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# Daylight Reception Analysis Report

DAYLIGHT RECEPTION IN HABITABLE ROOMS WITHIN THE PROPOSED DEVELOPMENT

# Phase 5 – Development at Oldtown

Proposed Residential Development

Oldtown, Swords, Co. Dublin

Gerard Gannon Properties

**DKP-N14-5020-1P** 2022-03-22

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ING Gerard (Craig) van Deventer CEng., BE(mech)., HDip CIOB, MCIBSE

M: [00] 353 (0)87 260 8080 E: gerard@dkpartnership.com

DKPartnership

70 Main Street, Applewood , Swords, Co. Dublin, Ireland

Reen Kenmare Co. Kerry

post@dkpartnership.com www.dkpartnership.com

T: [00] 353 (0) 1813 1930 T: [00] 353 (0)64664 1686

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### 1 Introduction

### 1.1 Report purpose

This report gives information on the level of achieved daylight reception in habitable rooms within the proposed new development.

#### 1.2 Instruction

DKP

DKPartnership (DKP) have been commissioned by Gerard Gannon Properties, to carry out the analysis and report for the proposed development at Oldtown, Swords, Co. Dublin.

### 1.3 Brief development description

'A proposed Strategic Housing Development consisting of the removal of the temporary site office/site compound structures on site and the construction of 377 no. residential units comprising of duplexes, apartments and houses, all with associated car parking; a childcare facility with associated car parking; landscaping including play equipment; boundary treatments; public lighting; and all associated engineering and site works necessary to facilitate the development including proposed vehicular accesses onto Miller's Avenue, and a proposed stormwater storage tank (with proposed vehicular/service access onto Balheary Road) and overflow outfall gravity sewer to the Broadmeadow River with associated manholes on lands locally known as the Celestica/Motorola site, junction of Glen Ellan Road and Balheary Road, and at/on Balheary Road.'

### 1.4 Policy and building regulation requirements

There are no particular building regulations in relation day light/shadow effect standards other than recommendations outlined or referred to in the CIBSE lighting guide 10, BS EN17037/EN17037 and the BRE document" Site layout planning for daylight and sun light".

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### **2** Executive summary

### 2.1 Analysis conducted

This report details the achieved calculated daylight reception in habitable rooms within the new development and compares these for compliance with the recommendations of the relevant guidelines and standards.

### 2.2 Daylight reception and building orientation

Day light reception in habitable rooms within the proposed development under the BRE, CIBSE and BS EN17037/EN17037 is calculated using the area of the glazed element, the room depth/height ratio, the room light reflection capability and the amount of direct or blocked/partially blocked daylight it receives. i.e. building orientation is not relevant to day light reception or daylight reception calculations. In other words day light factor analysis is equal to all orientations. This note is for clarity as day light is often confused with sunlight or sunlight energy which is effected by orientation.

### 2.3 Guidelines and standards applied

For this report we applied the recommendations and guideline of the following;

- The Building Research Establishment (BRE) report, site layout planning for daylight and sunlight a guide to good practice (referred to as the BRE Report).
- British European Standard BS EN17037/EN17037 Day lighting standards and contains guidance on the minimum recommended levels of interior day lighting.
- CIBSE guide 10 Day light and lighting for buildings.

### 2.4 Technical analysis

The amount of daylight received in a room is calculated and expressed as a daylight factor. This calculated daylight factor is then compared with the BRE recommended room daylight factor to ensure sufficient daylight reception. Calculations were conducted in accordance with the BRE guidelines to determine the average day light factor in a number of selected rooms within the new development. These selected rooms are generally in (daylight) challenging locations typically based at the lowest (ground floor) levels given that these would receive the least amount of day light. Once the ground floor rooms achieve compliance all other rooms at higher levels with similar room/window configurations and parameters will also achieve compliance as the vertical daylight impact angle will improve increasing the daylight reception typically 0.3%-0.5% per floor level (3m).

### 2.5 Daylight reception in rooms within the new development conclusion

The calculation assessment has been segregated according to building type, these are;

- (I) Residential Apartment blocks: A, B1, B2 and C.
- (II) Residential Duplex blocks: A, B, C, D, E and F.
- (III) Residential Housing.

The BRE report recommends as a methodology for assessing sufficient daylight reception in a habitable room, that the calculated average daylight factor (ADF) of a habitable room to be in excess of the BRE bench marks of a kitchen at 2%, a living room at 1.5%, a bedroom at 1%, a living/kitchen/dining room at 2% and a living room/bedroom at 1.5%. Calculation findings are as follows; (see images in chapter 5 for receptor locations):

(I) Residential apartment blocks: A, B1, B2 and C.

From the calculation results presented in table 5.1 we note;

- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline or are equal to minimum guidelines.
- Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor typically 0.3%-0.5% per floor level.
- (II) Residential Duplex blocks: A, B, C, D, E and F.

From the calculation results presented in table 5.2 we note;

- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline or are equal to minimum guidelines.
- Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.

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- Level 02: All floors above the first floor dwellings are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

### (III) Residential housing

From the calculation results presented in table 5.3 we note;

- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 01: All floors above the ground floor level are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

Given the results and conclusions above we, DKP, deem the proposed project at Oldtown to be in compliance with the recommendations in the BRE design guidelines 'site layout and planning for daylight and sunlight - a guide to good practice'.

### 2.6 Mitigation measures/actions

No mitigation measures anticipated.

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## **3** Geographical overview

### 3.1 Project overview

Image 3.1 the (google) site map below indicates the location of the site approximately outlined.



Image 3.1 proposed development site outline

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### 4 Approach and methodology

### 4.1 General approach

This report covers the day light reception of habitable rooms within the new proposed development. The day light reception is expressed as the average day light factor (ADF) in the following rooms:

- Bed rooms within dwellings
- Living rooms/dining rooms
- Kitchens
- Any combination of the above

### 4.2 The nature and effects of day light and sun light

When assessing the effects of proposed building projects on the potential to cause issues relating to light, it is important to recognise the distinction between daylight and sunlight. Daylight is the combination of all direct and indirect sunlight during the daytime, whereas sunlight (for the purposes of this report) comprises only the direct elements of sunlight. For example, on a cloudy or overcast day diffused daylight still comes in through windows, even when sunlight is absent. Any development within a built-up area has the potential to alter the amount of daylight received by nearby residential properties.

Care should be taken when designing new buildings in built-up areas, especially when the proposed development is relatively tall or situated to the south of existing buildings, because in the northern hemisphere the majority of the sunlight comes from the south. In Ireland (and other northern hemisphere countries) south-facing facades will in general, receive the most sunlight, while the north facing facades will receive sunlight on only a handful of occasions, specifically early mornings and late evenings during the summer months. It is therefore important to ensure that new buildings to the south of any development do not cause over shadowing to existing dwellings and therefore reduce their capacity to receive sunlight.

#### 4.3 Assessment criteria

National Policy/building regulations:

The government does not have an adopted policy on daylight, sunlight and the effects of overshadowing, and does not have targets, criteria or relevant planning guidance in the way it has for other environmental impacts such as noise, landscape or air quality. However, there are a number of guidance documents which are relevant when considering daylight, sunlight and overshadowing in dwellings:

- The Building Research Establishment (BRE) report, "Site layout planning for daylight and sunlight a guide to good practice (referred to as the BRE Report).
   Although not Government guidance, this report is commonly referenced as the main guide in Ireland/UK in determining the minimum standards of daylight and sunlight and for determining the impact of a development.
- British European Standard BS EN17037 / EN17037 Day Lighting for buildings.
   BS EN17037/EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces some of the calculation procedures used in the BRE Report.
- CIBSE guide 10 Day light and lighting for buildings.
   CIBSE lighting guide 10, BS EN17037/EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces recommended day light levels for general buildings.

### 4.4 The BRE Report – "Site Layout and Planning for Daylight and Sunlight – A Guide to Good Practice"

The BRE report contains guidance on how to design developments whilst minimising the impacts on existing buildings from overshadowing and reduced levels of daylight and sunlight. The advice provided within the guide is not mandatory and should not be seen as an instrument of planning policy, its aim is to help rather than constrain the designer. Although it gives numerical guidance values these should be interpreted flexibly since natural lighting is one of many factors in site layout design. The guidance should be applied appropriately to developments to assist in gaining the best development possible without adverse impacts.

As well as advice the report contains a methodology to assess levels of daylight, sunlight and over shadowing and contains criteria to determine the potential impacts of a new development on surrounding buildings. Table 4.1 below details the BRE assessment criteria for daylight reception within the proposed development.

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Analysis	Description	Acceptable parameters
Daylight reception criterion	Average daylight factor (ADF)	Habitable rooms to have ADF factors between 1% and 2% pending room type
Table 4.1		

There are also recommendations with regards to minimum proposed glazed area in facades in relation to the available sky view component angle. BS EN17037/EN17037 gives guidance on the minimum glazed area with different virtual sky component angles to maintain sufficient daylight reception. Table 4.2 presents the minimum glazed areas fractions relative to the available sky view angle.

Room depth	VSC <=25°	VSC >=25° <=45°	VSC >=45° <=65°	VSC >=65°	Comments
1 to 8	20%	20% - 31%	31% - 35%	35% - 40%	
8 – 11	25%	25% - 40%	40% - 44%	44% - 50%	
11 – 14	30%	30% - 47%	47% - 53%	53% - 60%	
14 - 20	35%	35% - 54%	54% - 61%	61% - 70%	

Table 4.2

#### 4.5 ADF or Average day light factor

The average day light assessment is the amount of day light received by the habitable rooms in the proposed development only. Whereas there are no standards applied for day light factors there are recommendations published in the CIBSE guides and BRE documents in relation to the percentage and minimum area of the room/area to conform to same. Table 4.4 below represents recommended minimum day light factors.

Habitable room types		Minimum day light factor	Minimum floor area cover
Multi-residential buildings	Kitchen	2%	75%
Multi-residential buildings	Living rooms, dining rooms,	1.50%	70%
Multi-residential buildings	Bedrooms	1%	50%

Table 4.3

### 4.6 ADF or Average Daylight Factor calculation method

The average daylight factor provides a useful technique for assessing the daylight potential of interior spaces under standard overcast conditions. The average daylight factor *df* is defined as;

 $df = TAw q / [A (1-R^2)] \%$ 

where,

T is the diffuse visible transmittance of the glazing, including corrections for dirt on glass

Aw is the net glazed area of the window (m<sup>2</sup>)

A is the total area of the room surfaces: ceiling, floor, walls and windows (m<sup>2</sup>)

R is their average reflectance of the ceiling, walls and floor surfaces

q is the angle of visible sky in degrees (VSC)

#### 4.7 Project ADF calculation parameters

The following calculation parameters have been applied. For T (Em), the overall maintained light transmittance into the room we applied a conservative 0.66. Current triple glazed elements can now be supplied with light emittance in excess of 0.72 effecting/improving the final resultant ADF by a further 0.3% to 0.5%.

Glass light emittance	0.72
Glazing maintenance factor	8%
Maintained light emittance Em	0.66

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For R (Rf), the average reflectance of the walls, ceiling and floor we have used an overall average figure 0.61 representing a dark floor, medium dark walls and a light ceiling. R can also be significantly improved by implementing lighter colours on the walls and floor effecting/improving the ADF by 0.5% to 0.7%.

Ceiling	0.8	95%	Light
Walls	0.6	80%	Medium dark
Floor	0.4	70%	Dark
Combined Rf	0.61		

For q, the vertical sky component angle we use the combined calculated vertical sky component over the full visual horizontal plane from the relevant window/room point. i.e. at each obstacle in the general 180° horizontal view plane the vertical sky component is measured and combined to form the overall resultant VSC. The illustration 4.1 below shows the room analysed to be effected by 3 different vertical sky component angles A, B and C on its horizontal plane. The resultant VSC is a calculated combination of all three VSC angles.

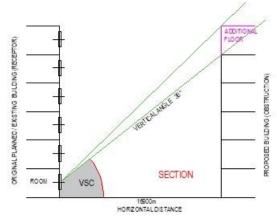
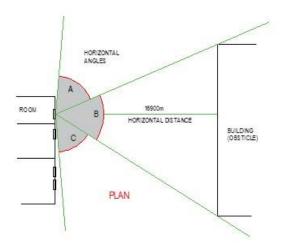


Image 4.1



### ■ 5 Basis of receptor selection of habitable rooms within the development and Calculation results

### 5.1 Basis of receptor (room) selection

The daylight reception assessment has been targeted to rooms which are perceived to receive less day light i.e. ground floor rooms / rooms facing close-by large obstacles. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms. A combined total of 185 room locations have been selected on the basis that these locations are more daylight challenging.

### 5.2 Assessment approach and colour indicators

The result tables provide the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

The assessment has been segregated according to building type, these are;

- (I) Residential Apartment blocks A, B1, B2 and C.
- (II) Residential Duplex blocks A, B, C, D, E and F.
- (III) Residential Housing.

Note: The ADF calculation results have been given the following colour code guide depending on its level of resulting compliance. The overall conclusion is presented at the end of the chapter.

### Compliance guide





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### 5.3 (I) Residential Apartment Blocks - receptors and ADF calculation results

**Receptors**: Images 5.1 to 5.8 indicate the locations of the rooms chosen from residential apartment blocks A, B1, B2 and C for the ADF analysis. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.



Image 5.1: Level 00 with selected rooms - Apartment block A



Image 5.2: Level 01 with selected rooms - Apartment block A



Image 5.3: Level 00 with selected rooms – Apartment block B1



Image 5.4: Level 01 with selected rooms - Apartment block B1



Image 5.5: Level 00 with selected rooms – Apartment block B2  $\,$ 



Image 5.6: Level 01 with selected rooms – Apartment block B2  $\,$ 



Image 5.7: Level 00 with selected rooms – Apartment block C



Image 5.8: Level 01 with selected rooms – Apartment block C

### ADF calculation results: Residential apartment blocks – A, B1, B2 and C.

The table below provides the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

⊱		Receptor		eptor	Hor S	Sec a	Hor S	ec b	Hor S	бес с	Hor S	Sec d		٦	glass		Room		Room	BRE
Receptor	. <u>*</u>	Unit ID	<u>—</u>		Hor	Vert	Hor	Vert	Hor	Vert	Hor	Vert	Hor I	VSC	area	w idth	depth	height	ADF	ADF
Rec	Block	U	Leve	Room / type	L°	L°	L.°	∟°	L°	L°	L°	L°	Σŀ	١٦	m2	m	m	m	%	%
1	block A	Apt 01	00	Living - Kitchen	83	6	28	23	37	15	32	10	180	33%	4.20	4.40	5.20	2.70	3.65	2.00
2	block A	Apt 01	00	Bed room	48	7	116	6	16	20			180	35%	2.00	3.60	3.10	2.70	3.04	1.00
3	block A	Apt 02	00	Living - Kitchen	28	80	22	7	120	6	10	17	180	30%	4.20	3.50	6.30	2.70	3.35	2.00
4	block A	Apt 22	00	Living - Kitchen	4	75	117	7	30	8	29	6	180	34%	4.20	4.80	6.40	2.70	3.03	2.00
5	block A	Apt 22	00	Bed room	13	80	48	7	119	7			180	33%	2.00	3.20	3.20	2.70	3.04	1.00
6	block A	Apt 05	01	Bed room	48	5	29	17	57	15	46	9	180	33%	2.00	3.60	3.60	2.70	2.62	1.00
7	block A	Apt 04	01	Living - Kitchen	49	9	42	37	67	16	22	6	180	30%	3.60	3.30	6.90	2.70	2.79	2.00
8	block A	Apt 04	01	Bed room	39	9	42	37	76	17	23	6	180	30%	2.00	3.10	3.70	2.70	2.58	1.00
9	block A	Apt 09	01	Bed room	29	8	38	37	87	18	26	6	180	30%	2.00	3.10	3.70	2.70	2.58	1.00
10	block A	Apt 09	01	Living - Kitchen	25	8	35	36	92	18	28	6	180	30%	4.00	3.30	6.90	2.70	3.07	2.00
11	block A	Apt 08	01	Bed room	53	74	91	17	20	6	16	70	180	22%	2.00	3.40	3.10	2.70	2.02	1.00
12	block A	Apt 26	01	Bed room	15	70	6	6	107	18	52	75	180	22%	2.00	3.40	3.10	2.70	1.98	1.00
13	block A	Apt 25	01	Living - Kitchen	14	6	22	14	97	18	47	6	180	32%	4.00	3.30	6.90	2.70	3.28	2.00
14	block A	Apt 30	01	Bed room	11	6	61	13	42	25	66	6	180	32%	2.00	3.10	3.70	2.70	2.79	1.00
15	block A	Apt 30	01	Living - Kitchen	11	6	49	13	43	25	77	6	180	33%	4.00	3.30	6.90	2.70	3.32	2.00
16	block B1	Apt 01	00	Living - Kitchen	45	75	76	18	37	5	22	13	180	26%	4.20	4.60	7.55	2.70	2.05	2.00
17	block B1	Apt 01	00	Bed room	42	6	76	18	30	5	32	14	180	33%	2.00	2.90	3.90	2.70	2.82	1.00
18	block B1	Apt 02	00	Living - Kitchen	45	75	59	18	33	6	43	16	180	26%	4.20	4.50	7.55	2.70	2.06	2.00
19	block B1	Apt 05	01	Living - Kitchen	10	11	108	6	43	18	19	75	180	31%	4.00	4.10	7.50	2.70	2.56	2.00
20	block B1	Apt 07	01	Bed room	73	6	57	25	30	11	20	15	180	32%	2.00	3.10	3.60	2.70	2.81	1.00
21	block B1	Apt 07	01	Living - Kitchen	63	6	59	25	29	12	29	75	180	28%	4.00	3.70	6.50	2.70	2.75	2.00
22	block B1	Apt 08	01	Bed room	45	6	56	25	51	11	28	20	180	31%	2.00	3.20	3.56	2.70	2.71	1.00
23	block B1	Apt 08	01	Living - Kitchen	21	75	68	25	57	11	34	23	180	27%	4.00	4.10	7.50	2.70	2.22	2.00
24	block B2	Apt 01	00	Living - Kitchen	44	75	25	6	111	19			180	25%	4.20	4.60	7.55	2.70	2.00	2.00
25	block B2	Apt 01	00	Bed room	35	6	117	19	28	7			180	32%	2.00	2.90	3.90	2.70	2.74	1.00
26	block B2	Apt 02	00	Living - Kitchen	44	75	14	6	113	19	9	8	180	25%	4.20	4.50	7.55	2.70	2.01	2.00
27	block B2	Apt 04	01	Living - Kitchen	25	70	109	15	41	6	5	10	180	29%	4.00	4.10	7.70	2.70	2.36	2.00
28	block B2	Apt 05	01	Living - Kitchen	33	39	117	6	5	8	25	70	180	29%	4.00	4.10	7.50	2.70	2.40	2.00
29	block B2	Apt 05	01	Bed room	27	38	122	6	31	8			180	33%	2.00	3.20	3.50	2.70	2.90	1.00
30	block B2	Apt 08	01	Bed room	13	15	118	6	49	16			180	34%	2.00	3.20	3.56	2.70	2.93	1.00
31	block B2	Apt 08	01	Living - Kitchen	17	70	108	6	55	17			180	31%	4.00	4.10	7.70	2.70	2.54	2.00
32	block C	Apt 01	00	Living - Kitchen	44	80	37	9	99	15			180	25%	4.20	3.30	7.00	2.70	2.68	2.00
33	block C	Apt 02	00	Bed room	124	15	56	9					180	32%	2.00	3.20	3.90	2.70	2.62	1.00
34	block C	Apt 03	00	Living - Kitchen	44	80	85	15	51	8			180	26%	4.20	4.30	7.55	2.70	2.15	2.00
35	block C	Apt 06	01	Living - Kitchen	24	9	51	23	26	7	79	6	180	33%	4.00	3.70	7.03	2.70	3.08	2.00
36	block C	Apt 06	01	Bed room	28	9	52	24	26	7	74	6	180	33%	2.00	3.10	3.60	2.70	2.88	1.00
37	block C	Apt 07	01	Bed room	36	10	65	33	8	7	71	6	180	31%	2.00	3.10	3.60	2.70	2.71	1.00
38	block C	Apt 07	01	Living - Kitchen	44	11	74	26	62	6			180	31%	4.00	3.70	7.03	2.70	2.92	2.00
39	block C	Apt 08	01	Bed room	57	9	92	15	12	6	19	19	180	32%	2.00	3.50	3.99	2.70	2.43	1.00

Table 5.1: Residential apartment blocks results

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### 5.4 (II) Residential Duplex Blocks – receptors and ADF calculation results

**Receptors**: Images 5.9 to 5.20 indicate the locations of the rooms chosen from residential duplex blocks A, B, C, D, E and F for the ADF analysis. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.



Image 5.9: Level 00 with selected rooms - Duplex block A



Image 5.10: Level 01 with selected rooms - Duplex block A



Image 5.11: Level 00 with selected rooms – Duplex block B



Image 5.12: Level 01 with selected rooms – Duplex block B



Image 5.13: Level 00 with selected rooms – Duplex block  $\ensuremath{\text{C}}$ 



Image 5.14: Level 01 with selected rooms – Duplex block C



Image 5.15: Level 00 with selected rooms – Duplex block D  $\,$ 



Image 5.16: Level 01 with selected rooms – Duplex block D



Image 5.17: Level 00 with selected rooms – Duplex block E



Image 5.18: Level 01 with selected rooms – Duplex block E



Image 5.19: Level 00 with selected rooms – Duplex block  ${\sf F}$ 

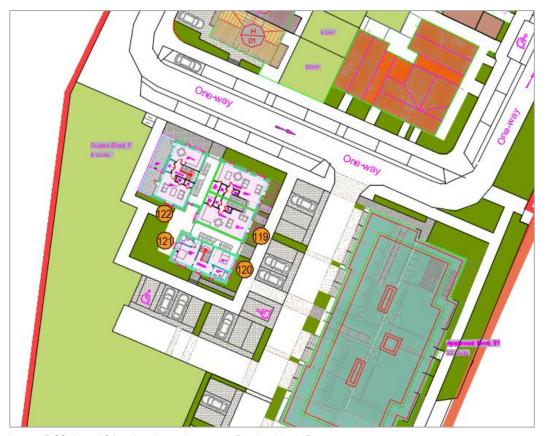


Image 5.20: Level 01 with selected rooms – Duplex block F

### ADF calculation results: Residential Duplex blocks - A, B, C, D, E and F

The table below provides the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

5	Receptor		Hor S	ec a	Hor S	ec b	Hor S	ес с	Hor S	Sec d			glass		Room		Room	BRE		
Receptor	×	Unit ID	<u>—</u>		Hor	Vert	Hor	Vert	Hor	Vert	Hor	Vert	Hor	VSC	area	width	depth	height	ADF	ADF
Rec	Block	U	Level	Room / type	L°	L°	L°	L°	L°	∟°	L°	∟°	$\stackrel{\sim}{\sim}$	Δ	m2	m	m	m	%	%
40	duplex A	Apt 02	00	Bed room	25	5	98	14	35	6	22	11	180	33%	2.00	3.30	3.96	2.70	2.61	1.00
41	duplex A	Apt 01	00	Living - Kitchen	28	5	104	14	27	6	21	11	180	33%	2.60	2.70	5.44	2.70	3.02	2.00
42	duplex A	Apt 01	00	Living	67	31	19	5	94	44			180	23%	3.60	4.70	3.60	2.70	2.71	1.50
43	duplex A	Apt 02	00	Bed room	62	31	14	5	13	44	91	80	180	15%	2.00	3.30	4.50	2.70	1.06	1.00
44	duplex A	Apt 04	00	Liv ing	18	23	12	5	80	31	70	62	180	21%	3.60	4.70	3.60	2.70	2.44	1.50
45	duplex A	Apt 06	00	Living	28	28	15	7	96	31	41	45	180	25%	4.00	5.90	3.80	2.70	2.59	1.50
46	duplex A	Apt 08	00	Bed room	77	80	9	25	13	6	81	28	180	18%	2.00	3.38	4.50	2.70	1.23	1.00
47	duplex A	Apt 09	00	Living	85	31	20	6	31	19	44	70	180	23%	4.00	4.70	3.60	2.70	2.98	1.50
48	duplex A	Apt 07	00	Bed room	62	7	75	17	22	9	21	19	180	32%	2.00	4.50	3.38	2.70	2.28	1.00
49	duplex A	Apt 06	00	Living - Kitchen	70	7	83	25	27	9			180	31%	2.60	2.70	4.20	2.70	3.48	2.00
50	duplex A	Apt 05	00	Living - Kitchen	59	7	87	28	34	9			180	30%	2.60	2.70	5.44	2.70	2.77	2.00
51	duplex A	Apt 04	00	Living - Kitchen	52	7	89	28	39	9			180	30%	2.60	2.70	5.44	2.70	2.76	2.00
52	duplex A	Apt 03	00	Bed room	42	6	79	28	43	9	16	11	180	31%	2.00	3.90	3.38	2.70	2.41	1.00
53	duplex A	Apt 01	01	Bed room	65	26	20	5	20	16	75	37	180	27%	2.00	4.70	2.83	2.70	2.02	1.00
54	duplex A	Apt 04	01	Bed room	68	52	80	26	13	5	19	18	180	24%	2.00	4.70	2.83	2.70	1.82	1.00
55	duplex A	Apt 06	01	Bed room	28	23	14	5	98	26	40	31	180	27%	2.00	3.75	2.80	2.70	2.49	1.00
56	duplex A	Apt 06	01	Bed room	25	22	15	5	98	26	42	32	180	27%	1.60	2.60	3.26	2.70	2.31	1.00
57	duplex A	Apt 09	01	Bed room	81	17	20	6	17	16	62	31	180	29%	2.00	4.70	2.83	2.70	2.23	1.00
58	duplex A	Apt 07	01	Living - Kitchen	18	21	19	6	70	10	73	6	180	34%	4.00	8.56	5.38	2.70	2.09	2.00
59	duplex A	Apt 04	01	Bed room	9	8	27	7	91	17	53	6	180	33%	2.00	3.70	3.95	2.70	2.39	1.00
60	duplex A	Apt 03	01	Living - Kitchen	44	5	80	17	42	8	14	8	180	33%	5.00	8.56	5.38	2.70	2.55	2.00
61	duplex A	Apt 02	01	Living - Kitchen	25	5	97	11	33	6	25	10	180	34%	4.00	5.38	8.56	2.70	2.09	2.00
62	duplex B	Apt 01	00	Living - Kitchen	9	10	43	6	88	7	40	7	180	35%	2.60	2.70	5.58	2.70	3.11	2.00
63	duplex B	Apt 01	00	Living	29	9	52	12	27	28	72	57	180	25%	3.60	4.70	3.60	2.70	2.87	1.50
64	duplex B	Apt 04	00	Living	73	56	45	18	20	6	42	14	180	25%	3.60	4.70	3.60	2.70	2.90	1.50
65	duplex B	Apt 04	00	Living - Kitchen	72	6	20	10	42	8	46	8	180	35%	2.60	2.70	5.44	2.70	3.16	2.00
66	duplex B	Apt 03	00	Bed room	78	6	20	10	38	8	44	8	180	35%	2.00	3.38	3.96	2.70	2.69	1.00
67	duplex B	Apt 02	00	Bed room	10	10	43	6	73	7	54	7	180	35%	2.00	3.38	3.96	2.70	2.70	1.00
68	duplex B	Apt 01	01	Bed room	29	7	52	10	27	25	72	52	180	26%	2.20	4.70	2.80	2.70	2.18	1.00
69	duplex B	Apt 04	01	Bed room	73	52	45	16	20	5	42	12	180	26%	2.20	4.70	2.80	2.70	2.19	1.00
70	duplex B	Apt 04	01	Bed room	72	5	20	8	42	7	46	7	180	35%	2.20	3.03	3.95	2.70	3.22	1.00
71	duplex B	Apt 03	01	Living - Kitchen	78	5	20	8	38	7	44	7	180	35%	4.00	5.38	8.64	2.70	2.14	2.00
72	duplex C	Apt 03	00	Bed room	76	6	23	10	59	7	22	8	180	35%	2.00	3.38	3.96	2.70	2.69	1.00
73	duplex C	Apt 04	00	Living - Kitchen	69	6	26	10	59	7	26	9	180	35%	2.40	2.70	5.44	2.70	2.92	2.00
74	duplex C	Apt 04	00	Living	48	56	37	15	55	13	40	38	180	25%	3.60	4.70	3.60	2.70	2.94	1.50
75	duplex C	Apt 01	00	Living	67	56	37	29	22	7	54	13	180	25%	3.60	4.70	3.60	2.70	2.88	1.50
76	duplex C	Apt 01	00	Living - Kitchen	11	10	56	7	105	6	8	10	180	35%	2.40	2.70	5.59	2.70	2.88	2.00
77	duplex C	Apt 03	01	Living - Kitchen	75	5	23	9	54	6	28	7	180	35%	4.00	5.38	8.64	2.70	2.15	2.00
78	duplex C	Apt 04	01	Bed room	48	50	37	13	55	11	40	36	180	26%	2.00	4.70	2.80	2.70	2.02	1.00
79	duplex C	Apt 01	01	Bed room	67	50	37	26	22	5	54	11	180	26%	2.00	4.70	2.80	2.70	2.01	1.00

