Existing Value	
Location ID	Assumed room use	Existing	Proposed	Ratio	Existing	Proposed	Ratio		
		% of APSH	% of APSH	If less than 25% APSH Target >80%	% PSH	% PSH	If less than 5% PSH Target >80%		
4a Rose View									
1	Living	49.77%	43.91%	88.2%	18.1%	13.3%	73.1%	Y	
3	Living	39.23%	35.12%	89.5%	11.7%	8.3%	70.8%	Y	
4	Kitchen	50.18%	44.84%	89.4%	20.5%	16.0%	78.3%	Y	
5a Rose View									
7	Dining/ Kitchen	20.13%	17.23%	85.6%	6.4%	4.0%	62.6%	Y	N
8	Dining/ Kitchen	56.34%	48.36%	85.8%	19.2%	12.5%	65.4%	Y	

Table 4: Annual Probable Sunlight hours to adjoining properties - proposed

Annual Probable Sunlight Hours - Planning approved									
		APSH >25% Target			Sept 21 - Mar 21 PSH >5% Target			Meets criteria of >25% APSH and >5% PSH Or <25% or <5% PSH but >80% Existing Value	
Location ID	Assumed room use	Existing	Proposed	Ratio	Existing	Proposed	Ratio		
		% of APSH	% of APSH	If less than 25% APSH Target >80%	% PSH	% PSH	If less than 5% PSH Target >80%		
4a Rose View									
1	Living	48.43%	45.53%	94.0%	17.0%	14.6%	85.8%	Y	
3	Living	39.23%	36.47%	93.0%	11.7%	9.4%	80.4%	Y	
4	Kitchen	48.86%	46.35%	94.9%	19.4%	17.3%	89.2%	Y	
5a Rose View									
7	Kitchen	20.13%	18.26%	90.7%	6.4%	4.9%	75.9%	Y	N
8	Living	55.98%	50.55%	90.3%	18.9%	14.4%	76.1%	Y	

Table 5: Annual Probable Sunlight hours to adjoining properties - Planning approved

4.2 Discussion

In assessing the overall quality of light within a space it is important to note that sunlight is of lesser importance than good quality daylight. Direct sunlight is intermittent and a bright well lit living space is more desirable than a gloomy living space with spells of sunshine.

All windows assessed exceed the target values set out for annual probable sunlight hours. One window, No.7 has a reduction below the target value of sunlight in the Winter period. This window has obstructions on both sides, the house at No. 4a Rose View and the extension in 5a which is the main contributing factor to blocking access to sunlight. While the layout of this house is not known, it is assumed that this windows is to an open plan Dining/ Kitchen which is also served by Window No. 8, which has good availability of Sunlight.

4.3 Conclusion

All windows assessed exceed the target values set out for annual probable sunlight hours. One window is marginally below the winter target value. Any reduction in available sunlight will be minor and any impact will be negligible.

5. Daylight to proposed apartments.

The BRE guidelines recommend that the Average Daylight Factor (ADF) be assessed in habitable rooms of new developments. BS 8206-2 gives minimum values of ADF of 2% for kitchens and living rooms which include a kitchen, 1.5% for living rooms and 1% for bedrooms. An average daylight factor of 5% is a well 'daylit' space. Where there are two room uses within a space then the higher ADF value should be used.

The factors that affect ADF are room depth, aspect, window size relative to floor area and closeness to an adjacent obstruction. All habitable rooms on the ground, first and the second floors were assessed. Results are shown for each block in table form together with false colour plans from generated analysis.

Average Daylight Factor - Block C						
Space ID	Description	Area m2	Sensor Count	ADF	Minimum ADF	Meets Criteria
Ground Floor						
C01.1	Liv / Kit	24.50	66	2.05%	2%	Y
C01.2	Bed	11.83	32	3.96%	1%	Y
C02.1	Liv / Kit	28.74	75	3.20%	2%	Y
C02.2	Bed	10.98	25	2.40%	1%	Y
C02.3	Bed	12.20	31	3.15%	1%	Y
C03.1	Liv / Kit	23.40	57	4.72%	2%	Y
C03.2	Bed	11.23	27	2.21%	1%	Y
C04.1	Liv / Kit	24.68	64	2.00%	2%	Y
C04.2	Bed	10.48	27	1.84%	1%	Y
C05.1	Liv / Kit	31.13	77	3.69%	2%	Y
C05.2	Bed	10.11	25	4.84%	1%	Y
C05.3	Bed	12.43	33	1.65%	1%	Y
C06.1	Liv / Kit	24.06	68	2.99%	2%	Y
C06.2	Bed	10.31	32	3.00%	1%	Y
C07.1	Liv / Kit	24.70	64	3.42%	2%	Y
C07.2	Bed	9.51	25	3.56%	1%	Y
C08.1	Liv / Kit	32.59	80	3.61%	2%	Y
C08.2	Bed	10.62	24	2.23%	1%	Y
First Floor						
C09.1	Liv / Kit	27.38	70	3.93%	2%	Y
C09.2	Bed	11.16	23	2.48%	1%	Y
C09.3	Bed	13.40	34	3.10%	1%	Y
C10.1	Liv / Kit	28.57	75	4.71%	2%	Y
C10.2	Bed	10.60	27	2.73%	1%	Y
C10.3	Bed	11.99	28	3.07%	1%	Y
C11.1	Liv / Kit	21.51	62	2.57%	2%	Y
C11.2	Bed	11.57	30	2.30%	1%	Y
C12.1	Liv / Kit	31.12	77	3.95%	2%	Y
C12.2	Bed	10.11	25	4.95%	1%	Y
C12.3	Bed	12.43	33	1.94%	1%	Y
C13.1	Liv / Kit	23.20	65	3.45%	2%	Y
C13.2	Bed	12.75	33	2.58%	1%	Y
C14.1	Liv / Kit	24.44	68	3.70%	2%	Y
C14.2	Bed	10.61	27	3.22%	1%	Y
C15.1	Liv / Kit	23.77	63	4.94%	2%	Y
C15.2	Bed	10.64	25	2.56%	1%	Y
C16.1	Liv / Kit	22.60	55	2.45%	2%	Y
C16.2	Bed	11.65	30	1.71%	1%	Y

Average Daylight Factor - Block C						
Space ID	Description	Area m2	Sensor Count	ADF	Minimum ADF	Meets Criteria
Second Floor						
C17.1	Liv / Kit	24.50	66	2.76%	2%	Y
C17.2	Bed	11.83	32	5.30%	1%	Y
C18.1	Liv / Kit	28.74	75	3.95%	2%	Y
C18.2	Bed	12.20	31	3.51%	1%	Y
C18.3	Bed	10.98	25	3.67%	1%	Y
C19.1	Liv / Kit	26.12	72	5.26%	2%	Y
C19.2	Bed	12.59	30	2.32%	1%	Y
C19.3	Bed	11.81	27	2.36%	1%	Y
C20.1	Liv / Kit	23.51	63	2.19%	2%	Y
C20.2	Bed	10.45	25	1.36%	1%	Y
C21.1	Liv / Kit	31.13	77	4.13%	2%	Y
C21.2	Bed	10.11	25	4.92%	1%	Y
C21.3	Bed	12.43	33	2.20%	1%	Y
C22.1	Liv / Kit	24.06	68	3.32%	2%	Y
C22.2	Bed	10.31	32	3.32%	1%	Y
C23.1	Liv / Kit	24.70	64	3.92%	2%	Y
C23.2	Bed	9.51	25	4.09%	1%	Y
C24.1	Liv / Kit	32.59	80	4.70%	2%	Y
C24.2	Bed	10.62	24	2.61%	1%	Y

Table 6: Block C - Average Daylight Factor of Ground, First & Second Floor Habitable Rooms

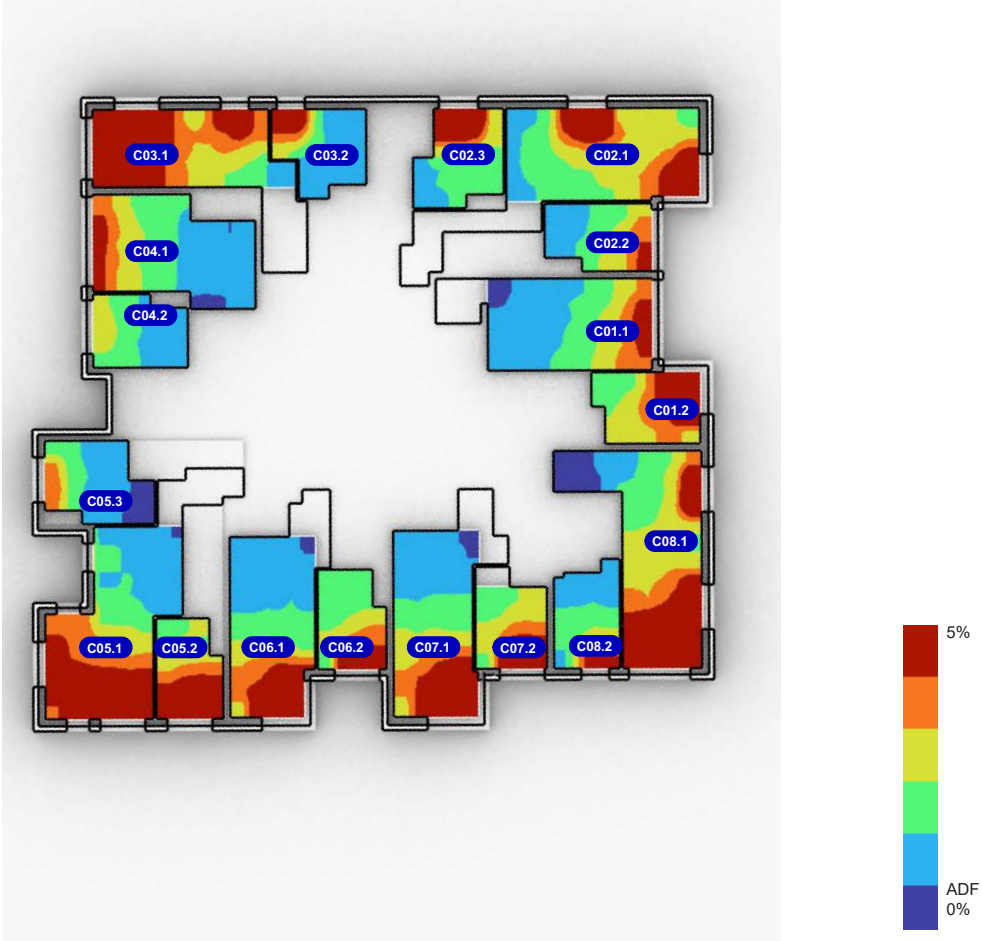


Figure 6: Block C - Ground floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

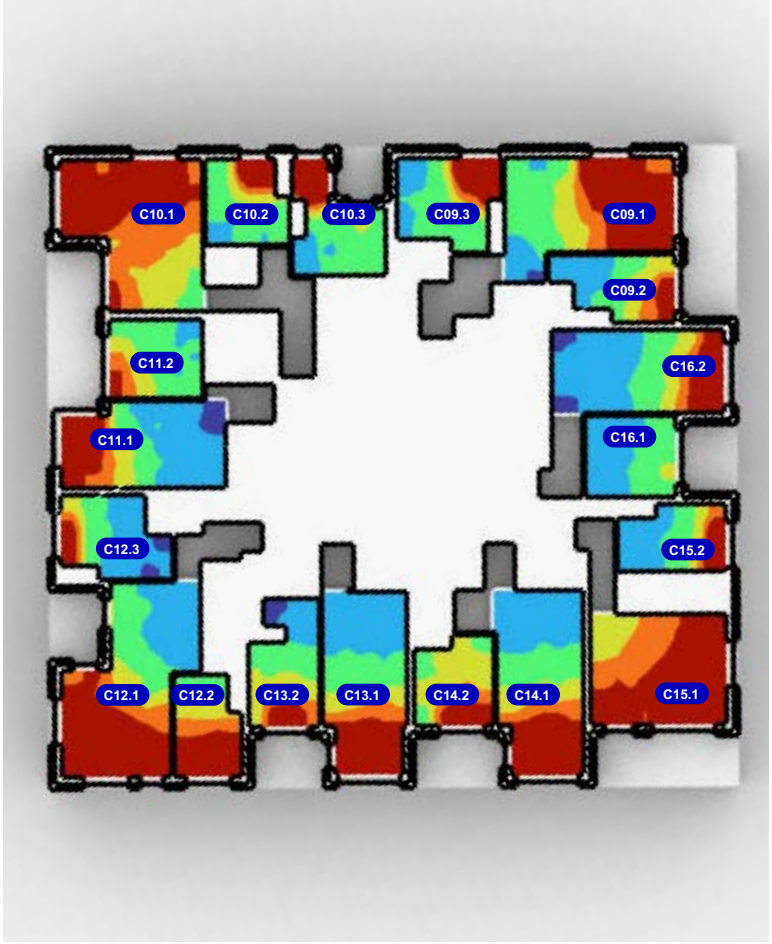


Figure 8: Block C- First floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

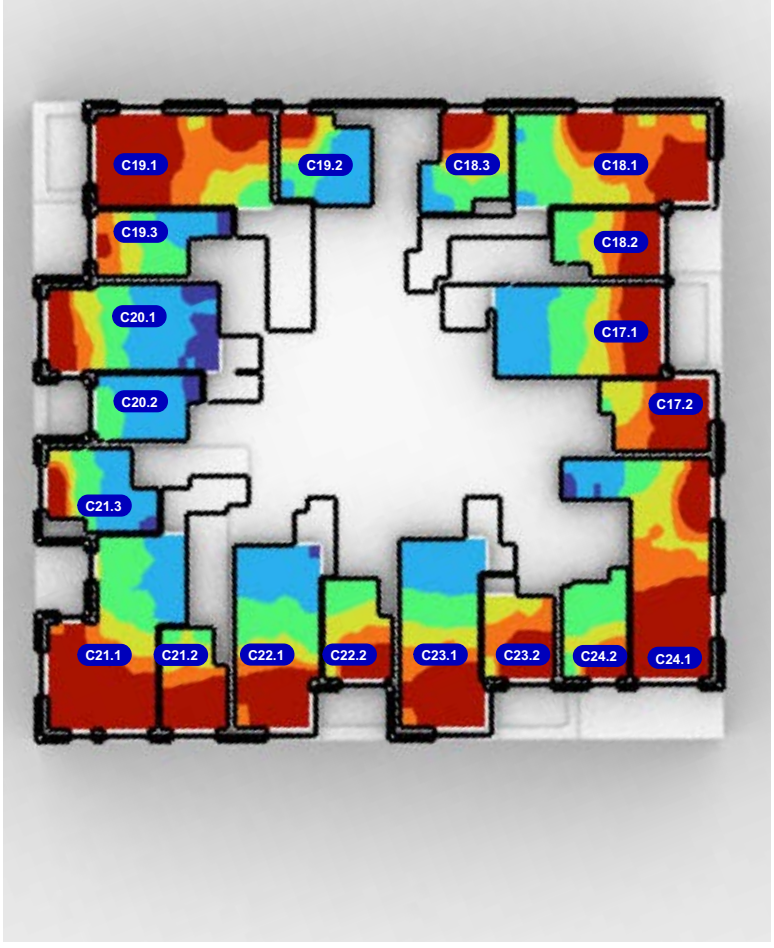
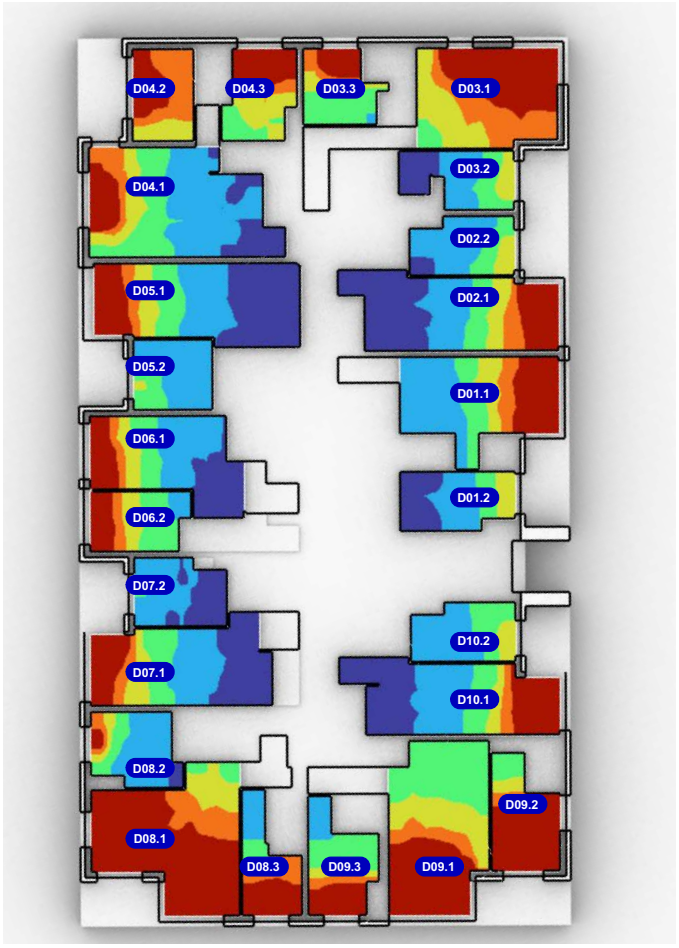


Figure 7: Block C- Second floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