Table continued on next page ▶

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	luplex D	•		Living - Kitchen	23	15	15	6	111	11	31	19	180	33%	2.40	2.70	5.40	2.70	2.75	2.00
	luplex D			Living	18	10	74	13	24	19	64	49	180	27%	3.60	4.70	3.60	2.70	3.14	1.50
	luplex D	•		Bed room	24	75	68	12	88	75			180	17%	2.00	3.38	4.50	2.70	1.15	1.00
83 d	luplex D	Apt 07	00	Living	64	73	23	12	79	11	14	68	180	22%	3.60	4.70	3.60	2.70	2.59	1.50
84 d	luplex D	Apt 06	00	Living	32	70	25	20	93	12	30	68	180	24%	3.60	5.61	3.80	2.70	2.38	1.50
85 d	luplex D	Apt 04	00	Living	17	60	47	11	48	20	68	75	180	20%	3.60	4.70	3.60	2.70	2.36	1.50
86 d	luplex D	Apt 02	00	Bed room	86	75	18	25	53	12	23	75	180	17%	2.00	3.38	4.50	2.70	1.14	1.00
87 d	luplex D	Apt 01	00	Living	67	65	26	24	57	9	30	11	180	24%	3.60	4.70	3.60	2.70	2.84	1.50
88 d	luplex D	Apt 01	00	Living - Kitchen	50	9	95	14	35	8			180	33%	2.40	2.70	5.40	2.70	2.79	2.00
89 d	luplex D	Apt 02	00	Bed room	43	8	98	14	39	9			180	33%	2.00	3.38	3.96	2.70	2.55	1.00
90 d	luplex D	Apt 03	00	Bed room	32	12	70	9	46	9	32	8	180	34%	2.00	4.50	3.38	2.70	2.39	1.00
91 d	luplex D	Apt 04	00	Living - Kitchen	28	11	71	9	47	9	34	8	180	34%	2.80	2.70	5.44	2.70	3.33	2.00
92 d	luplex D	Apt 06	00	Living - Kitchen	22	10	71	8	47	9	40	9	180	34%	2.80	2.80	4.29	2.70	3.94	2.00
93 d	luplex D	Apt 07	00	Living - Kitchen	27	8	54	8	64	10	35	9	180	34%	2.80	2.70	5.59	2.70	3.27	2.00
94 d	luplex D	Apt 08	00	Bed room	23	7	62	7	59	10	36	10	180	34%	2.00	3.96	3.38	2.70	2.65	1.00
95 d	luplex D	Apt 09	00	Bed room	21	15	13	6	118	11	28	19	180	33%	2.00	3.38	3.96	2.70	2.52	1.00
96 d	luplex D	Apt 10	01	Bed room	18	8	74	11	24	18	64	46	180	28%	2.00	4.70	2.83	2.70	2.12	1.00
97 d	luplex D	Apt 07	01	Bed room	64	65	23	11	79	9	14	61	180	24%	2.00	4.70	2.83	2.70	1.84	1.00
98 d	luplex D	Apt 04	01	Bed room	17	52	47	9	48	17	68	65	180	23%	2.00	4.70	2.83	2.70	1.74	1.00
99 d	luplex D	Apt 01	01	Bed room	67	60	26	21	57	8	30	9	180	26%	2.00	4.70	2.83	2.70	1.96	1.00
100 d	luplex D	Apt 02	01	Living - Kitchen	43	6	98	12	39	7			180	34%	4.00	5.30	8.56	2.70	2.10	2.00
101 d	luplex D	Apt 09	01	Living - Kitchen	21	13	13	5	118	8	28	16	180	34%	4.00	5.30	8.56	2.70	2.11	2.00
102 d	luplex E	Apt 04	00	Living - Kitchen	36	6	44	24	68	8	32	36	180	31%	2.80	2.70	5.44	2.70	3.03	2.00
103 d	luplex E	Apt 04	00	Living	48	55	45	17	15	5	72	20	180	26%	4.00	4.70	3.60	2.70	3.43	1.50
104 d	luplex E	Apt 03	00	Bed room	88	75	17	17	9	5	66	20	180	19%	2.00	3.38	4.50	2.70	1.31	1.00
105 d	luplex E	Apt 01	00	Living	67	58	87	20	9	5	17	19	180	24%	4.00	4.70	3.60	2.70	3.11	1.50
106 d	luplex E	Apt 01	00	Living - Kitchen	90	7	32	11	58	10			180	34%	2.80	2.70	5.59	2.70	3.28	2.00
107 d	luplex E	Apt 02	00	Bed room	75	7	34	11	71	10			180	34%	2.00	3.38	3.96	2.70	2.63	1.00
108 d	luplex E	Apt 03	00	Bed room	30	6	42	24	58	8	50	38	180	30%	2.00	3.38	3.96	2.70	2.28	1.00
109 d	luplex E	Apt 04	01	Bed room	38	4	45	17	52	32	45	7	180	31%	2.00	3.03	3.95	2.70	2.59	1.00
110 d	luplex E	Apt 04	01	Bed room	45	33	49	11	13	5	73	13	180	31%	2.00	4.70	2.80	2.70	2.36	1.00
111 d	luplex E	Apt 01	01	Bed room	19	13	9	5	86	13	66	49	180	27%	2.00	4.70	2.80	2.70	2.07	1.00
112 d	luplex E	Apt 03	01	Living - Kitchen	30	4	43	19	49	32	58	7	180	31%	4.80	5.38	8.64	2.70	2.27	2.00
113 d	luplex F	Apt 01	00	Bed room	67	66	50	5	63	6			180	26%	2.00	3.38	4.50	2.70	1.83	1.00
	luplex F			Bed room	47	6	53	22	46	14	34	8		32%	2.00	3.96	3.38	2.70	2.50	1.00
	luplex F			Bed room	56	18	94	38	30	18				26%	2.00	3.38	3.96	2.70		
	luplex F			Living - Kitchen	44	17	98	38	38	18				26%	4.00	2.70	5.44	2.70	3.61	2.00
	luplex F			Living	50	56	70	6	60	7				29%	4.00	4.70	3.60	2.70		
	luplex F			Bed room	88	75	69	7	23	75				18%	2.00	3.38	4.50	2.70		
	luplex F			Living - Kitchen	57	14	93	34	17	13	13	6		28%	4.80	5.38	8.64	2.70	2.05	
	luplex F			Bed room	43	13	99	34	24	14	14	7		28%	2.00	3.03	3.95	2.70		
	luplex F			Bed room	50	65	87	6	43	6				28%	2.00	4.70	2.80	2.70		
	luplex F			Living - Kitchen	67	65	62	6	51	6				26%	3.00	5.34	3.51	2.70		2.00
122 U	apion i	, thr o i	V.	Living Michell	01	50	JŁ	U	01	U			100	20/0	0.00	0.07	0.01	2.70	2.00	2.00

Table 5.2: Residential duplex blocks results

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### 5.5 (III) Residential Housing – receptors and ADF calculation results

**Receptors**: Images 5.21 to 5.25 indicate the locations of the rooms chosen from the residential houses for the ADF analysis. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.



Image 5.21: Level 00 with selected rooms – Residential Houses



Image 5.22: Level 00 with selected rooms – Residential Houses



Image 5.23: Level 00 with selected rooms – Residential Houses



Image 5.24: Level 00 with selected rooms – Residential Houses



Image 5.25: Level 00 with selected rooms – Residential Houses

### ADF calculation results: Residential Housing

The table below provides the full calculation results of the selected rooms including the overall calculated vertical sky component together with the 'to-be-achieved' BRE minimum daylight factor standards.

5		Receptor			Hor S	ec a	Hor S	ec b	b Hor Sec c		Hor S	Sec d			glass		Room		Room	BRE
Receptor	쑹	Unit ID	<del> </del>		Hor	Vert	Hor	Vert	Hor	Vert	Hor	Vert	Hor I	VSC	area	width	depth	height	ADF	ADF
Rec	Block	U	Level	Room / type	∟°	∟°	∟°	L°	L°	∟°	L°	∟°	Σ	Σ	m2	m	m	m	%	%
400 117	T I/	110	00	Linday Witches	10	70	71	20	co	0	20		100	200/	2 14	E E0	E 00	2.70	2.07	2.00
123 HT		116	00	Living - Kitchen	19	70	71	28	62	8	28	5	180	29%	3.14	5.50	5.00	2.70	2.07	2.00
124 HT		115	00	Living - Kitchen	16	5	111	29	21	7	32	5	180	29%	3.14	5.50	5.00	2.70	2.13	2.00
125 HT		114	00	Living - Kitchen	36	5 5	59 69	33 34	37	8	48 40	17	180	30%	3.14	5.10 5.10	4.45 4.45	2.70	2.51	2.00
126 HT		113	00	Living - Kitchen	51			17	20	8	40	17	180	30%	3.14	5.50		2.70	2.47	2.00
127 H		109	00	Living - Kitchen	51	12	103 118	17	34	5 7			180 180	32% 32%	3.14	5.50	5.10 5.10	2.70	2.28	2.00
128 HT		103	00	Living - Kitchen	28	6									3.14	5.40		2.70	2.28	
130 HT		100 97	00	Living - Kitchen	25 45	5 54	93 26	17 5	62 45	9 19	64	7	180 180	32% 29%	3.14	5.70	5.30 5.00	2.70	2.02	2.00
131 HT		96	00	Living - Kitchen	92	16	21	5	47	35	20	7	180	30%	3.14	5.80	3.80	2.70	2.51	2.00
132 HT		128	00	Living - Kitchen	22	7	93	17	65	27	20	1	180	30%	3.14	3.70	4.80	2.70	2.93	2.00
132 TT		128	00	Living - Kitchen	29	5	87	16	64	7			180	33%	3.14	3.70	4.50	2.70	3.44	2.00
134 HT		126	00	Living - Kitchen	54	5	103	16	23	7			180	33%	3.14	3.70	4.10	2.70	3.66	2.00
135 HT		120	00	Living - Kitchen	49	9	103	17	27	8			180	32%	3.14	5.80	4.10	2.70	2.40	2.00
136 HT		117	00	Living - Kitchen Living - Kitchen	22	25	99	19	59	8			180	31%	3.14	3.70	4.80	2.70	3.07	2.00
137 HT		116	00		68	61	30	7	82	17			180	25%	3.14	5.10	4.40	2.70	2.06	2.00
137 111 138 HT		137	00	Living - Kitchen	51	16	31	11	47	30	51	7	180	31%	3.14	5.10	4.40	2.70	2.72	2.00
139 HT		136	00	Living - Kitchen	96	20	54	13	30	7	31	1	180	31%	3.14	3.70	4.80	2.70	3.08	2.00
140 HT		130	00	Living - Kitchen	30	16	67	13	83	9			180	33%	3.14	5.80	4.50	2.70	2.46	2.00
140 HT		144	00	Living - Kitchen	40	10	97	18	43	10			180	32%	3.14	5.80	4.50	2.70	2.40	2.00
141 HT		140	00	Living - Kitchen	49	64	24	7	64	17	43	13	180	26%	3.14	5.10	4.90	2.70	2.05	2.00
142 111 143 HT		140	00	Living - Kitchen	69	4	43	21	48	11	20	9	180	33%	3.14	5.40	3.80	2.70	2.96	2.00
143 TT		151	00	Living - Kitchen	61	12	56	36	31	6	32	14	180	30%	3.14	5.80	3.70	2.70	2.55	2.00
144 111		147	00	Living - Kitchen	27	38	72	16	39	8	42	17	180	30%	3.14	5.60	3.90	2.70	2.57	2.00
145 HT		173	00	Living - Kitchen Living - Kitchen	27	33	61	17	12	7	80	14	180	31%	3.14	5.60	4.50	2.70	2.34	2.00
140 TT		167	00		34	8	81	17	65	15	00	14	180	32%	3.14	5.50	5.10	2.70	2.25	2.00
148 HT		163	00	Living - Kitchen	27	24	47	13	41	34	65	25	180	28%	3.14	5.50	4.20	2.70	2.27	2.00
149 HT		161	00	Living - Kitchen	64	10	24	6	92	33	03	23	180	29%	3.14	4.60	3.70	2.70	2.95	2.00
150 HT		160	00	Living - Kitchen	48	21	48	33	84	14			180	29%	3.14	5.80	3.70	2.70	2.48	2.00
151 HT		159	00	Living - Kitchen Living - Kitchen	63	53	41	10	41	35	35	12	180	25%	3.14	5.20	4.50	2.70	2.02	2.00
152 HT		158	00	Living - Kitchen	35	28	42	16	77	14	26	9	180		3.14	5.60	3.90	2.70	2.62	2.00
153 HT		152	00	Living - Kitchen	32	18	30	18	87	15	31	8		32%	3.14	5.60	3.90	2.70	2.67	2.00
154 HT		92	00	Living - Kitchen	37	15	37	9	51	34	55	13	180		3.14	5.60	4.90	2.70	2.17	2.00
155 HT		94	00	Living - Kitchen	37	12	44	24	59	20	40	8		31%	3.14	3.60	5.10	2.70	2.96	2.00
156 HT		90	00	Living - Kitchen	59	9	58	33	35	8	28	15		30%	3.14	5.80	3.70	2.70	2.60	2.00
157 HT		63	00	Living - Kitchen	38	10	55	19	87	9	20	13	180		3.14	5.90	4.00	2.70	2.61	2.00
158 HT		63	00	Living - Kitchen	55	13	50	37	75	16			180		3.14	5.80	4.00	2.70	2.35	2.00
159 HT		68	00		18	6	67	10	44	33	51	10	180		3.14	5.50	4.50	2.70	2.44	2.00
160 HT		70	00	Living - Kitchen Living - Kitchen	49	29	38	9	53	38	40	11		28%	3.14	5.60	4.50	2.70	2.44	2.00
161 HT		71	00	Living - Kitchen	25	8	89	17	66	21	40	- 11		31%	3.14	5.60	4.80	2.70	2.14	2.00
162 HT		59	00	Living - Kitchen	78	6	75	10	27	8				34%	3.14	5.80	4.80	2.70	2.46	2.00
163 HT		57	00	Living - Kitchen	44	10	89	19	47	12				31%	3.14	3.70	4.50	2.70	3.27	2.00
164 HT		77	00	Living - Kitchen	59	13	93	16	28	8			180		3.14	5.80	4.80	2.70	2.28	2.00
165 HT		79	00	Living - Kitchen	67	22	69	36	44	17			180		3.14	4.30	4.70	2.70	2.42	2.00
166 HT			00		22	34	22	8	47		20	12			3.14	4.70	4.70	2.70		2.00
100 円	IJ	80	UU	Living - Kitchen	22	34	22	0	41	30	89	12	100	30%	J. 14	4.70	4.30	2.70	2.70	2.00

Table continued on next page ▶

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167 HT F	51	00	Living - Kitchen	46	21	47	7	47	25	40	9	180	31%	3.14	5.80	4.00	2.70	2.53	2.00
168 HT D	50	00	Living - Kitchen	43	7	51	15	86	26			180	30%	3.14	5.50	5.50	2.70	2.03	2.00
169 HT T	47	00	Living - Kitchen	62	15	64	16	54	10			180	32%	3.14	5.50	4.90	2.70	2.34	2.00
170 HT D	42	00	Living - Kitchen	39	16	63	8	23	11	55	51	180	28%	3.14	5.60	4.90	2.70	2.04	2.00
171 HT B	40	00	Living - Kitchen	48	8	41	10	67	10	24	19	180	33%	3.14	5.60	5.00	2.70	2.37	2.00
172 HT H	37	00	Living - Kitchen	70	8	60	30	30	9	20	12	180	31%	3.14	5.80	4.70	2.70	2.25	2.00
173 HT G	36	00	Living - Kitchen	38	18	30	16	85	14	27	11	180	32%	3.14	5.80	4.60	2.70	2.32	2.00
174 HT G	31	00	Living - Kitchen	21	8	24	10	83	15	52	20	180	32%	3.14	5.80	4.60	2.70	2.32	2.00
175 HT B	18	00	Living - Kitchen	75	11	52	26	53	11			180	31%	3.14	5.20	5.10	2.70	2.32	2.00
176 HT C	20	00	Living - Kitchen	78	21	26	16	76	13			180	31%	3.14	5.60	3.90	2.70	2.60	2.00
177 HT D	14	00	Living - Kitchen	64	32	62	12	30	17	24	7	180	30%	3.14	5.60	4.50	2.70	2.28	2.00
178 HT N1	13	00	Living - Kitchen	39	9	62	37	31	10	48	13	180	29%	3.14	5.50	4.50	2.70	2.29	2.00
179 HT C	10	00	Living - Kitchen	65	13	27	15	88	13			180	32%	3.14	5.60	3.90	2.70	2.73	2.00
180 HT Ec	29	00	Living - Kitchen	50	12	52	30	78	12			180	31%	3.14	5.90	4.50	2.70	2.25	2.00
181 HT B	8	00	Living - Kitchen	61	11	63	26	38	17	18	9	180	31%	3.14	5.20	5.10	2.70	2.26	2.00
182 HT B	4	00	Living - Kitchen	17	7	57	14	74	37	32	14	180	28%	3.14	5.20	5.10	2.70	2.09	2.00
183 HT B	3	00	Living - Kitchen	14	7	58	14	67	43	41	18	180	27%	3.14	5.20	5.10	2.70	2.02	2.00
184 HT B	2	00	Living - Kitchen	19	7	46	12	66	43	49	19	180	28%	3.14	5.20	5.10	2.70	2.03	2.00
185 HT H	1	00	Living - Kitchen	30	10	52	43	73	22	25	24	180	27%	3.14	5.90	4.30	2.70	2.03	2.00

Table 5.3: Residential houses results

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#### 5.6 Daylight reception in buildings within the new development conclusion

The calculation assessment has been segregated according to building type, these are;

- (I) Residential Apartment blocks: A, B1, B2 and C.
- (II) Residential Duplex blocks: A, B, C, D, E and F.
- (III) Residential Housing.

The BRE report recommends as a methodology for assessing sufficient daylight reception in a habitable room, that the calculated average daylight factor (ADF) of a habitable room to be in excess of the BRE bench marks of a kitchen at 2%, a living room at 1.5%, a bedroom at 1% and a living room/bedroom at 1.5%. Calculation findings are as follows; (see images in chapter 5 for receptor locations):

### (I) Residential apartment blocks: A, B1, B2 and C.

From the calculation results presented in table 5.1 we note;

- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline or are equal to minimum guidelines.
- Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 02: All floors above the first floor apartments are further deemed compliant as they naturally would have an
  improved vertical daylight impact angle thus increasing the daylight reception factor typically 0.3%-0.5% per floor
  level.

#### (II) Residential Duplex blocks: A, B, C, D, E and F.

From the calculation results presented in table 5.2 we note;

- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline or are equal to minimum guidelines.
- Level 01: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 02: All floors above the first floor dwellings are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

### (III) Residential housing

From the calculation results presented in table 5.3 we note;

- Level 00: All selected habitable rooms have achieved an ADF in excess of the recommended BRE guideline.
- Level 01: All floors above the ground floor level are further deemed compliant as they naturally would have an improved vertical daylight impact angle thus increasing the daylight reception factor.

Given the results and conclusions above we, DKP, deem the proposed project at Oldtown to be in compliance with the recommendations in the BRE design guidelines 'site layout and planning for daylight and sunlight - a guide to good practice'.

No mitigation measures required.

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# Effect on Daylight Reception Analysis Report

EFFECT ON DAYLIGHT RECEPTION IN EXISTING NEIGHBOURING BUILDINGS

# Phase 5 - Development at Oldtown

Proposed Residential Development

Oldtown, Swords, Co. Dublin

Gerard Gannon Properties

**DKP-N14-5025 | 1P** 2022-03-22

### Document control

DKP project no: N14 DKP document no: 5025 Project file no: DKP-N14-5025

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Clients Architects Planning consultant	Gerard Gannon Properties Conroy Crowe Kelly Architects Downey Planning		<ul><li>✓</li><li>✓</li><li>✓</li></ul>	ସ ସ ସ

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- # Draft
- G General/Information
- P Planning
- S Scheme/concept
- D Design
- T Tender
- C Construction
- A As-build/constructed

Issue	Prepared	Checked	Approved
1P#	201	208	208
1P	201	208	208

ING Gerard (Craig) van Deventer CEng., BE(mech)., HDip CIOB, MCIBSE

M: [00] 353 (0)87 260 8080 E: gerard@dkpartnership.com

DKPartnership

70 Main Street, Applewood , Swords, Co. Dublin, Ireland

Reen Kenmare Co. Kerry

post@dkpartnership.com www.dkpartnership.com

T: [00] 353 (0) 1813 1930 T: [00] 353 (0)64664 1686

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### 1 Introduction

### 1.1 Report purpose

This report gives information on the level of achieved daylight reception in habitable rooms in existing neighbouring buildings before and after the introduction of the new development.

#### 1.2 Instruction

DKPartnership (DKP) have been commissioned by Gerard Gannon Properties, to carry out the analysis and report for the proposed development at Oldtown, Swords, Co. Dublin.

### 1.3 Brief development description

'A proposed Strategic Housing Development consisting of the removal of the temporary site office/site compound structures on site and the construction of 377 no. residential units comprising of duplexes, apartments and houses, all with associated car parking; a childcare facility with associated car parking; landscaping including play equipment; boundary treatments; public lighting; and all associated engineering and site works necessary to facilitate the development including proposed vehicular accesses onto Miller's Avenue, and a proposed stormwater storage tank (with proposed vehicular/service access onto Balheary Road) and overflow outfall gravity sewer to the Broadmeadow River with associated manholes on lands locally known as the Celestica/Motorola site, junction of Glen Ellan Road and Balheary Road, and at/on Balheary Road.'

#### 1.4 Statutory requirement

There are no particular building regulations in relation day light/shadow effect standards other than recommendations outlined or referred to in the CIBSE lighting guide 10, BS EN17037/EN17037 and the BRE document" Site layout planning for daylight and sun light". The aforementioned documents do refer to a" right to a sky view" relating to existing buildings facing a new adjacent development in so far that it compares an existing sky view with the sky view when the new development is constructed. The difference, if any, must be within a certain acceptable threshold.

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# **2** Executive summary

#### 2.1 Analysis conducted

This report details the achieved calculated daylight reception in selected rooms in neighbouring buildings before and after the introduction of the new proposed development and compares these for compliance with the recommendations of the relevant guidelines and standards.

#### 2.2 Daylight reception and building orientation

Day light reception under the BRE, CIBSE and BS 8206 is calculated using the room area of the glazed element, the room depth/height ratio, the room light reflection capability and the amount of direct or blocked/partially blocked daylight it receives. i.e. building orientation is not relevant to day light reception or daylight reception calculations. In other words day light factor analysis is equal to all orientations. This note is for clarity as day light is often confused with sunlight or sunlight energy which is effected by orientation.

#### 2.3 Guidelines and standards applied

For this report we applied the recommendations and guideline of the following:

- The Building Research Establishment (BRE) report, "Site layout planning for daylight and sunlight a guide to good practice (referred to as the BRE Report).
- European/British Standard EN17037/BS EN17037 Lighting for buildings code of practice for day lighting.
   EN17037/BS EN17037 contains guidance on the minimum recommended levels of interior day lighting.
- CIBSE guide 10 Day light and lighting for buildings.

#### 2.4 Technical analysis

Initially the daylight reception is assessed using the vertical sky component factor and where this is marginally in excess of the maximum allowable change under the BRE recommendations the daylight reception is calculated using the more in-depth daylight factor calculation analysis. The calculated daylight factor is then compared with the BRE recommended room daylight factor to ensure sufficient daylight reception. In basic terms the change in sky views/day light reception between the original and current proposed should not be more than 0.8 its previous value unless other measures (increased glazed areas) have been taken to maintain sufficient day light reception.

#### 2.5 Daylight reception in neighbouring habitable rooms/buildings conclusion

The BRE Report suggests a VSC of 27% or more should be achieved if a room is to have adequate daylight. It also recommends that the effects of a new development on daylight reception should not affect any existing VSC by more than 20% or have a maximum change factor in excess of 0.8. From the calculation results we note all selected neighbouring habitable receptors are effected to some degree with regards to daylight reception due to the introduction of the proposed development in their respective habitable rooms facing the proposed development. The calculated change in daylight reception in all of the analysed neighbouring receptors achieved a change factor ranging from 0.82 to 0.94 which are all above the maximum change factor of 0.80. Summarized result findings are as follows (see images 5.1-5.5 for receptor locations):

- South neighbouring receptors (Rathbeal cottages): Receptors 1 to 3 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.93-0.94. These receptors resulted in a change of daylight reception, all of which are comfortably within the BRE guidelines.
- Phase 2C neighbouring receptors: Receptors 4 to 15 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.84-0.91. These receptors resulted in a change of daylight reception, all of which are well within the guidelines.
- Phase 2B neighbouring receptors: Receptors 16 to 33 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.90-0.93. These receptors resulted in a change of daylight reception, all of which are comfortably within the guidelines.
- Phase 2A neighbouring receptors: Receptors 34 to 38 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.90-0.94. These receptors resulted in a change of daylight reception, all of which are comfortably within the guidelines also.

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- Phase 4D neighbouring receptors: Receptors 39 to 43 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.82-0.93. These receptors resulted in a change of daylight reception, all of which are within the guidelines.

We conclude that the new proposed development's effect on daylight reception in the neighbouring rooms are all within the constraints and recommendations of the BRE Report 'site layout and planning for daylight and sunlight' and we therefore deem the new development to be compliant with this element.

#### 2.6 Mitigation measures/actions

No mitigation measures anticipated.

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# **3** Geographical overview

#### 3.1 Project overview

Image 3.1 the (google maps) site map below indicates the location of the site, approximately outlined.



Image 3.1 proposed development site area outline

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# **4** Approach and methodology

#### 4.1 General approach

This report covers the day light reception in habitable rooms in existing neighbouring buildings. The day light reception is applied as the vertical sky component (angle) but where found to be marginally in excess of the maximum allowable change a second more in depth analysis in the form of an average day light factor calculation is conducted to ensure sufficient levels of daylight is being received.

#### 4.2 The nature and effects of day light and sun light

When assessing the effects of proposed building projects on the potential to cause issues relating to light, it is important to recognise the distinction between daylight and sunlight. Daylight is the combination of all direct and indirect sunlight during the daytime, whereas sunlight (for the purposes of this report) comprises only the direct elements of sunlight. For example, on a cloudy or overcast day diffused daylight still comes in through windows, even when sunlight is absent. Any development within a built-up area has the potential to alter the amount of daylight and direct sun received by nearby residential properties.

Care should be taken when designing new buildings in built-up areas, especially when the proposed development is relatively tall or situated to the south of existing buildings, because in the northern hemisphere the majority of the sunlight comes from the south. In Ireland (and other northern hemisphere countries) south-facing facades will in general, receive the most sunlight, while the north facing facades will receive sunlight on only a handful of occasions, specifically early mornings and late evenings during the summer months. It is therefore important to ensure that new buildings to the south of any development do not cause over shadowing to existing dwellings and therefore reduce their capacity to receive sunlight.

#### 4.3 Assessment criteria

National Policy/building regulations: The government does not have an adopted policy on daylight, sunlight and the effects of overshadowing, and does not have targets, criteria or relevant planning guidance in the way it has for other environmental impacts such as noise, landscape or air quality. However, there are a number of guidance documents which are relevant when considering daylight, sunlight and overshadowing in dwellings:

- The Building Research Establishment (BRE) report, "Site layout planning for daylight and sunlight a guide to good practice (referred to as the BRE Report).
   Although not Government guidance, this report is commonly referenced as the main guide in Ireland/UK in determining the minimum standards of daylight and sunlight and for determining the impact of a development.
- European / British standard EN17037 / BS EN17037 Lighting for buildings: Code of practice for day lighting.
   EN17037/BS EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces some of the calculation procedures used in the BRE Report.
- CIBSE guide 10 Day light and lighting for buildings.
   CIBSE lighting guide 10, like BS EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces recommended day light levels for general buildings.

#### 4.4 The BRE Report - "Site Layout and Planning for Daylight and Sunlight - A Guide to Good Practice"

The BRE report contains guidance on how to design developments, whilst minimising the impacts on existing buildings from overshadowing and reduced levels of daylight and sunlight. The advice provided within the guide is not mandatory and should not be seen as an instrument of planning policy, its aim is to help rather than constrain the designer. Although it gives numerical guidance values, these should be interpreted with flexibility since natural lighting is one of many factors in site layout design. The guidance should be applied appropriately to developments to assist in gaining the best development possible without adverse impacts. As well as advice the report contains a methodology to assess levels of daylight, sunlight and over shadowing and contains criteria to determine the potential impacts of a new development on surrounding buildings. The table below summarises the criteria used to assess the daylight reception in properties.

#### 4.5 Day light reception analysis, Sky view component

The day light assessment is the effects the proposed development has on adjoining existing buildings. The assessment of daylight is required for windows serving rooms in adjoining dwellings where daylight is required including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be assessed.

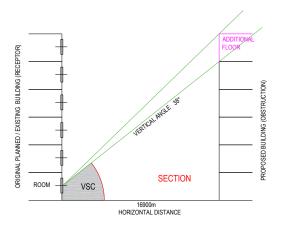
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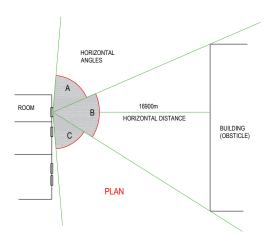


The guidelines also apply to any room that may have a reasonable expectation of daylight, including schools, hospitals, hotels and some offices. When assessing daylight, the numerical criteria must be viewed with flexibility and should be considered against other site layout constraints. In addition, it is important to consider whether the existing building is itself a good neighbour, standing a reasonable distance from the boundary and not taking more than its fair share of light.

The assessment takes on several specific stages:

- The distance test: loss of light to windows need not be analysed if the distance from the existing window to the development is three or more times its height above the centre of the existing window;
- The 25° rule: loss of light to windows need not be analysed if the angle to the horizontal subtended by the new development from the centre of the existing window is less than 25° (an angle of 25° equates to a VSC of 27%).
- Daylight assessment: diffuse daylight of an existing building may be adversely affected by a proposed development if either: the vertical sky component measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value; or the area of the working plane which can receive direct skylight is reduced to less than 0.8 times its former value.





#### 4.6 Criteria for daylight reception effects on neighbouring receptors

Table 4.1 details the BRE assessment criteria for daylight reception.

Analysis	Description	Acceptable parameters
Daylight reception criterion	Existing daylight incoming angle	Existing angles should not be effected more then 0.8 time its former value or a maximum loss of 20%.

Table 4.1

If the vertical sky component angles are beyond the maximum allowable change factor a further analysis can be conducted to establish the effects on daylight reception more accurately. The average day light factor can be applied to calculate the amount of day light received before and after the introduction of the new proposed development however this requires more accurate data on the room effected by the relevant window/receptor.

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# 5 Receptor selection and calculation results

#### 5.1 Basis of receptor (room/window) selection

The VSC assessment has been targeted to neighbouring windows / rooms / dwellings in phase 2A, 2B, 2C, south of the development (Rathbeal cottages) and north east of the development (Phase 4D, Meadowbank houses) that are perceived to be in challenging locations i.e. basement rooms, ground floor rooms and dwellings/rooms in the near vicinity of the new proposed development on the basis that if these rooms pass the minimum requirements all rooms at higher levels will definitely pass the minimum recommendations as a result of the improving vertical sky view angle. Selected neighbouring buildings are listed below in table 5.1 and also shown in image 5.1 to 5.5.



Image 5.1 Neighbouring receptors (1 to 43), overall site image

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Image 5.2 Neighbouring receptors (1 to 15)



Image 5.3 Neighbouring receptors (16 to 27)



Image 5.4 Neighbouring receptors (28 to 38)



Image 5.5 Neighbouring receptors (39 to 43)

Receptor no.	Unit no. / address	Description	Level description
1	11 Rathbeale Cottages, Oldtown, Swords, Co. Dublin	Residential	GF living space
2	12 Rathbeale Cottages, Oldtown, Swords, Co. Dublin	Residential	GF living space
3	12 Rathbeale Cottages, Oldtown, Swords, Co. Dublin	Residential	GF living space
4	Phase 2C – house no. 30	Residential	GF living space
5	Phase 2C – house no. 31	Residential	GF living space
6	Phase 2C – house no. 32	Residential	GF living space
7	Phase 2C – house no. 33	Residential	GF living space
8	Phase 2C – house no. 34	Residential	GF living space
9	Phase 2C – house no. 35	Residential	GF living space
10	Phase 2C – house no. 36	Residential	GF living space
11	Phase 2C – house no. 37	Residential	GF living space
12	Phase 2C – house no. 38	Residential	GF living space
13	Phase 2C – house no. 39	Residential	GF living space
14	Phase 2C – house no. 40	Residential	GF living space
15	Phase 2C – house no. 41	Residential	GF living space
16	Phase 2B - Block A apartment	Residential	GF living space
17	Phase 2B - Block A apartment	Residential	GF living space
18	Phase 2B - Block A apartment	Residential	GF living space
19	Phase 2B - Block A apartment	Residential	GF living space
20	Phase 2B - House no. 102	Residential	GF living space
21	Phase 2B - House no. 102	Residential	GF living space
22	Phase 2B - House no. 99	Residential	GF living space
23	Phase 2B - House no. 99	Residential	GF living space
24	Phase 2B - House no. 100	Residential	GF living space
25	Phase 2B - House no. 101	Residential	GF living space
26	Phase 2B - House no. 61	Residential	GF living space
27	Phase 2B - House no. 61	Residential	GF living space
28	Phase 2B - House no. 50	Residential	GF living space
29	Phase 2B - House no. 50	Residential	GF living space
30	Phase 2B - House no. 51	Residential	GF living space
31	Phase 2B - House no. 51	Residential	GF living space
32	Phase 2B - House no. 53	Residential	GF living space
33	Phase 2B - House no. 53	Residential	GF living space
34	Phase 2A - House no. 25	Residential	GF living space
35	Phase 2A - House no. 26	Residential	GF living space
36	Phase 2A - House no. 28	Residential	GF living space
37	Phase 2A - House no. 30	Residential	GF living space
38	Phase 2A - House no. 01	Residential	GF living space
39	Phase 4D - Meadowbank Houses	Residential	GF living space
40	Phase 4D - Meadowbank Houses	Residential	GF living space
41	Phase 4D - Meadowbank Houses	Residential	GF living space
42	Phase 4D - Meadowbank Houses	Residential	GF living space
43	Phase 4D - Meadowbank Houses	Residential	GF living space

Table 5.1: List of selected neighbouring receptors

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#### 5.2 Vertical sky component (VSC)

The VSC has been calculated for potentially affected windows within the neighbouring /adjacent properties. When undertaking a daylight assessment, the BRE Report suggests a VSC of 27% or more should be achieved if a room is to have adequate daylight. This level need not be applied to rooms which do not require high levels of natural light such as garages, storage rooms, etc. It also recommends that the effects of a new development on daylight reception should not affect any existing VSC by more than 20% or have a maximum change factor in excess of 0.8. The tables below provide the full calculation results of selected neighbouring locations including the overall calculated vertical sky component before and after the introduction of the new development. Note: The VSC calculation results have been given the following colour code guide depending on its level of resulting compliance.

# Compliance guide 0% Over /equal to 5% Within 10% Within 10% In excess of

#### 5.3 VSC calculation results

DAYLIGHT RECEPTION ANA	ALYSIS
4	I EVIOTINO II NEW
1	EXISTING   NEW   Section 1   Section 2   Section 3   Section 4   E   S   S   Section 1   Section 2   Section 3   Section 4   E   S   S   S   S   S   S   S   S   S
VSC test distance 35 m	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Target distance 41m	Hor° Ver°   Hor°
window GF-living	30 10 122 4 100 35% 30 10 40 20 110 4 100 35% 0.54
2	EXISTING NEW
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화 Section 4 중 영화 Section 1 Section 2 Section 3 Section 4 중 영화 Section 4 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중
Target distance 39m	Hor's Ver's Hor's
window GF-living	69 10 111 4 180 35% 39 10 45 28 96 4 180 33% 0.94
3	EXISTING NEW
VSC test distanc∈ 35 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   $\frac{1}{5}$
Target distance 28m	Hor° Ver° Hor° V
window GF-living	78     10     102     4       180     35%     48     10     53     28     79     4     180     32%       0.93
	1
4	EXISTING NEW
VSC test distanc∈ 35 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{1}{2}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$
Target distance 30m	Hor° Ver°   Hor° Ver°   Hor° Ver°   Hor° Ver°   Mor° Ver°   Hor°
window GF-living	78 4 102 3 180 36% 78 4 31 24 55 18 16 4 180 33% 0.91
5	EXISTING NEW
VSC test distanc∈ 35 m	
Target distance 30m	Section 1 Section 2 Section 3 Section 4 Section 1 Section 2 Section 3 Section 4 Section 4 Section 1 Section 2 Section 3 Section 4 Section 4 Section 2 Section 3 Section 4 Section 4 Section 4 Section 4 Section 4 Section 5 Section 6 Section 6 Section 7 Section 7 Section 7 Section 8 Section 8 Section 8 Section 8 Section 8 Section 8 Section 9 Sectio
window GF-living	76 4 104 3 180 36% 70 4 30 24 63 18 17 4 180 32% 0.90
Thindon of armig	
6	EXISTING NEW
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화 Section 4 중 영화 Section 1 Section 2 Section 3 Section 4 중 영화 Section 4 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중 중
Target distance 30m	Hor's Ver's Hor's
window GF-living	74     4     106     3       180     36%     57     4     31     24     74     19     18     4     180     32%       0.89
7	EXISTING NEW
VSC test distanc∈ 35 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{1}{2}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$
Target distance 32m	Hor° Ver°   Hor°
window GF-living	73 4 105 3 178 36% 51 4 30 22 80 22 19 4 180 31% 0.86
0	I SVIOTING II NEW
8	EXISTING NEW
VSC test distance 35 m	Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 4 $\frac{1}{5}$ Section 4 $\frac{1}{5}$ Section 5 Section 6 Section 6 Section 6 Section 6 Section 7 Section 7 Section 7 Section 8 Section 8 Section 8 Section 9 Sectio
Target distance 30m	Hor° Ver°   Hor°
window GF-living	71 4 109 3 180 36% 41 4 31 22 87 22 21 4 180 31% 0.86

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9	EXISTING
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 Section 1 Section 2 Section 3 Section 4 Section 1 Section 2 Section 3 Section 4 Sectio
Target distance 30m	Hor° Ver°   Hor° Ver°   Hor° Ver°   Hor° Ver°   W   W   Hor° Ver°   Hor° Ver°   Hor° Ver°   Hor° Ver°   Hor° Ver°   W   W   change
window GF-living	69 3 111 3 180 36% 37 4 29 21 91 22 23 4 180 31% 0.85
10	EXISTING NEW
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 Section 1 Section 2 Section 3 Section 4 Section 1 Section 2 Section 3 Section 4 Sectio
Target distance 30m	
window GF-living	65 3 115 3 180 36% 28 3 22 16 102 23 28 5 180 31% 0.84
11	EXISTING NEW
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화
Target distance 30m	Hor° Ver°   Hor°
window GF-living	64 3 116 3 180 36% 26 3 19 16 105 23 30 5 180 31% 0.84
12	EXISTING NEW
VSC test distance 35 m	Section 1 Section 2 Section 3 Section 4 호 Section 1 Section 2 Section 3 Section 4 호 Section 4 당 Section 1 Section 2 Section 3 Section 4 당 Section 4 t
Target distance 30m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 8   Section 9   Sect
window GF-living	62 3 118 3 180 36% 23 3 14 15 108 23 35 6 180 31% 0.84
13	I EXISTING II NEW I
VSC test distanc∈ 35 m	
Target distance 30m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Sect
window GF-living	61 3 119 3 180 36% 31 3 12 13 107 23 30 7 180 31% 0.84
14	EXISTING   NEW
VSC test distance 35 m	
Target distance 30m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 8   Section 9   Sect
window GF-living	59 3 121 3 180 36% 20 3 10 12 106 23 44 8 180 31% <b>0.84</b>
William Of William	100 00 10 12 100 20 11 0 100 0170
15	EXISTING NEW
VSC test distanc∈ 35 m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 8   Section 9   Sect
Target distance 30m	· · · · · · · · · · · · · · · · · · ·
window GF-living	58 3 122 3 180 36% 19 3 9 11 100 23 52 8 180 31% 0.85
16	EXISTING NEW
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 3 Section 4 $\frac{1}{5}$ Section 4 $\frac{1}{5}$ Section 5 Section 6 Section 6 Section 7 Section 7 Section 8 Section 8 Section 9 Sectio
Target distance 38m	Hor° Ver°   Hor°
window GF-living	120 4 26 3 34 4 180 36% 30 5 51 23 68 12 31 6 180 32% 0.90
17	EXISTING
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4 호 및 Section 1 Section 2 Section 3 Section 4 호 및 Section 1 Section 2 Section 3 Section 4 호 및 Section 4 및 모든 Section 2 Section 3 Section 4 및 모든 Section 4 및 모든 Section 3 Section 4 및 모든 Section
Target distance 39m	Hor° Ver°   Hor°
window GF-living	118 4 27 3 35 4 180 36% 27 5 46 23 71 12 36 6 180 32% 0.90
18	EXISTING NEW
VSC test distanc∈ 35 m	Section 1 Section 2 Section 3 Section 4  Section 1 Section 2 Section 3 Section 4 Section 1 Section 2 Section 3 Section 4 Secti
Target distance 38m	
window GF-living	117     4     26     3     37     4     180     36%     26     5     43     23     74     13     37     6     180     32%     0.90
19	EXISTING NEW
VSC test distance 35 m	Section 1 Section 2 Section 3 Section 4 호 Section 1 Section 2 Section 3 Section 4 호 Section 4 S
Target distance 37m	Hor° Ver° Hor° V
window GF-living	119     4     25     3     36     4     180     36%     23     5     38     23     80     13     39     6     180     32%     0.90
20	EXISTING NEW
VSC test distanc∈ 35 m	
Target distance 36m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 8   Section 9   Sect
window GF-living	79 4 35 3 66 4 180 36% 18 5 25 14 73 16 64 6 180 33% <b>0.91</b>
21	EXISTING NEW
VSC test distanc∈ 35 m	
Target distance 36m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Sect
window GF-living	72 4 34 3 74 4 180 36% 16 5 23 14 67 16 74 7 180 33% <b>0.91</b>

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22 VSC test distanc∈ 35 m Target distance 39m	EXISTING  Section 1   Section 2   Section 3   Section 4   $\frac{1}{9}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{9}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{9}$   Section 4   Hore Vere Hore
window GF-living	110 4 14 3 56 3 180 36% 30 5 40 13 80 10 30 8 180 34% 0.93
23	EXISTING NEW
VSC test distanc∈ 35 m  Target distance 38m	Section 1 Section 2 Section 3 Section 4  Section 1 Section 2 Section 3 Section 4  Section 1 Section 2 Section 3 Section 4  Section 4 Sec
window GF-living	118 4 18 3 44 3 180 36% 28 5 36 13 80 10 36 8 180 34% 0.93
24	EXISTING    NEW
VSC test distanc∈ 35 m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Section 9   Section 1   Section 1   Section 9   Sectio
Target distance 40m	Hor° Ver°   Hor°
window GF-living	121 4 14 3 45 3 180 36% 33 9 72 13 56 10 19 7 180 33% 0.92
25	EXISTING NEW
VSC test distanc∈ 35 m  Target distance 40m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{$
window GF-living	122 4 15 3 43 3 180 36% 31 9 68 13 54 10 27 7 180 33% <b>0.92</b>
26	I EXISTING II NEW I
VSC test distance 35 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$
Target distance 39m	Hor° Ver°   Hor°
window GF-living	120 4 18 3 42 3 180 36% 18 8 52 10 67 12 43 8 180 33% <b>0.92</b>
27	EXISTING NEW
VSC test distanc∈ 35 m  Target distance 39m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Section 9   Section 9   Section 1   Section 1   Section 9   Section 1   Section 2   Section 1   Sect
window GF-living	117 4 20 3 43 3 180 36% 16 8 42 10 74 12 48 8 180 33% 0.92
28	EXISTING NEW
VSC test distanc∈ 35 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{1}{2}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$
Target distance 41m	Hor° Ver° Hor° V
window GF-living	114 4 24 3 42 3 180 36% 37 7 60 14 57 13 26 6 180 33% 0.91
29	EXISTING NEW
VSC test distance 35 m	Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 5 Section 4 $\frac{1}{5}$ Section 6 Section 6 $\frac{1}{5}$ Section 7 Section 9 Sectio
Target distance 41m window GF-living	Hor° Ver°   Hor°
30 VSC test distanc∈ 26 m	EXISTING Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화 Section 4 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명
Target distance 22m	Hor° Ver° Hor° V
window GF-living	94 4 31 3 55 3 180 36% 18 6 39 10 55 17 68 8 180 33% 0.92
31	EXISTING NEW
VSC test distance 26 m	Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 1 Section 2 Section 3 Section 4 $\frac{1}{5}$ Section 4 $\frac{1}{5}$ Section 3 Section 4 $\frac{1}{5}$ Section 4 $\frac{1}{5}$ Section 5 Section 6 Section 6 Section 7 Section 7 Section 8 Section 8 Section 9 Sectio
Target distance 22m window GF-living	Hor° Ver°   Hor°
-	
32 VSC test distanc∈ 26 m	EXISTING Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화 Section 4 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명 명
Target distance 35m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{6}{2}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{2}$   $\frac{6}{2}$   Hore Vere
window GF-living	99 4 42 3 39 3 180 36% 31 8 104 12 45 9 180 33% 0.92
33	EXISTING NEW
VSC test distanc∈ 26 m	Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화
Target distance 35m window GF-living	Hor° Ver°   Hor°
34 VSC test distanc∈ 26 m	EXISTING   NEW   Section 1   Section 2   Section 3   Section 4   $\frac{1}{6}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{6}$   Section 5   Section 6   Section 7   Section 8   Section 8   Section 9
Target distance 22m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 1   Section 2   Section 3   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Sect
window GF-living	114     4     35     3     31     3     180     36%     95     10     35     19     50     9     180     33%     0.91

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35	EXISTING NEW
VSC test distance 26 m	Section 1 Section 2 Section 3 Section 4 호 영 Section 1 Section 2 Section 3 Section 4 당 영 Section 1 Section 2 Section 3 Section 4 당
Target distance 22m	Hor° Ver° Hor° V
window GF-living	15 65 74 4 91 3 180 34% 15 65 56 10 33 19 76 10 180 31% 0.90
36	EXISTING
VSC test distanc∈ 26 m	Section 1 Section 2 Section 3 Section 4 호 영화 Section 1 Section 2 Section 3 Section 4 호 영화 Section 4 명
Target distance 34m	Hor° Ver°   Hor°
window GF-living	43 45 100 3 37 3 180 32% 43 45 47 11 52 11 38 6 180 30% 0.94
	11
37	EXISTING NEW
VSC test distanc∈ 26 m	Section 1 Section 2 Section 3 Section 4 5 Section 1 Section 2 Section 3 Section 4 5 Section 1 Section 2 Section 3 Section 4 Section 4 Section 5 Section 6 Section 6 Section 7 Section 7 Section 7 Section 8 Se
Target distance 35m	Hor® Ver®   Hor®
window GF-living	42 45 48 3 90 3 180 32% 42 45 42 11 51 11 45 6 180 30% 0.94
38	I EXISTING II NEW I
VSC test distanc∈ 26 m	
Target distance 31m	Section 1   Section 2   Section 3   Section 4   Section 1   Section 1   Section 2   Section 3   Section 4   Section 2   Section 3   Section 4   Section 4   Section 4   Section 4   Section 5   Section 6   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Sect
window GF-living	111 3 16 4 53 3 180 36% 32 8 47 13 101 6 180 34% 0.94
willdow Gi -livilig	111 3 10 4 33 3 100 30 8 32 0 47 13 101 0 100 34 8 0 34
39	EXISTING   NEW
VSC test distanc∈ 17 m	Section 1 Section 2 Section 3 Section 4 호 영 Section 1 Section 2 Section 3 Section 4 호 영 Section 1 Section 2 Section 3 Section 4 호 영
Target distance 22m	Hor° Ver° Hor° V
window GF-living	54 8 25 5 101 3 180 36% 54 8 25 5 74 16 27 6 180 33% 0.93
40	EXISTING NEW
VSC test distanc∈ 17 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   $\frac{1}{5}$
Target distance 22m	Hor° Ver° Hor° V
window GF-living	45 8 16 5 119 3 180 36% 45 8 99 16 36 6 180 32% 0.91
41	EXISTING NEW
VSC test distanc∈ 17 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{5}$   $\frac{1}{5}$   $\frac{1}{5}$
Target distance 22m	Hor° Ver° Hor° V
window GF-living	54     7     126     3       180   36%       35     7     95     16     50     9     180   32%       0.91
40	EVICTNO   NEW
42	EXISTING   NEW   Section 1   Section 2   Section 3   Section 4   5   8   Section 1   Section 2   Section 3   Section 4   5   8
VSC test distance 17 m	
Target distance 22m window GF-living	Hor° Ver°   Hor°
willidow Gi -livilig	-0 0 102 3 100 30% 20 0 02 10 12 13 100 31% 0.00
43	EXISTING   NEW
VSC test distance 17 m	Section 1   Section 2   Section 3   Section 4   $\frac{1}{29}$   Section 1   Section 2   Section 3   Section 4   $\frac{1}{29}$   Section 5   Section 6   Section 7   Section 7   Section 8   Section 8   Section 9   Sect
Target distance 22m	Hor° Ver° Hor° V
window GF-living	42 5 138 3 180 36% 20 5 55 16 37 10 68 34 180 29% 0.82

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#### 5.4 Daylight reception in neighbouring habitable rooms conclusion

The BRE Report suggests a VSC of 27% or more should be achieved if a room is to have adequate daylight. It also recommends that the effects of a new development on daylight reception should not affect any existing VSC by more than 20% or have a maximum change factor in excess of 0.8. From the calculation results we note all selected neighbouring habitable receptors are effected to some degree with regards to daylight reception due to the introduction of the proposed development in their respective habitable rooms facing the proposed development. The calculated change in daylight reception in all of the analysed neighbouring receptors achieved a change factor ranging from 0.82 to 0.94 which are all above the maximum change factor of 0.80. Summarized result findings are as follows (see images 5.1-5.5 for receptor locations):

- South neighbouring receptors (Rathbeal cottages): Receptors 1 to 3 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.93-0.94. These receptors resulted in a change of daylight reception, all of which are comfortably within the BRE guidelines.
- Phase 2C neighbouring receptors: Receptors 4 to 15 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.84-0.91. These receptors resulted in a change of daylight reception, all of which are well within the guidelines.
- Phase 2B neighbouring receptors: Receptors 16 to 33 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.90-0.93. These receptors resulted in a change of daylight reception, all of which are comfortably within the guidelines.
- Phase 2A neighbouring receptors: Receptors 34 to 38 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.90-0.94. These receptors resulted in a change of daylight reception, all of which are comfortably within the guidelines also.
- Phase 4D neighbouring receptors: Receptors 39 to 43 are residential dwellings with ground floor windows. These dwellings were examined and resulted in a change factor ranging from 0.82-0.93. These receptors resulted in a change of daylight reception, all of which are within the guidelines.