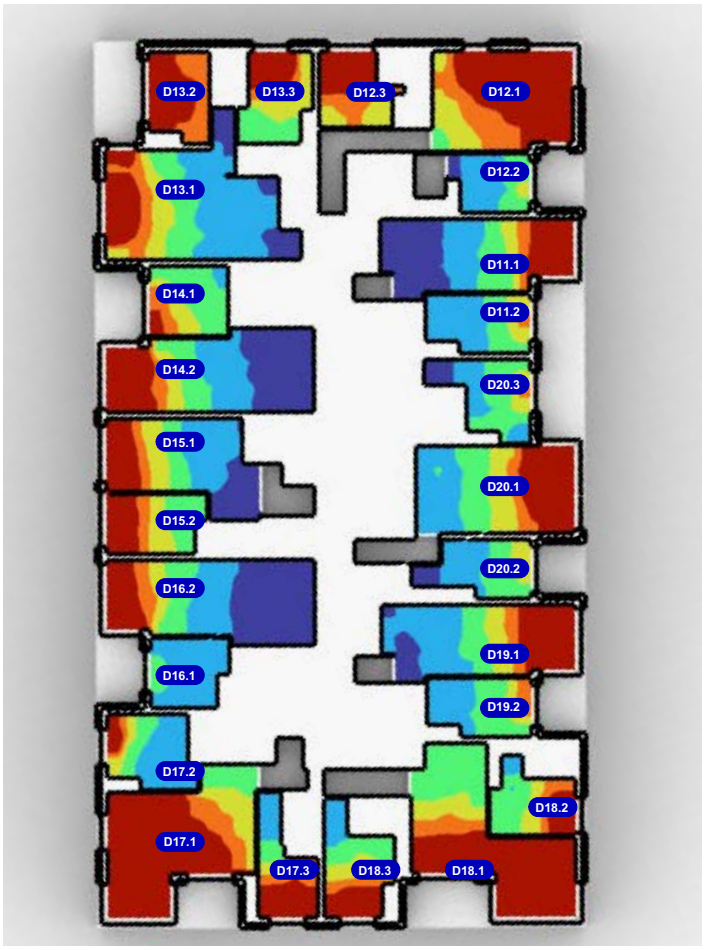
Average Daylight Factor - Block D						
Space ID	Description	Area m2	Sensor Count	ADF	Minimum ADF	Meets Criteria
Ground Floor						
D01.1	Liv / Kit	26.17	60	3.27%	2%	Y
D01.2	Bed	12.89	29	1.31%	1%	Y
D02.1	Liv / Kit	30.07	74	2.48%	2%	Y
D02.2	Bed	11.67	29	1.56%	1%	Y
D03.1	Liv / Kit	27.79	66	5.06%	2%	Y
D03.2	Bed	11.79	24	1.47%	1%	Y
D03.3	Bed	10.41	27	3.54%	1%	Y
D04.1	Liv / Kit	37.52	91	2.14%	2%	Y
D04.2	Bed	11.36	35	4.04%	1%	Y
D04.3	Bed	11.97	34	4.50%	1%	Y
D05.1	Liv / Kit	32.34	81	2.03%	2%	Y
D05.2	Bed	11.17	30	1.47%	1%	Y
D06.1	Liv / Kit	24.02	56	2.11%	2%	Y
D06.2	Bed	11.43	25	3.27%	1%	Y
D07.1	Liv / Kit	28.08	66	2.13%	2%	Y
D07.2	Bed	12.03	32	1.00%	1%	Y
D08.1	Liv / Kit	34.24	81	5.80%	2%	Y
D08.2	Bed	12.19	34	1.71%	1%	Y
D08.3	Bed	10.43	21	4.40%	1%	Y
D09.1	Liv / Kit	32.53	79	4.84%	2%	Y
D09.2	Bed	13.42	33	5.37%	1%	Y
D09.3	Bed	12.55	30	3.66%	1%	Y
D10.1	Liv / Kit	28.42	69	2.59%	2%	Y
D10.2	Bed	11.67	29	1.68%	1%	Y
First Floor						
D11.1	Liv / Kit	27.12	66	2.47%	2%	Y
D11.2	Bed	11.67	29	1.76%	1%	Y
D12.1	Liv / Kit	27.79	66	5.65%	2%	Y
D12.2	Bed	8.94	21	1.55%	1%	Y
D12.3	Bed	10.41	27	5.23%	1%	Y
D13.1	Liv / Kit	39.51	94	2.45%	2%	Y
D13.2	Bed	10.55	32	4.75%	1%	Y
D13.3	Bed	11.97	34	3.95%	1%	Y
D14.1	Liv / Kit	32.06	77	2.28%	2%	Y
D14.2	Bed	11.17	30	2.56%	1%	Y
D15.1	Liv /Kit	24.02	56	2.61%	2%	Y
D15.2	Bed	11.43	25	4.17%	1%	Y
D16.1	Liv / Kit	32.98	80	2.00%	2%	Y
D16.2	Bed	10.35	27	1.27%	1%	Y
D17.1	Liv / Kit	33.31	79	6.54%	2%	Y
D17.2	Bed	12.13	34	1.95%	1%	Y
D17.3	Bed	10.43	21	4.53%	1%	Y
D18.1	Liv / Kit	32.68	70	7.12%	2%	Y
D18.2	Bed	10.65	25	3.46%	1%	Y
D18.3	Bed	12.55	30	3.68%	1%	Y
D19.1	Liv / Kit	27.02	70	3.44%	2%	Y
D19.2	Bed	11.67	29	1.98%	1%	Y
D20.1	Liv / Kit	28.04	72	3.68%	2%	Y
D20.2	Bed	12.23	26	1.88%	1%	Y
D20.3	Bed	11.15	25	1.75%	1%	Y

Average Daylight Factor - Block D						
Space ID	Description	Area m2	Sensor Count	ADF	Minimum ADF	Meets Criteria
Second Floor						
D21.1	Liv / Kit	29.64	78	3.13%	2%	Y
D21.2	Bed	10.54	32	2.25%	1%	Y
D21.3	Bed	12.04	26	7.10%	1%	Y
D22.1	Liv / Kit	30.07	74	3.04%	2%	Y
D22.2	Bed	11.67	29	1.89%	1%	Y
D23.1	Liv / Kit	27.79	66	5.51%	2%	Y
D23.2	Bed	10.41	27	3.98%	1%	Y
D23.3	Bed	11.79	24	1.76%	1%	Y
D24.1	Liv / Kit	37.52	91	2.53%	2%	Y
D24.2	Bed	11.36	35	4.72%	1%	Y
D24.3	Bed	11.97	34	5.17%	1%	Y
D25.1	Liv / Kit	32.34	81	2.35%	2%	Y
D25.2	Bed	11.17	30	1.77%	1%	Y
D26.1	Liv / Kit	24.02	56	2.33%	2%	Y
D26.2	Bed	11.43	25	3.67%	1%	Y
D27.1	Liv / Kit	28.08	66	2.63%	2%	Y
D27.2	Bed	12.03	32	1.21%	1%	Y
D28.1	Liv / Kit	34.24	81	6.06%	2%	Y
D28.2	Bed	12.19	34	1.98%	1%	Y
D28.3	Bed	10.43	21	4.32%	1%	Y
D29.1	Liv / Kit	32.53	79	4.97%	2%	Y
D29.2	Bed	13.42	33	5.77%	1%	Y
D29.3	Bed	12.55	30	3.68%	1%	Y
D30.1	Liv / Kit	28.42	69	3.17%	2%	Y
D30.2	Bed	11.67	29	2.07%	1%	Y

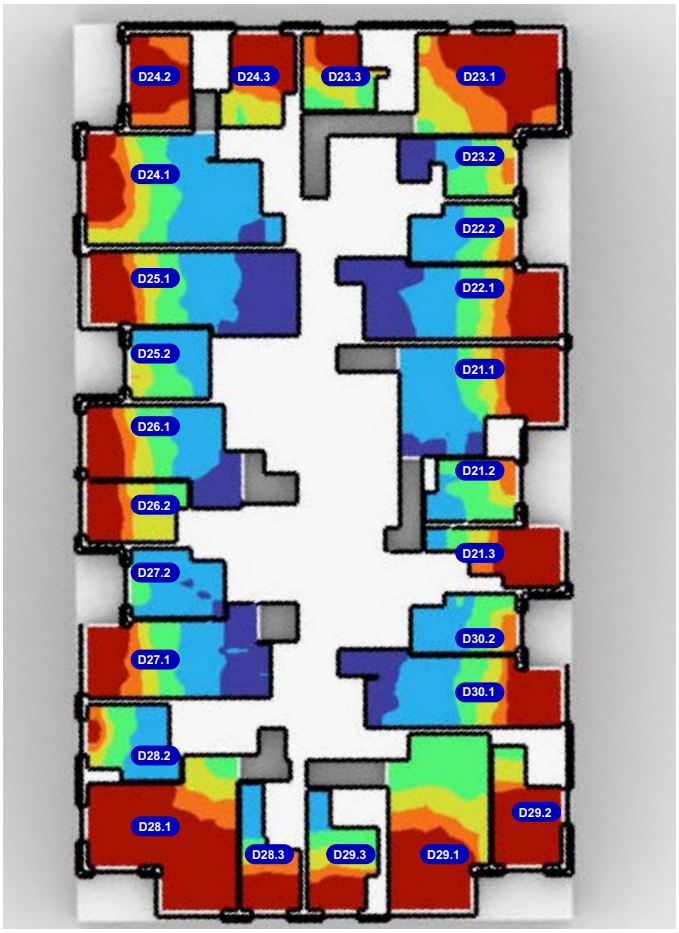
Table 7: Block D - Average Daylight Factor of Ground, First & Second Floor Habitable Rooms



Ground floor plan



First floor plan



Second floor plan

Figure 9: Block D - Ground, First & Second floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

Average Daylight Factor - Block E						
Space ID	Description	Area m2	Sensor Count	ADF	Minimum ADF	Meets Criteria
Ground Floor						
E01.1	Lik / Kit	20.64	54	2.02%	2%	Y
E01.2	Bed	11.32	30	1.47%	1%	Y
E02.1	Liv / Kit	23.36	57	4.02%	2%	Y
E02.2	Bed	11.24	27	2.07%	1%	Y
E03.1	Liv / Kit	29.85	69	3.71%	2%	Y
E03.2	Bed	11.81	28	2.60%	1%	Y
E03.3	Bed	12.20	31	3.11%	1%	Y
E04.1	Liv / Kit	24.81	62	2.07%	2%	Y
E04.2	Bed	11.84	32	4.99%	1%	Y
E05.1	Liv / Kit	32.21	80	5.10%	2%	Y
E05.2	Bed	10.62	24	2.52%	1%	Y
E06.1	Liv / Kit	24.70	64	3.77%	2%	Y
E06.2	Bed	10.61	29	3.70%	1%	Y
E07.1	Liv / Kit	24.82	69	3.10%	2%	Y
E07.2	Bed	10.31	32	3.17%	1%	Y
E08.1	Liv / Kit	31.13	77	3.96%	2%	Y
E08.2	Bed	10.93	28	4.67%	1%	Y
E08.3	Bed	13.25	36	1.73%	1%	Y
First Floor						
E09.1	Liv / Kit	18.02	50	2.22%	2%	Y
E09.2	Bed	10.49	27	1.84%	1%	Y
E10.1	Liv / Kit	28.58	75	3.70%	2%	Y
E10.2	Bed	10.60	27	2.60%	1%	Y
E10.3	Bed	11.99	28	2.77%	1%	Y
E11.1	Liv / Kit	25.59	66	4.45%	2%	Y
E11.2	Bed	11.16	23	3.04%	1%	Y
E11.3	Bed	13.39	34	2.98%	1%	Y
E12.1	Liv / Kit	23.97	58	3.45%	2%	Y
E12.2	Bed	10.49	27	3.21%	1%	Y
E13.1	Liv / Kit	23.77	63	6.33%	2%	Y
E13.2	Bed	10.65	25	4.47%	1%	Y
E14.1	Liv / Kit	26.99	62	3.42%	2%	Y
E14.2	Bed	10.61	27	3.25%	1%	Y
E15.1	Liv / Kit	23.20	65	3.55%	2%	Y
E15.2	Bed	10.20	27	3.09%	1%	Y
E16.1	Liv / Kit	31.13	77	4.17%	2%	Y
E16.2	Bed	10.11	25	5.12%	1%	Y
E16.3	Bed	12.43	33	1.72%	1%	Y
Second Floor						
E17.1	Liv / Kit	23.50	63	2.10%	2%	Y
E17.2	Bed	11.26	28	1.00%	1%	Y
E18.1	Liv / Kit	26.10	72	4.29%	2%	Y
E18.2	Bed	13.41	33	2.11%	1%	Y
E18.3	Bed	11.82	27	1.33%	1%	Y
E19.1	Liv / Kit	29.85	69	4.51%	2%	Y
E19.2	Bed	12.20	31	3.71%	1%	Y
E19.3	Bed	11.81	28	3.39%	1%	Y
E20.1	Liv / Kit	24.81	62	2.70%	2%	Y
E20.2	Bed	11.84	32	6.55%	1%	Y
E21.1	Liv / Kit	32.21	80	5.60%	2%	Y
E21.2	Bed	10.62	24	2.53%	1%	Y

Average Daylight Factor - Block E						
Space ID	Description	Area m2	Sensor Count	ADF	Minimum ADF	Meets Criteria
E22.1	Liv / Kit	24.70	64	4.21%	2%	Y
E22.2	Bed	10.61	29	3.81%	1%	Y
E23.1	Liv / Kit	24.82	69	3.48%	2%	Y
E23.2	Bed	10.31	32	3.15%	1%	Y
E24.1	Liv / Kit	31.13	77	4.25%	2%	Y
E24.2	Bed	10.93	28	4.70%	1%	Y
E24.3	Bed	13.25	36	1.93%	1%	Y

Table 8: Block E - Average Daylight Factor of Ground, First & Second Floor Habitable Rooms

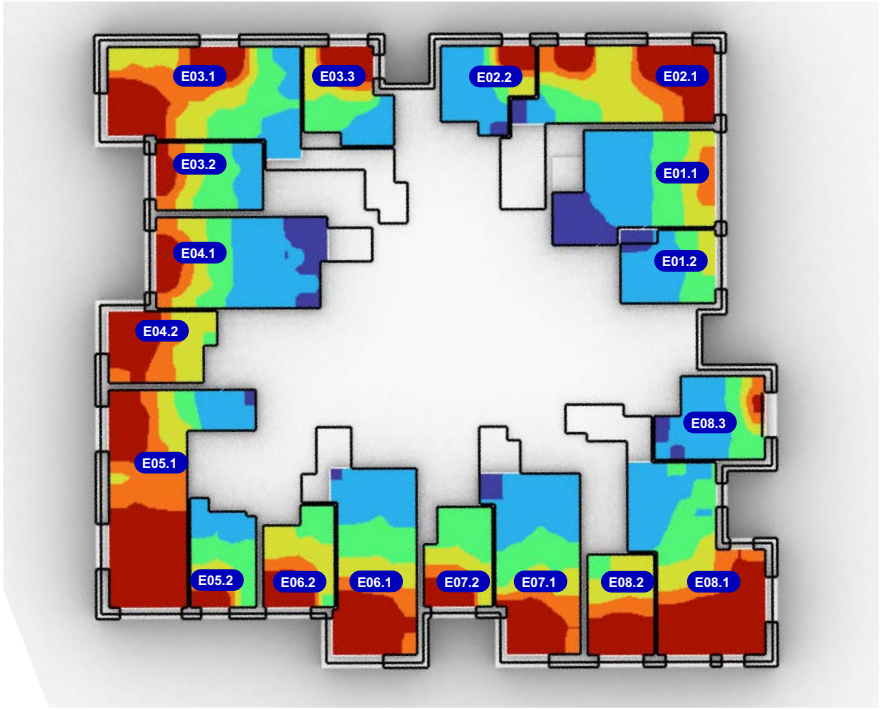


Figure 10: Block E - Ground floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

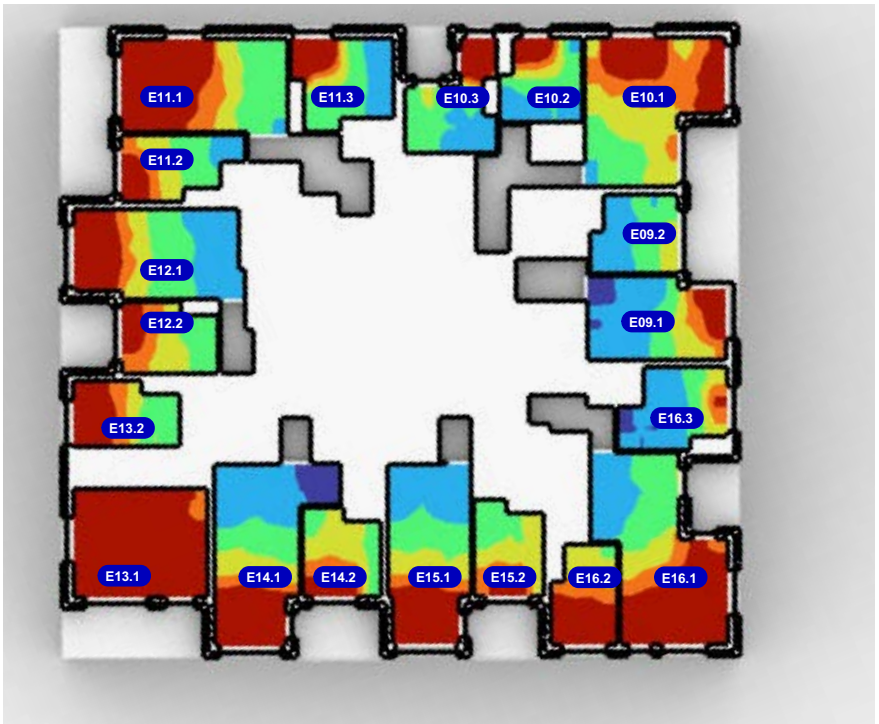


Figure 11: Block E- First floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