We conclude that the new proposed development's effect on daylight reception in the neighbouring rooms are all within the constraints and recommendations of the BRE Report 'site layout and planning for daylight and sunlight' and we therefore deem the new development to be compliant with this element.

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# Sunlight Reception Analysis Report

SUNLIGHT RECEPTION IN AMENITY SPACES WITHIN THE PROPOSED DEVELOPMENT EFFECTS on SUNLIGHT RECEPTION IN EXISTING NEIGHBOURING AMENITY SPACES AS A RESULT OF THE PROPOSED DEVELOPMENT

# Phase 5 – Development at Oldtown

Proposed Residential Development

Oldtown, Swords, Co. Dublin

Gerard Gannon Properties

Project file no **DKP-N14-5060 ¦ 1P** 2022-03-22

# Document control

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Circular		Issue >	1P#	1P
Clients Architects Planning consultant	Gerard Gannon Properties Conroy Crowe Kelly Architects Downey Planning		<ul><li>✓</li><li>✓</li><li>✓</li></ul>	<ul><li>✓</li><li>✓</li></ul>
Planning consultant	Downey Planning		$\checkmark$	$\checkmark$

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# Sketch/draft

P Planning

C Concept

D Design

G General information

T Tender

W Works/construction

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ING Gerard (Craig) van Deventer  $\,$  CEng., BE(mech)., HDip CIOB, MCIBSE

M: [00] 353 (0)87 260 8080 E: gerard@dkpartnership.com

DKPartnership 70 Main Street, Applewood , Swords, Co. Dublin, Ireland Reen Kenmare Co. Kerry

post@dkpartnership.com www.dkpartnership.com

T: [00] 353 (0) 1813 1930 T: [00] 353 (0)64664 1686

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3	Geographical project overview	7
4	Approach and methodology	8
5	Basis of receptor selection and calculation results (amenity spaces within development)	10
6	Basis of receptor selection and calculation results (existing amenity spaces)	13
Appendix		
Α	5061 One hourly overall site shadow – sunlight status illustrations	Attached
В	5062 One hourly overall site shadow – sunlight status calculations	Attached

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# 1 Introduction

#### 1.1 Report purpose

This report gives information on the level of achieved sunlight reception in amenity spaces within the proposed new development and the effects of the proposed development on sunlight reception in existing neighbouring amenity spaces.

#### 1.2 Instruction

DKPartnership (DKP) have been commissioned by Gerard Gannon Properties, to carry out the analysis and report for the proposed development at Oldtown, Swords, Co. Dublin.

#### 1.3 Brief development description

'A proposed Strategic Housing Development consisting of the removal of the temporary site office/site compound structures on site and the construction of 377 no. residential units comprising of duplexes, apartments and houses, all with associated car parking; a childcare facility with associated car parking; landscaping including play equipment; boundary treatments; public lighting; and all associated engineering and site works necessary to facilitate the development including proposed vehicular accesses onto Miller's Avenue, and a proposed stormwater storage tank (with proposed vehicular/service access onto Balheary Road) and overflow outfall gravity sewer to the Broadmeadow River with associated manholes on lands locally known as the Celestica/Motorola site, junction of Glen Ellan Road and Balheary Road, and at/on Balheary Road.'

#### 1.4 Statutory requirement

There are no particular building regulations in relation day light/shadow effect standards other than recommendations outlined or referred to in the CIBSE lighting guide 10, BS EN17037/EN17037 and the BRE document" Site layout planning for daylight and sun light". The aforementioned documents do refer to a" right to a sky view" relating to existing buildings facing a new adjacent development in so far that it compares an existing sky view with the sky view when the new development is constructed. The difference, if any, must be within a certain acceptable threshold.

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# **2** Executive summary

#### 2.1 Analysis conducted

This report details the effects on the sunlight/shadow status of the sunlight/shadow status of new amenity spaces within the proposed development and the effects of the proposed development on sunlight reception in existing neighbouring amenity spaces.

#### 2.2 Guidelines and standards applied

For this report we applied the recommendations and guideline of the following;

- The Building Research Establishment (BRE) report, "Site layout planning for daylight and sunlight a guide to good practice (referred to as the BRE Report).
- British European Standard BS EN17037/EN17037 Day lighting standards and contains guidance on the minimum recommended levels of interior day lighting.
- CIBSE guide 10 Day light and lighting for buildings.

#### 2.3 Technical analysis

Calculations were conducted in accordance with the BRE guidelines to determine the extent to which the proposed development could affect the shadow/sun light reception in any existing amenity spaces and new amenity spaces proposed with the development. For new amenity spaces, in basic terms, the minimum criteria is that at least 50% of the amenity space should receive at least two hours of sunlight on the 21st March and for "existing" amenity spaces there is also the additional criteria that any loss of sunlight should not be greater than 0.8 times its former size.

#### 2.4 Amenity spaces within the development, sunlight assessment conclusion

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21<sup>st</sup> March. From the calculation results we note all of the new amenity spaces received more than the recommended sunlight or were equal to minimum guidelines. Calculation findings are summarised as follows (see image 5.1 for amenity locations):

Amenity area outlined in A was calculated to have 03.00 hours at 50% area. Amenity area outlined in C was calculated to have 06.00 hours at 50% area. Amenity area outlined in D was calculated to have 09.00 hours at 50% area. Amenity area outlined in E was calculated to have 02.00 hours at 50% area. Amenity area outlined in F was calculated to have 02.00 hours at 50% area. Amenity area outlined in F was calculated to have 11.00 hours at 50% area. Amenity area outlined in G was calculated to have 07.00 hours at 50% area. Amenity area outlined in I was calculated to have 09.00 hours at 50% area. Amenity area outlined in J was calculated to have 10.00 hours at 50% area. Amenity area outlined in K was calculated to have 05.00 hours at 50% area. Amenity area outlined in L was calculated to have 03.00 hours at 50% area. Amenity area outlined in M was calculated to have 08.00 hours at 50% area. Amenity area outlined in M was calculated to have 08.00 hours at 50% area. Amenity area outlined in N was calculated to have 08.00 hours at 50% area.

We conclude that the new amenity spaces receive sunlight on 50% of the area is in line with the recommendations of the BRE Report - Site Layout and Planning for Daylight and Sunlight - and therefore deem these to be compliant to this element.

#### 2.5 Existing neighbouring amenity spaces, sunlight assessment conclusion

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21<sup>st</sup> March and that and any loss of sunlight should not be greater than 0.8 (20% reduction) times its former size. From the calculation results we note that selected existing amenity spaces all received 2 hours of sunlight or more on at least 50% of the area before and after the introduction of the new development. Results are as follows (see image 6.1 - 6.4 for receptor locations):

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- Phase 2C neighbouring receptors: Receptors 1 to 11 are residential dwellings with private front gardens / amenity spaces. These areas resulted in change factors ranging from 0.80-1.00 meaning the new proposed development has an effect on the amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 17.00-19.00. The results are within BRE recommendations. Receptor 1 and 6 has a change factor of 1.00 meaning the new proposed has no effect on the existing sunlight status.
- Phase 2B neighbouring receptors: Receptors 12 to 17 are residential dwellings with private back gardens / amenity spaces. These areas resulted in change factors ranging from 0.89-0.91 meaning the new proposed development has an effect on the amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 17.00-19.00. The results are comfortably within BRE guidelines.
- Phase 4D neighbouring receptors: Receptors 18 to 26 are residential dwellings with private back gardens / amenity spaces. These areas resulted in change factors ranging from 0.80-0.85 meaning the new proposed development has an effect on the amenity spaces shadow/sunlight. This effect happens in the afternoon hours of 15.00-19.00. The results are within BRE guidelines and some result in minimum recommendations.

We conclude that the sunlight reception in the existing neighbouring amenity spaces after the introduction of the new development is in accordance with the recommendations of the BRE Report

"Site Layout and Planning for Daylight and Sunlight and therefore deem this to be compliant to this element.

# 2.6 Mitigation measures / actions

No mitigation measures.

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# **3** Geographical overview

#### 3.1 Project overview

Image 3.1 the (google) site map below indicates the location of the site boundary, approximately outlined.



Image 3.1: proposed development site area outlined

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# **4** Approach and methodology

#### 4.1 General approach

This report covers

- the sunlight reception/shadow status of new proposed amenity spaces within the new development.
- the effects of the new development on the sunlight reception/shadow status of existing neighbouring amenity spaces/gardens.

#### 4.2 The nature and effects of day light and sun light

When assessing the effects of proposed building projects on the potential to cause issues relating to light, it is important to recognise the distinction between daylight and sunlight. Daylight is the combination of all direct and indirect sunlight during the daytime, whereas sunlight (for the purposes of this report) comprises only the direct elements of sunlight. For example, on a cloudy or overcast day diffused daylight still shines through windows, even when sunlight is absent. Any development within a built-up area has the potential to alter the amount of daylight and direct sun received by nearby residential properties.

Care should be taken when designing new buildings in built-up areas, especially when the proposed development is relatively tall or situated to the south of existing buildings, because in the northern hemisphere the majority of the sunlight comes from the south. In Ireland (and other northern hemisphere countries) south-facing facades will in general, receive the most sunlight, while the north facing facades will receive sunlight on only a handful of occasions, specifically early mornings and late evenings during the summer months. It is therefore important to ensure that buildings to the south of any development do not cause over shadowing to existing dwellings and therefore reduce their capacity to receive sunlight.

#### 4.3 Assessment criteria

National Policy/building regulations.

The government does not have an adopted policy on daylight, sunlight and the effects of overshadowing, and does not have targets, criteria or relevant planning guidance in the way it has for other environmental impacts such as noise, landscape or air quality. However, there are a number of guidance documents which are relevant when considering daylight, sunlight and overshadowing in dwellings:

- The Building Research Establishment (BRE) report, "Site layout planning for daylight and sunlight a guide to good practice (referred to as the BRE Report). Although not Government guidance, this report is commonly referenced as the main guide in Ireland/UK in determining the minimum standards of daylight and sunlight and for determining the impact of a development.
- British European Standard BS EN17037/EN17037 Day Lighting for buildings. BS EN17037/EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces some of the calculation procedures used in the BRE Report.
- CIBSE guide 10 Day light and lighting for buildings. CIBSE lighting guide 10 like BS EN17037/EN17037 contains guidance on the minimum recommended levels of interior day lighting and introduces recommended day light levels for general buildings.

#### 4.4 The BRE Report – "Site Layout and Planning for Daylight and Sunlight – A Guide to Good Practice"

The BRE report contains guidance on how to design developments, whilst minimising the impacts on existing buildings from overshadowing and reduced levels of daylight and sunlight. The advice provided within the guide is not mandatory and should not be seen as an instrument of planning policy, its aim is to help rather than constrain the designer. Although it gives numerical guidance values, these should be interpreted with flexibility since natural lighting is one of many factors in site layout design. The guidance should be applied appropriately to developments to assist in gaining the best development possible without adverse impacts.

As well as advice, the report contains a methodology to assess levels of daylight, sunlight and over shadowing and contains criteria to determine the potential impacts of a new development on surrounding buildings. The table below summarises the criteria used to assess the overshadowing/sunlight reception in amenity spaces.

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In this report we have separated the new and existing amenity spaces as they are assessed slightly differently. BRE sunlight/shadow assessment criteria. Table 4.1 Sunlight reception requirements for amenity spaces within the new proposed development.

Type	Criteria	Acceptable parameters
Overshadowing new	Amenity space prevented from	At least 50% of the amenity space should receive at least two hours of sunlight
amenity spaces	receiving any sunlight on March 21st	
Table 4.1		

Table 4.2 Effects on Sunlight reception requirements for existing neighbouring amenity spaces.

Туре	Criteria	Acceptable parameters
Overshadowing existing amenity spaces	Amenity space prevented from receiving any sunlight on March 21st	Any loss of sunlight should not be greater than 0.8 times its former size.

Table 4.2

#### 4.5 Overshadowing effects measured

The minimum sunlight requirement in this report measured in sunlight time 2 hours (120 minutes) multiplied by 50% area  $m^2$  or the minimum requirement = 120 (min) \* 0.5a ( $m^2$ ) = [ ] min· $m^2$ .

#### 4.6 Existing amenity spaces

The overshadowing/sun light assessment is the effects the proposed development has on existing open amenity spaces. In basic terms, based on the BRE report states that at least 50% of the amenity space should receive at least two hours of sunlight on the 21<sup>st</sup> March and any loss of sunlight should not be greater than 0.8 times its former size. The overshadowing/sun light assessment is executed in using a 3D model of the project and adjoining buildings with the results illustrated in tabular format showing the hourly status of the shadow/sunlight fraction in the relevant amenity spaces. The impacts of vegetation: It is important to note that according to the BRE Report, calculations do not normally take into account vegetation. The exception is when evergreen vegetation exists that forms a continuous barrier and would be permanent throughout the seasons.

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## 5 Receptor selection and Calculation results - Amenity spaces within the proposed development

#### 5.1 Amenity spaces within the proposed development

Image 5.1 below indicates the amenity areas that have been selected and analysed on the basis that the shadow casted from the proposed development may effect the amenity areas given its geographical location in relation to the development.

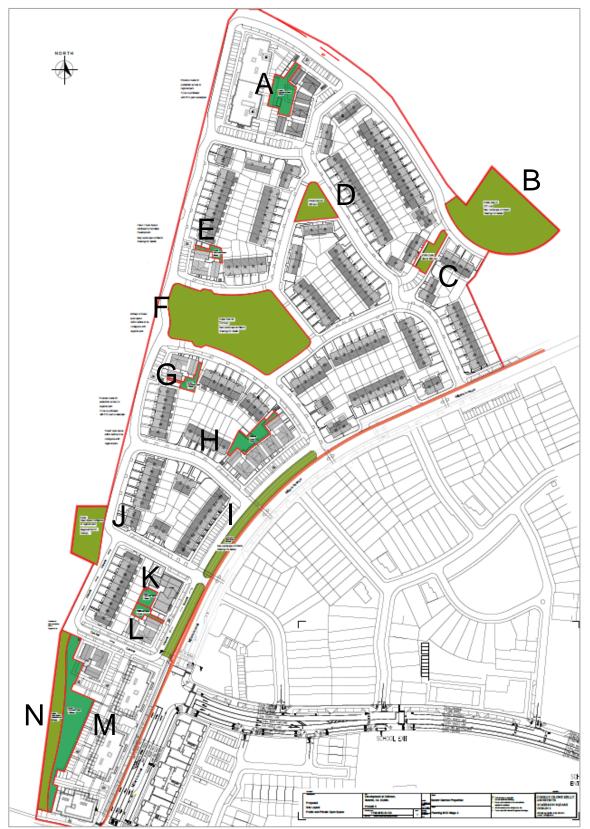


Image 5.1: New proposed amenity spaces within phase 5

Receptor	Description	Approx. Area m <sup>2</sup>
Α	Private communal space	450
В	Public park 01	2771
С	Public open space	286
D	Public park 02	500
E	Private communal space	65
F	Public park 03	4147
G	Private communal space	133
Н	Residents Garden	379
1	Biodiversity open space	798
J	Public open space	744
K	Private communal space	125
L	Private communal space	123
M	Private communal space	1259
N	Public open space	966

Table 5.1: New proposed amenity spaces

#### 5.2 Assessment approach

The tables below represent the one hourly sunlight/shadow status of the respective new amenity spaces provided within the new development on March 21<sup>st</sup>. To compare against the BRE guidelines, the calculation results have been given the following colour code guide depending on its level of resulting compliance. See appendix A for the modelled shadow/sunlight imaging per hour on March 21<sup>st</sup>.

#### Compliance guide



#### 5.3 Proposed development amenity space calculation results

The calculation results of the one hourly sunlight & shadow status of the proposed amenity space of phase 5 development are all detailed in Appendix B. As there is a number of amenity spaces assessed in this report we have only shown the result tables of 2 no. amenity spaces (A & B). Relevant sunlight & shadow calculation results are summarised in the next section.

					450	m2	В					
\ IEW ST	ATHE				March 21st	IIIZ	NEW STA	THE				2,7 March
ime	Shadow	Sunlight	Sun time	Sun area	Sun time.area		Time	Shadow	Sunlight	Sun time	Sun area S	
24 Hr	% /		min	m2	min*m2		24 Hr	% /		min	m2	mir
6.00	100%	0%		0	0		6.00	100%	0%		0	
7.00	92%	8%		36	-		7.00	68%	32%	60	887	53.
3.00	92%	8%		36	2,160		8.00	21%	79%	60	2189	131,
9.00	90%	10%	60	45	2,700		9.00	15%	85%	60	2355	141,
10.00	86%	14%	60	63	3,780		10.00	15%	85%	60	2355	141,
11.00	76%	24%	60	108	6,480		11.00	15%	85%	60	2355	141,
12.00	57%	43%	60	194	11,610		12.00	15%	85%	60	2355	141,
13.00	31%	69%	60	311	18,630		13.00	14%	86%	60	2383	142
14.00	29%	71%	60	320	19,170		14.00	14%	86%	60	2383	142,
15.00	35%	65%	60	293	17,550		15.00	17%	83%	60	2300	137,
16.00	69%	31%	60	140	8,370		16.00	22%	78%	60	2161	129,
17.00	88%	12%	60	54	3,240		17.00	34%	66%	60	1829	109,
18.00	92%	8%		36			18.00	77%	23%	60	637	38,
19.00	100%	0%	60	0	0		19.00	100%	0%	60	0	
Required	sun hours	@ 50% a	rea		2		Required s	un hours (	@ 50% aı	rea		
Achieve	d sun hou	rs on @	50% area		3.00		Achieved	sun hou	rs on @	50% area		10
Achieve	d total sun	time (hr	s)		3.63		Achieved	total sun	time (hr	rs)		8
Achieved	daily sun t	ime * are	a		98010		Achieved	daily sun t	ime * are	a		1451

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#### 5.4 Summary table of results - March 21st

The calculation results of the one hourly sunlight & shadow status of each selected amenity space of the new development are all detailed in Appendix B. The relevant sunlight & shadow calculation data has been summarised in table 5.2 below.

Column 1: The amenity space ID

Column 2: The amenity space area

Column 3: The new status sun hours \* amenity space area (hr\*m2)

Column 4: The new status total sun hours

Column 5: The new status sun hours on 50% of the area

Column 6: Comment

#### **NEW STATUS**

Area ID	m²	Sun Hr*m²	Sun Hr	SunHr 50%	COMMENTS
Α	450	98010	3.63	3.00	In excess of minimum guidelines
В	2771	1451450	8.73	10.00	In excess of minimum guidelines
С	286	117031.2	6.82	6.00	In excess of minimum guidelines
D	500	213000	7.1	9.00	In excess of minimum guidelines
Е	95	18297	3.21	2.00	Minimum guidelines achieved
F	4147	2279191	9.16	11.00	In excess of minimum guidelines
G	133	52987.2	6.64	7.00	In excess of minimum guidelines
Н	379	83455.8	3.67	2.00	Minimum guidelines achieved
1	798	373942.8	7.81	9.00	In excess of minimum guidelines
J	744	397742.4	8.91	10.00	In excess of minimum guidelines
K	125	37950	5.06	5.00	In excess of minimum guidelines
L	123	25903.8	3.51	3.00	In excess of minimum guidelines
М	1259	560506.8	7.42	8.00	In excess of minimum guidelines
N	966	459043.2	7.92	9.00	In excess of minimum guidelines

Table 5.2: New proposed amenity spaces, summary table of results

#### 5.5 Amenity spaces within proposed development, sunlight results conclusion

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21<sup>st</sup> March. From the calculation results we note all of the new amenity spaces received more than the recommended sunlight or were equal to minimum guidelines. Calculation findings are summarised as follows (see image 5.1 for amenity locations):

Amenity area outlined in A was calculated to have 03.00 hours at 50% area. Amenity area outlined in C was calculated to have 06.00 hours at 50% area. Amenity area outlined in D was calculated to have 09.00 hours at 50% area. Amenity area outlined in E was calculated to have 02.00 hours at 50% area. Amenity area outlined in E was calculated to have 02.00 hours at 50% area. Amenity area outlined in F was calculated to have 11.00 hours at 50% area. Amenity area outlined in G was calculated to have 07.00 hours at 50% area. Amenity area outlined in H was calculated to have 02.00 hours at 50% area. Amenity area outlined in I was calculated to have 09.00 hours at 50% area. Amenity area outlined in J was calculated to have 10.00 hours at 50% area. Amenity area outlined in K was calculated to have 05.00 hours at 50% area. Amenity area outlined in L was calculated to have 03.00 hours at 50% area. Amenity area outlined in M was calculated to have 08.00 hours at 50% area. Amenity area outlined in N was calculated to have 09.00 hours at 50% area. Amenity area outlined in N was calculated to have 09.00 hours at 50% area.

We conclude that the new amenity spaces receive sunlight on 50% of the area is in line with the recommendations of the BRE Report - Site Layout and Planning for Daylight and Sunlight - and therefore deem these to be compliant to this element.

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### **Existing** 6 Receptor selection and calculation results – Existing neighbouring amenity spaces

#### 6.1 Selected existing amenity spaces

Images 6.1-6.4 below indicates the neighbouring amenity areas that have been selected and analysed on the basis that the shadow casted from the new development may effect these amenity areas given its geographical location in relation to the proposed development. To note:

- Amenity spaces south of the proposed (Rathbeal cottages): these private amenity spaces are located south of the phase 5 development with no impact in sunlight/shadow expected for March 21<sup>st</sup>.
- Phase 2C neighbouring amenity spaces: potential private garden and communal amenity spaces that may be affected.
- Phase 2B neighbouring amenity spaces: potential private garden and communal amenity spaces that may be affected.
- Phase 2A neighbouring amenity spaces: no private garden or communal amenity spaces directly facing the phase 5 development that may be affected with regards its current sunlight/shadow, furthermore phase 2A is south/southeast of phase 5 with no impact in sunlight/shadow expected for March 21st.
- Phase 4D neighbouring amenity spaces: potential private garden amenity spaces that may be affected.

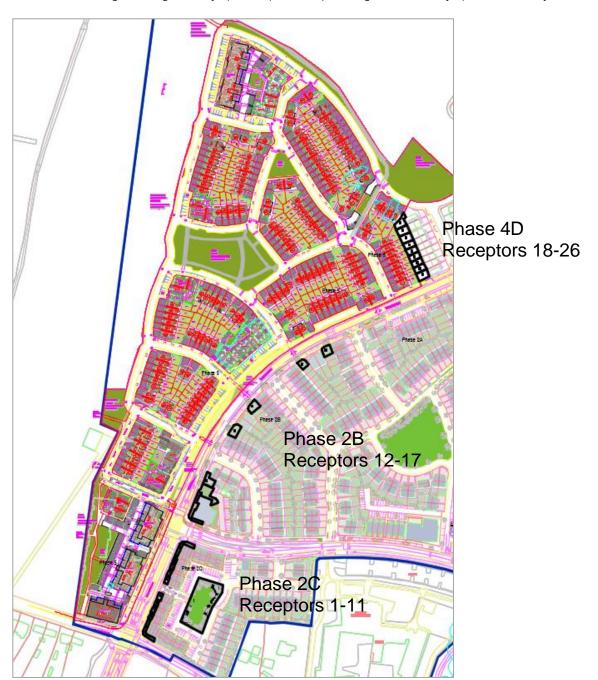


Image 6.1: Existing neighbouring amenity spaces, overall site image

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Image 6.2: existing neighbouring amenity spaces, Phase 2C (receptors 1-11)

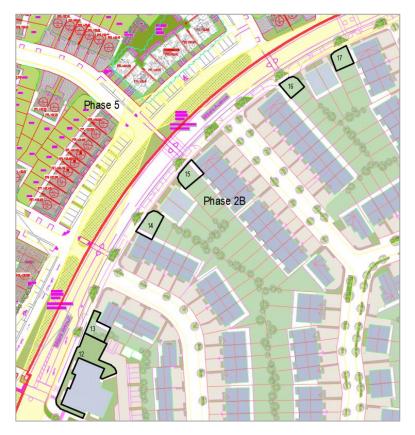


Image 6.3: existing neighbouring amenity spaces, Phase 2B (receptors 12-17)



Image 6.4: existing neighbouring amenity spaces, Phase 4D (receptors 18-26)

Receptor	Location / Address	Description	~Area m²
1	Phase 2C - House	Private amenity space	70
2	Phase 2C - House	Private amenity space	16
3	Phase 2C - House	Private amenity space	17
4	Phase 2C - House	Private amenity space	17
5	Phase 2C - House	Private amenity space	28
6	Phase 2C - Green	Communal amenity space	1160
7	Phase 2C - House	Private amenity space	27
8	Phase 2C - House	Private amenity space	17
9	Phase 2C - House	Private amenity space	17
10	Phase 2C - House	Private amenity space	16
11	Phase 2C - House	Private amenity space	70
12	Phase 2B - Apartment Block A	Communal amenity space	270
13	Phase 2B - House no.102	Private amenity space	88
14	Phase 2B - House no.99	Private amenity space	93
15	Phase 2B - House no.61	Private amenity space	85
16	Phase 2B - House no.50	Private amenity space	64
17	Phase 2B - House no.53	Private amenity space	74
18	Phase 4D - Meadowbank houses	Private amenity space	85
19	Phase 4D - Meadowbank houses	Private amenity space	68
20	Phase 4D - Meadowbank houses	Private amenity space	68
21	Phase 4D - Meadowbank houses	Private amenity space	68
22	Phase 4D - Meadowbank houses	Private amenity space	68
23	Phase 4D - Meadowbank houses	Private amenity space	68
24	Phase 4D - Meadowbank houses	Private amenity space	85
25	Phase 4D - Meadowbank houses	Private amenity space	85
26	Phase 4D - Meadowbank houses	Private amenity space	85

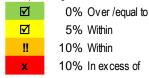
Table 6.1: existing neighbouring amenity spaces

#### 6.2 Assessment approach

The left-hand side calculation tables below represent the one hourly sunlight/shadow status of the respective existing amenity space before the introduction of the new development and the right hand side tables below represent the one hourly sunlight/shadow status of the respective existing amenity space after the introduction of the new development. See appendix A for the predicted sunlight/shadow imaging per hour. Note: The calculation results have been given the following colour code guide depending on its level of resulting compliance.

#### Compliance guide

**EXISTING STATUS** 



#### 6.3 Existing amenity spaces calculation results

**70** m2

**NEW STATUS** 

March 21st

The calculation results of the one hourly sunlight & shadow status of each selected amenity space before and after the introduction of the new development are all detailed in Appendix B. As there is a number of amenity spaces assessed in this report we have only shown the result tables of 2 no. amenity spaces (1 & 2). Relevant sunlight & shadow calculation results are summarised in the next section.

March 21st

change

		00			Widion 2 13t		17100				WIGHT Z TOL	citarigo
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% /	/ %	min	m2	min*m2	24 Hr	%	/ %	min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	92%	8%	60	6	336	7.00	92%	8%	60	6	336	0
8.00	92%	8%	60	6	336	8.00	92%	8%	60	6	336	0
9.00	80%	20%	60	14	840	9.00	80%	20%	60	14	840	0
10.00	76%	24%	60	17	1,008	10.00	76%	24%	60	17	1,008	0
11.00	70%	30%	60	21	1,260	11.00	70%	30%	60	21	1,260	0
12.00	61%	39%	60	27	1,638	12.00	61%	39%	60	27	1,638	0
13.00	22%	78%	60	55	3,276	13.00	22%	78%	60	55	3,276	0
14.00	0%	100%	60	70	4,200	14.00	0%	100%	60	70	4,200	0
15.00	0%	100%	60	70	4,200	15.00	0%	100%	60	70	4,200	0
16.00	0%	100%	60	70	4,200	16.00	0%	100%	60	70	4,200	0
17.00	16%	84%	60	59	3,528	17.00	16%	84%	60	59	3,528	0
18.00	57%	43%	60	30	1,806	18.00	57%	43%	60	30	1,806	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	0
Required	sun hours	@ 50%	area (hr)		2	Required	sun hours	s @ 50%	area (hr)		2	
Achieve	d sun ho	urs on (h	nrs) @ 50	% area	5.00	Achieve	d sun ho	urs on (h	rs) @ 50	)% area	5.00	
Achieve	d total su	ın time (l	nrs)		6.34	Achieve	Achieved total sun time (hrs)				6.34	1.00
Achieved	d daily sun	time * ar	ea		26628	Achieved	d daily sur	time * aı	ea		26628	1.00
2					16	m2						
	IG STAT	us			16 March 21st	m2 NEW ST	TATUS				March 21st	change
	IG STAT	US Sunlight	Sun time	Sun area			TATUS Shadow	Sunlight	Sun time	Sun area	March 21st time * area	change time * area
EXISTI	IG STAT	Sunlight	Sun time	Sun area m2	March 21st	NEW ST	Shadow	Sunlight	Sun time	Sun area m2		
EXISTIN Time	Shadow	Sunlight	min		March 21st time * area	NEW ST Time	Shadow				time * area	time * area
EXISTIN Time 24 Hr	Shadow	Sunlight	min	m2	March 21st time * area min*m2	NEW ST Time 24 Hr	Shadow %	/ %	min	m2	time * area min*m2	time * area min*m2
Time 24 Hr 6.00	Shadow %	Sunlight / % 0%	min 60	m2 0	March 21st time * area min*m2	NEW ST Time 24 Hr 6.00	Shadow %	/ % 0%	min 60	m2 0	time * area min*m2 0	time * area min*m2
Time 24 Hr 6.00 7.00	Shadow % , 100% 92%	Sunlight / % 0% 8%	min 60 60	m2 0 1	March 21st time * area min*m2 0 77	NEW ST Time 24 Hr 6.00 7.00	Shadow % , 100% 92%	/ % 0% 8%	min 60 60	m2 0 1	time * area min*m2 0 77	time * area min*m2 0
Time 24 Hr 6.00 7.00 8.00	Shadow % / 100% 92% 92%	Sunlight / %  0%  8%  8%	min 60 60 60	m2 0 1	March 21st time * area min*m2 0 77	NEW \$1 Time 24 Hr 6.00 7.00 8.00	Shadow % 100% 92% 92%	/ % 0% 8% 8%	min 60 60 60	m2 0 1	time * area min*m2 0 77 77	time * area min*m2 0 0
Time 24 Hr 6.00 7.00 8.00 9.00	Shadow % , 100% 92% 92% 85%	Sunlight / %	60 60 60 60	m2 0 1 1 2	March 21st time * area min*m2 0 77 77 144	NEW \$1 Time 24 Hr 6.00 7.00 8.00 9.00	Shadow % 100% 92% 92% 85%	/ %  0%  8%  8%  15%	min 60 60 60 60	m2 0 1 1 2	time * area min*m2 0 77 77 144	time * area min*m2 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00	Shadow % , 100% 92% 92% 85% 85%	Sunlight / %	60 60 60 60 60	m2 0 1 1 2 2	March 21st time * area min*m2 0 77 77 144 144	NEW \$1 Time 24 Hr 6.00 7.00 8.00 9.00 10.00	Shadow % , 100% 92% 92% 85%	/ %  0%  8%  8%  15%	60 60 60 60 60	m2 0 1 1 2	time * area min*m2 0 77 77 144 144	time * area min*m2 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	Shadow % 100% 92% 92% 85% 85%	Sunlight / %	60 60 60 60 60 60	m2 0 1 1 2 2	March 21st time * area min*m2 0 77 77 144 144 144	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	Shadow % , 100% 92% 92% 85% 85%	/ %  0%  8%  8%  15%  15%	min 60 60 60 60 60	m2 0 1 1 2 2	time * area min*m2 0 77 77 144 144	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00	Shadow  100% 92% 92% 85% 85% 85%	Sunlight / %  0%  8%  8%  15%  15%	60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2	March 21st time * area min*m2 0 77 77 144 144 144 144	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00	Shadow % / 100% 92% 92% 85% 85% 85%	/ %  0%  8%  8%  15%  15%  15%	min 60 60 60 60 60 60	m2 0 1 1 2 2 2	time * area min*m2 0 77 77 144 144 144	time * area min*m2
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00	Shadow % , 100% 92% 92% 85% 85% 85% 85%	Sunlight / %  0%  8%  8%  15%  15%  15%  47%	min 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2	March 21st time * area min*m2 0 77 77 144 144 144 144 451	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00	\$\text{Shadow}\$ \text{\tint{\text{\tin\text{\texic}\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\texicr{\text{\texict{\texit{\texi\texit{\texi\tin\texi{\texict{\texit{\texi\tinte\tint{\tiint{\texi{\texi{\texi{\texi{\texi{\texi{\texi{\texi{\texit{\texi{\ti	0% 8% 8% 15% 15% 15% 47%	min 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 8	time * area min*m2 0 77 77 144 144 144 451	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00	NG STATI Shadow % / 100% 92% 92% 85% 85% 85% 85% 0%	Sunlight / %  0%  8%  8%  15%  15%  15%  47%  40%	min 60 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2 8 16	March 21st time * area min*m2 0 77 77 144 144 144 451 960	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00	\$\text{Shadow}\$  100% 92% 92% 85% 85% 85% 85% 0%	0% 8% 88% 15% 15% 15% 47% 100%	min 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2 8 16	time * area min*m2 0 77 77 144 144 144 144 451 960	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00	NG STATI Shadow % / 100% 92% 92% 85% 85% 85% 0% 0%	Sunlight / %  0%  8%  8%  15%  15%  15%  47%  100%  100%	min 60 60 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2 8 16	March 21st time * area min*m2 0 77 77 144 144 144 451 960	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00	\$hadow	0% 8% 8% 15% 15% 15% 47% 100%	min 60 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2 8 8 16 16	time * area min*m2 0 77 77 144 144 144 144 451 960 960	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00	86 STATI Shadow % / 100% 92% 92% 85% 85% 85% 85% 0% 0%	Sunlight / %	min 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 8 8 16 16 16 16	March 21st time * area min*m2 0 77 77 144 144 144 451 960 960	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00	Shadow % / 100% 92% 92% 85% 85% 85% 0% 0% 0%	0% 8% 8% 15% 15% 15% 47% 100% 100%	min 60 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2 8 8 16 6 16 16	time * area min*m2 0 77 77 144 144 144 144 451 960 960 960	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00	Shadow % /6 /100% 100% 92% 92% 85% 85% 85% 95% 0% 0% 0% 0%	Sunlight / %	min 60 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 8 8 16 16 16 16 16	March 21st time * area min*m2 0 77 77 144 144 144 144 451 960 960 960	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 14.00 15.00 16.00 17.00	Shadow %	0% 8% 8% 15% 15% 15% 47% 100% 100% 100%	min 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 2 8 8 16 16 16 16 16	time * area min*m2 0 77 77 77 144 144 144 144 451 960 960 960 960	time * area min*m2
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00	86 STATI Shadow % / 100% 92% 92% 85% 85% 85% 0% 0% 0% 0%	Sunlight / %  0% 8% 8% 15% 15% 15% 10% 10% 100% 83%	min 60 60 60 60 60 60 60 60 60 60	m2 0 0 1 1 2 2 2 2 2 8 8 16 16 16 16 13	March 21st time * area min*m2 0 77 77 144 144 144 144 451 960 960 960 960	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 14.00 15.00 16.00 17.00	Shadow	0% 8% 8% 15% 15% 15% 100% 100% 100% 100%	min 60 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 8 8 16 16 16 16 2	time * area min*m2 0 77 77 144 144 144 144 451 960 960 960 115	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 11.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00	86 STATI Shadow % / 100% 92% 92% 85% 85% 85% 0% 0% 0% 0%	Sunlight  ( %	min 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 1 1 2 2 2 2 2 8 8 16 16 16 16 13	March 21st time * area min*m2 0 77 77 144 144 144 144 451 960 960 960 960	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00	Shadow	0% 8% 8% 15% 15% 15% 47% 100% 100% 100%	min 60 60 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 8 8 16 16 16 16 2	time * area min*m2 0 77 77 144 144 144 144 451 960 960 960 115	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 Required	86 STATI Shadow % / 100% 92% 92% 85% 85% 85% 0% 0% 0% 17% 100%	Sunlight ( %	min 60 60 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 8 16 16 16 16 13 0 0	March 21st time * area min*m2 0 777 777 1444 1444 1444 451 960 960 960 960 797 0	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00	Shadow	0% 8% 8% 15% 15% 15% 15% 47% 100% 100% 100% 120% 0%	min 60 60 60 60 60 60 60 60 60 60 60	m2 0 1 1 2 2 2 2 2 8 8 16 16 16 2 2 0	time * area min*m2 0 77 77 144 144 144 144 451 960 960 960 115 0	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 17.00 18.00 19.00  Required Achieve	86 STATI Shadow % / 100% 92% 92% 85% 85% 85% 0% 0% 0% 17% 100%	Sunlight / %  0%  8%  8%  15%  15%  15%  15%  100%  47%  100%  100%  0%  \$\$ @ 50%  urs on (f	min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 1 1 1 2 2 2 2 2 8 16 16 16 16 13 0 0	March 21st time * area min*m2 0 77 77 144 144 451 960 960 960 797 0	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00	Shadow % 100% 92% 85% 85% 85% 0% 0% 0% 100% Sun hours	0% 8% 8% 15% 15% 15% 15% 47% 100% 100% 100% 12% 0%	min 60 60 60 60 60 60 60 60 area (hr) mrs) @ 50	m2 0 1 1 2 2 2 2 2 8 8 16 16 16 2 2 0	time * area min*m2 0 77 77 144 144 144 144 451 960 960 960 960 115 0	time * area min*m2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00  Required Achieve Achieve	86 STATI Shadow % , 100% 92% 92% 85% 85% 85% 0% 0% 0% 0% 17% 100% sun hours d	Sunlight (%) % % % % % % % % % % % % % % % % % %	min 60 60 60 60 60 60 60 60 60 area (hr) mrs) @ 50 nrs)	m2 0 1 1 1 2 2 2 2 2 8 16 16 16 16 113 0	March 21st time * area min*m2 0 777 777 1444 1444 1444 451 960 960 960 9797 0 2 5.00	NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 Required Achieve Achieve	Shadow %	0% 8% 8% 15% 15% 15% 15% 100% 100% 100% 0% 8 @ 50% urs on (Hun time (I	min 60 60 60 60 60 60 60 60 60 60 area (hr) mrs) @ 50 nrs)	m2 0 1 1 2 2 2 2 2 8 8 16 16 16 2 2 0	time * area min*m2 0 777 777 144 144 144 451 960 960 960 915 0 2 4.00	time * area min*m2

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#### 6.4 Summary table of results - March 21st

The calculation results of the one hourly sunlight & shadow status of each selected amenity space before and after the introduction of the new development are all detailed in Appendix B. The relevant sunlight & shadow calculation data is summarised in table 6.2 below.

Column 1: The amenity space ID

Column 2: The amenity space area

Column 3: The existing status sun hours \* amenity space area (hr\*m2)

Column 4: The existing status total sun hours

Column 5: The existing status sun hours on 50% of the area

Column 6: The new status sun hours \* amenity space area (hr\*m2)

Column 7: The new status total sun hours

Column 8: The new status sun hours on 50% of the area

Column 9: The change factor (should be NOT less than 0.8)

Column 10: Comment

		EXISTING	STATUS	_	NE'	W STATI	JS _	_	COMMENTS
Area ID	m²	Sun Hr*m²	Sun Hr	SunHr 50%	Sun Hr*m²	Sun Hr	Sun Hr 50%	Change	
1	70	26628	6.34	5	26628	6.34	5	1.00	no change in shadow/sunlight
2	16	5817.6	6.06	5	5136	5.35	4	0.89	change factor within guidelines
3	17	6222	6.1	6	5395.8	5.29	5	0.87	change factor within guidelines
4	17	6415.8	6.29	6	5161.2	5.06	4	0.81	change factor within guidelines
5	28	10920	6.5	6	8635.2	5.14	4	0.80	minimum guidelines achieved
6	1160	567936	8.16	8	567936	8.16	8	1.00	no change in shadow/sunlight
7	27	11404.8	7.04	7	9039.6	5.58	5	0.80	minimum guidelines achieved
8	17	7180.8	7.04	7	5712	5.6	5	0.80	minimum guidelines achieved
9	17	7180.8	7.04	7	5742.6	5.63	5	0.80	minimum guidelines achieved
10	16	6758.4	7.04	7	5404.8	5.63	5	0.80	minimum guidelines achieved
11	70	25914	6.17	7	20496	4.88	5	0.80	minimum guidelines achieved
12	270	87318	5.39	5	75492	4.66	3	0.87	change factor within guidelines
13	88	44721.6	8.47	10	38068.8	7.21	8	0.86	change factor within guidelines
14	93	34038	6.1	7	30243.6	5.42	6	0.89	change factor within guidelines
15	85	37128	7.28	8	33354	6.54	7	0.90	change factor well within guidelines
16	64	24038.4	6.26	5	22464	5.85	5	0.94	change factor well within guidelines
17	74	30813.6	6.94	8	27972	6.3	7	0.91	change factor well within guidelines
18	85	53142	10.42	11	43809	8.59	9	0.83	change factor within guidelines
19	68	38025.6	9.32	10	30273.6	7.42	8	0.80	minimum guidelines achieved
20	68	36312	8.9	9	28723.2	7.04	7	0.80	minimum guidelines achieved
21	68	36312	8.9	9	28723.2	7.04	7	0.80	minimum guidelines achieved
22	68	36312	8.9	9	28723.2	7.04	7	0.80	minimum guidelines achieved
23	68	36312	8.9	9	28723.2	7.04	7	0.80	minimum guidelines achieved
24	85	45390	8.9	9	35904	7.04	7	0.80	minimum guidelines achieved
25	85	45390	8.9	9	37791	7.41	8	0.84	change factor within guidelines
26	85	45390	8.9	9	38148	7.48	7	0.85	change factor within guidelines

Table 6.2: Existing neighbouring amenity spaces, summary table of results



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#### 6.5 Existing neighbouring amenity spaces, sunlight assessment conclusion

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the  $21^{st}$  March and that and any loss of sunlight should not be greater than 0.8 (20% reduction) times its former size. From the calculation results we note that selected existing amenity spaces all received 2 hours of sunlight or more on at least 50% of the area before and after the introduction of the new development. Results are as follows (see image 6.1 - 6.4 for receptor locations):

- Phase 2C neighbouring receptors: Receptors 1 to 11 are residential dwellings with private front gardens / amenity spaces. These areas resulted in change factors ranging from 0.80-1.00 meaning the new proposed development has an effect on the amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 17.00-19.00. The results are within BRE recommendations. Receptor 1 and 6 has a change factor of 1.00 meaning the new proposed has no effect on the existing sunlight status.
- Phase 2B neighbouring receptors: Receptors 12 to 17 are residential dwellings with private back gardens / amenity spaces. These areas resulted in change factors ranging from 0.89-0.91 meaning the new proposed development has an effect on the amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 17.00-19.00. The results are comfortably within BRE guidelines.
- Phase 4D neighbouring receptors: Receptors 18 to 26 are residential dwellings with private back gardens / amenity spaces. These areas resulted in change factors ranging from 0.80-0.85 meaning the new proposed development has an effect on the amenity spaces shadow/sunlight. This effect happens in the afternoon hours of 15.00-19.00. The results are within BRE guidelines and some result in minimum recommendations.

We conclude that the sunlight reception in the existing neighbouring amenity spaces after the introduction of the new development is in accordance with the recommendations of the BRE Report– "Site Layout and Planning for Daylight and Sunlight and therefore deem this to be compliant to this element.

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5061 Appendix A

APPENDIX to SUNLIGHT RECEPTION REPORT 1 (one) HOURLY SUNLIGHT / SHADOW STATUS ILLISTRATIONS

# Phase 5 – Development at Oldtown

Proposed Residential Development

Oldtown, Swords, Co. Dublin

Gerard Gannon Properties

Project file no **DKP-N14-5061 ¦ 1P** 2022-03-22

# Document control

DKP project no: N14 DKP document no: 5061 Project file no: DKP-N14-5061

Circular		Issue >	1P#	1P
Clients Architects Planning consultant	Gerard Gannon Properties Conroy Crowe Kelly Architects Downey Planning		<ul><li>✓</li><li>✓</li><li>✓</li></ul>	<ul><li>✓</li><li>✓</li></ul>

1P# 2021-11-10 Draft issue Issue Issue 1P 2022-03-22 Planning issue

#### Document issue status ID

Sketch/draft

# P Planning

С Concept

D Design

G General information

Τ Tender

W Works/construction Ζ As-build/constructed

Issue	Prepared	Checked	Approved
1P#	201	208	201
1P	201	208	201



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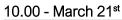


08.00 - March 21st



09.00 - March 21st







11.00 - March 21st



12.00 - March 21st





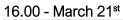


14.00 - March 21st



15.00 - March 21st





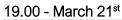


17.00 - March 21st



18.00 - March 21st







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5062 Appendix B

APPENDIX to SUNLIGHT RECEPTION REPORT 1 (one) HOURLY SUNLIGHT / SHADOW STATUS ILLISTRATIONS WITH THE NEW DEVELOPMENT

# Phase 5 – Development at Oldtown

Proposed Residential Development

Oldtown, Swords, Co. Dublin

Gerard Gannon Properties

Project file no **DKP-N14-5062 ¦ 1P** 2022-03-22

## Document control

DKP project no: N14 DKP document no: 5062 Project file no: DKP-N14-5062

Circular		Issue >	1P#	1P
Clients Architects Planning consultant	Gerard Gannon Properties Conroy Crowe Kelly Architects Downey Planning		<ul><li>✓</li><li>✓</li></ul>	<ul><li>✓</li><li>✓</li><li>✓</li></ul>
3	7 - 3			

Issue 1P# 2021-11-10 Draft issue Issue 1P 2022-03-22 Planning issue

#### Document issue status ID

# Sketch/draft

P Planning

C Concept

D Design

G General information

T Tender

W Works/construction

Z As-build/constructed

Issue	Prepared	Checked	Approved
1P#	208	201	201
1P	208	201	201

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## New proposed amenity spaces sunlight-shadow calculations - March 21st 2021

Α					450	m2	3					2,771	m
NEW ST	ATUS				March 21st	N	NEW STA	TUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	T	Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	%	/ %	min	m2	min*m2	2	24 Hr	% /	/ %	min	m2	min*m2	
6.00	100%	0%	60	0	0	6	6.00	100%	0%	60	0	0	
7.00	92%	8%	60	36	2,160	7	7.00	68%	32%	60	887	53,203	
8.00	92%	8%	60	36	2,160	8	3.00	21%	79%	60	2189	131,345	
9.00	90%	10%	60	45	2,700	9	9.00	15%	85%	60	2355	141,321	
10.00	86%	14%	60	63	3,780	1	10.00	15%	85%	60	2355	141,321	
11.00	76%	24%	60	108	6,480	1	11.00	15%	85%	60	2355	141,321	
12.00	57%	43%	60	194	11,610	1	12.00	15%	85%	60	2355	141,321	
13.00	31%	69%	60	311	18,630	1	13.00	14%	86%	60	2383	142,984	
14.00	29%	71%	60	320	19,170	1	14.00	14%	86%	60	2383	142,984	
15.00	35%	65%	60	293	17,550	1	15.00	17%	83%	60	2300	137,996	
16.00	69%	31%	60	140	8,370	1	16.00	22%	78%	60	2161	129,683	
17.00	88%	12%	60	54	3,240	1	17.00	34%	66%	60	1829	109,732	
18.00	92%	8%	60	36	2,160	1	18.00	77%	23%	60	637	38,240	
19.00	100%	0%	60	0	0	1	19.00	100%	0%	60	0	0	
Required	sun hours	@ 50% a	rea		2	F	Required s	un hours (	@ 50% aı	rea		2	
Achieve	d sun hou	rs on @	50% area		3.00	F	Achieved	sun hou	rs on @	50% area		10.00	
Achieve	d total sun	time (hi	s)		3.63	ļ.	Achieved	total sun	time (hr	s)		8.73	
Achieved	daily sun t	ime * are	a		98010	F	Achieved o	dailv sun t	ime * are	a		1451450	

C					286	m2
NEW STA	ATUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% .	%	min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	77%	23%	60	66	3,947	
8.00	71%	29%	60	83	4,976	
9.00	53%	47%	60	134	8,065	
10.00	51%	49%	60	140	8,408	
11.00	49%	51%	60	146	8,752	
12.00	23%	77%	60	220	13,213	
13.00	9%	91%	60	260	15,616	
14.00	4%	96%	60	275	16,474	
15.00	4%	96%	60	275	16,474	
16.00	15%	85%	60	243	14,586	
17.00	70%	30%	60	86	5,148	
18.00	92%	8%	60	23	1,373	
19.00	100%	0%	60	0	0	
Required :	sun hours	@ 50% aı	rea		2	
Achieved	sun hou	rs on @	50% area	ı	6.00	
Achieved	total sun	time (hr	s)		6.82	
Achieved	dailv sun t	ime * are:	a		117031	

D					500	r
NEW ST	ATUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% /	%	min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	94%	6%	60	30	1,800	
8.00	64%	36%	60	180	10,800	
9.00	21%	79%	60	395	23,700	
10.00	31%	69%	60	345	20,700	
11.00	27%	73%	60	365	21,900	
12.00	26%	74%	60	370	22,200	
13.00	26%	74%	60	370	22,200	
14.00	25%	75%	60	375	22,500	
15.00	24%	76%	60	380	22,800	
16.00	18%	82%	60	410	24,600	
17.00	46%	54%	60	270	16,200	
18.00	88%	12%	60	60	3,600	
19.00	100%	0%	60	0	0	
Required:	sun hours (	@ 50% aı	rea		2	
Achieved	sun hour	s on @	50% area		9.00	
Achieved	l total sun	time (hr	s)		7.1	
Achieved	daily sun ti	me * are	a		213000	

E					95
NEW STA	TUS				March 21st
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% /	%	min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	92%	8%	60	8	456
8.00	63%	37%	60	35	2,109
9.00	27%	73%	60	69	4,161
10.00	47%	53%	60	50	3,021
11.00	71%	29%	60	28	1,653
12.00	85%	15%	60	14	855
13.00	87%	13%	60	12	741
14.00	86%	14%	60	13	798
15.00	85%	15%	60	14	855
16.00	80%	20%	60	19	1,140
17.00	78%	22%	60	21	1,254
18.00	78%	22%	60	21	1,254
19.00	100%	0%	60	0	0
Required s	un hours (	@ 50% aı	rea		2
Achieved	sun hou	s on @	50% area		2.00
Achieved	total sun	time (hr	s)		3.21
Achieved a	daily sun t	mo * am	,		18297

F .					4,147
NEW STA	TUS				March 21st
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% /	/ %	min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	74%	26%	60	1078	64,693
8.00	26%	74%	60	3069	184,127
9.00	16%	84%	60	3483	209,009
10.00	12%	88%	60	3649	218,962
11.00	12%	88%	60	3649	218,962
12.00	12%	88%	60	3649	218,962
13.00	12%	88%	60	3649	218,962
14.00	16%	84%	60	3483	209,009
15.00	19%	81%	60	3359	201,544
16.00	22%	78%	60	3235	194,080
17.00	25%	75%	60	3110	186,615
18.00	38%	62%	60	2571	154,268
19.00	100%	0%	60	0	0
Required s	un hours (	@ 50% aı	rea		2
Achieved	sun hou	rs on @	50% area		11.00
Achieved	total sun	time (hr	s)		9.16
Achieved of	daily sun t	ime * are	a		2279191

G					133	n
NEW STA	TUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% /	· %	min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	92%	8%	60	11	638	
8.00	71%	29%	60	39	2,314	
9.00	44%	56%	60	74	4,469	
10.00	18%	82%	60	109	6,544	
11.00	18%	82%	60	109	6,544	
12.00	17%	83%	60	110	6,623	
13.00	8%	92%	60	122	7,342	
14.00	11%	89%	60	118	7,102	
15.00	16%	84%	60	112	6,703	
16.00	65%	35%	60	47	2,793	
17.00	86%	14%	60	19	1,117	
18.00	90%	10%	60	13	798	
19.00	100%	0%	60	0	0	
Required s	un hours (	@ 50% aı	rea		2	
Achieved	sun hou	rs on @	50% area		7.00	
Achieved	total sun	time (hr	s)		6.64	
Achieved of	dailv sun t	ime * are	a		52987	

H					379
NEW STA	TUS				March 21st
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% /	%	min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	92%	8%	60	30	1,819
8.00	88%	12%	60	45	2,729
9.00	84%	16%	60	61	3,638
10.00	84%	16%	60	61	3,638
11.00	73%	27%	60	102	6,140
12.00	59%	41%	60	155	9,323
13.00	49%	51%	60	193	11,597
14.00	50%	50%	60	190	11,370
15.00	38%	62%	60	235	14,099
16.00	52%	48%	60	182	10,915
17.00	74%	26%	60	99	5,912
18.00	90%	10%	60	38	2,274
19.00	100%	0%	60	0	0
Required s	un hours (	@ 50% aı	rea		2
Achieved	sun hour	s on @	50% area		2.00
Achieved	total sun	time (hr	s)		3.67
Achieved of	daily sun ti	me * are	a		83456