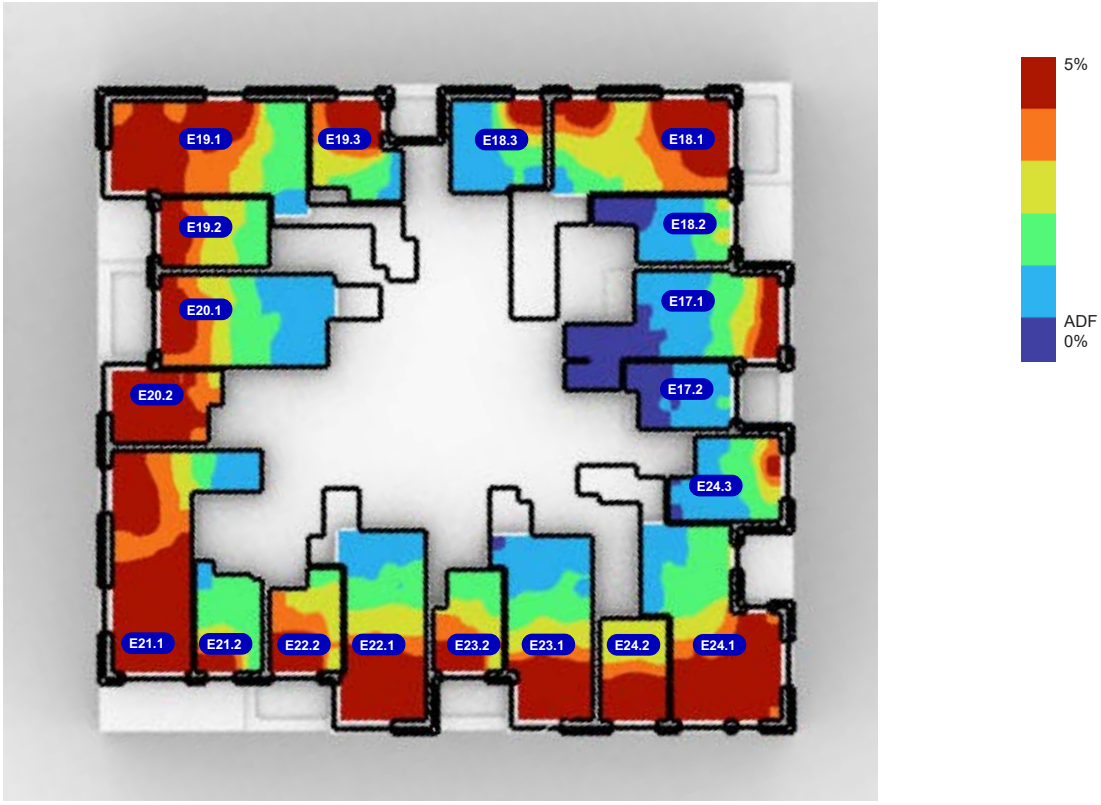


Figure 12: Block E- Second floor habitable rooms assessed with false colour plan for ADF. Scale is 0-5%.

5.1 Discussion

Within the development the design was optimised for good quality daylight. Priority is given to main living spaces over bedrooms and where possible they are positioned away from inner corners or projecting stair cores to maximise available daylight. The use of very large windows also enhances available daylight and light penetration to the depths of the rooms.

Blocks C, D & E were assessed for the Average Daylight Factor taking into account the surrounding environment and including the proposed Blocks A & B which currently have planning permission but are not constructed. All habitable rooms on the ground, first and second floors were assessed in Blocks C, D & E. All exceed the recommendations of the guidelines. The units on the floors above are stacked the same as either the first or second floors. It can be extrapolated that the higher the floor the greater the availability of access to the sky and daylight which would result in an increased ADF value for an identical unit on a higher floor. This would result in 100% of the units meeting the recommendations of the BRE guidelines.

5.2 Conclusion

100% of the rooms to the proposed development will exceed the minimum recommendations for the Average Daylight Factor and will be well daylit. The proposed development meets the recommendations of the BRE Guidelines and BS8206 Part 2:2008 Lighting for Buildings, Code of Practice for Daylighting.

6. Sunlight to gardens and open spaces

The BRE document indicates that for an amenity area to have good quality sunlight throughout the year, 50% should receive in excess of 2 hours sunlight on the 21st March. It also states that front gardens need not be assessed for sunlight.
The BRE document indicates that for an amenity area, such as a garden, to have good quality sunlight throughout the year, 50% should receive in excess of 2 hours sunlight on the 21st March. It also states that front gardens need not be assessed for sunlight.

The guidelines states that the 21 March should be used for the assessment and that “Sunlight at an altitude of 10° or less does not count, because it is likely to be blocked by low level planting anyway.” The amenity space is assessed for the amount of direct sunlight received by the space in 5 minute intervals between 8am and 6pm on the 21st March over an analysis grid with a 300mm grid size and the average is calculated.

6.1 Private amenity space to neighbouring properties.

The private amenity spaces to the North of Blocks C, D & E have been assessed with a calculation of Sun on the Ground. The houses to the South, on the opposite side of the Chapelizod Bypass, will not be affected. The results are shown in Table 7 and radiation maps of generated analysis are shown in Figures 13 & 14 below.

Sunlight on the Ground - Adjacent Residences					
Location ID	Location	Existing	Proposed	Ratio	Meets criteria of >50% area Or if <50% but >80% Existing Value
		% Area receiving 2 hours sunlight on 21st March			
L1	4a Rose View	88.2	89.0	100.9%	Y
L2	5a Rose View	91.5	90.0	98.4%	Y
L3	1 Old Lucan Road	91.7	90.5	98.7%	Y
L4	2 Old Lucan Road	99.1	98.7	99.6%	Y
L5	3 Old Lucan Road	98.7	97.7	99.0%	Y

Table 9: Calculation of Sun on the Ground to Adjacent Amenity Spaces.

6.2 Conclusion

The impact on the amenity spaces, both positive or negative is so slight that it would be imperceptible. All amenity spaces retain an area well in excess of 50% receiving 2 hours sunlight on the 21st March. The proposed development meets the recommendations of the BRE guidelines.

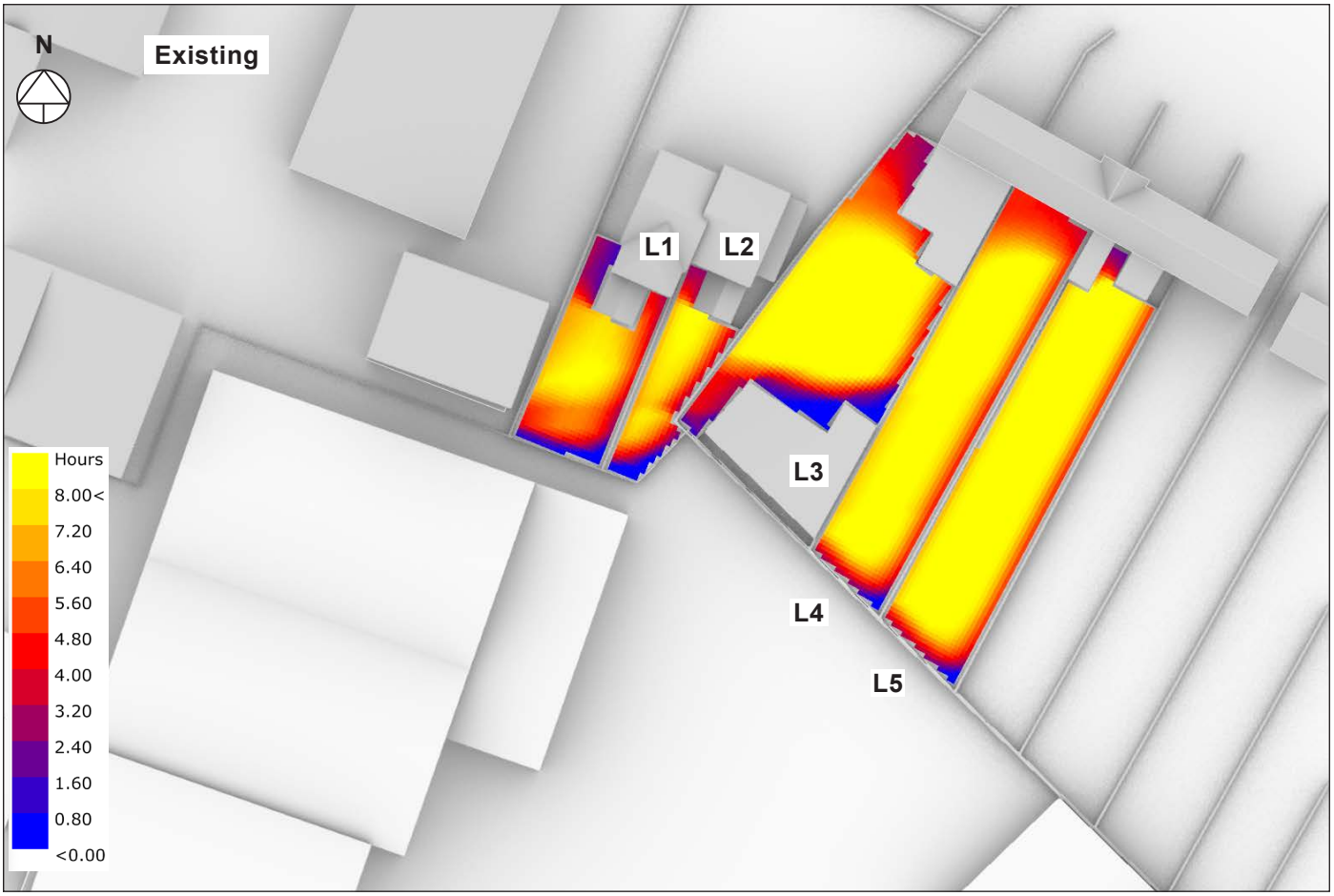


Figure 13: Existing radiation map generated through the calculation of sun on the ground, on the 21st March. Scale indicates 0-8 hours of sunlight.

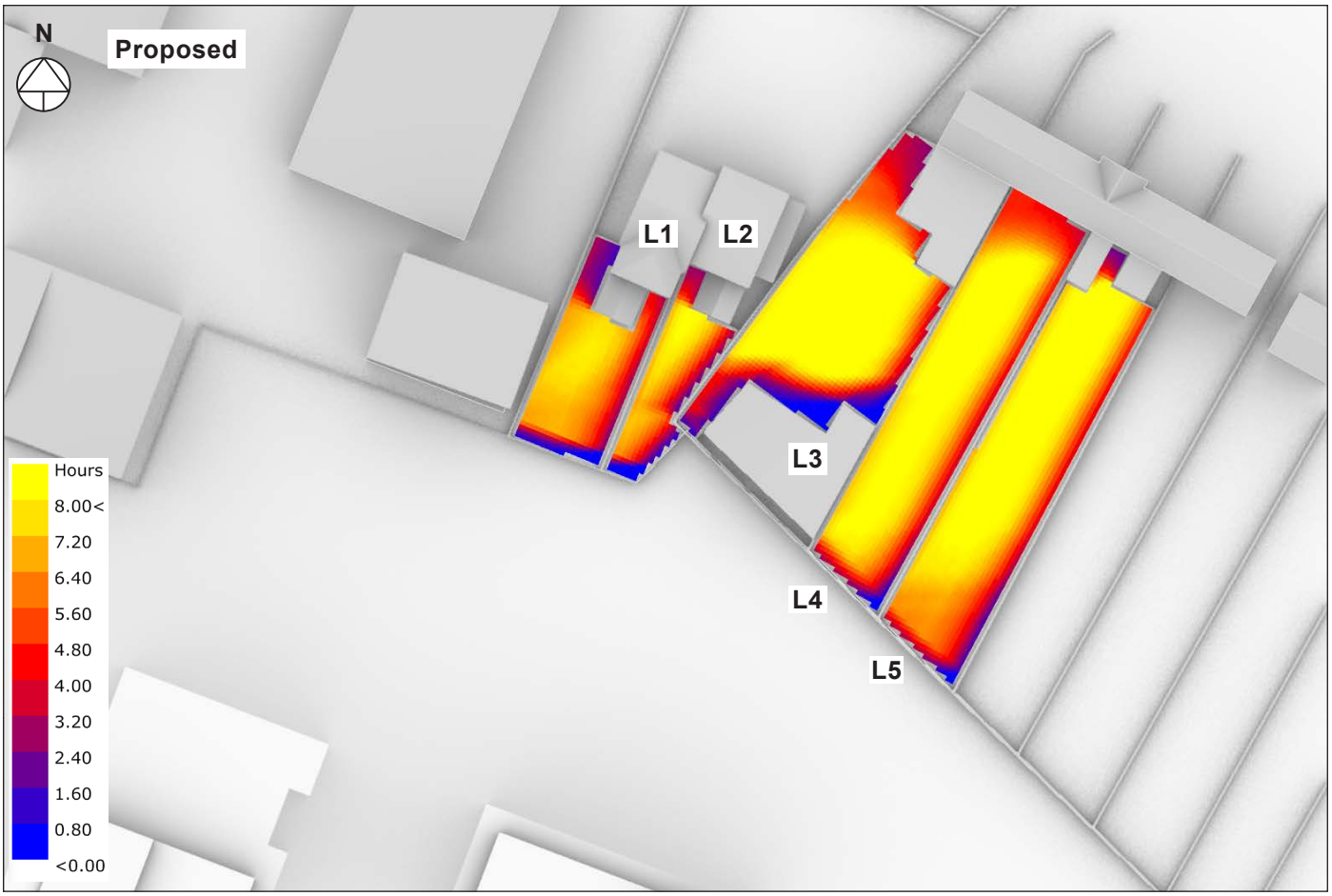


Figure 14: Proposed radiation map generated through the calculation of sun on the ground, on the 21st March. Scale indicates 0-8 hours of sunlight.

6.3 Sunlight to Amenity within the Proposed Development

A variety of amenity spaces have been designed into this scheme. All exceed the BRE recommendation that 50% of the area receive more than 2 hours of sunlight on the 21st March. A plan of generated analysis is shown in Figure 15 and results in Table 8 below.

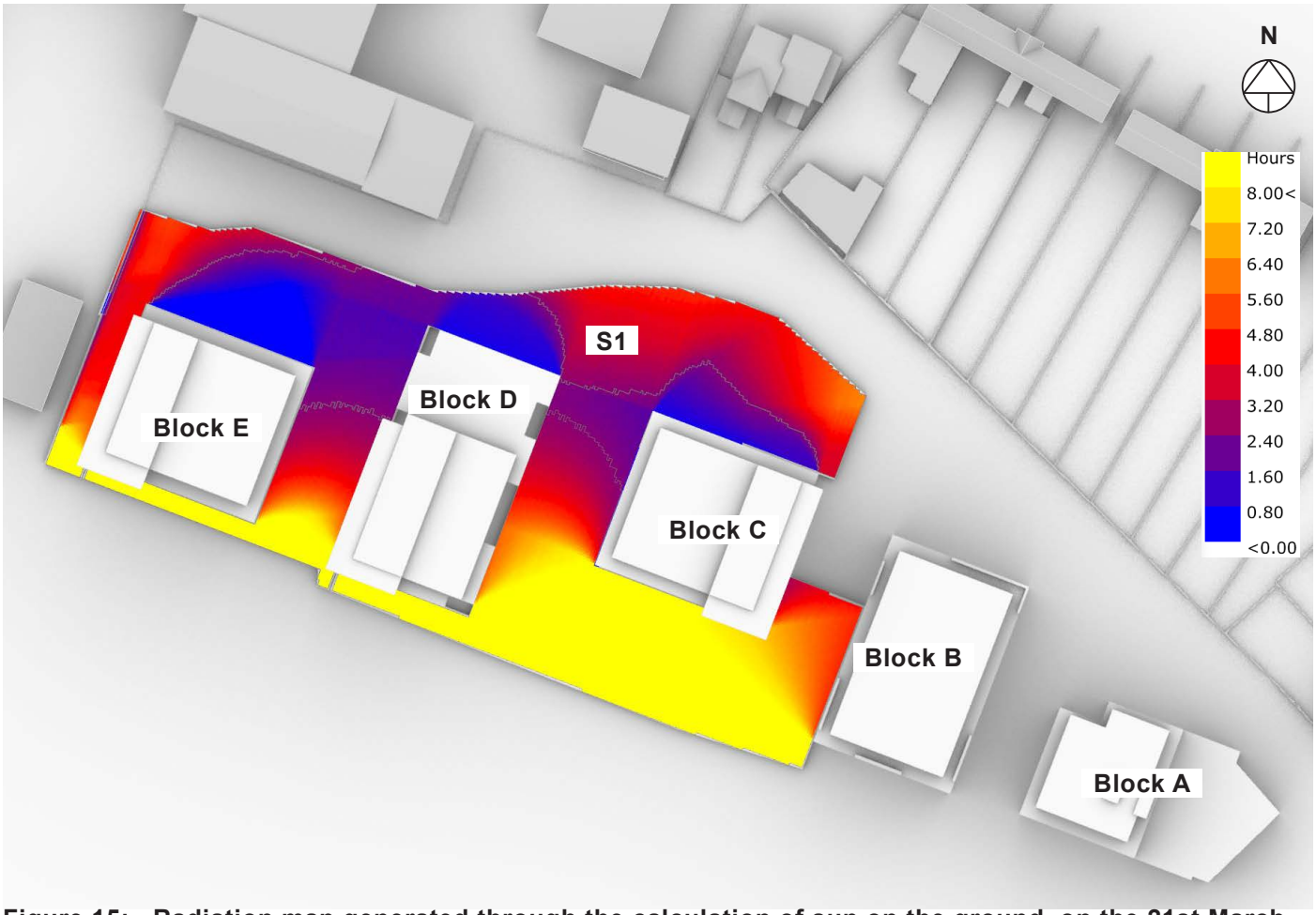


Figure 15: Radiation map generated through the calculation of sun on the ground, on the 21st March as per BRE guidelines. Scale indicates 0-8 hours of sunlight.

Sunlight on the Ground - Proposed Development			
	Description	Proposed	Meets Criteria
S1	Ground level area at Blocks C, D & E	72%	Y

Table 10: Area of amenity space to the that receives 2 or more hours of sunlight on the 21st March.

6.4 Conclusion

The proposed development meets the recommendations of the BRE guidelines and will receive in excess of 2 hours sunlight over 50% of the open space.

7. Shadow Diagrams

7.1 BRE Guidance on Shadow Studies

Shadow diagrams are a visual aid to understand where possible shading may occur. The BRE guidelines recommends using the March Equinox due the equal length of the day and night time. It states:

"If a space is used all year round, the equinox (21 March) is the best date for which to prepare shadow plots as it gives an average level of shadowing. Lengths of shadows at the autumn equinox (21 September) will be the same as those for 21 March, so a separate set of plots for September is not required."

June 21st and December 21st are provided below for information but it should be noted that the summer solstice is the best case scenario with shadows at their shortest. In Winter even low buildings will cast long shadows and it is common for large areas of the ground to be in shadow throughout the day especially in a built up area and sun barely rises above an altitude of 10° during the course of the day. The guidelines recommends that Sunlight at an altitude of 10° or less does not count. Below are the times for the Equinox and Solstice that the sun is above 10° altitude rounded to the nearest half hour.

Equinox: between 8:30 and 17:30
Summer Solstice: Between 6:30 and 20:00
Winter Solstice: Between 10:30 and 14:00

Section 7.2 shows the existing and proposed shadow diagrams for the Equinox on the 21st March at 2 hourly intervals during the day between 10:00 and 17:00.
Section 7.3 shows the existing and proposed shadow diagrams for the Summer Solstice on the 21st June at 2 hourly intervals during the day between 10:00 and 18:00.
Section 7.4 shows the existing and proposed shadow diagrams for the Equinox on the 21st September at 2 hourly intervals during the day between 10:00 and 17:00.
Section 7.5 shows the existing and proposed shadow diagrams for the Winter Solstice on the 21st December at 2 hourly intervals during the day between 10:00 and 14:00.

The shadows cast on the September equinox are the same as the March Equinox. They are included here with the Daylight Saving Time (DST) applied, as with the Summer Solstice diagrams.

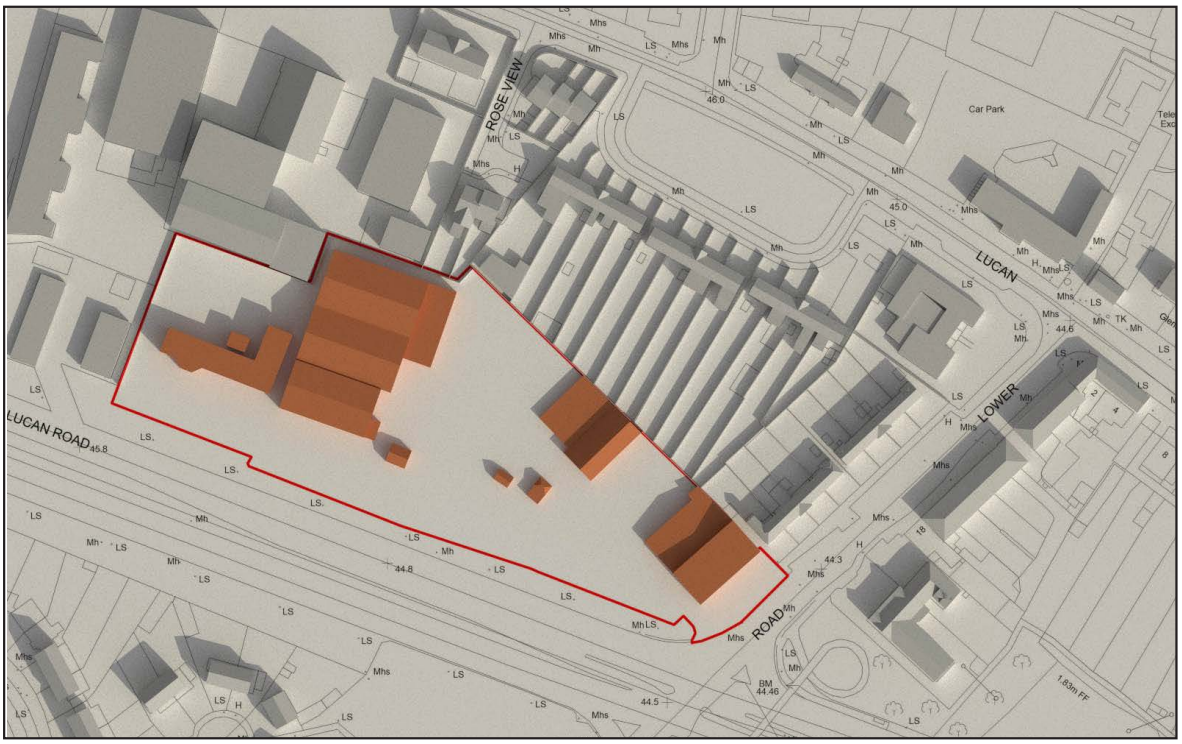
The use of shadow diagrams as an assessment method should be taken over the course of the day and not a specific time due to the transient nature of the sun and the shade caused by obstructions.

In relation to the effects of trees and hedges the BRE guidelines states,

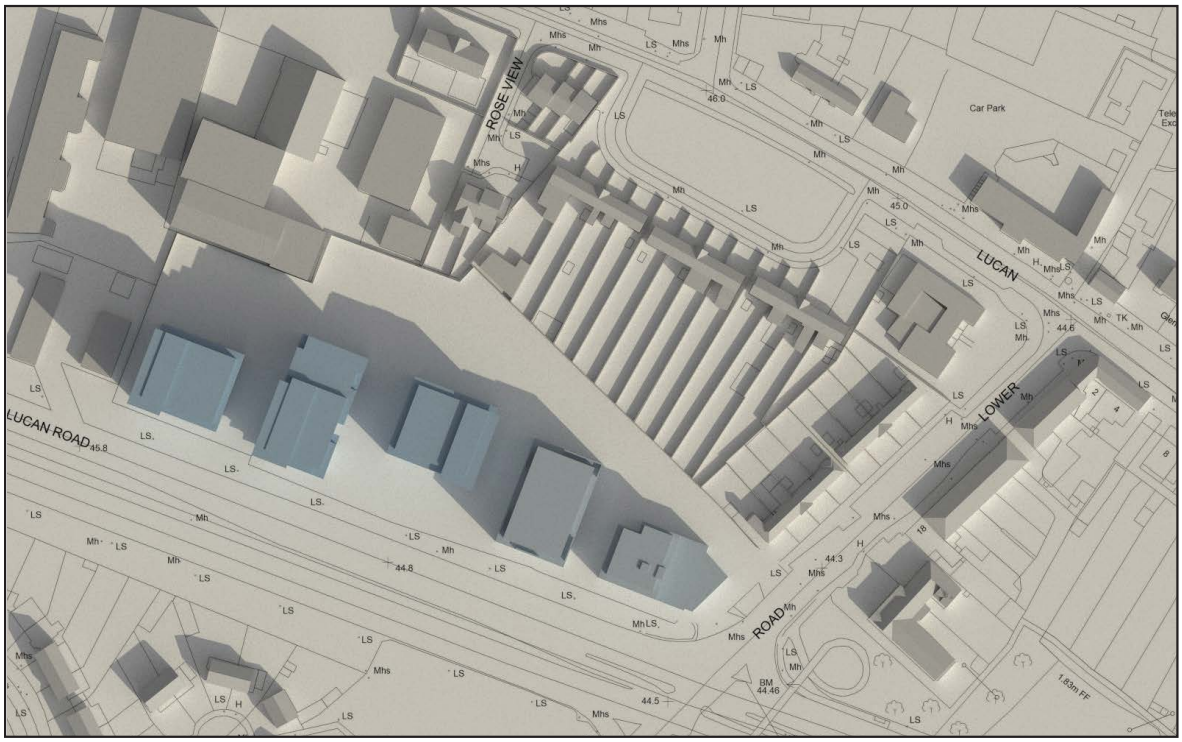
> *"It is generally more difficult to calculate the effects of trees on daylight because of their irregular shape and because some light will generally penetrate through the crown. Where the effects of a new building on existing buildings nearby is being analysed, it is usual to ignore the effects of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."*

The trees were not included because they are mostly deciduous and guidelines recommends only including trees where there are dense bands of evergreen trees.