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					798	m2 .					744
NEW STA	ATUS				March 21st	NEV	V STATUS				March 21st
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% /	/ %	min	m2	min*m2	24 H	łr %	/ %	min	m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0
.00	90%	10%	60	80	4,788	7.00	93%	7%	60	52	3,125
3.00	64%	36%	60	287	17,237	8.00	67%	33%	60	246	14,731
.00	16%	84%	60	670	40,219	9.00	26%	74%	60	551	33,034
0.00	16%	84%	60	670	40,219	10.0	0 14%	86%	60	640	38,390
1.00	16%	84%	60	670	40,219	11.0	0 14%	86%	60	640	38,390
2.00	16%	84%	60	670	40,219	12.0	0 14%	86%	60	640	38,390
3.00	16%	84%	60	670	40,219	13.0	0 14%	86%	60	640	38,390
4.00	16%	84%	60	670	40,219	14.0	0 10%	90%	60	670	40,176
15.00	20%	80%	60	638	38,304	15.0	0 10%	90%	60	670	40,176
6.00	23%	77%	60	614	36,868	16.0	0 14%	86%	60	640	38,390
7.00	41%	59%	60	471	28,249	17.0	0 15%	85%	60	632	37,944
8.00	85%	15%	60	120	7,182	18.0	0 18%	82%	60	610	36,605
9.00	100%	0%	60	0	0	19.0	100%	0%	60	0	0
equired s	sun hours	@ 50% ar	ea		2	Ren	uired sun hours	@ 50% a	nea .		2
											10.00
	l sun hou	rs on @ :	50% area		9.00	Ach	ieved sun hou	rs on (a)	50% area		
Achieved Achieved Achieved	l sun houi I total sun daily sun t	time (hr	s)		9.00 7.81 373943	Ach	ieved sun hou ieved total sur ieved daily sun t	time (h	s)		8.91 397742
chieved chieved chieved	l total sun daily sun t	time (hr	s)		7.81 373943 <b>125</b>	Ach	ieved total sur ieved daily sun t	time (h	s)		8.91 397742 <b>123</b>
Achieved Achieved Achieved	l total sun daily sun t ATUS	time (hr ime * area	s) a		7.81 373943 <b>125</b> March 21st	Ach Ach m2 L NEV	ieved total sur ieved daily sun t	time (hi	s) a		8.91 397742 123 March 21st
Achieved Achieved Achieved ( IEW ST/	total sun daily sun t ATUS Shadow	time (hr ime * area	Sun time		7.81 373943 125 March 21st Sun time.area	Ach Ach m2 L NEV	ieved total sur ieved daily sun t V STATUS Shadow	time (hi	s) a Sun time		8.91 397742 123 March 21st Sun time.area
Achieved Achieved Achieved ( MEW STA Time	daily sun t	time (hr ime * area Sunlight	S) a Sun time	m2	7.81 373943 125 March 21st Sun time.area min*m2	Ach Ach m2 L NEV Time 24 H	ieved total sur ieved daily sun t V STATUS e Shadow fr %	time (hi ime * are Sunlight	Sun time	m2	8.91 397742 123 March 21st Sun time.area min*m2
Achieved Ach	ATUS Shadow % 100%	time (hr ime * area Sunlight / %	Sun time	m2 0	7.81 373943 125 March 21st Sun time.area min*m2	Ach m2 L NEV Time 24 H	v status s Shadow fr % 100%	time (hi ime * are	Sun time	m2 0	8.91 397742 123 March 21st Sun time.area min*m2
Achieved Ach	ATUS Shadow % 100% 92%	time (hr ime * area Sunlight / % 0% 8%	Sun time min 60 60	m2 0 10	7.81 373943 125 March 21st Sun time.area min*m2 0	Ach Ach m2 L NEV Time 24 H 6.00 7.00	v status s Shadow fr % 100% 100% 88%	sunlight	Sun time min 60 60	m2 0 15	8.91 397742 123 March 21st Sun time.area min*m2 0 886
Achieved Ach	ATUS Shadow % 100% 92% 90%	time (hr ime * area Sunlight / % 0% 8% 10%	Sun time min 60 60 60	m2 0 10 13	7.81 373943 125 March 21st Sun time.area min*m2 0 600 750	M2 L NEV Time 24 H 6.00 7.00 8.00	v status shadow fr % 100% 100% 100% 100% 100% 100% 100% 10	sunlight	Sun time min 60 60 60 60	m2 0 15 54	8.91 397742 123 March 21st Sun time.area min*m2 0 886 3,247
Achieved Achieved Achieved ( NEW STA Time 24 Hr 5.00 7.00 3.00	ATUS Shadow %.1 100% 92% 90% 81%	time (hr ime * area Sunlight / % 0% 8% 10% 19%	Sun time min 60 60 60 60	m2 0 10 13 24	7.81 373943 125 March 21st Sun time.area min*m2 0 600 750 1,425	M2 L NEV Time 24 H 6.00 7.00 8.00 9.00	v status e Shadow fr % 0 100% 0 88% 0 56% 0 41%	Sunlight / %  0% 12% 44% 59%	Sun time min 60 60 60 60	m2 0 15 54 73	8.91 397742 <b>123</b> March 21st Sun time.area min*m2 0 8866 3,247 4,354
Achieved Ach	ATUS Shadow % , 100% 92% 90% 81% 74%	sunlight / % 0% 8% 10% 19% 26%	Sun time min 60 60 60 60 60	m2 0 10 13 24 33	7.81 373943 <b>125</b> March 21st Sun time.area min*m2 0 600 750 1,425	M2 L NEV Time 24 H 6.000 7.000 9.000 10.00	v status s Shadow fr % 0 100% 0 88% 0 56% 0 41% 0 76%	Sunlight / %  0%  12%  44%  59%  24%	Sun time min 60 60 60 60 60	m2 0 15 54 73 30	8.91 397742 <b>123</b> March 21st Sun time.area min*m2 0 8866 3,247 4,354
Achieved Ach	ATUS Shadow % , 100% 92% 90% 81% 74% 55%	Sunlight / % 0% 8% 10% 26% 45%	Sun time min 60 60 60 60 60 60 60	m2 0 10 13 24 33 56	7.81 373943 <b>125</b> March 21st Sun time.area min*m2 0 6000 750 1,425 1,950 3,375	Ach Ach m2 L NEV Time 24 H 6.00 7.00 8.000 9.00 10.0	v status s Shadow fr % 100% 100% 100% 100% 100% 1007 1007 100	Sunlight / %  0%  12%  44%  59%  24%  10%	Sun time min 60 60 60 60 60 60	m2 0 15 54 73 30	8.91 397742 123 March 21st Sun time.area min*m2 0 886 3,247 4,354 1,771 738
Achieved Ach	ATUS Shadow % 100% 92% 90% 81% 74% 55% 48%	time (hr ime * area Sunlight / %	Sun time min 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56	7.81 373943  125 March 21st Sun time.area min*m2 0 6000 7500 1,425 1,950 3,375 3,900	Mach Ach Nev Nev Time 24 H 6.00 7.00 8.00 9.00 11.1.1 12.0 12.0 12.0 12.0 12.0 12.0	v status s Shadow tr % 0 100% 0 88% 0 41% 0 0 0 76% 0 0 90% 0 90% 0 84%	Sunlight / %	Sun time min 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12	8.91 397742 123 March 21st Sun time.area min*m2 0 8866 3,247 4,354 1,771 738
Achieved Ach	ATUS Shadow % 92% 90% 81% 74% 55% 48% 24%	time (hr ime * area Sunlight / %	Sun time min 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95	7.81 373943  125 March 21st Sun time area min*m2 0 6000 750 1,425 1,950 3,375 3,900 5,700	m2 L NEW Time 24 H 6.00 7.00 8.00 11.0.0 11.2.0 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13	v status s Shadow fr % 0 1000 0 2000 0 389% 0 56% 0 41% 0 76% 0 88% 0 56% 0 49% 0 68% 0 68% 0 76% 0 88% 0 76% 0 88% 0 76% 0 88%	Sunlight / %  Sunlight / %  12%  44%  59%  10%  16%  15%	Sun time min 60 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12 20	8.91 397742 123 March 21st Sun time.area min*m2 0 886 3.247 4.354 1,771 738 1,181
K Achieved Achieved Achieved Achieved K NEW ST/ Fime 24 Hr 6.00 7.00 8.00 10.00 11.00 12.00 13.00 14.00	ATUS Shadow % 92% 990% 74% 55% 48% 24% 16%	time (hr ime * are: Sunlight / % 0% 8% 10% 19% 26% 45% 52% 76% 84%	Sun time min 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95	7.81 373943  125 March 21st Sun time.area min*m2 0 6000 7500 1,425 1,950 3,375 3,900 5,700 6,300	Ach Ach  m2 L NEV Time 24 + 6.00 7.00 8.00 10.0 11.1 12.0 13.0 14.0	V STATUS Shadow 1009 Shadow 1000 Shadow 10	Sunlight / %  0% 12% 44% 59% 10% 16% 15% 21%	Sun time min 60 60 60 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12 20 18 26	8.91 397742 123 March 21st Sun time area min*m2 0 8866 3,247 4,354 1,771 738 1,181 1,107 1,550
Achieved Ach	ATUS Shadow % 92% 92% 90% 81% 55% 48% 24% 16% 21%	time (hr ime * are: Sunlight / % 0% 8% 10% 26% 45% 52% 76% 84% 79%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105	7.81 373943  125 March 21st Sun time.area min*m2 0 6000 7500 1,425 1,950 3,375 3,900 6,300 6,300 5,925	Ach Ach m2 L NEV Time 24 H 6.00 7.00 8.00 9.00 11.0 12.0 14.0 14.0 15.0	v STATUS  Shadow  1 100%  1 10	Sunlight / %  0% 12% 44% 59% 10% 16% 15% 21%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12 20 18 26 68	8.91 397742 123 March 213t Sun time.area min*m2 0 886 3,247 4,354 1,771 738 1,181 1,107 1,550 4,059
Achieved Achieved Achieved Achieved Achieved  (  (  (	ATUS Shadow %. 100% 92% 90% 81% 74% 55% 48% 24% 16% 21% 13%	Sunlight ( % 0% 8% 10% 45% 52% 76% 84% 79% 87% 87%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105	7.81 373943  125 March 21st Sun time.area min*m2 0 600 750 1,425 1,950 3,375 3,900 5,700 6,300 5,925 6,525	Ach Ach  m2 L  NEV  Times  24 H  600  7.00  8.00  10.00  11.1  12.6  13.1  14.6  15.6  16.00	v STATUS Search Shadow Star Sh	Sunlight / %  Sunlight / %  12%  44%  59%  16%  24%  10%  15%  68%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12 20 18 26 68	8.91 397742  123 March 21st Sun time.area min*m2 0 8866 3.247 4,354 1,771 738 1,181 1,107 1,550 4,059 5,018
Achieved Ach	ATUS Shadow % , 100% 92% 90% 81% 74% 55% 48% 24% 116% 21% 13% 88%	time (hr ime * are:  Sunlight  %  0%  8%  10%  19%  45%  76%  84%  79%  87%  12%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105 99	7.81 373943  125 March 21st Sun time area min*m2 600 750 1,425 1,950 3,375 3,900 5,700 6,300 5,925 6,525 900	M2 L NEW Time 24 H 6.00 7.00 10.0 11.0 12.2 13.0 14.4 15.0 16.0 16.0 17.0 17.0 17.0 17.0 18.0 18.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19	v status s Shadow fr % 100% 100% 100% 100% 100% 100% 100% 10	Sunlight / %  Sunlight / %  0%  12%  44%  59%  11%  21%  16%  119%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12 20 18 26 68 84	8.91 397742  123 March 21st Sun time area min*m2 8866 3,247 4,354 1,771 7383 1,181 1,107 1,550 4,059 5,018 1,402
Achieved Ach	ATUS Shadow %6   100% 92% 90% 81% 74% 55% 48% 24% 16% 21% 13% 88% 92%	time (hr	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105 99 109	7.81 373943  125 March 21st Sun time-area min**m2 0 600 750 1,425 1,950 3,375 3,900 6,300 5,700 6,300 6,525 9,000 600	M2 L NEV 100 100 100 100 110 110 110 110 110 11	v status  s Shadow fr % 0 100% 0 88% 0 141% 0 0 76% 0 0 40% 0 0 30% 0 0 44% 0 0 10 32% 0 0 10 88%	Sunlight  Sunlight  %  0%  12%  44%  59%  24%  10%  15%  88%  19%  88%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 15 54 73 30 12 20 18 26 68 84 23 10	8.91 397742  123 March 21st Sun time area min*m2 0 8866 3,247 4,354 1,771 738 1,181 1,107 1,550 4,059 5,018 1,402 590
Achieved Ach	ATUS Shadow %. 100% 92% 90% 48% 55% 48% 24% 16% 21% 88% 92% 100%	time (hr	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105 99	7.81 373943  125 March 21st Sun time.area min*m2 600 750 1,425 1,950 3,375 3,900 6,300 5,925 6,525 900 6000 0	Ach Ach m2 L NEV Time 24 4 6.00 7.00 8.00 10.0 11.6 12.C 13.6 16.0 17.0 18.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19	ieved total sur livered daily sun livered daily	Sunlight  's are  Sunlight  's are  Sunlight  's are  12%  44%  59%  24%  10%  15%  68%  19%  8%  0%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 15 54 73 30 12 20 18 26 68 84	8.91 397742  123 March 21st Sun time.area min*m2 0 8868 3,247 4,354 1,771 738 1,181 1,1070 1,550 4,059 5,018 1,402 5990
Chieved Achieved Achi	ATUS Shadow %. 100% 81% 92% 92% 1100% 138% 92% 93% 100% 138% 92% 100% 138% 92% 100% 138% 92% 100% 138% 92% 100% 138% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 100% 100% 100% 100% 100% 100% 10	time (hr	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105 99 109	7.81 373943  125 March 21st Sun time.area min*m2 0 6000 7500 1,425 1,950 3,307 5,700 6,300 5,925 6,525 900 0 0 2	Ach Ach m2 L NEV Time 24 H 6.00 7.00 8.00 9.00 10.0 11.0 12.0 13.1 14.0 15.1 16.0 17.7 18.0	v STATUS Se Shadow If % 100% 100% 100% 100% 100% 100% 100% 10	Sunlight / %  Sunlight / %  0%  12%  44%  59%  21%  16%  18%  88%  0%  0%  0%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 15 54 73 30 12 20 18 26 68 84 23 10	8.91 397742  123 March 21st Sun time area min*m2 8866 3,247 4,354 1,777 738 1,181 1,107 1,550 4,059 5,018 1,402 0 2
Achieved Ach	ATUS Shadow %	time (hr	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105 99 109	7.81 373943  125 March 21st Sun time.area min*m2 0 600 7500 1,425 1,950 3,375 3,900 6,300 6,700 6,300 0 0 0 2	McV L NEV Time 24 H 6.00 7.00 8.00 9.00 10.0 11.0 12.0 15.0 16.0 17.0 18.0 19.0 Request Ach	v STATUS Se Shadow If % 10 100% 10 88% 10 41% 10 100% 10 88% 10 45% 10 45% 10 45% 10 85% 10 85% 10 85% 10 85% 10 85% 10 85% 10 90% 10 85% 10 90% 10 9	Sunlight / %  Sunlight / %  0%  12%  44%  59%  11%  55%  68%  0%  0%  87  87  87  87  87  87	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 15 54 73 30 12 20 18 26 68 84 23 10	8.91 397742  123 March 21st Sun time.arease min*m2 0 8866 8864 1,771 738 1,181 1,107 1,550 4,059 5,018 1,402 590 0 2 3.000
Achieved Ach	ATUS Shadow %. 100% 81% 92% 92% 1100% 138% 92% 93% 100% 138% 92% 100% 138% 92% 100% 138% 92% 100% 138% 92% 100% 138% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 138% 92% 92% 100% 100% 100% 100% 100% 100% 100% 10	Sunlight (hr are) 3 sunlight (% 0% 8% 6 10% 10% 10% 10% 10% 10% 10% 10% 10% 10%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 10 13 24 33 56 65 95 105 99 109	7.81 373943  125 March 21st Sun time.area min*m2 0 6000 7500 1,425 1,950 3,307 5,700 6,300 5,925 6,525 900 0 0 2	m2 L NEV Time 24 4 4 6.00 7.00 8.00 10.0 11.1 12.0 15.1 14.0 15.0 19.0 Req Ach	v STATUS Se Shadow If % 100% 100% 100% 100% 100% 100% 100% 10	Sunlight  Sunlig	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 15 54 73 30 12 20 18 26 68 84 23 10	8.91 397742  123 March 21st Sun time area min*m2 8866 3,247 4,354 1,777 738 1,181 1,107 1,550 4,059 5,018 1,402 0 2

М					1,259
NEW STA	TUS				March 21st
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% /	/ %	min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	92%	8%	60	101	6,043
8.00	78%	22%	60	277	16,619
9.00	71%	29%	60	365	21,907
10.00	63%	37%	60	466	27,950
11.00	31%	69%	60	869	52,123
12.00	22%	78%	60	982	58,921
13.00	17%	83%	60	1045	62,698
14.00	14%	86%	60	1083	64,964
15.00	14%	86%	60	1083	64,964
16.00	14%	86%	60	1083	64,964
17.00	14%	86%	60	1083	64,964
18.00	28%	72%	60	906	54,389
19.00	100%	0%	60	0	0
Required s	un hours	@ 50% aı	rea		2
Achieved	sun hou	rs on @	50% area		8.00
Achieved	total sun	time (hr	s)		7.42
Achieved of	daily sun t	ime * are	a		560507

N					966
NEW ST	ATUS				March 21st
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% /	/ %	min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	92%	8%	60	77	4,637
8.00	78%	22%	60	213	12,751
9.00	68%	32%	60	309	18,547
10.00	37%	63%	60	609	36,515
11.00	18%	82%	60	792	47,527
12.00	17%	83%	60	802	48,107
13.00	14%	86%	60	831	49,846
14.00	14%	86%	60	831	49,846
15.00	14%	86%	60	831	49,846
16.00	14%	86%	60	831	49,846
17.00	14%	86%	60	831	49,846
18.00	28%	72%	60	696	41,731
19.00	100%	0%	60	0	0
Required	sun hours (	@ 50% aı	rea		2
Achieved	sun hou	rs on @	50% area		9.00
Achieved	d total sun	time (hr	s)		7.92
Achieved	daily sun t	imo * aro	a		459043

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## Neighbouring amenity spaces sunlight-shadow calculations - March 21st 2021

	G STATU		un For-	Cum con	March 21st	NEW S		Cuelland	Cue E	C	March 21st	
ime 4 Hr	Shadow 3		un time min	Sun area m2	time * area min*m2	Time 24 Hr	Shadow %		Sun time min	Sun area m2	time * area min*m2	t
4 Hr 6.00	100%	0%	60	m2 0	min-m2 0	6.00	100%	0%	60	m2 0	min-m2	ı
7.00	92%	8%	60	6	336	7.00	92%	8%	60	6	336	ı
3.00	92%	8%	60	6	336	8.00	92%	8%	60	6	336	i
9.00	80%	20%	60	14	840	9.00	80%	20%	60	14	840	
10.00	76%	24%	60	17	1,008	10.00	76%	24%	60	17	1,008	
11.00	70%	30%	60	21	1,260	11.00	70%	30%	60	21	1,260	
12.00	61%	39%	60	27	1,638	12.00	61%	39%	60	27	1,638	
13.00	22%	78%	60	55	3,276	13.00	22%	78%	60	55	3,276	
14.00	0%	100%	60	70	4,200	14.00	0%	100%	60	70	4,200	
15.00	0%	100%	60	70	4,200	15.00	0%	100%	60	70	4,200	
16.00	0%	100%	60	70	4,200	16.00	0%	100%	60	70	4,200	
17.00	16%	84%	60	59	3,528	17.00	16%	84%	60	59	3,528	
18.00	57%	43%	60	30	1,806	18.00	57%	43%	60	30	1,806	
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	Ī
		O =00/						0 5001				
	sun hours			/ 0500	5.00		d sun hour			10/ 0.000	5.00	
	d sun hou d total sun			% area	6.34		ed sun ho ed total su			170 area	6.34	
	daily sun t				26628		d daily sur				26628	H
101110400	dully Sull t	iiiic dice			20020	Adilicac	a daily Sui	i tillic al	ca		20020	
2						m2						
	G STATU			0	March 21st	NEW S					March 21st	į
Γime	Shadow 3			Sun area	time * area	Time		Sunlight		Sun area	time * area	ti
24 Hr	%/9		min	m2	min*m2	24 Hr	% .		min	m2	min*m2	
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	
7.00	92%	8%	60	1	77	7.00	92%	8%	60	1	77	
3.00	92%	8%	60	1	77	8.00	92%	8%	60	1	77	1
9.00	85%	15%	60	2	144	9.00	85%	15%	60	2	144	ı
10.00	85%	15%	60	2	144	10.00	85%	15%	60	2	144	
11.00	85%	15%	60	2	144	11.00	85%	15%	60	2	144	
12.00	85%	15%	60	2	144	12.00	85%	15%	60	2	144	Į
13.00	53%	47%	60	8	451	13.00	53%	47%	60	8	451	
14.00	0%	100%	60	16	960	14.00	0%	100%	60	16	960	Į
15.00	0%	100%	60	16	960	15.00	0%	100%	60	16	960	Į
16.00	0%	100%	60	16	960	16.00	0%	100%	60	16	960	Į
17.00	0%	100%	60	16	960	17.00	0%	100%	60	16	960	Į
18.00	17%	83%	60	13	797	18.00	88%	12%	60	2	115	Į
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	
			_			_			_		_	
		en con/ or	na /hr\		2	Require	sun hour	s @ 50%	area (hr)		2	
	sun hours											
Achieve	d sun hou	rs on (hr	s) @ 50	% area	5.00	Achiev	ed sun ho	urs on (h		1% area	4.00	
Achieved Achieved	d sun hou d total sun	rs on (hr: time (hr:	s) @ 50 <sup>o</sup> s)	% area	5.00 6.06	Achieve Achieve	ed sun ho ed total su	urs on (h ın time (h	nrs)	1% area	5.35	
Achieved Achieved	d sun hou	rs on (hr: time (hr:	s) @ 50 <sup>o</sup> s)	% area	5.00	Achieve Achieve	ed sun ho	urs on (h ın time (h	nrs)	1% area		
Achieved Achieved	d sun hou d total sun	rs on (hr: time (hr:	s) @ 50 <sup>o</sup> s)	% area	5.00 6.06	Achieve Achieve	ed sun ho ed total su	urs on (h ın time (h	nrs)	1% area	5.35	
Achieved Achieved	d sun hou d total sun	rs on (hr: time (hr:	s) @ 50 <sup>o</sup> s)	% area	5.00 6.06 5817.6	Achieve Achieve	ed sun ho ed total su	urs on (h ın time (h	nrs)	9% area	5.35	
Achieved Achieved	d sun hou d total sun daily sun t	rs on (hrs time (hr ime * area	s) @ 50 <sup>o</sup> s)	% area	5.00 6.06 5817.6	Achieve Achieve Achieve	ed sun ho ed total su d daily sur	urs on (h ın time (h	nrs)	9% area	5.35 5136	
Achieved Achieved Achieved 3 EXISTIN	d sun hou d total sun daily sun t	rs on (hrs time (hrs ime * area	s) @ 50 <sup>1</sup> s)		5.00 6.06 5817.6 17 March 21st	Achieve Achieve Achieve	ed sun ho ed total su d daily sur TATUS	urs on († in time († i time * ar	nrs) ea		5.35 5136 March 21st	197
Achieved Achieved Achieved 3 EXISTIN	d sun hou d total sun daily sun t G STATU: Shadow	rs on (hrs time (hrs ime * area s Sunlight S	s) @ 50 <sup>t</sup> s) un time	Sun area	5.00 6.06 5817.6 17 March 21st time * area	Achieve Achieve M2 NEW S	ed sun ho ed total su d daily sur  TATUS Shadow	urs on (h in time (h i time * ar Sunlight	nrs) ea Sun time	Sun area	5.35 5136 March 21st time * area	ti
Achieved Achieved Achieved 3 EXISTIN Fime 24 Hr	d sun hou d total sun daily sun t G STATU: Shadow 3	rs on (hrs time (hrs ime * area s Sunlight S	s) @ 50 <sup>d</sup> s) un time	Sun area m2	5.00 6.06 5817.6 17 March 21st time * area min*m2	Achieve Achieve Achieve m2 NEW S Time 24 Hr	ed sun ho ed total su d daily sur TATUS Shadow %	urs on († in time († i time * ar Sunlight	ea Sun time	Sun area m2	5.35 5136 March 21st time * area min*m2	ti
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Achieved  3 3 3 3 EXISTIN 11-100 11-1	d sun hou daily sun to daily su	rs on (hr: time (hr ime * area  \$  \$  \$  \$  \$  \$  \$  \$  \$  \$  \$  \$  \$	s) @ 500 s)	Sun area m2 0 1 1 3 3 3 3 3 3 9 9 177 177 144 0 6 6 8 12 17 17 17 17 17 17 17 17 17 17 17 17 17	5.00 6.06 5817.6  17  March 21st time * area min*m2 82 82 153 153 153 153 153 153 620 1,020 1,020 847 0 2 6.00 6.1 6222  17  March 21st time * area min*m2 82 82 153 153 153 153 153 153 153 153 153 153	m2  NEW S  Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 Required Achieve Achieve Achieve M2  NEW S  Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 10.00 11.	## A Shadow of the state of the	urs on († in time t it time * ar s s sunlight t it time * ar s s sunlight t it time * ar s s s s s s s s s s s s s s s s s s	Sun time min 600 600 600 600 600 600 600 600 600 60	Sun area m2 0 1 1 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 12 7 7 17 17 17 17 17 17 17 18 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	5.35 5136  March 21st time * area min*m2 0 82 153 153 153 153 153 153 20 1,020 1,020 918 122 0 2 5.00 5.29 5396  March 21st time * area min*m2 82 82 153 153 153 153 153 153 153 153 153 153	
Achieved  33  34  Achieved  Achieved  35  36  36  37  38  38  38  38  38  38  38  38  38	d sun hou daily sun to daily sun to daily sun to daily sun to shadow sha	rs on (hr: time	un time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 1 1 1 3 3 3 3 3 9 9 17 7 17 17 14 0 6 6 8 12 17 17 17 17 17 17 17 17 17 17 17 17 17	5.00 6.06 5817.6  177 March 21st time * area min*m2 82 82 153 153 153 153 153 153 200 1,020 1,020 847 0  March 21st time * area min*m2 82 82 6.00 6.1 6222  177 March 21st time * area min*m2 82 82 153 153 153 153 153 153 153 153 153 153	m2  NEW S Time 24 Hr 6.00 10.00 11.00 12.00 13.00 15.00 16.00 17.00 Required Achieve  m2  NEW S Time 24 Hr 6.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 8.00 19.00  Required Achieve  m2  NEW S Time 24 Hr 6.00 7.00 8.00 9.00 11.00 11.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 8.00 9.00 17.00 8.00 9.00 17.00 8.00 9.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 19.00 Required	## A Shadow ## A S	urs on († in time t it time * ar s s sunlight t it time * ar s s sunlight t it time * ar s s s s s s s s s s s s s s s s s s	Sun time min	Sun area m2 0 1 1 1 3 3 3 3 3 3 9 9 17 7 17 17 15 5 2 0 0 1 1 1 1 3 3 3 3 3 3 1 2 1 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1	5.35 5136  March 21st time * area min*m2 0 82 82 153 153 153 153 153 1,020 1,020 1,020 918 122 0  March 21st time * area min*m2 82 82 153 153 153 153 153 153 153 153 153 153	
Achieved  3 3 3 CEXISTIN Firme 24 Hr 10.00 11.00	d sun hou daily sun to daily su	rs on (hr: time (hr time * area  \$ \$ Sunlight S %  0% 8% 8% 8% 15% 15% 15% 15% 15% 6 100% 83% 0% \$ \$ Sunlight S 15% 15% 15% 15% 15% 15% 15% 15% 15% 15%	un time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 1 1 1 3 3 3 3 3 9 9 17 7 17 17 14 0 6 6 8 12 17 17 17 17 17 17 17 17 17 17 17 17 17	5.00 6.06 5817.6  17  March 21st time * area min*m2 82 82 153 153 153 153 153 153 620 1,020 1,020 847 0 2 6.00 6.1 6222  17  March 21st time * area min*m2 82 82 153 153 153 153 153 153 153 153 153 153	m2  NEW S Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 Requires Achieve Achieve  m2  NEW S Time 24 Hr 6.00 17.00 18.00 19.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 Requires Achieve Achieve Achieve  m2  NEW S Time 24 Hr 6.00 7.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 Requires Achieve Achieve	## A Shadow of the state of the	urs on († in time t it time * ar s s sunlight * (% 0% 0% 6% 0% 0% 6% 0% 0% 6% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 1 1 1 3 3 3 3 3 3 9 9 17 7 17 17 15 5 2 0 0 1 1 1 1 3 3 3 3 3 3 1 2 1 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1	5.35 5136  March 21st time * area min*m2 0 82 153 153 153 153 153 153 20 1,020 1,020 918 122 0 2 5.00 5.29 5396  March 21st time * area min*m2 82 82 153 153 153 153 153 153 153 153 153 153	