7.2 Shadow Casting diagrams March Equinox



Existing

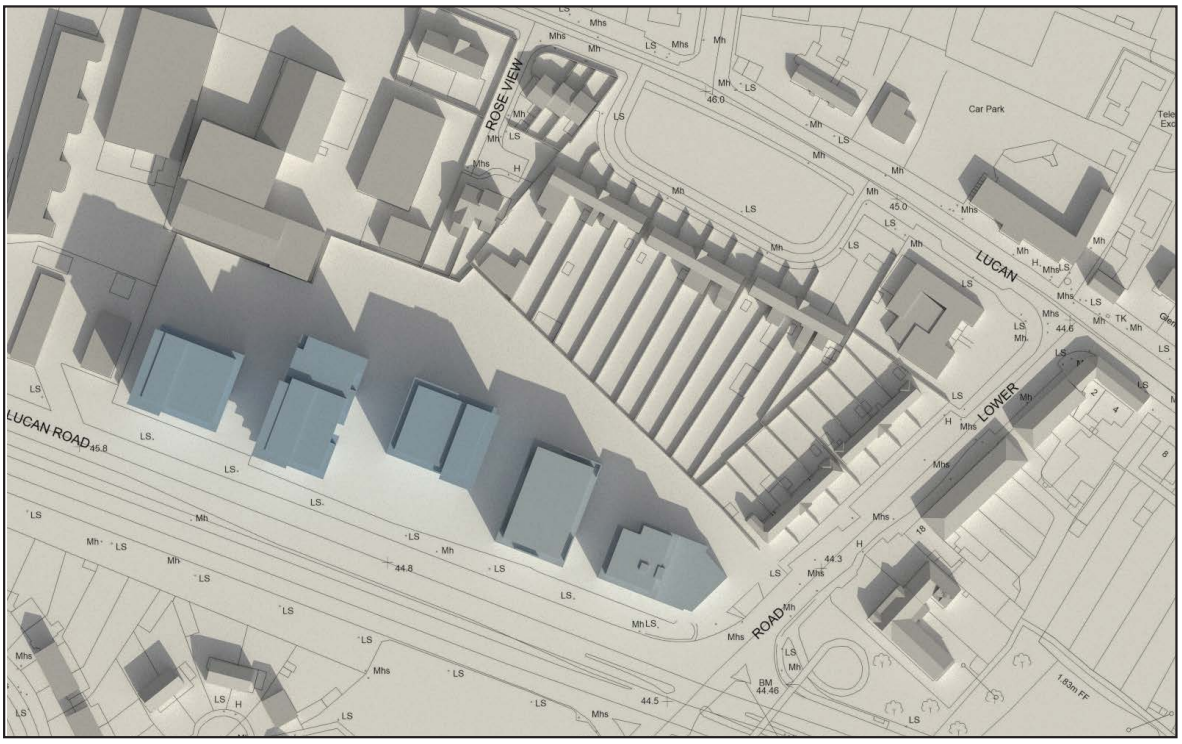


Proposed

Figure 16: Existing & Proposed Shadow diagram 21 March 10:00 GMT

Shadow Casting diagrams March Equinox

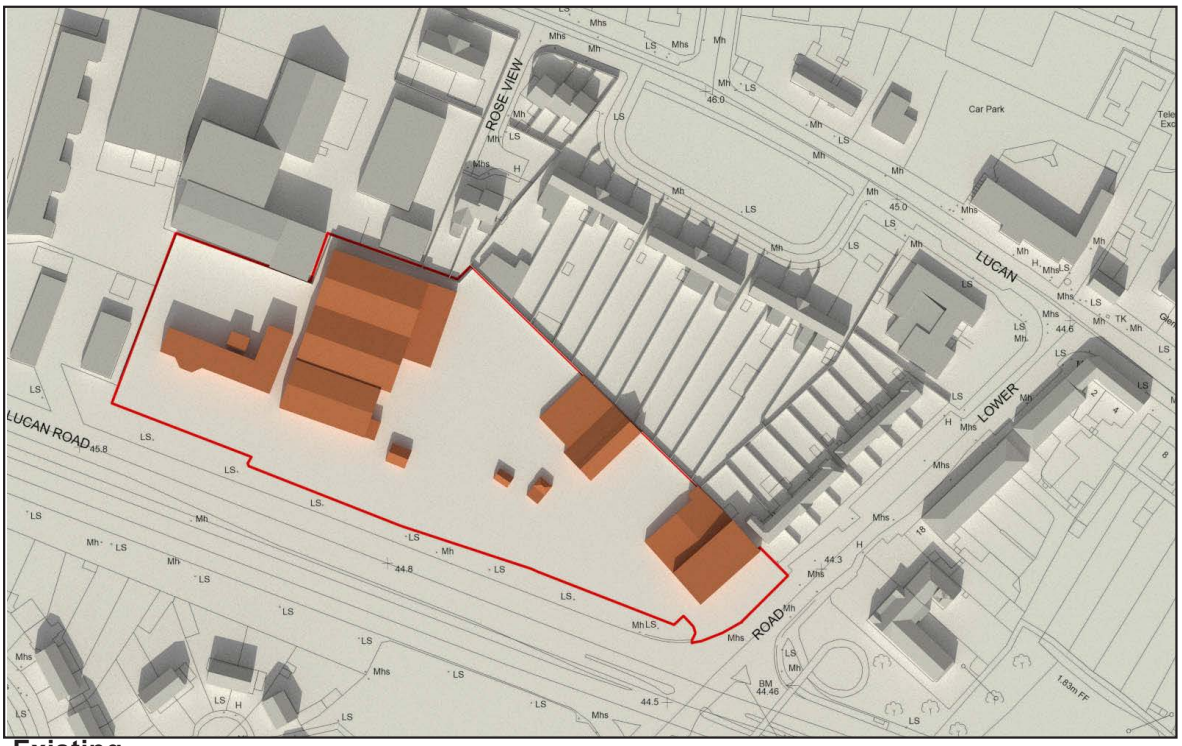
Existing



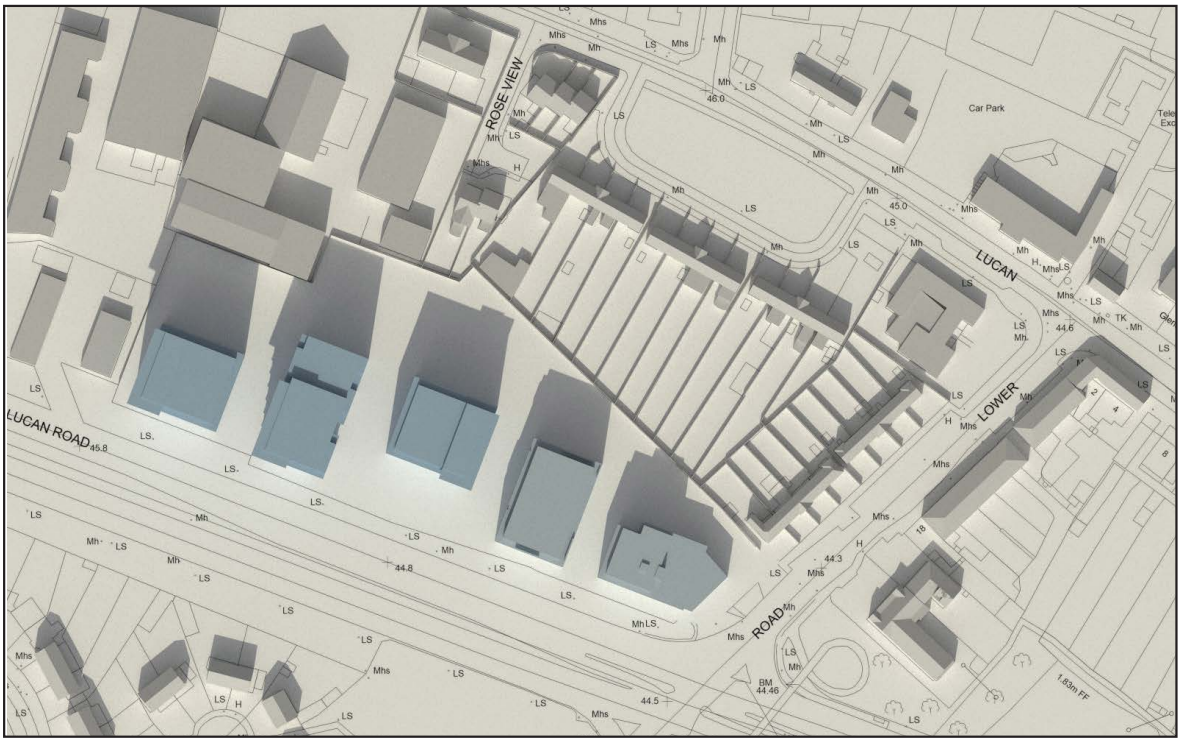
Proposed

Figure 17: Existing & Proposed Shadow diagram 21 March 11:00 GMT

Shadow Casting diagrams March Equinox



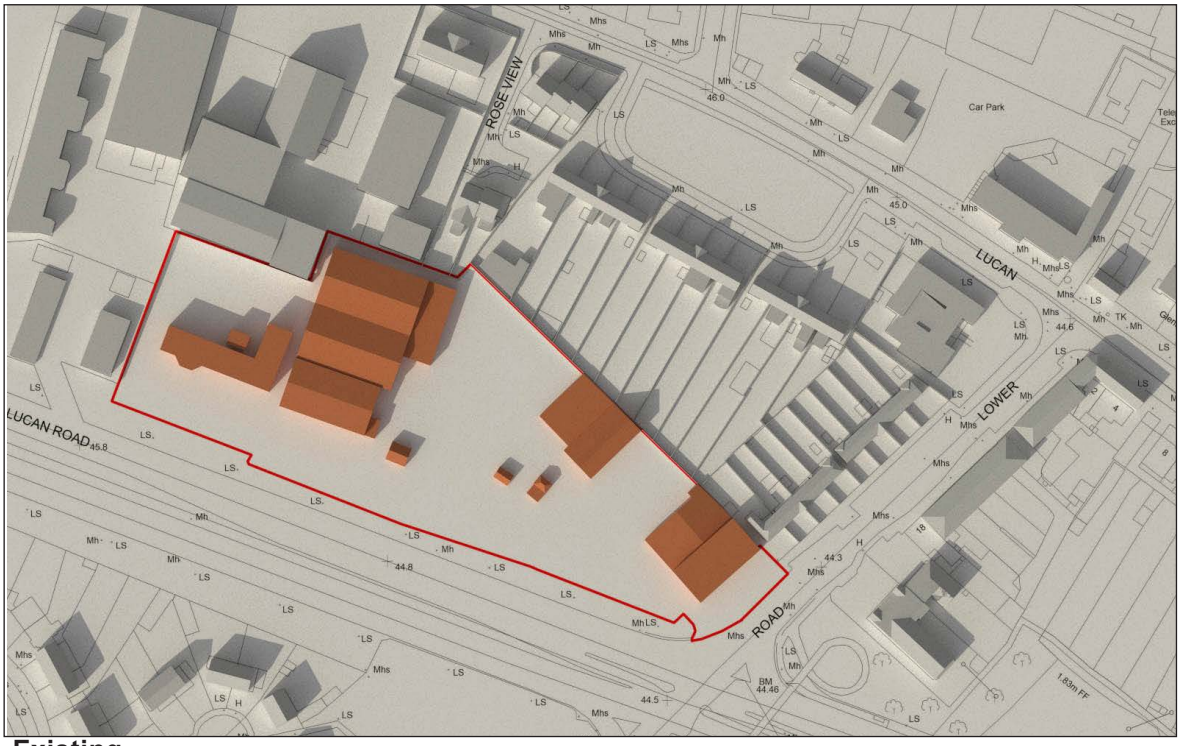
Existing



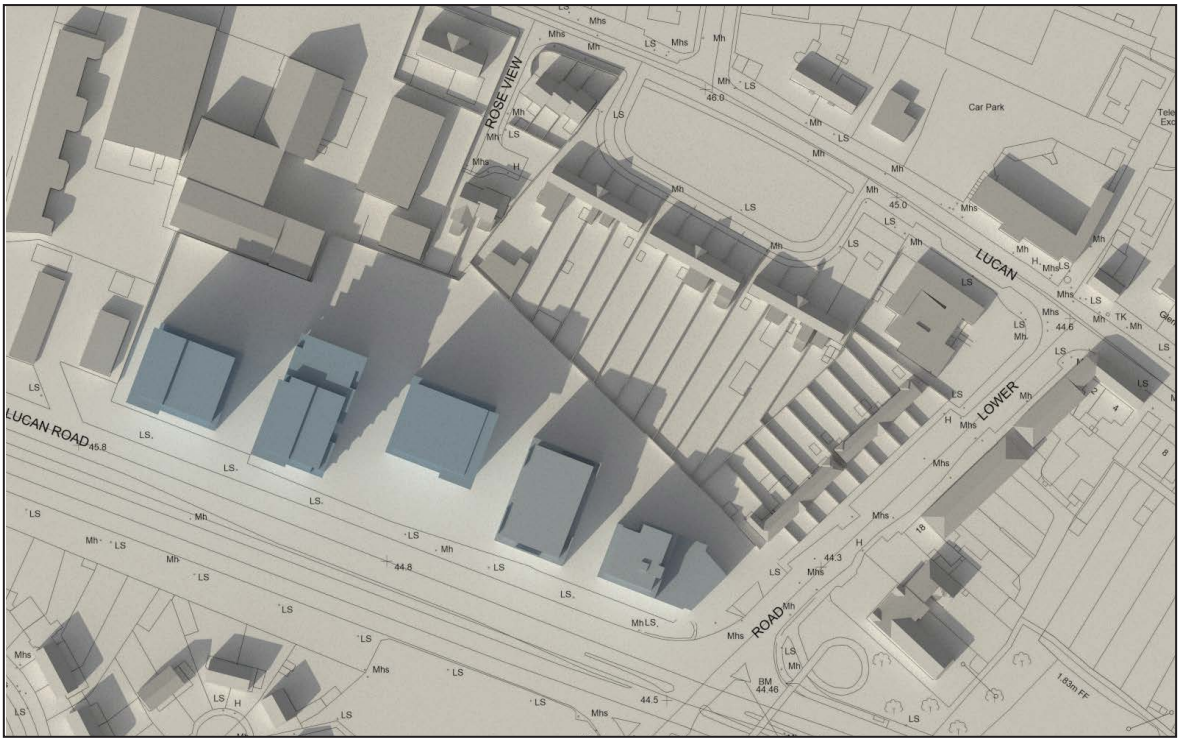
Proposed

Figure 18: Existing & Proposed Shadow diagram 21 March 13:00 GMT

Shadow Casting diagrams March Equinox



Existing

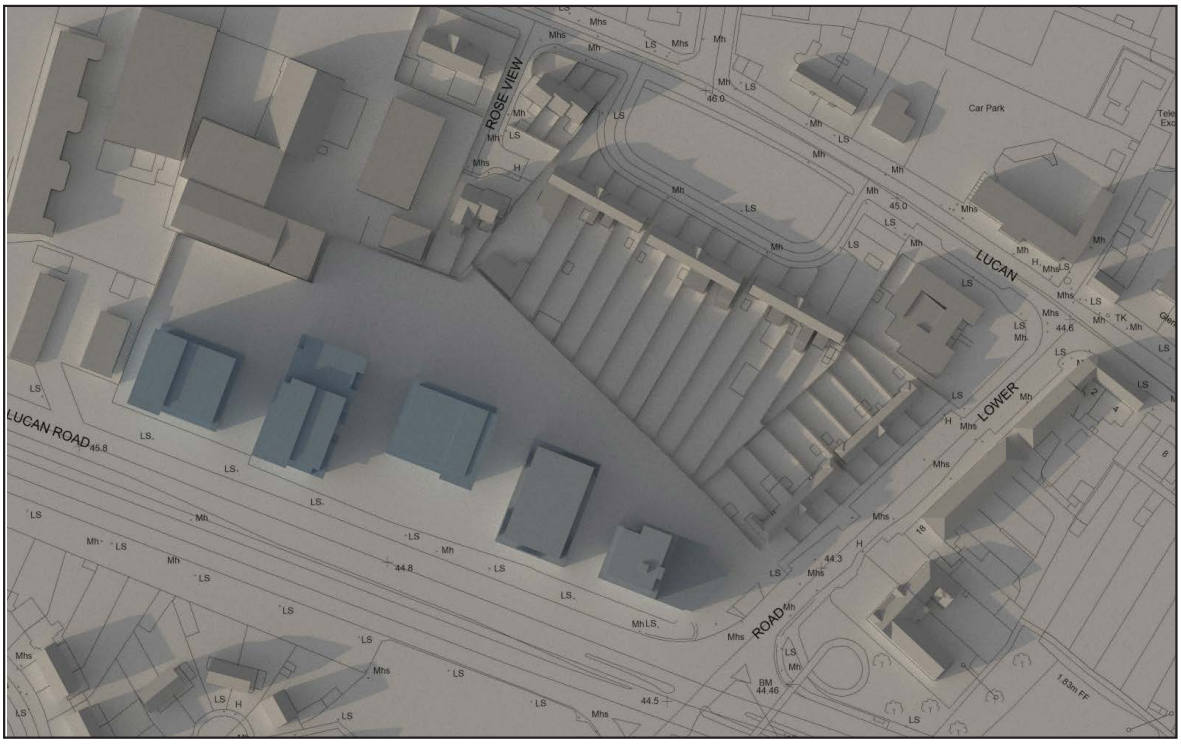


Proposed

Figure 19: Existing & Proposed Shadow diagram 21 March 15:00 GMT

Shadow Casting diagrams March Equinox

Existing

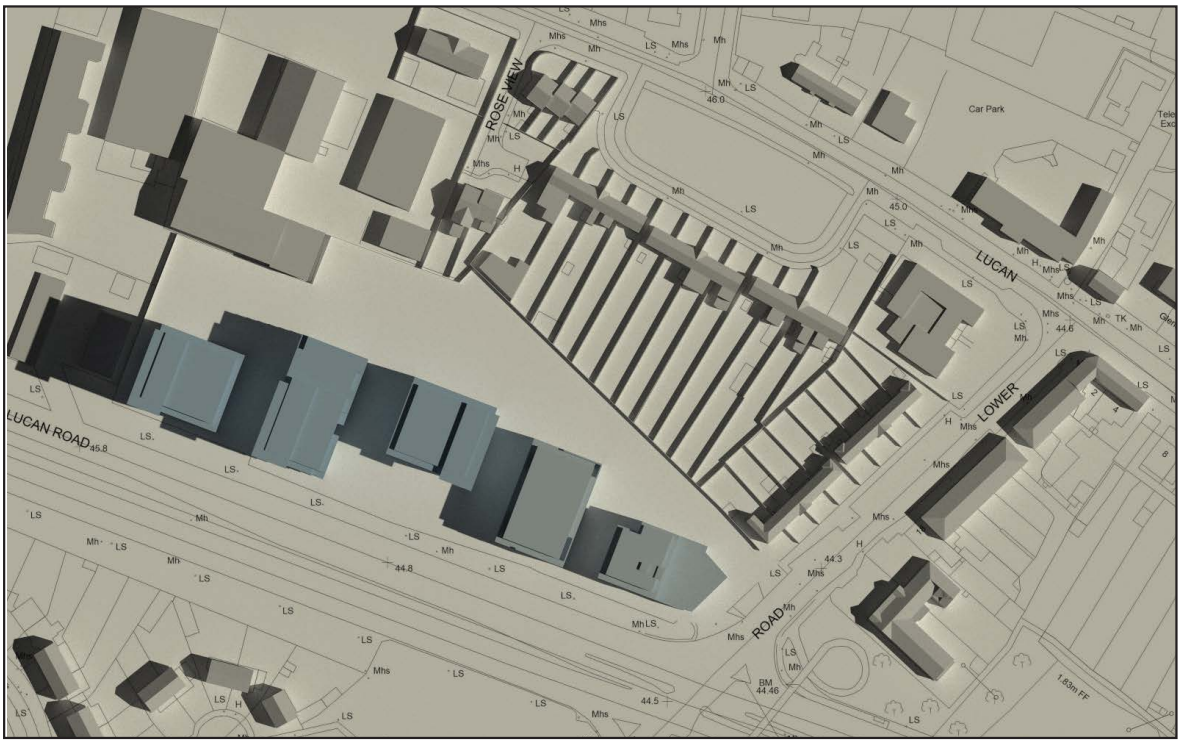


Proposed

Figure 20: Existing & Proposed Shadow diagram 21 March 17:00 GMT

7.3 Shadow Casting diagrams June Solstice

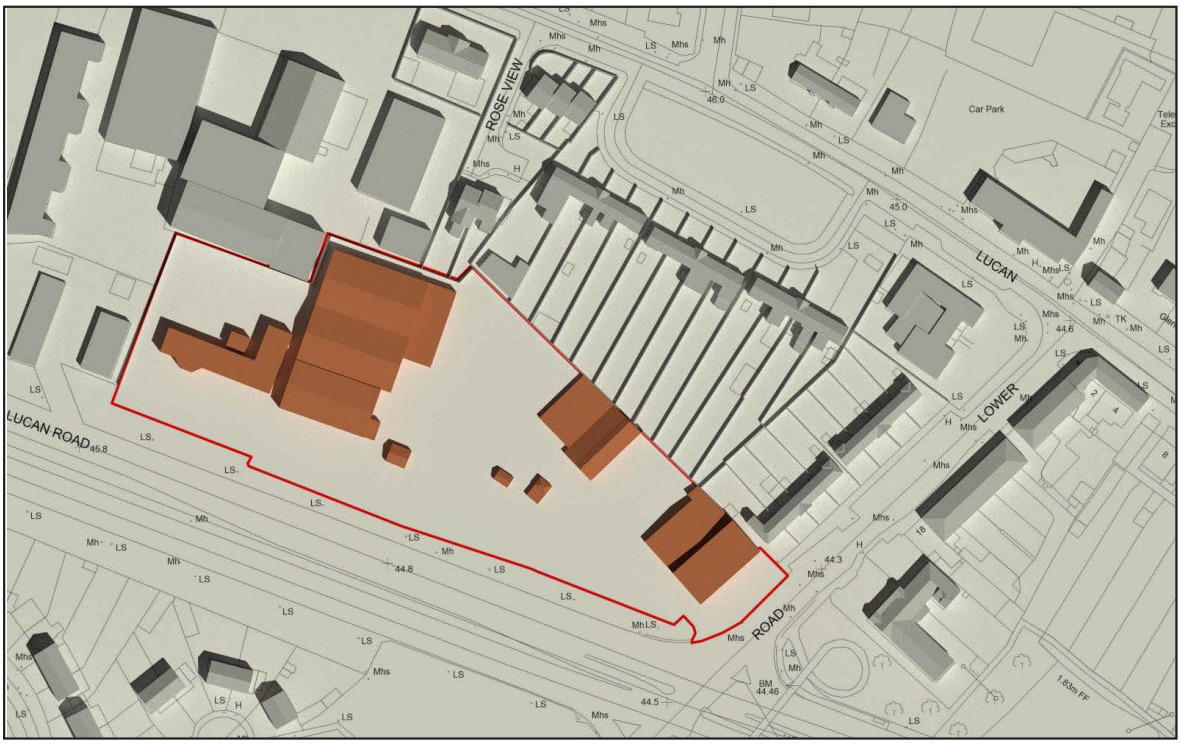
Existing



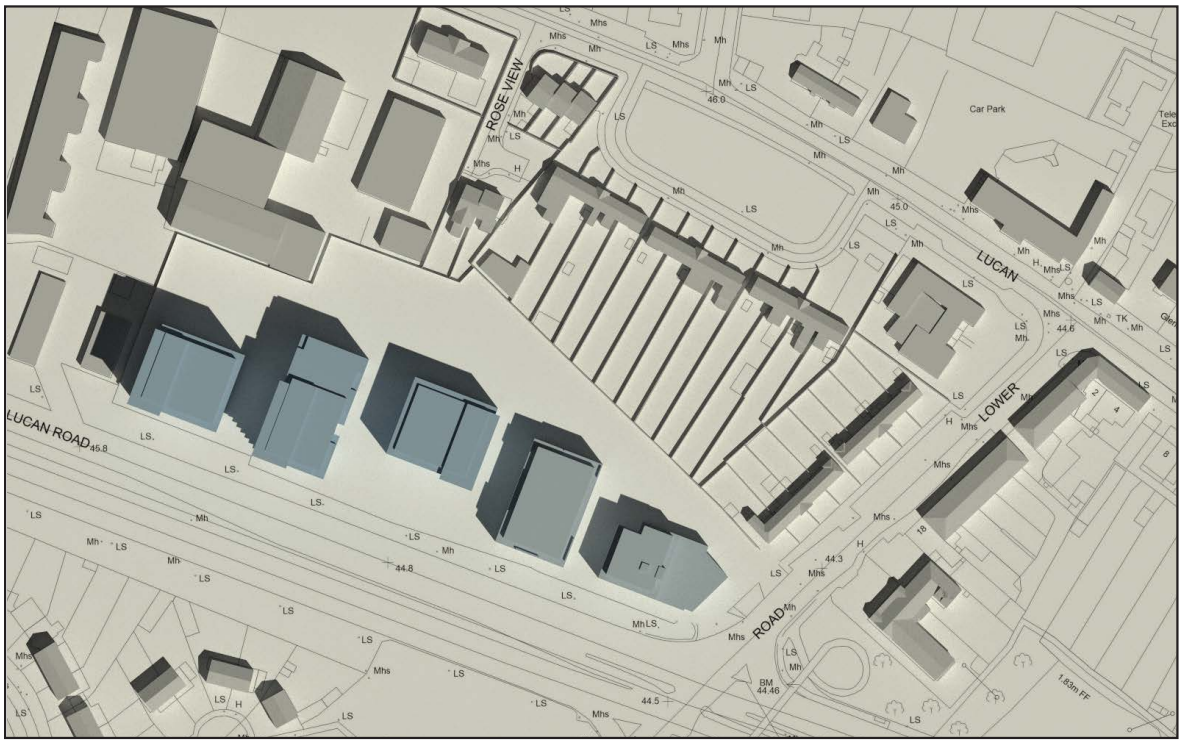
Proposed

Figure 21: Existing & Proposed Shadow diagram 21 June 10:00 GMT +1 (DST)

Shadow Casting diagrams June Solstice



Existing

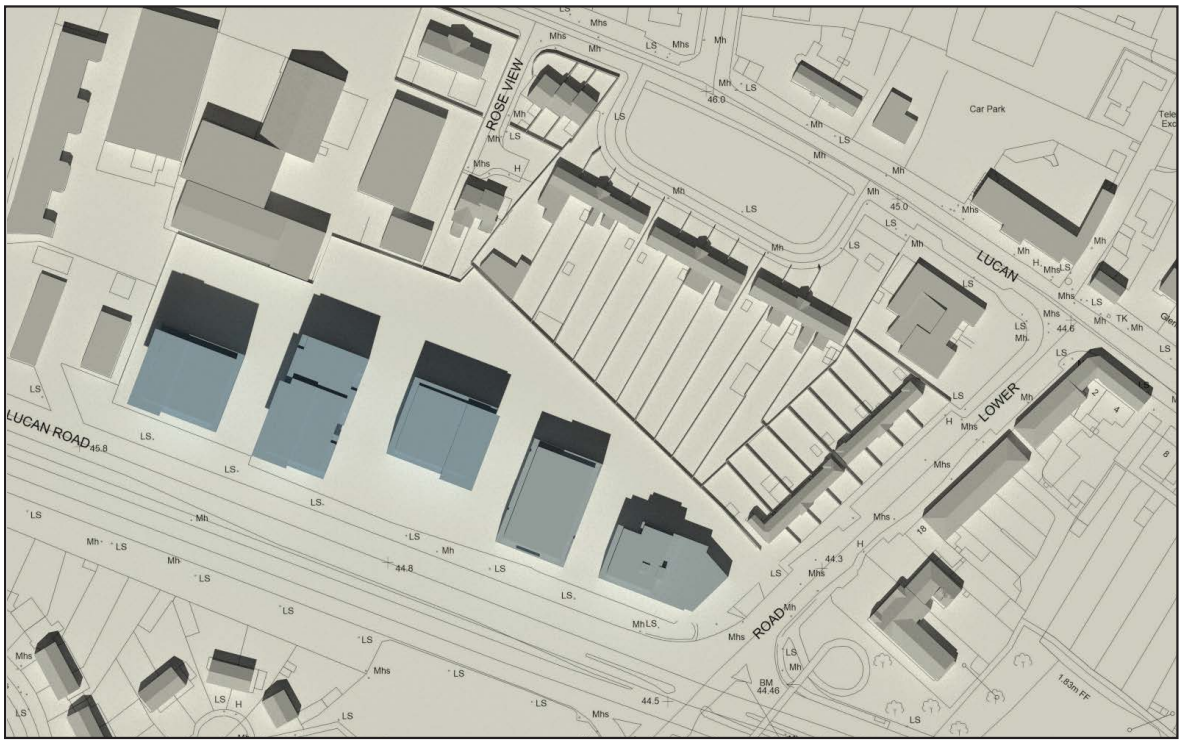


Proposed

Figure 22: Existing & Proposed Shadow diagram 21 June 12:00 GMT +1 (DST)

Shadow Casting diagrams June Solstice

Existing

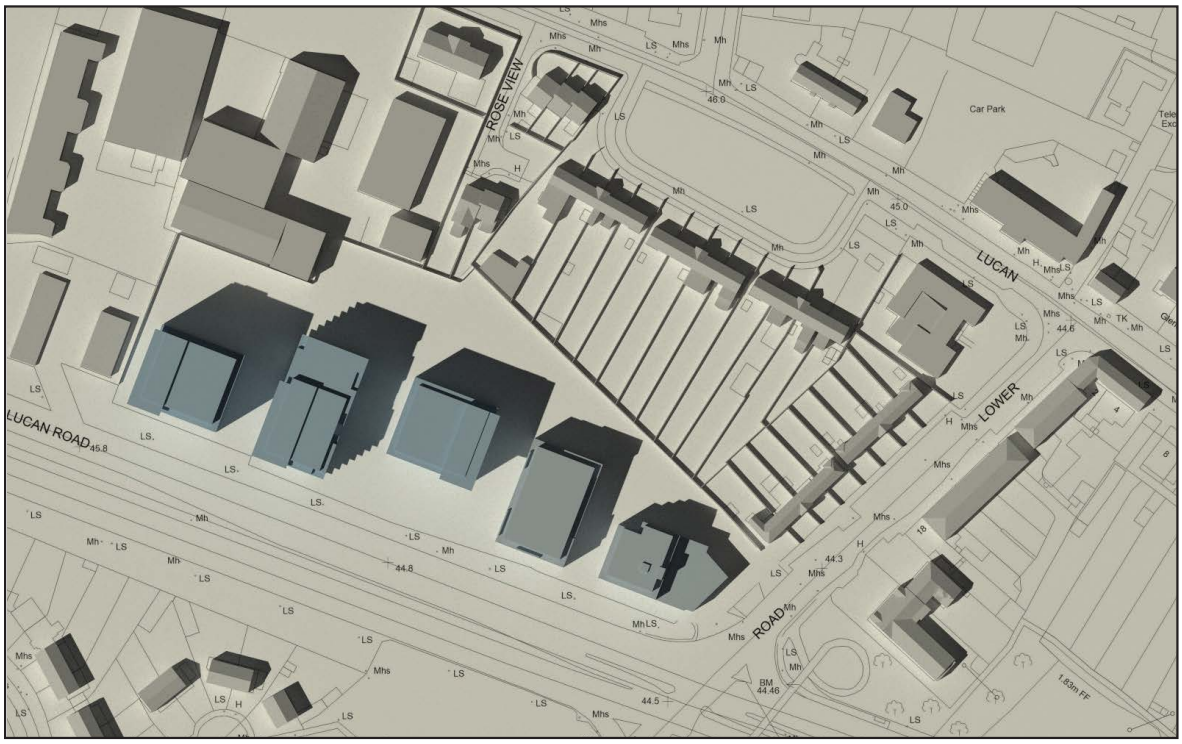


Proposed

Figure 23: Existing & Proposed Shadow diagram 21 June 14:00 GMT +1 (DST)

Shadow Casting diagrams June Solstice

Existing

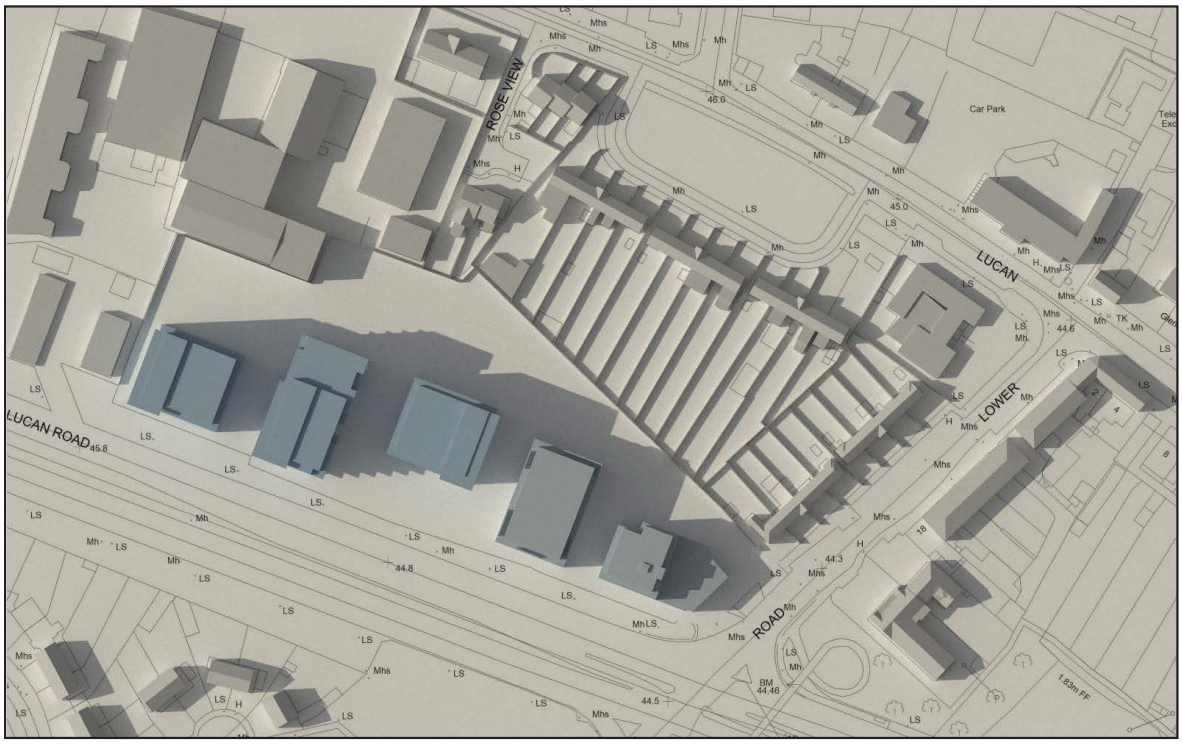


Proposed

Figure 24: Existing & Proposed Shadow diagram 21 June 16:00 GMT +1 (DST)

Shadow Casting diagrams June Solstice

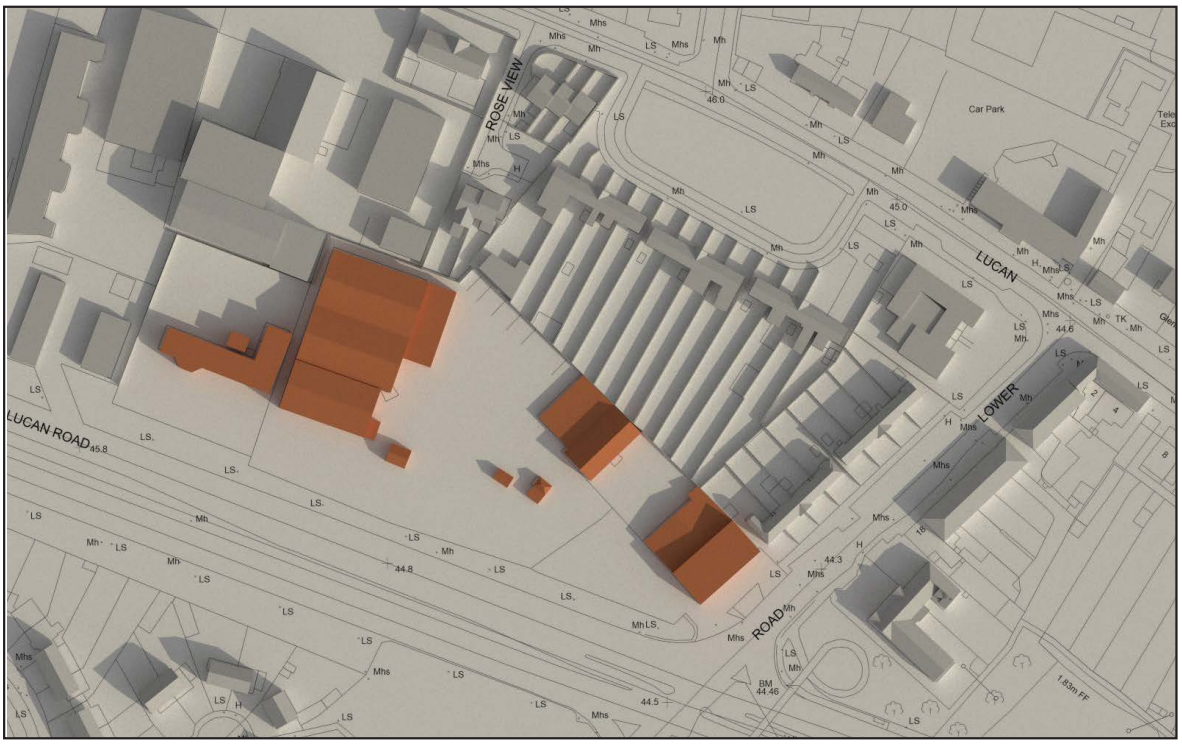
Existing



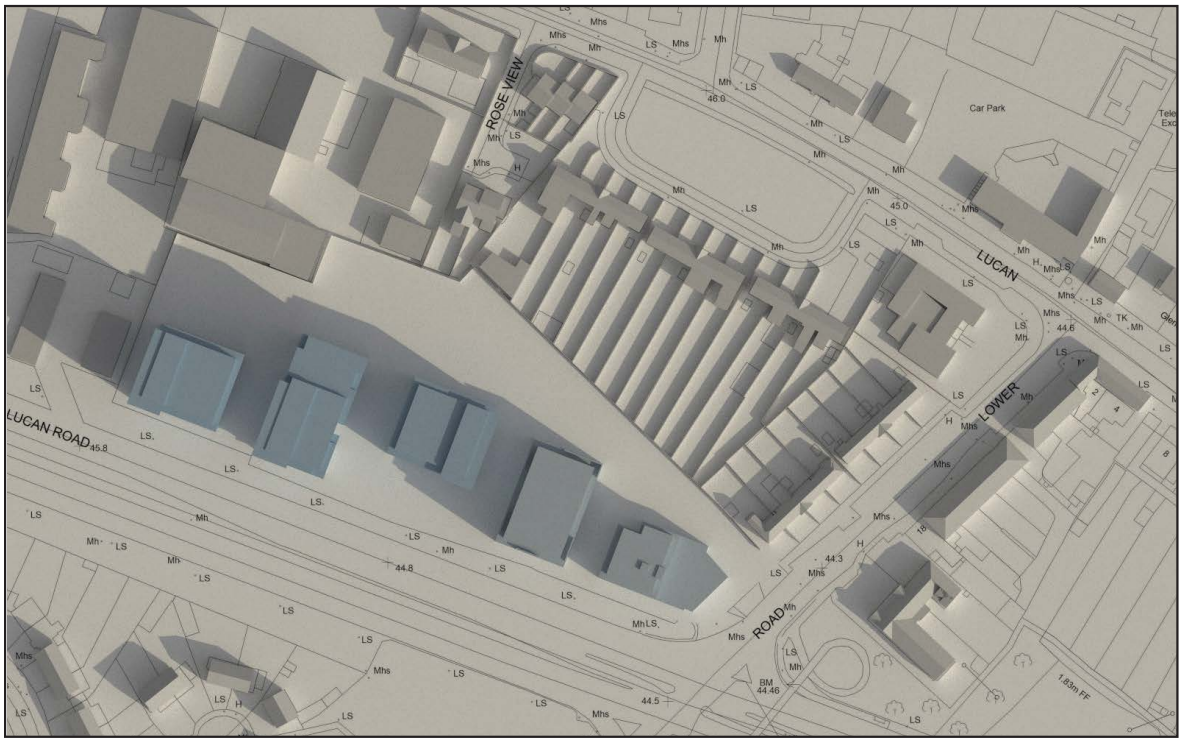
Proposed

Figure 25: Existing & Proposed Shadow diagram 21 June 18:00 GMT +1 (DST)