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5 Stin	G STATI	JS			28 March 21st
me	Shadow	Sunlight	Sun time	Sun area	time * area
4 Hr	% /		min	m2	min*m2
00	100%	0%	60	0	0
	92% 92%	8% 8%	60	2	134 134
00	85%	15%	60	4	252
0.00	85%	15%	60	4	252
1.00	85%	15%	60	4	252
2.00	75%	25%	60	7	420
3.00	19%	81%	60	23	1,361
4.00	0%	100%	60	28	1,680
15.00	0%	100%	60	28	1,680
16.00	0%	100%	60	28	1,680
17.00	0%	100%	60	28	1,680
18.00	17%	83%	60	23	1,394
19.00	100%	0%	60	0	0
chieved chieved	d sun ho d total su	@ 50% urs on (h n time (h time * ar	nrs) @ 50 nrs)	0% area	6.00 6.5 10920
6 Existin	G STATI	IS			1,160 March 21st
ime		Sunlight	Sun time	Sun area	time * area
4 Hr	% /	-	min	m2	min*m2
i.00	100%	0%	60	0	0
7.00	79%	21%	60	244	14,616
3.00	71%	29%	60	336	20,184
9.00	22%	78%	60	905	54,288
10.00	7%	93%	60	1079	64,728
1.00	7%	93%	60	1079	64,728
2.00	7%	93%	60	1079	64,728
3.00	7%	93%	60	1079	64,728
14.00	7%	93%	60	1079	64,728
15.00	7%	93%	60	1079	64,728
16.00	17%	83%	60	963	57,768
17.00 18.00	63% 90%	37% 10%	60	429 116	25,752 6,960
19.00	100%	0%	60	0	0,500
Achieved	daily sun	time * ar	rea		567936
<b>7</b> ISTIN ne Hr	G STATI Shadow %	JS Sunlight	Sun time	Sun area m2	27 March 21st time * area min*m2
7 EXISTIN Time 24 Hr 5.00	G STATI Shadow % /	JS Sunlight '%	Sun time min 60	m2 0	27 March 21st time * area min*m2
7 EXISTIN Time 24 Hr 5.00	G STATI Shadow % / 100% 92%	JS Sunlight '% 0% 8%	Sun time min 60 60	m2 0 2	27 March 21st time * area min*m2 0 130
7 EXISTING 124 Hr 5.00 7.00	G STATU Shadow % / 100% 92%	JS Sunlight ' % 0% 8%	Sun time min 60 60 60	m2 0 2	27 March 21st time * area min*m2 0 130
7 XISTIN me 4 Hr .00 .00	G STATI Shadow % / 100% 92% 92% 85%	JS Sunlight ' % 0% 8% 8% 15%	Sun time min 60 60 60 60	m2 0 2 2	27 March 21st time * area min*m2 0 130 130 243
7 XISTIN ime 4 Hr .00 .00 .00	G STATI Shadow % / 100% 92% 92% 85% 85%	JS Sunlight ' % 0% 8% 8% 15%	Sun time min 60 60 60 60 60	m2 0 2 2 4	27 March 21st time * area min*m2 0 130 130 243 243
7 EXISTING Time 24 Hr 5.00 7.00 8.00 9.00 10.00	G STATU Shadow % / 100% 92% 92% 85% 85% 80%	JS Sunlight ' % 0% 8% 8% 15% 15% 20%	Sun time min 60 60 60 60 60 60	m2 0 2 2 4 4 5	27 March 21st time * area min*m2 0 130 130 243 243 324
7 EXISTING Time 4 Hr 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.0	G STATI Shadow % / 100% 92% 92% 85% 85% 85% 80%	JS Sunlight '%  0%  8%  15%  15%  20%  64%	Sun time min 60 60 60 60 60 60 60	m2 0 2 2 4 4 5	27 March 21st time * area min*m2 0 130 130 243 243 324 1,037
7 XISTIN ime 4 Hr .00 .00 .00 .00 .00 .00 2.00 3.00	G STATU Shadow % / 100% 92% 92% 85% 85% 80% 36% 9%	JS Sunlight ' % 0% 8% 8% 15% 15% 20% 64%	Sun time min 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 5 17 25	27 March 21st time * area min*m2 0 130 243 243 324 1,037 1,474
7 EXISTING Time 4 Hr 5.00 7.00 8.00 9.00 9.00 9.00 9.00 9.00 9.00 9	G STATU Shadow % / 100% 92% 92% 85% 85% 80% 36% 9% 0%	US Sunlight '% 0% 8% 8% 15% 20% 64% 91% 100%	Sun time min 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 5 17 25	27 March 21st time * area min*m2 0 130 130 243 243 324 1,037 1,474 1,620
7 EXISTING Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00	G STATU Shadow % / 100% 92% 92% 85% 85% 80% 36% 9% 0%	US Sunlight '%  0% 8% 8% 15% 20% 64% 91% 100%	Sun time min 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 5 17 25 27 27	27 March 21st time * area min*m2 0 130 130 243 243 324 1,037 1,474 1,620 1,620
7 EXISTIN Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00	G STATI Shadow % / 100% 92% 92% 85% 85% 80% 36% 9% 0% 0%	JS Sunlight '% 8% 8% 15% 20% 64% 91% 100% 100%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 2 2 4 4 5 5 17 25 27 27 27	27 March 21st time * area min*m2 0 130 130 243 224 1,037 1,474 1,620 1,620
7 EXISTIN Time 24 Hr 6.00 7.00 3.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00	G STATU Shadow % / 100% 92% 92% 85% 85% 80% 36% 9% 0% 0%	JS Sunlight '% 8% 8% 15% 20% 64% 91% 100% 100%	Sun time min 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 5 5 17 25 27 27 27 27	27 March 21st time * area min*m2 0 130 243 224 1,037 1,474 1,620 1,620 1,620
7 XXISTIN me 4 Hr 000 000 000 000 000 000 000 0	G STATI Shadow % / 100% 92% 92% 85% 85% 80% 36% 9% 0% 0%	JS Sunlight '% 8% 8% 15% 20% 64% 91% 100% 100%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 2 2 4 4 5 5 17 25 27 27 27	27 March 213t time * area min*m2 0 130 130 243 243 324 1,037 1,474 1,620 1,620 1,620 1,620
7 7 7 EXISTIN 124 Hr 124 Hr 124 Hr 126 6.00 17.00 18.00 19.00 11.00 112.00 113.00 114.00 115.00 116.00 17.00 18.00 19.00 Achieved	9 STATI Shadow % // 100% 92% 85% 85% 80% 36% 0% 0% 17% 100%	US Sunlight (% 0% 8% 8% 8% 15% 50% 15% 15% 100% 100% 100% 83% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 5 5 17 25 27 27 27 22 0	277 March 21st time * area min*m2 0 1300 1300 243 243 324 1,037 1,474 1,620 1,620 1,620 1,345 0 2 7.00
77 76:2XISTIN 17:00 18:4 Hr 18	6 STATI Shadow % 6 100% 92% 85% 85% 80% 0% 0% 0% 17% 100% sun hours sun hours daily sun	US Sunlight %  0% 8% 8% 15% 15% 100% 100% 83% 0% 83% 100% 83% 0% 83% 0%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 5 5 17 25 27 27 27 22 0	27 March 21st time * area min*m2 0 0 130 130 243 324 1,037 1,474 1,620 1,620 1,345 0 2 7,000 7.04
77 77 78 78 79 70 70 70 70 70 70 70 70 70 70 70 70 70	6 STATI Shadow % / 100% 92% 92% 85% 85% 36% 96 0% 0% 00% 17% 0 ds un hou d sly sun daily sun	US Sunlight %  0% 8% 8% 15% 15% 100% 100% 83% 0% 83% 100% 83% 0% 83% 0%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 5 17 25 27 27 27 22 0	27 March 21st time * area min*m2 0 130 130 243 324 1,037 1,474 1,620 1,620 1,620 2 7,00 7,04 11404.8
77 77 78 78 79 70 70 70 70 70 70 70 70 70 70 70 70 70	6 STATI Shadow % / 100% 92% 92% 85% 85% 36% 96 0% 0% 00% 17% 0 ds un hou d sly sun daily sun	Sunlight % 0% 8% 8% 8% 15% 15% 15% 15% 15% 100% 100% 100% 20% 0% 64% 100% 20% 100% 100% 100% 100% 100% 100%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 4 5 5 117 25 27 27 27 22 0 0% area	27 March 21st time * area min*m2 0 1300 1300 243 243 324 1,037 1,474 1,620 1,620 1,620 2 7.00 7.04 11404.8
77 77 77 78 78 78 79 70 70 70 70 70 70 70 70 70 70 70 70 70	6 STATI Shadow % /6 /6 100% 85% 85% 85% 85% 96% 0% 0% 100% 100% 100% 6 STATI Shadow	Sunlight % 0% 8% 8% 8% 15% 15% 100% 100% 100% 100% 100% 100%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 5 117 25 27 27 27 20 0 % area	27 March 21st time * area min*m2 0 130 130 243 324 1,037 1,474 1,620 1,620 1,620 1,345 0 2 7,00 7,04 11404.8 17 March 21st time * area min*m2 0
77 77 78 78 78 79 70 70 70 70 70 70 70 70 70 70 70 70 70	G STATI Shadow % /6 / 100% 92% 92% 85% 85% 85% 36% 9% 0% 0% 100% 100% 1 bon hou' t total su daily sun G STATI Shadow % / 6 / 00% 92%	Sunlight % 0% 8% 8% 15% 15% 64% 100% 100% 100% 100% 100% 100% 100% 10	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 5 177 25 27 27 27 20 0 9% area	27 March 21st time * area min*m2 0 1300 1300 243 243 324 1,037 1,474 1,620 1,620 1,620 2 7.00 7.04 11404.8 17 March 21st time * area min*m2 0 82
77 Tirme 24 Hr 6.000 113.00 114.00 115.00 115.00 116.00 117.00 118.00 11	G STATI Shadow %6, 100% 92% 92% 85% 85% 85% 86% 0% 0% 0% 100% 1 sun hours of it total su daily sun Shadow %6, 100%	Sunlight % 0% 8% 8% 8% 15% 15% 100% 100% 100% 100% 100% 100%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 5 177 25 27 27 27 22 0 0 3% area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 2,700 7,04 11404.8 17 March 21st time * area min*m2 0 822 82
77 77 78 78 79 70 70 70 70 70 70 70 70 70 70 70 70 70	G STATI Shadow % /6 / 100% 92% 92% 85% 85% 85% 36% 9% 0% 0% 100% 100% 1 bon hou' t total su daily sun G STATI Shadow % / 6 / 00% 92%	Sunlight % 0% 8% 15% 0% 15% 15% 15% 15% 15% 15% 15% 15% 15% 15	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 4 5 5 117 25 27 27 27 22 0 0 3 area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 2,7.00 7.04 11404.8 17 March 21st time * area min*m2 0 82 82 153
77 Time 24 Hr 24 Hr 10.00 Time 25 Hr 10.00 Time 26 Hr 10.00 Time 26 Hr 10.00 Time 27 Hr 10.	G STATI Shadow % /6 / 100% 92% 92% 85% 85% 86% 0% 0% 0% 17% 100% 1 sun hours 3 sun hours 4 sun hours 1 sun hours 9 / 6 STATI Shadow % / 6 / 6 / 6 / 6 / 6 / 6 / 6 / 6 / 6 /	Sunlight % 0% 8% 8% 15% 100% 100% 100% 100% 100% 100% 100%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 177 25 27 27 27 20 0 34 Sun area m2 0 11 11 3 3	27 March 21st time * area min*m2 0 130 243 324 1,037 1,474 1,620 1,620 1,620 7.04 11404.8 17 March 21st time * area min*m2 82 82 82 82 1,53
7	G STATI Shadow % 1 100% 92% 85% 80% 85% 80% 10% 10% 10% 11% 1 total sus hours 1 sun hours 1 sun hours 1 sun hours 2 sun hours 2 sun hours 1 sun hours 2 sun hours 3 sun hours 1 sun hours 2 sun hours 3 sun hours 3 sun hours 4 sun hours 5 sun hours 6 STATI	US Sunlight % % 0% 8% 8% 15% 0% 100% 83% 100% 83% 100% 83% 100% 83% 100% 83% 100% 83% 100% 83% 100% 100% 100% 100% 100% 100% 100% 10	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 177 25 27 27 27 20 0 9% area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 2,7.00 7.04 11404.8 17 March 21st time * area min*m2 82 82 82 153 153 255
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	G STATI Shadow %6 100% 92% 92% 85% 80% 80% 100% 100% 100% 100% 100% 100%	US Sunlight % 8 % 8 % 8 % 15 % 20 % 6 4 % 100 % 100 % 8 3 % 100 % 8 3 % 100 % 8 3 % 100 % 8 5 % 100 % 8 5 % 100 % 8 5 % 100 % 8 5 % 100 % 8 8 % 8 % 15 % 15 % 15 %	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 5 177 255 277 277 27 22 0 0 3% area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 1,345 0 2,7.00 7.04 11404.8 17 March 21st time * area min*m2 0 822 82 82 153 153 2555 581
77  78  78  78  78  79  70  70  70  70  70  70  70  70  70	G STATI Shadow % 100% 92% 92% 85% 85% 0% 0% 0% 100% 17% 100% 1 sun hours 1 sun	Sunlight % 0% 8% 8% 15% 0% 64% 100% 100% 100% 100% 25% 0% 83% 15% 657% 93% 93%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 4 5 5 117 25 27 27 27 27 20 0 3 4 area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 2,7.00 7.04 11404.8 17 March 21st time * area min*m2 82 82 153 153 255 581
77 Time 24 Hr 6.00 9.00 10.00 110.00 12.00 13.00 14.00 17.00 18.00 19.00 Required Achieved Achieved	G STATI Shadow %6 100% 92% 92% 85% 80% 80% 100% 100% 100% 100% 100% 100%	US Sunlight % 8 % 8 % 8 % 15 % 20 % 6 4 % 100 % 100 % 8 3 % 100 % 8 3 % 100 % 8 3 % 100 % 8 5 % 100 % 8 5 % 100 % 8 5 % 100 % 8 5 % 100 % 8 8 % 8 % 15 % 15 % 15 %	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 5 177 25 27 27 27 20 0 9% area	27 March 21st time * area min*m2 0 1300 2433 3244 1,037 1,474 1,620 1,620 1,620 1,620 1,020
77 Time 24 Hr 6.00 15.00 16.00 17.00 18.00 19.00 11.00	G STATI Shadow % 100% 92% 92% 85% 85% 0% 0% 0% 100% 17% 100% 1 sun hours 1 sun	Sunlight % 0% 8% 8% 15% 0% 64% 100% 100% 100% 100% 25% 0% 83% 15% 657% 93% 93%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 2 2 4 4 4 4 5 5 117 25 27 27 27 27 20 0 3 4 area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 2,7.00 7.04 11404.8 17 March 21st time * area min*m2 82 82 153 153 255 581
7 7 EXISTIN Time 24 Hr 6.6.00 11.00	G STATI Shadow % /6 / 100% 92% 92% 85% 85% 85% 60% 0% 0% 0% 17% 100% 1 sun hours daily sun 100% 92% 92% 43% 65% 65% 65% 65% 66 STATI	Sunlight % 0% 8% 8% 15% 100% 100% 33% 8 0% 950% 115% 15% 15% 100% 35% 100% 100% 100% 100% 100% 100% 100% 10	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 5 5 177 25 27 27 27 20 0 9% area	27 March 21st time * area min*m2 0 1300 2433 3244 1,037 1,474 1,620 1,620 1,620 1,620 1,020
77 EXISTIN Time 24 Hr 24 Hr 24 Hr 10.00 17.00 8.00 19.00 11.00	G STATI Shadow %6 / 100% 92% 85% 86% 86% 86% 06% 06% 17% 100% 1 total su hou total su hours 1 shadow %6 / 6 100% 85% 85% 6 STATI 100% 85% 85% 6 STATI 100% 85% 85% 6 O% 6 O%	US Sunlight % % 0% 8% 8% 15% 0% 100% 83% 150% 100% 83% 0% 83% 100% 83% 0% 83% 0% 85 Sunlight % 0% 85 Sunlight 15% 15% 15% 15% 15% 15% 15% 15% 15% 15%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 4 5 5 177 25 27 27 27 22 0 0 9% area	27 March 21st time * area min*m2  130  130  243  324  1,037  1,620  1,620  1,620  1,620  7,00  7,04  11404.8  17 March 21st time * area min*m2  0  82  82  153  153  255  581  949  1,020  1,020  1,020
7 7 700 11.0	G STATI Shadow %6 100% 92% 85% 85% 80% 6 36% 0% 0% 100% 100% 100% 6 STATI Shadow 92% 85% 85% 6 43% 6 0% 6 0% 6 0% 6 0% 6 0% 6 0% 6 0% 6 0	US Sunlight %  8% 8% 8% 15% 20% 64% 100% 100% 100% 83% 0% 83% 0% 83% 15% 55% 93% 100% 100% 100% 100%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 4 5 5 17 7 25 27 27 27 27 22 0 0 3% area	27 March 21st time * area min*m2 130 130 243 324 1,037 1,474 1,620 1,620 1,620 1,345 0 2 7.00 7.04 11404.8 17 March 21st time * area min*m2 0 82 82 82 555 581 949 1,020 1,020 1,020
77.00 3.00 111.00 122.00 133.00 144.00 155.00 177.00 188.00	G STATI Shadow % 1 100% 92% 92% 85% 85% 96% 06% 06% 100% 1 sun hours 1 sun hours 1 sun hours 2 sun hours 6 STATI Shadow % 1 00% 92% 85% 75% 06% 06% 06%	Sunlight % 0% 8% 8% 15% 6% 15% 8% 15% 8% 100% 15% 100% 100% 15% 100% 100% 100%	Sun time min 600 600 600 600 600 600 600 600 600 60	m2 0 2 2 4 4 4 4 5 5 17 7 25 27 27 27 27 27 20 0 3 area 2 2 0 1 1 1 1 3 3 4 4 100 166 17 17 17 17 17	27 March 21st time * area min*m2 0 0 130 130 243 243 243 324 1,037 1,474 1,620 1,620 1,620 2 7.00 7.04 11404.8 17 March 21st time * area min*m2 82 82 153 153 255 581 949 1,020 1,020 1,020 1,020
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	G STATI					NEW ST					March 21s
me		Sunlight		Sun area	time * area	Time		Sunlight		Sun area	time * area
Hr	% /		min	m2	min*m2	24 Hr		/ %	min	m2	min*m2
00	100%	0%	60	0	0	6.00	100%	0%	60	0	C
00	92%	8%	60	1	82	7.00	92%	8%	60	1	82
00	92%	8%	60	1	82	8.00	92%	8%	60	1	82
00	85%	15%	60	3	153	9.00	85%	15%	60	3	153
0.00	85%	15%	60	3	153	10.00	85%	15%	60	3	153
1.00	75%	25%	60	4	255	11.00	75%	25%	60	4	255
2.00	43%	57%	60	10	581	12.00	43%	57%	60	10	581
3.00	7%	93%	60	16	949	13.00	7%	93%	60	16	949
1.00	0%	100%	60	17	1,020	14.00	0%	100%	60	17	1,020
5.00	0%	100%	60	17	1,020	15.00	0%	100%	60	17	1,020
6.00	0%	100%	60	17	1,020	16.00	0%	100%	60	17	1,020
7.00	0%	100%	60	17	1,020	17.00	73%	27%	60	5	275
3.00	17%	83%	60	14	847	18.00	85%	15%	60	3	153
9.00	100%	0%	60	0	0	19.00	100%	0%	60	0	2
chieve chieve	sun hours d sun ho d total su daily sun	urs on (h n time (h	ırs) @ 50 ırs)	% area	7.00 7.04 7180.8	Achieved Achieved	d sun ho d total su	s @ 50% : urs on (h in time (h i time * ar	ırs) @ 50 ırs)	% area	5.00 5.63 5743
10					16	m2					
	G STATI	JS			March 21st	NEW ST	ATUS				March 21st
me		Sunlight	Sun time	Sun area	time * area	Time		Sunlight	Sun time	Sun area	time * area
ille I Hr	SHAUUW % /	-	min	m2	min*m2	24 Hr		/ %	min	m2	min*m2
00	100%	70	60	0	0	6.00	100%	0%	60	0	0
00	92%	8%	60	1	77	7.00	92%	8%	60	1	77
00	92%	8%	60	1	77	8.00	92%	8%	60	1	77
00	85%	15%	60	2	144	9.00	85%	15%	60	2	144
0.00	85%	15%	60	2	144	10.00	85%	15%	60	2	144
1.00	75%	25%	60	4	240	11.00	75%	25%	60	4	240
2.00	43%	25% 57%	60	9	547	12.00	43%	25% 57%	60	9	547
3.00	45% 7%	93%	60	15	893	13.00	43% 7%	93%	60	15	893
1.00	7% 0%	100%	60	16	960	13.00	7% 0%	100%	60	16	960
			60	16					60	16	
5.00	0%	100%	60	16	960	15.00	0% 0%	100%	60	16	960 960
3.00		100%		-	960	16.00		100%	60	16	
7.00	0%	100%	60	16	960	17.00	73%	27%			259
3.00	17%	83%	60	13	797	18.00	85%	15%	60	2	144
9.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0
equired	sun hours	@ 50%	area (hr)		2	Required	sun hour	@ 50%	area (hr)		2
chieve			ırs) @ 50	% area	7.00	Achieved	d sun ho	urs on (h	,	1% area	5.00
chieve chieve	d sun ho d total su daily sun	n time (h	nrs)	% area		Achieved Achieved	d sun ho d total su		nrs)	9% area	5.00 5.63 5405
chiever chieved chieved	d total su daily sun G STATI	n time (h time * ar	nrs) ea		7.00 7.04 6758.4 <b>70</b> March 21st	Achieved Achieved Achieved m2	d sun ho d total su daily sur	urs on (h ın time (h ı time * ar	nrs) ea		5.63 5405 March 21st
chiever chieved chieved	d total su daily sun G STATI Shadow	n time (h time * ar JS Sunlight	nrs) ea Sun time	Sun area	7.00 7.04 6758.4 <b>70</b> March 21st time * area	Achieved Achieved Achieved m2 NEW ST	d sun ho d total su daily sur  ATUS Shadow	urs on (h un time (h i time * ar Sunlight	nrs) rea Sun time	Sun area	5.63 5405 March 21st time * area
chiever chieved chieved 11 KISTIN me	d total su daily sun G STATI Shadow % /	n time (h time * ar JS Sunlight	ea Sun time	Sun area m2	7.00 7.04 6758.4 <b>70</b> March 21st time * area min*m2	Achieved Achieved MEW ST Time 24 Hr	d sun ho d total su daily sur ATUS Shadow %	urs on (hun time (hun time * ar	nrs) ea Sun time min	Sun area m2	5.63 5405 March 21st time * area min*m2
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chiever chieved chieved 11 KISTIN me 1 Hr 00	d total su daily sun G STATI Shadow % / 100%	n time (f time * ar	Sun time min 60 60	Sun area m2 0 6	7.00 7.04 6758.4 70 March 21st time * area min*m2 0 336	Achieved Achieved  m2  NEW ST  Time 24 Hr 6.00 7.00	d sun ho d total su daily sur  ATUS Shadow % 100% 92%	urs on (h in time (h i time * ar Sunlight / %	Sun time min 60 60	Sun area m2 0 6	5.63 5405 March 21st time * area min*m2 0 336
chiever chieved chieved chieved chieved thr me thr 00 00	G STATI Shadow  100% 92% 45%	n time (f time * ar	Sun time min 60 60 60	Sun area m2 0 6 39	7.00 7.04 6758.4 <b>70</b> March 21st time * area min*m2 0 336 2,310	Achieved Achieved Achieved  m2  NEW ST Time 24 Hr 6.00 7.00 8.00	d sun ho d total su daily sur  ATUS Shadow % 100% 92% 45%	urs on (h un time (h un time * ar sunlight / % 0% 8% 55%	Sun time min 60 60 60	Sun area m2 0 6 39	5.63 5405 March 21st time * area min*m2 0 336 2,310
chiever chieved chieved chieved the triangle the the the the the the the the the th	G STATE Shadow 92% 45% 85%	n time (f time * ar JS Sunlight '% 0% 8% 55% 15%	Sun time min 60 60 60 60	Sun area m2 0 6 39	7.00 7.04 6758.4 <b>70</b> March 21st time * area min*m2 0 336 2,310 630	Achieved Achieved Achieved MEW ST Time 24 Hr 6.00 7.00 8.00 9.00	d sun ho d total su daily sur  ATUS Shadow % 100% 92% 45% 85%	urs on (h in time (l in time * ar  Sunlight / %  0%  8%  55% 15%	Sun time min 60 60 60 60	Sun area m2 0 6 39	5.63 5405 March 21st time * area min*m2 0 336 2,310 630
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111 KISTIN Hr 000 00 00 00 00 01 00 01	G STATI Shadow % / 100% 45% 85% 85%	n time (f time * ar string * ar string * ar string * ar string * s	Sun time min 60 60 60 60 60 60	Sun area m2 0 6 39 11 11	7.00 7.04 6758.4 <b>70</b> March 21st time * area min*m2 0 3366 2,310 630 630	Achieved Achieved achieved m2 NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	ATUS Shadow % 100% 92% 45% 85% 80%	urs on (hun time (hun time * ar sunlight / %	Sun time min 60 60 60 60 60 60	Sun area m2 0 6 39 11 11	5.63 5405  March 21st time * area min*m2 0 3366 2,310 630 840
11 11 11 11 11 11 11 11 11 11 11 11 11	G STATI Shadow % / 100% 45% 85% 80%	n time (h time * ar JS Sunlight ' % 0% 8% 55% 15% 20%	Sun time min 60 60 60 60 60 60 60 60	Sun area m2 0 6 39 11 11 14	7.00 7.04 6758.4  70 March 21st time * area min*m2 0 336 2,310 630 630 840 840	Achieved Achieved Achieved Achieved MEW ST Time 24 Hr. 6.00 7.00 8.00 9.00 10.00 11.00 12.00	ATUS Shadow % .100% .25% .45% .85% .85% .80% .80%	urs on (h un time (h un time * an  Sunlight / %	Sun time min 60 60 60 60 60 60 60 60	Sun area m2 0 6 39 111 111 14	5.63 5405 March 21st time * area min*m2 0 336 2,310 630 840 840
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11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	daily sun daily	n time (t time * ar	Sun time min	Sun area m2 0 0 6 6 3 9 9 11 1 11 1 4 4 3 3 5 7 6 0 6 6 2 5 8 8 0 8 4 6 6 2 2 2 2 4 6 6 1 2 4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7.00 7.04 6758.4  70 March 21st time * area min*m2 0 336 630 8400 2,562 3,444 3,528 3,612 3,696 3,486 0 2 7.00 6.17 25914  270 March 21st time * area min*m2 0 1,296 2,754 7,452 11,826 6,804 6,804 7,128 7,452 8,262 8,586	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 10.00 11.00 11.00 11.00 11.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 17.00 18.00 19.00	ATUS Shadow 90% 45% 45% 45% 45% 45% 80% 80% 80% 80% 80% 81% 84% 85% 80% 80% 84% 85% 85% 86% 86% 86% 86% 86% 86% 86% 86% 86% 86	urs on (f in time t in time t) in time t it time a ar a substitution of the time a substitution of the substitution of the time a substitution of the substitution of	Sun time min	Sun area m2 0 6 6 399 111 111 144 43 577 599 111 0 0 0 0 22 46 6 124 197 173 143 113 119 124 577 27	5.63 5405  March 21st time * area min*m2 0 336 630 630 840 2,562 3,444 3,528 3,612 1,134 630 0  March 21st time * area min*m2 0 1,296 2,754 7,452 11,826 10,368 8,586 6,804 7,128 7,452 3,402 1,620
11 11 11 11 11 11 11 11 11 11 11 11 11	G STATI Shadow % 6 85% 85% 80% 80% 100% 85% 85% 80% 14% 12% 12% 100% 100% 100% 100% 100% 100%	n time († time * ar ime	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 39 111 111 144 43 3 57 7 59 60 62 25 88 0 2 22 24 66 41 113 113 113 113 113 113 113 113 113	7.00 7.04 6758.4  70 March 21st time * area min*m2 0 630 630 840 2,562 3,444 3,528 3,612 3,696 3,486 0 2 7.00 6.17 25914  270 March 21st time * area min*m2 0 1,296 2,754 4,7452 11,826 6,804 6,804 7,452 8,262	m2  NEW ST Time 24 Hr 6.00 15.00 16.00 7.00 8.00 19.00 10.00 17.00 13.00 14.00 15.00 16.00 7.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00 16.00 17.00	ATUS Shadow % 45% 45% 85% 85% 80% 80% 100% 45% 85% 80% 80% 10% 100% 100% 85% 85% 80% 80% 100% 85% 85% 85% 80% 80% 85% 85% 80% 80% 85% 85% 80% 85% 85% 85% 80% 85% 85% 85% 85% 85% 85% 85% 85% 85% 85	urs on (f in time t in time t) in time t it time a ar a substitution of the time a substitution of the substitution of the time a substitution of the substitution of	Sun time min	Sun area m2 0 6 6 399 111 111 14 43 57 599 60 199 111 0 8 Sun area m2 0 22 46 124 497 173 143 113 113 1119 124 57	5.63 5405  March 21st time * area min*m2 0 3366 2,310 6300 8400 840 2,56e2 3,444 3,528 3,612 1,134 630 0 2 5.000 4.88 20496
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	G STATI Shadow 90 90 90 90 90 90 90 90 90 90 90 90 90	n time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 39 9 111 111 144 43 3 57 60 60 62 58 0 0 222 46 6 124 197 173 113 113 113 119 124 138 143 0 0	7.00 7.04 6758.4  70 March 21st time * area min*m2 0 336 630 8400 2,562 3,444 3,528 3,612 3,696 3,486 0 2 7.00 6.17 25914  270 March 21st time * area min*m2 0 1,296 2,754 7,452 11,826 6,804 6,804 7,128 7,452 8,262 8,586	m2  NEW ST Time 24 Hr 6.00 7.00 15.00 16.00 17.00 8.00 19.00 11.00 15.00 16.00 17.00 18.00 19.00 16.00 17.00 18.00 19.00 10.00 11.00 18.00 19.00 10.00 11.00 18.00 19.00 10.00 11.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 Required	ATUS Shadow % 45% 85% 85% 80% 80% 100% 80% 80% 80% 80% 80% 80% 80% 80% 80%	urs on (f in time t in time) and time t it ime and time t it ime. The time t it ime and time and time and time and time and time t ime. The time t ime and time t ime. The time and time t ime and time t ime. The time and time time and time time. The time and time time and time time. The time and time time and time time. The time and time and time and time and time and time and time. The time and	Sun time min	Sun area m2 0 6 6 399 111 111 144 433 57 599 600 199 111 0 9% area  Sun area m2 0 222 46 197 173 143 113 113 119 124 57 27 0	5.63 5405  March 21st time * area min*m2 0 336 630 840 2,562 3,444 3,528 3,612 1,134 630 0  March 21st time * area min*m2 0 1,296 2,754 7,452 11,826 10,368 8,8586 6,804 6,804 7,128 7,452 3,402 1,620
hiever hi	G STATI Shadow 90 90 90 90 90 90 90 90 90 90 90 90 90	n time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 39 9 111 111 144 43 3 57 60 60 62 58 0 0 222 46 6 124 197 173 113 113 113 119 124 138 143 0 0	7.00 7.04 6758.4  70 March 21st time * area min*m2 0 3366 2,310 630 2,562 3,444 3,528 3,612 3,696 2,7.00 6.17 25914  270 March 21st time * area min*m2 0 1,296 2,754 7,452 11,826 6,804 6,804 7,1452 8,586 6,804 6,804 7,452 8,586	m2  NEW ST Time 24 Hr 6.00 7.00 15.00 16.00 17.00 8.00 19.00 11.00 15.00 16.00 17.00 18.00 19.00 16.00 17.00 18.00 19.00 10.00 11.00 18.00 19.00 10.00 11.00 18.00 19.00 10.00 11.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 Required	ATUS Shadow % 45% 85% 85% 80% 80% 100% 80% 80% 80% 80% 80% 80% 80% 80% 80%	urs on (f in time t in time) and time t it time and time t it time. And time t it time and time a	Sun time min	Sun area m2 0 6 6 399 111 111 144 433 57 599 600 199 111 0 9% area  Sun area m2 0 222 46 197 173 143 113 113 119 124 57 27 0	5.63 5405  March 21st time * area min*m2 0 336 630 630 8400 8400 2,562 3,444 630 0 2 5.00 4.88 20496  March 21st time * area min*m2 0 1,296 2,502 11,326 6,804 7,1452 11,826 6,804 7,128 7,452 3,402 1,620 0