7.4 Shadow Casting diagrams September Equinox



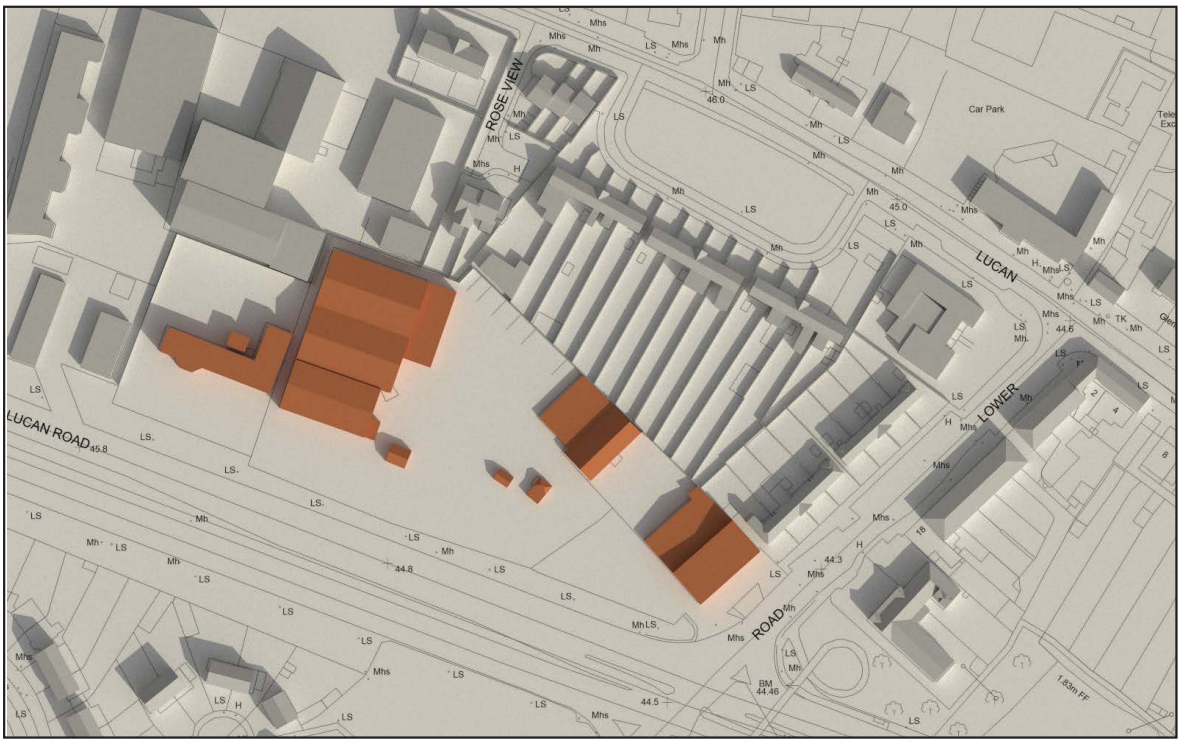
Existing



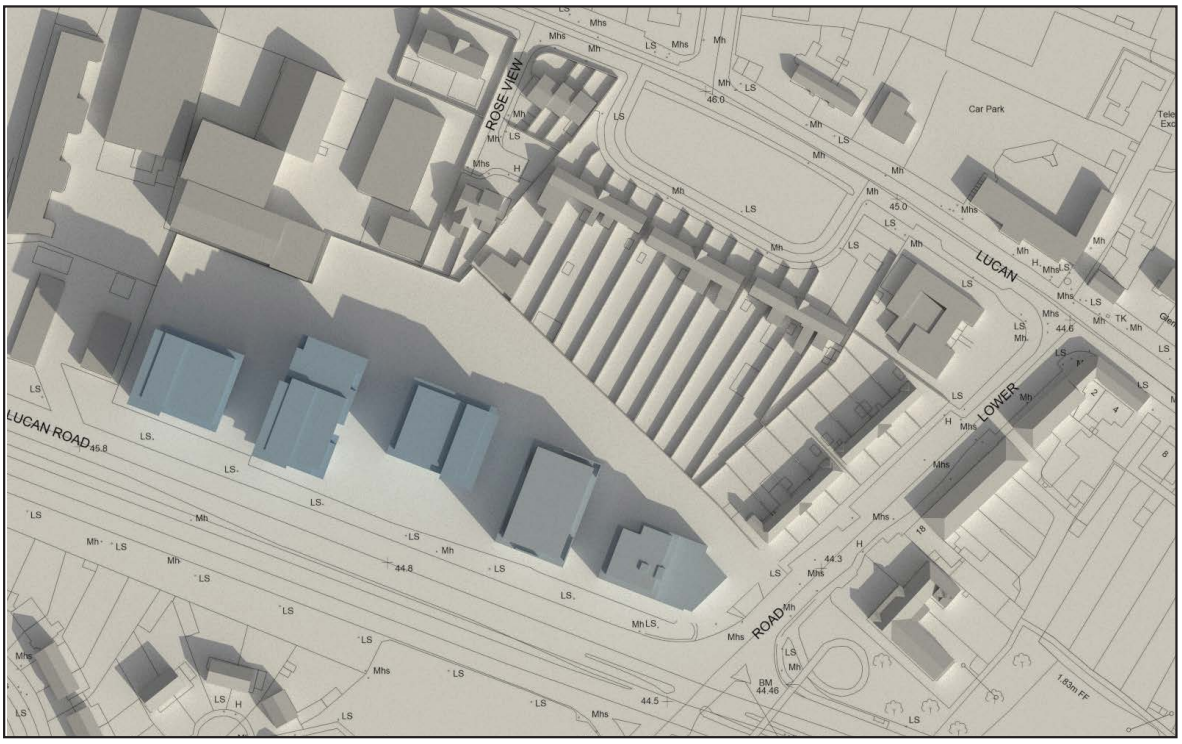
Proposed

Figure 26: Existing & Proposed Shadow diagram 21 September 10:00 GMT +1 (DST)

Shadow Casting diagrams September Equinox



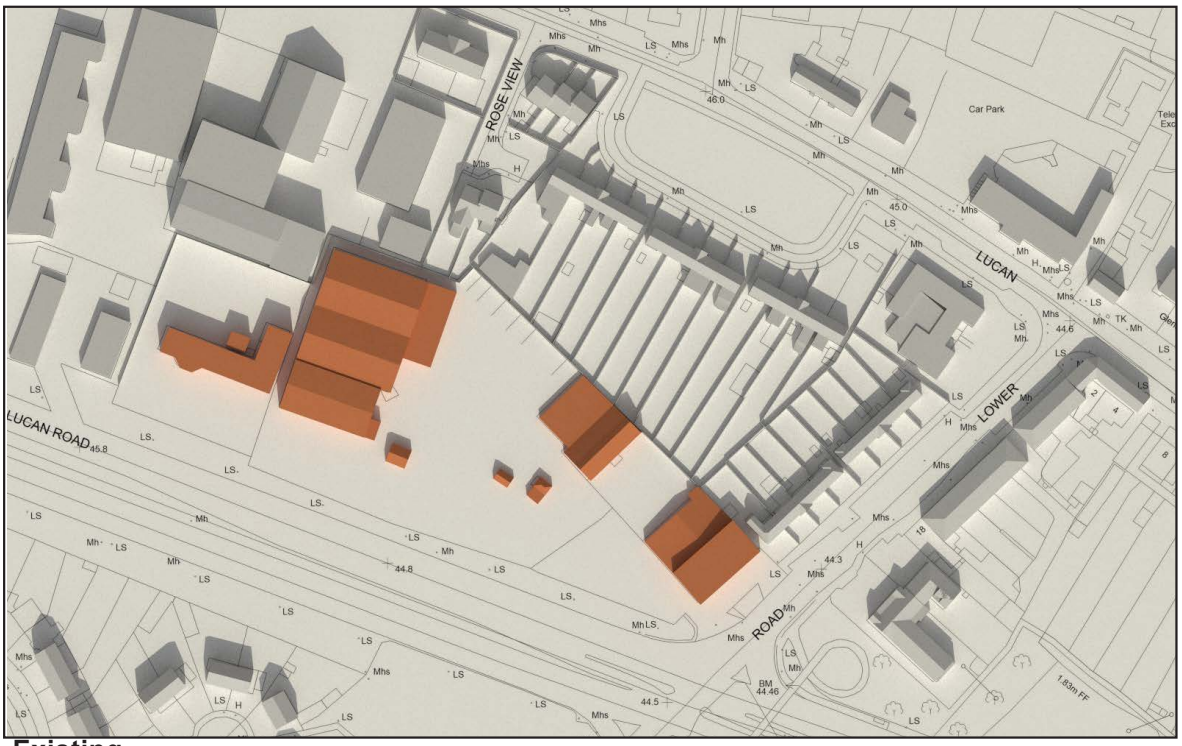
Existing



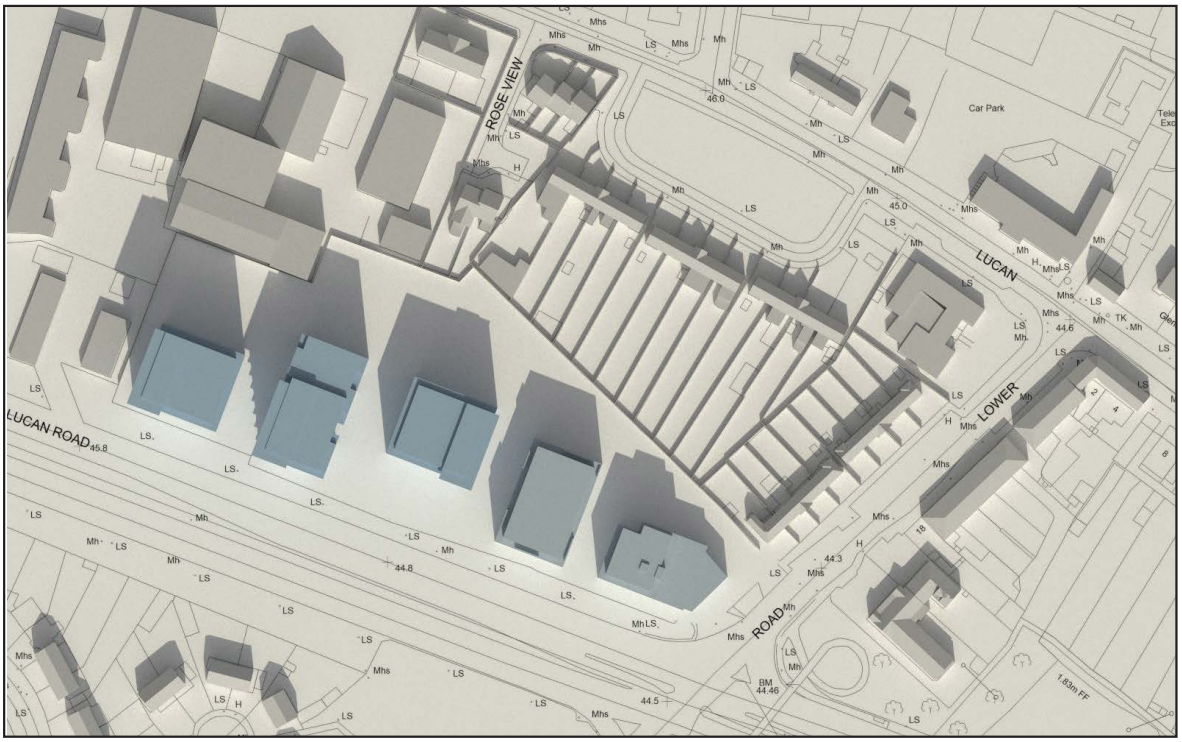
Proposed

Figure 27: Existing & Proposed Shadow diagram 21 September 11:00 GMT +1 (DST)

Shadow Casting diagrams September Equinox



Existing

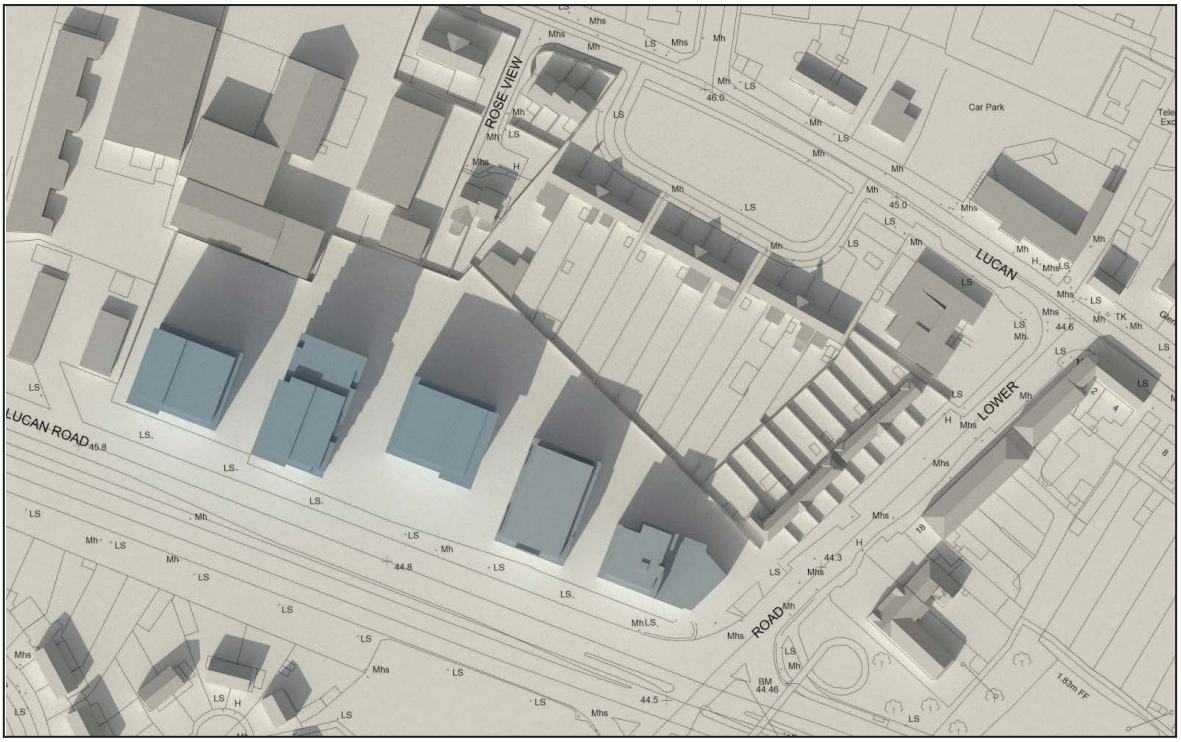


Proposed

Figure 28: Existing & Proposed Shadow diagram 21 September 13:00 GMT +1 (DST)

Shadow Casting diagrams September Equinox

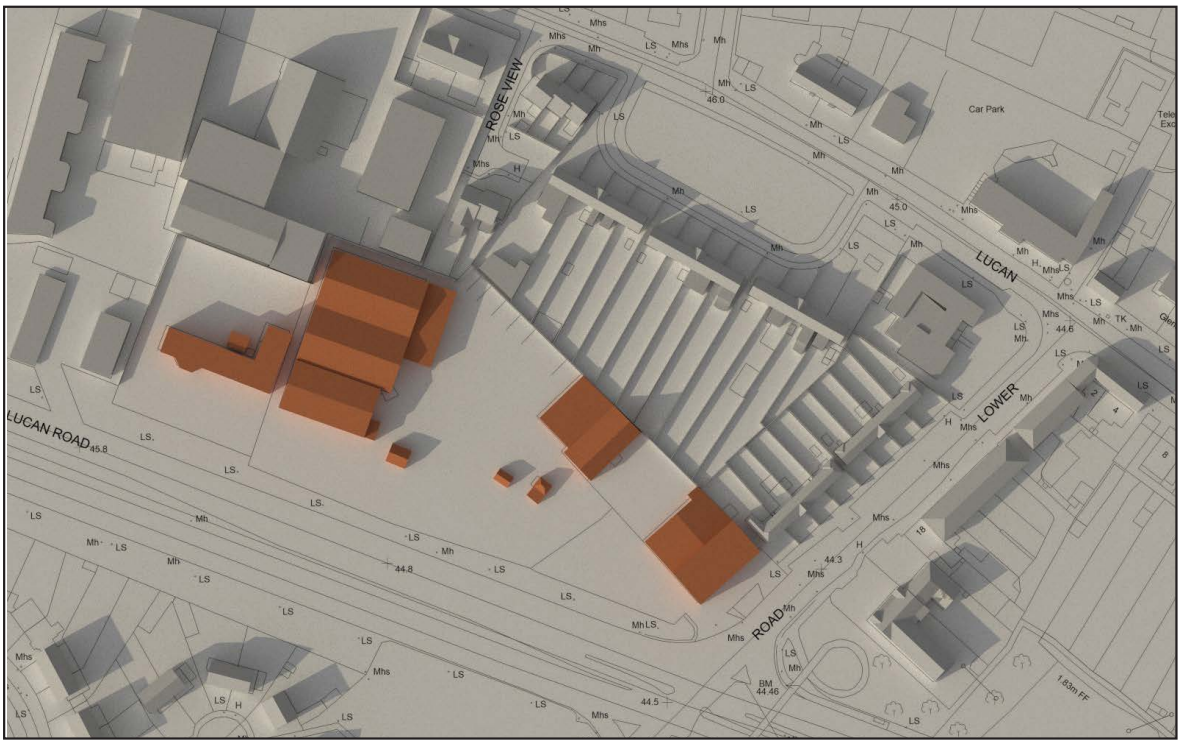
Existing



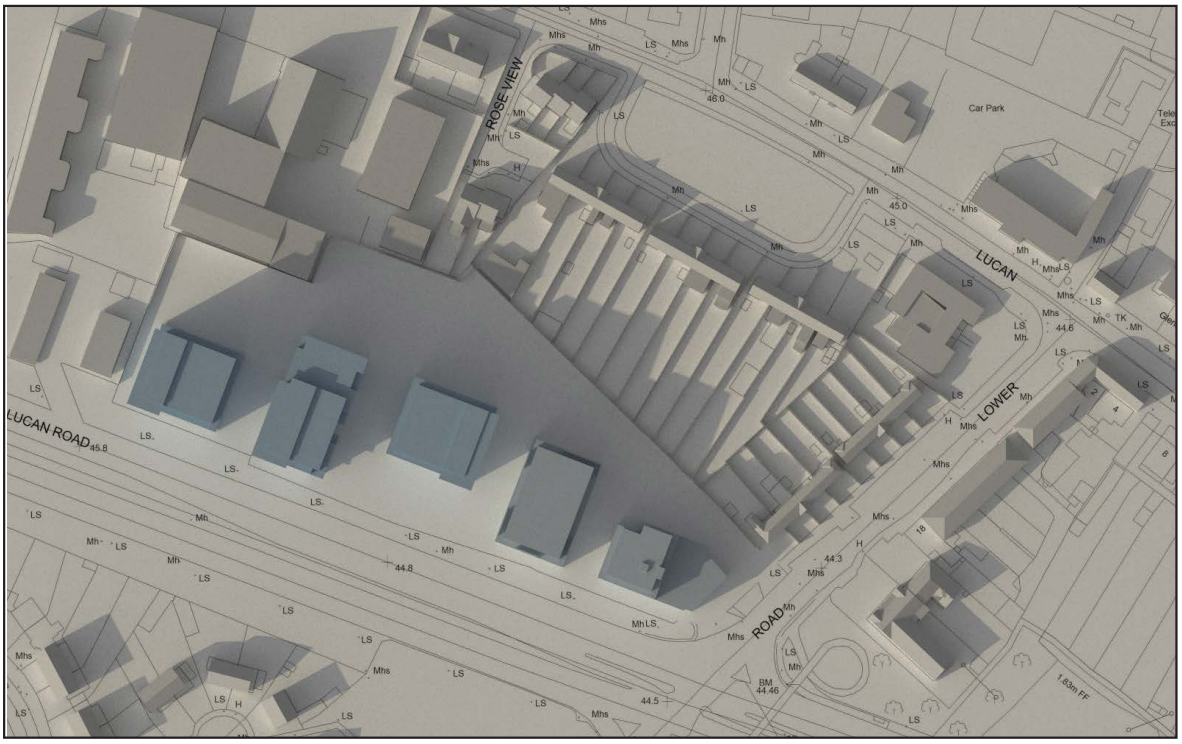
Proposed

Figure 29: Existing & Proposed Shadow diagram 21 September 15:00 GMT +1 (DST)

Shadow Casting diagrams September Equinox



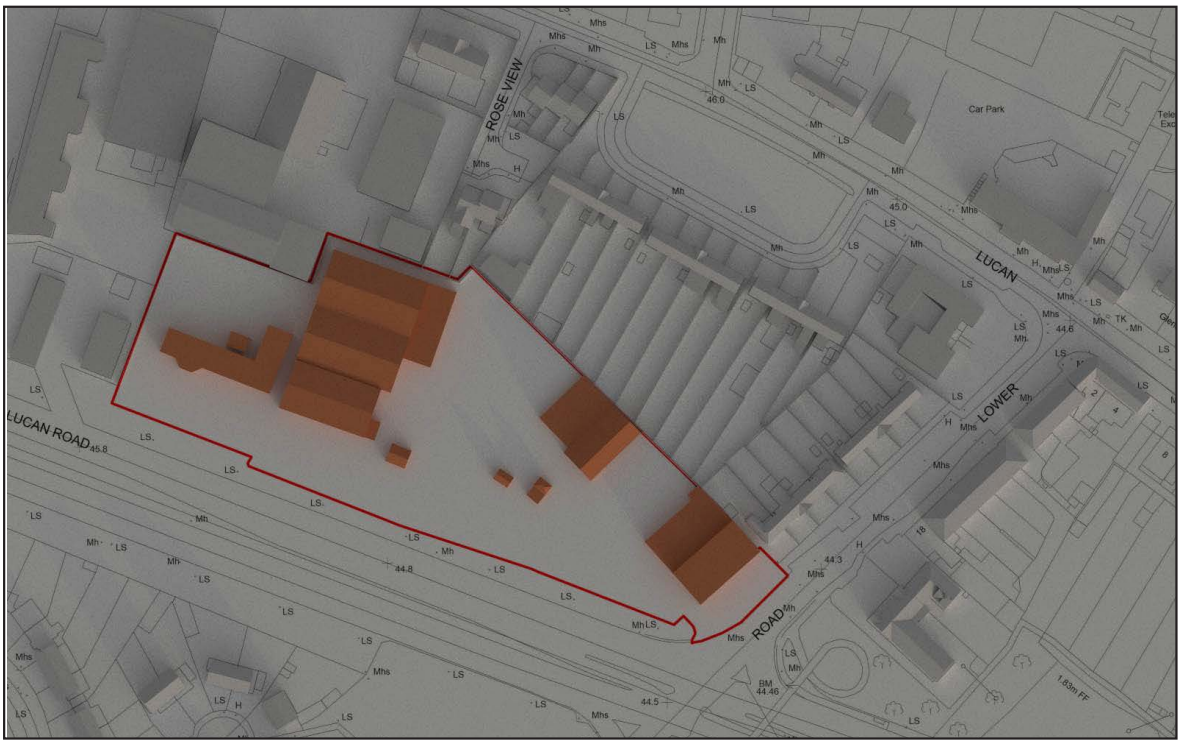
Existing



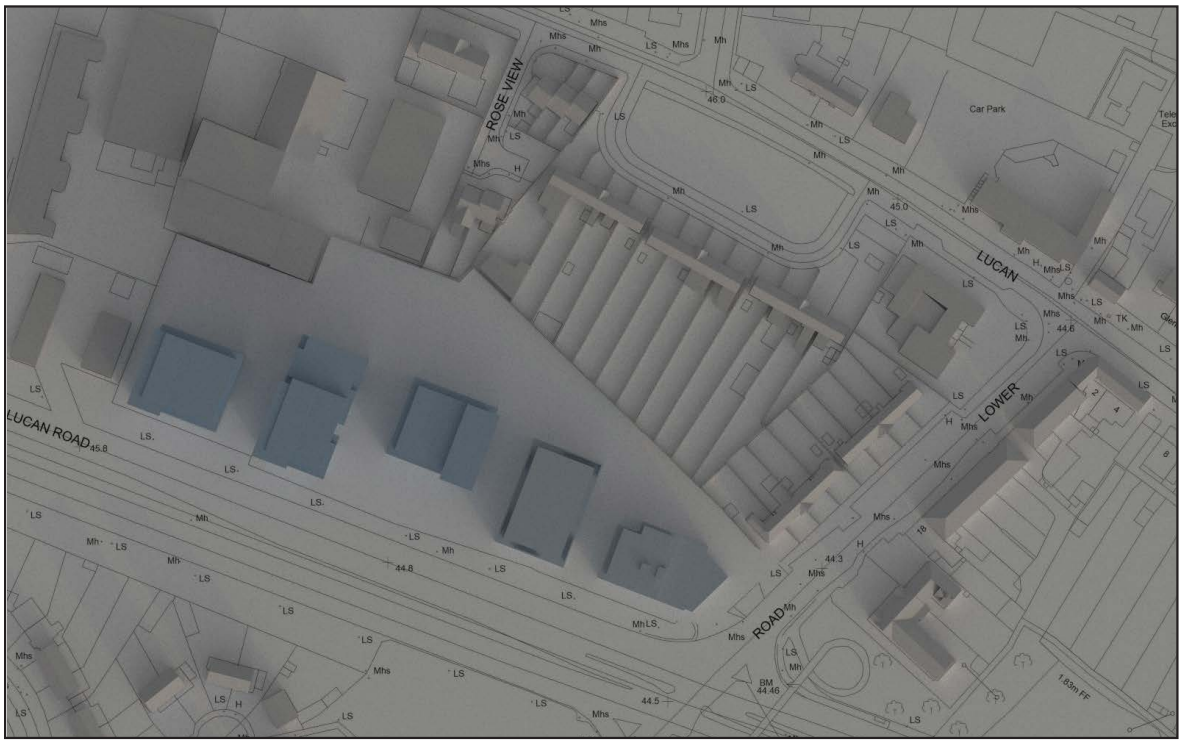
Proposed

Figure 30: Existing & Proposed Shadow diagram 21 September 17:00 GMT +1 (DST)

7.5 Shadow Casting diagrams December Solstice



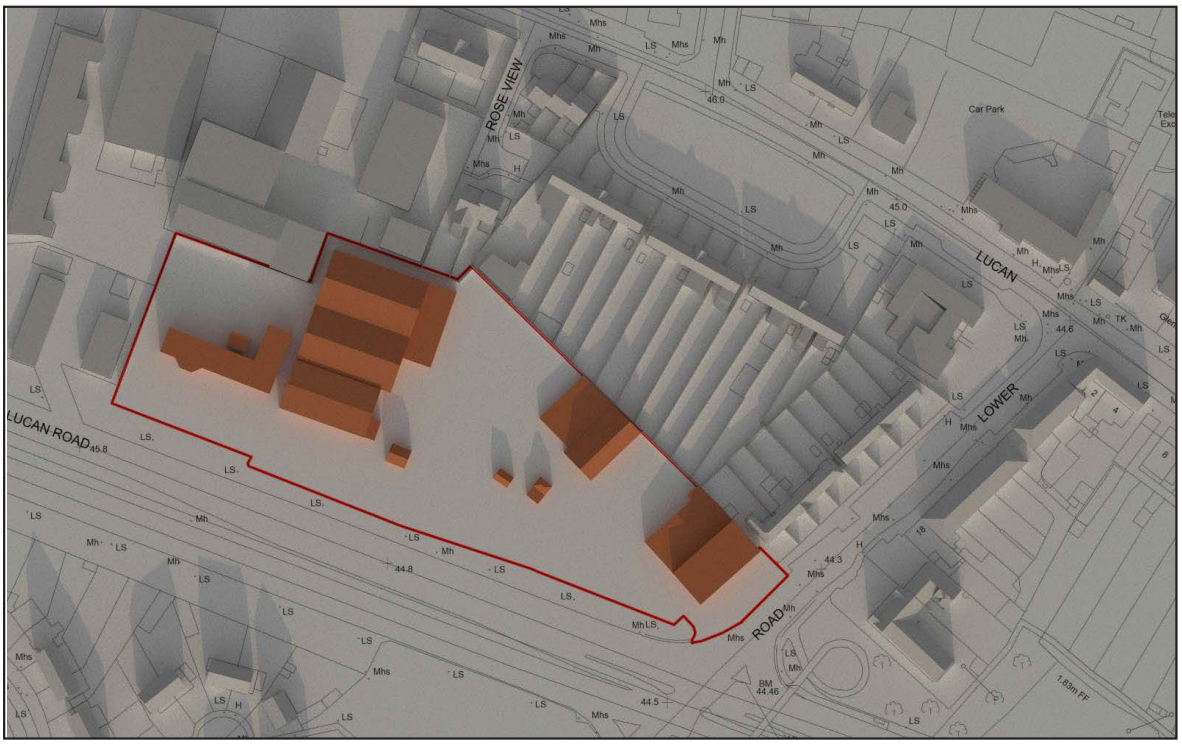
Existing



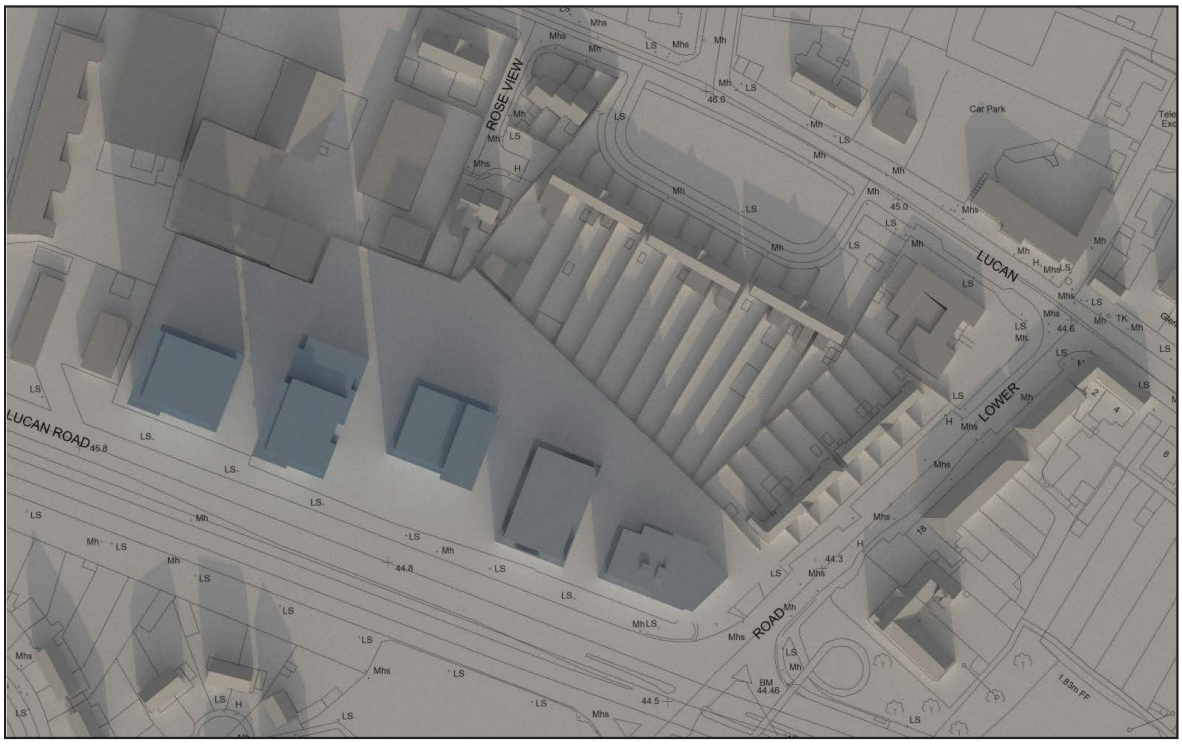
Proposed

Figure 31: Existing & Proposed Shadow diagram 21 December 10:00 GMT

Shadow Casting diagrams December Solstice



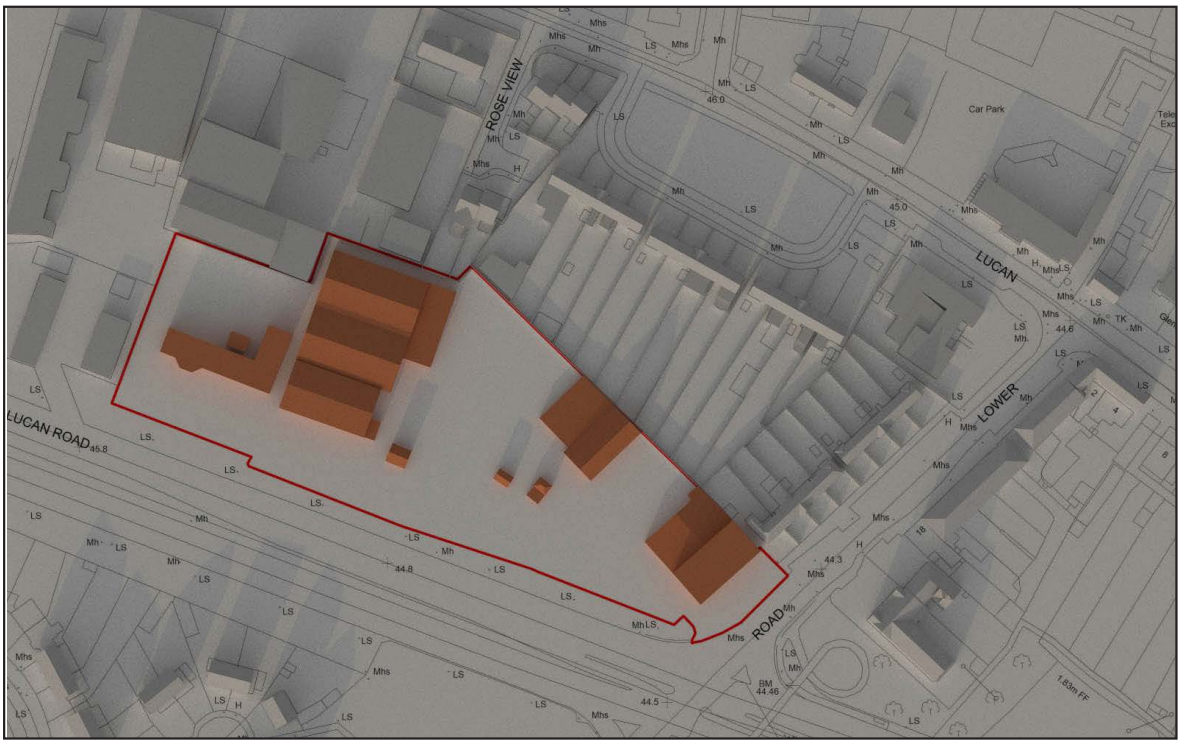
Existing



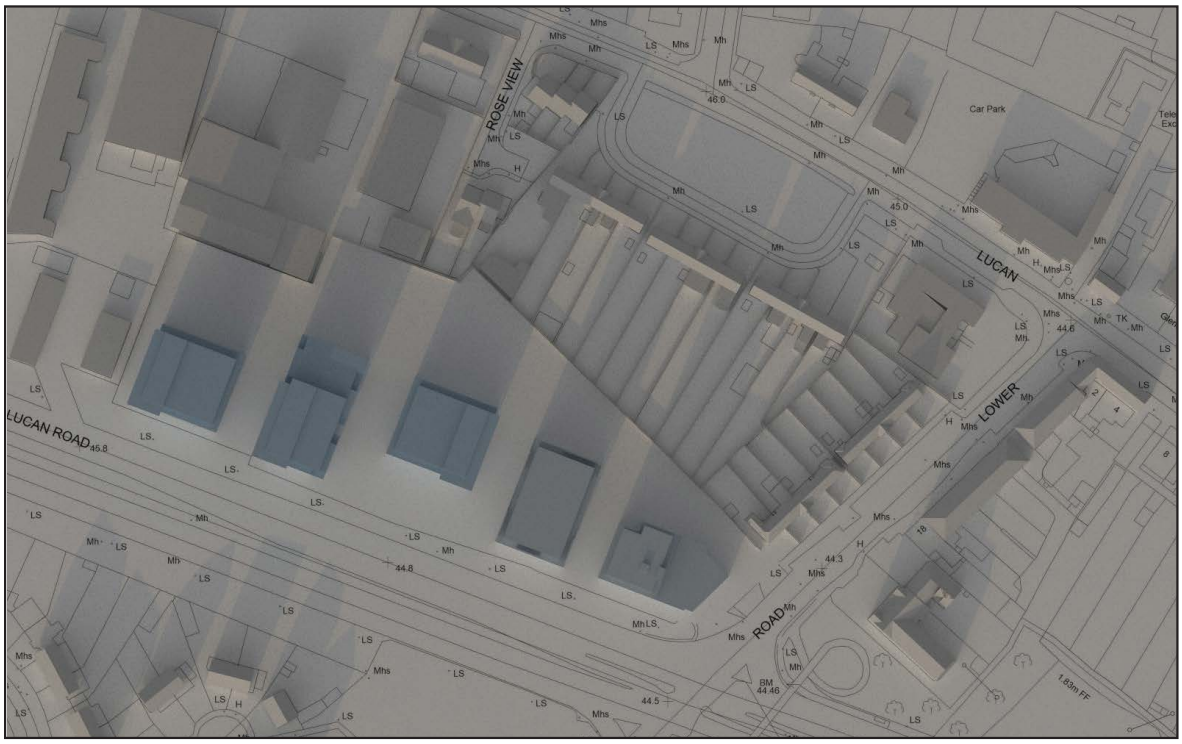
Proposed

Figure 32: Existing & Proposed Shadow diagram 21 December 12:00 GMT

Shadow Casting diagrams December Solstice



Existing



Proposed

Figure 33: Existing & Proposed Shadow diagram 21 December 14:00 GMT