10		G STATI				March 21st	NEW ST					March 21s
10			-	Sun time						Sun time		
20 99 99 199 60 99 528 700 99 198 60 99 528 700 999 198 60 99 528 700 999 198 60 199 198 198 60 199 198 198 198 60 199 198 198 198 60 199 198 198 198 60 199 198 198 198 198 198 198 198 198 198	Hr			min		min*m2						min*m2
1.6   1.5	.00	100%	0%	60	0	0	6.00	100%	0%	60	0	C
100	.00	90%	10%	60	9	528	7.00	90%	10%	60		528
100	.00	68%	32%	60	28	1,690	8.00	68%	32%		28	1,690
100	.00											
14	0.00	21%	79%	60	70	4,171	10.00	21%	79%	60	70	4,171
100	1.00	15%	85%	60	75	4,488	11.00	15%	85%	60	75	4,488
14	2.00	15%	85%	60	75	4,488	12.00	15%	85%		75	4,488
100	3.00	15%	85%	60	75	4,488	13.00	15%	85%	60	75	4,488
14	4.00	15%	85%	60	75	4,488	14.00	15%	85%	60	75	4,488
14   93   96   96   97   98   96   97   98   98   98   98   98   98   98	5.00	18%	82%	60	72	4,330	15.00	18%	82%	60	72	4,330
12.5   1.5	6.00	15%	85%	60	75	4,488	16.00	15%	85%	60	75	4,488
100	7.00	15%	85%	60	75	4,488	17.00	74%	26%	60	23	1,373
14	8.00	23%	77%	60	68	4,066	18.00	90%	10%	60	9	528
Achieved daily sun time ' area   10.0   Achieved daily sun time ' area   38093	9.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0
March 21st   Mar	chieve chieve	d sun ho d total su	urs on (h ın time (h	ırs) @ 50 ırs)	% area	10.00 8.47	Achieve Achieve	d sun ho d total su	urs on (h ın time (h	ırs) @ 50 ırs)	% area	
March 214   MEW STATUS   March 215   Mar	UTIIOVOU	dully Sull	timo a	ou.		44721.0	Pieriieved	dully Sul	i tillio di	cu		00000
Time   Shadow   Sunlight Sum time   Sun area   Ime   Shadow   Sunlight Sum time   Sun area   Ime   Ime   Sun area   Ime   Sun area   Ime   Sun area   Ime   Sun area   Ime   Ime   Sun area   Ime   Ime   Sun area   Ime   Ime												
He		G STATI	US			March 21st	NEW ST	ATUS				March 21st
100   100%   0%   60   0   0   0   0   0   0   0   0	ime	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area
200	4 Hr		-			min*m2	24 Hr	% .	/ %	min		min*m2
22%   88%   60	.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0
100	.00	92%	8%	60	7	446	7.00	92%	8%	60	7	446
1996	.00	92%	8%	60	7	446	8.00	92%	8%	60	7	446
1996	.00											781
15	0.00											4,520
100	1.00											4,297
15	2.00											4,241
1,000	3.00						13.00					3,794
1.5	4.00											1,618
15	5.00	65%	35%	60	33					60		1,953
15	6.00											3,125
15	7.00											4,408
100 100% 0% 60 0 0 0 19,00 100% 0% 60 0 0 0 0 19,00 100% 0% 60 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8.00											614
Achieved sun hours on (hrs) @ 50% area hieved total sun time (hrs)	9.00											0
Achieved sun hours on (hrs) @ 50% area hieved total sun time (hrs)	equirod	sun hour	: @ 5n%	area /hr\		2	Required	siin hoim	s @ 50%	area (hr)		2
Achieved total sun time (hrs)   6.1   Achieved total sun time (hrs)   5.42	-yanta	Juit HUUIS	, <sub>We</sub> JU70	urou (III)			nequiled		- we UU70 i	urua (III)		
15	chiava	d cun ho	ure on /h	re\ @ 50	0/2 area				ure on /h	re) @ 50	10% arga	6.00
NEW STATUS					% area	7.00	Achieve	d sun ho		,	1% area	6.00
100	chieve chieved	d total su	ın time (l	nrs)	% area	7.00 6.1 34038	Achieve Achieved	d sun ho d total su	ın time (h	nrs)	1% area	6.00 5.42 30244
100   93%   7%   60   6   357   7.00   93%   7%   60   6   357   7.00   93%   7%   60   6   357   7.00   93%   7%   60   6   357   7.00   93%   7%   60   6   355   2.091   8.00   55%   45%   60   35   2.295   9.00   55%   45%   60   38   2.295   9.00   55%   45%   60   38   2.295   9.00   55%   45%   60   38   2.295   9.00   55%   45%   60   38   2.295   9.00   55%   45%   60   50   4.131   10.00   19%   81%   60   69   4.131   10.00   19%   81%   60   69   4.131   10.00   14%   86%   60   73   4.386   11.00   14%   86%   60   73   4.386   11.00   14%   86%   60   57   3.417   12.00   33%   67%   60   57   3.417   12.00   33%   67%   60   57   3.417   12.00   33%   67%   60   57   3.417   12.00   16%   62%   60   44   2.652   13.00   48%   62%   60   44   2.652   13.00   48%   62%   60   44   2.652   13.00   48%   62%   60   44   2.652   13.00   48%   62%   60   46   2.754   15.00   46%   54%   60   46   2.754   15.00   46%   54%   60   46   2.754   15.00   16%   84%   60   71   4.284   18.00   90%   10%   60   9   510   100%   05%   60   0   0   0   100%   05%   60   0   0   0   0   0   0   0   0	chieve chieved	d total su daily sun	in time (I i time * ar	nrs) ea		7.00 6.1 34038 <b>85</b> March 21st	Achiever Achiever Achieved	d sun ho d total su daily sur	ın time (f ı time * ar	nrs) ea		5.42
200	chieve chieved 15 XISTIN	d total su daily sun G STATI	in time (finitime * ar time * ar US Sunlight	nrs) ea Sun time	Sun area m2	7.00 6.1 34038 <b>85</b> March 21st time * area	Achieved Achieved M2 NEW ST	d sun ho d total su daily sur  ATUS Shadow	un time (h i time * ar Sunlight	nrs) rea Sun time	Sun area m2	5.42 30244 March 21st time * area min*m2
16   13   14   15   16   17   18   18   18   18   18   18   18	chieve chieved 15 XISTIN ime 4 Hr	d total su daily sun G STATI Shadow %	un time (h time * ar us Sunlight	ea Sun time	Sun area m2	7.00 6.1 34038 85 March 21st time * area min*m2	Achieved Achieved m2 NEW ST Time 24 Hr	d sun ho d total su daily sur ATUS Shadow %	un time (h i time * ar Sunlight / %	nrs) ea Sun time min	Sun area m2	5.42 30244 March 21st time * area
100	15 KISTIN me I Hr	d total su daily sun G STATU Shadow % / 100%	un time (I u time * ar us Sunlight / %	Sun time min 60 60	Sun area m2 0 6	7.00 6.1 34038 85 March 21st time * area min*m2	Achieved Achieved  m2  NEW ST  Time 24 Hr 6.00	d sun ho d total su daily sur  ATUS Shadow % 100%	un time (H time * an Sunlight / %	Sun time min 60 60	Sun area m2 0	5.42 30244 March 21st time * area min*m2 0 357
14%   86%   60   73   4,386   11.00   14%   86%   60   73   4,386   12.00   33%   67%   60   57   3,417   12.00   33%   67%   60   57   3,417   12.00   33%   67%   60   57   3,417   12.00   33%   67%   60   57   3,417   12.00   33%   67%   60   57   3,417   12.00   56%   44%   60   54   2,652   13.00   46%   52%   60   44   2,652   13.00   46%   52%   60   44   2,652   13.00   46%   52%   60   46   2,754   15.00   46%   54%   60   46   2,754   15.00   46%   54%   60   46   2,754   15.00   16%   53%   60   71   4,233   16.00   17%   83%   60   71   4,233   16.00   17%   83%   60   71   4,284   18.00   90%   10%   60   9   510   100%   09%   60   0   0   19.00   100%   09%   60   0   0   0   19.00   100%   09%   60   0   0   0   0   0   0   0   0	15 XISTIN me 4 Hr	d total su daily sun G STATI Shadow % / 100%	un time (I time * ar	Sun time min 60 60	Sun area m2 0 6	7.00 6.1 34038 <b>855</b> March 21st time * area min*m2 0 357 2,091	Achieved Achieved M2  NEW ST Time 24 Hr 6.00 7.00	d sun ho d total su daily sur  ATUS Shadow % 100% 93%	sun time (I time * ar Sunlight / %	Sun time min 60 60 60	Sun area m2 0 6 35	5.42 30244 March 21st time * area min*m2 0 357 2,091
16   100%   10	15 XISTIN me 4 Hr .00	d total su daily sun G STATI Shadow % / 100% 93% 59%	us Sunlight 7% 41%	Sun time min 60 60 60	Sun area m2 0 6	7.00 6.1 34038 <b>855</b> March 21st time * area min*m2 0 357 2,091	M2  NEW ST Time 24 Hr 6.00 7.00 8.00	d sun ho d total su daily sur  ATUS Shadow % 100% 93% 59%	Sunlight / % 0% 41%	Sun time min 60 60 60	Sun area m2 0 6 35	5.42 30244 March 21st time * area min*m2 0 357
16   18   18   18   18   18   18   18	chieve chieved 15 XISTIN	d total su daily sun G STATU Shadow % 1 100% 93% 59%	us Sunlight 7 % 0% 41% 45%	Sun time min 60 60 60 60	Sun area m2 0 6 35 38	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131	M2 Achieved M2 NEW ST Time 24 Hr 6.00 7.00 8.00 9.00	d sun ho d total su daily sur ATUS Shadow %. 100% 93% 59%	Sunlight / %  0%  7%  41%  45%	Sun time min 60 60 60 60	Sun area m2 0 6 35	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295 4,131
16   16   16   17   18   18   18   18   18   18   18	15 XISTIN ime 4 Hr .00	G STATI Shadow 100% 93% 59% 19%	us Sunlight / % 0% 41% 45% 81%	Sun time min 60 60 60 60 60	Sun area m2 0 6 35 38	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131	M2 NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00	ATUS Shadow % 100% 93% 559% 19%	Sunlight / %  0%  41%  45%  81%	Sun time min 60 60 60 60 60 60	Sun area m2 0 6 6 35 38 69	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295
16	15 XISTIN ime 4 Hr .00 .00 .00	G STATI Shadow % / 100% 93% 55% 19% 14%	us Sunlight / % 0% 41% 45% 81%	Sun time min 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386	Achieved Achieved m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	ATUS Shadow % . 100% . 93% . 55% . 19% . 14%	Sunlight / %  0%  41%  45%  81%  86%	Sun time min 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295 4,131
16   100   17%   83%   60   71   4,233   16.00   17%   83%   60   71   4,233   16.00   16%   84%   60   71   4,284   17.00   16%   84%   60   71   4,284   18.00   90%   10%   60   9   510   100%   0%   60   0   0   0   0   19.00   100%   0%   60   0   0   0   0   0   0   0   0	15 XISTIN ime 4 Hr .00 .00 .00	d total sul daily sun dail	US Sunlight / % 0% 41% 45% 86% 67%	Sun time min 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73 57	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417	Achieved Achieved  MEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00	ATUS Shadow % . 100% . 93% . 59% . 19% . 14% . 33%	Sunlight / %	Sun time min 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386
16   16%   84%   60   71   4,284   17,00   16%   84%   60   71   4,284   18,00   90%   10%   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   10,00   10%   60%   60   10   10,00   10%   60%   60   10   10,00   10%   60%   60   10   10,00	15 XISTIN ime 4 Hr .00 .00 .00 .00 .00 .00 .00	d total sur d daily sun d daily sun d daily sun Shadow % / 100% 59% 55% 19% 14% 33% 48%	us Sunlight / % 0% 41% 45% 81% 66% 52%	Sun time min 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73 57 44	7.00 6.1 34038 <b>85</b> March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652	Achieved Achieved Achieved Achieved Achieved Mr2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 11.00 11.00 11.00 13.00 13.00 13.00	ATUS Shadow % 100% 93% 55% 19% 14% 33% 48%	Sunlight / %	Sun time min 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73 57	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417
16   16%   84%   60   71   4,284   17,00   16%   84%   60   71   4,284   18,00   90%   10%   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   9   510   19,00   10%   60   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   19,00   10%   60%   60   10   10,00   10%   60%   60   10   10,00   10%   60%   60   10   10,00   10%   60%   60   10   10,00	15 XXISTIN ime 4 Hr .00 .00 .00 .00 .00 .00 .00 .00 .00 .0	d total sur d daily sun G STATU Shadow % / 100% 59% 55% 19% 14% 33% 48% 56%	us Sunlight / % 0% 41% 45% 81% 86% 67% 52% 44%	Sun time min 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 335 38 69 73 57 44 37	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 10.00 11.00 12.00 13.00 14.00	ATUS Shadow % 100% 93% 55% 19% 14% 33% 48% 56%	Sunlight / %  Sunlight / %  41%  45%  81%  86%  67%  52%  44%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 9 73 57 44 37	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652
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quired sun hours @ 50% area (hr)	15 XXISTIN ime 4 Hr .00 .00 .00 .00 .00 .00 4.00 4.00 5.00 6.00	d total sur d daily sun daily sun G STATI Shadow % / 100% 93% 59% 55% 19% 48% 48% 46%	US Sunlight 7 % 0% 41% 45% 88% 67% 52% 44% 54% 83%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73 57 44 37 46	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233	Achieved Achieved Achieved Achieved Achieved Achieved Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 16.00	**CATUS** **CATUS** **Shadow** **0.00% **100% **93% **55% **14% **33% **48% **66% **46% **17%	Sunlight / %  O%  41%  45%  88%  52%  44%  54%  83%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 355 388 69 73 57 444 377 466 71	5.42 30244 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 2,754 4,233
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### Achieved total sun time (hrs)	15 XISTIN ime 4 Hr00	G STATI Shadow % / 100% 100% 100% 100% 100%	In time (t time * ar time (t time * ar time *	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73 37 44 37 46 71 71 71	7.00 6.1 34038 85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0	MEW ST Time 24 Hr 6.00 7.00 11.00 11.00 12.00 13.00 14.00 15.00 17.00 18.00 19.00	d sun ho d d sun ho d d sun ho	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 35 38 69 73 3 57 44 37 46 711 711 9	5.42 30244  March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 510 0
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00   100%   00%   60   0   0   6.00   100%   0%   60   0   0   0   0   0   0   0   0	15 XXSTIN ime 4 Hr	IG STATII Shadow % 1 100% 55% 59% 55% 19% 14% 56% 16% 100% 100% 100% 100% 100% 100% 100	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 0 6 6 355 388 69 9 73 3 55 7 44 37 71 71 71 0 6 6 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6	7.00 6.1 34038  85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0 2 8.00 7,28 37128	m2  NEW ST  Time 24 Hr 6.00 7.00 10.00 11.00 11.00 12.00 13.00 14.00 15.00 17.00 18.00 19.00 Required Achieved Achieved	ATUS  ATUS  Shadow  60  100%  59%  59%  59%  48%  48%  100%  100%  48%  48%  48%  48%  48%  48%  48%	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 355 388 699 733 577 444 377 466 711 9 0	5.42 30244  March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.00 6,544 33354
200   93%   7%   60   4   269   7.00   93%   7%   60   4   269	15 XISTIN chieved 16 XISTIN chieved 15 XISTIN chieved 16 XISTIN chieved 17 XISTIN ch	daily sun daily	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 5 355 4 4 4 37 7 4 6 6 7 1 7 1 0 0 % area	7.00 6.1 34038  85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 4,284 0 2 8.00 7.28 37128  64 March 21st time * area	### Achieved Achieved Achieved Achieved Achieved Achieved ### 1	ATUS  ATUS  Shadow %. 100% 98, 99% 149% 149% 149% 149% 159% 169% 100% 46% 100% 56% 46% 100% 56% 56% 46% 100% 56% 56% 56% 56% 56% 56% 56% 56% 56% 56	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 355 388 699 73 577 444 377 46 711 711 9 0 0 9% area	5.42 30244 March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.00 6.54 33354
200         65%         37%         60         24         1,421         8.00         63%         37%         60         24         1,421           200         28%         72%         60         46         2,765         9.00         28%         72%         60         46         2,765           0.00         15%         85%         60         54         3,264         10.00         15%         85%         60         54         3,264           0.00         19%         81%         60         52         3,110         12.00         19%         81%         60         52         3,110           0.00         29%         74%         60         47         2,842         13.00         26%         74%         60         47         2,842           0.00         57%         43%         60         28         1,651         14.00         57%         43%         60         28         1,651           0.00         69%         31%         60         20         1,190         16.00         69%         31%         60         28         1,651           0.00         69%         31%         60         20         1,190	15 KISTIN me Hr Cook of the vector of the ve	d d total su daily sun hours d sun hou d total su sun hou d total su sun hours d sun hours sun hours d sun hours d sun hours	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 6 3 35 38 8 69 9 73 35 74 4 4 37 71 71 71 71 71 71 71 71 71 71 71 71 71	7.00 6.1 34038  855 March 21st time * area min*m2 0 3577 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,2754 4,233 4,284 4,	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 Required Achieved Achieved	ATUS  Shadow  6, 100%  59%  59%  59%  19%  48%  646%  100%  4 sun hounn  5 daily sur	In time (t time * ar in time (t time * ar in time (t time * ar in time * ar in time * ar in time * ar in time (t time * ar in time (t time * ar in t	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 35 38 69 73 3 57 444 37 71 71 9 0	5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.00 6.54 33354  March 21st time * area min*m2
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.00         15%         85%         60         54         3,264         10.00         15%         85%         60         54         3,264           .00         15%         85%         60         54         3,264         11.00         15%         85%         60         54         3,264           .00         19%         81%         60         52         3,110         12.00         19%         81%         60         52         3,110           .00         28%         74%         60         47         2,842         13.00         26%         74%         60         47         2,842           .00         77%         23%         60         15         883         15.00         77%         23%         60         15         883           .00         69%         31%         60         20         1,190         16.00         69%         31%         60         25         1,498           .00         61%         39%         60         25         1,498         17.00         61%         39%         60         25         1,498           .00         51%         49%         60         31         1,882	15 CISTIN ne Hr 000 000 000 000 000 000 000 000 000	IG STATU Shadow 100% 100% 100% 100% 100% 100% 100% 100	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2	7.00 6.1 34038  85 March 21st time * area min*m2 0 3.57 2.091 2.295 4.131 4.386 3.417 2.652 2.244 2.754 4,233 4.284 0 2 8.00 7.28 37128  84 March 21st time * area min*m2 0	m2  NEW ST Time 24 Hr 6.00 11.00 11.00 11.00 11.00 11.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 Required Achieved Achieved m2  NEW ST Time 24 Hr 6.00 10.00 11.	ATUS Shadow % 100% 59% 48% 100% 59% 59% 59% 19% 48% 17% 16% 90% 48% 17% 48% 17% 48% 17% 48% 10% 48% 10% 48% 10% 48% 10% 10% 10% 10% 10% 10% 10% 10% 10% 10	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 355 388 699 733 3757 444 377 466 711 711 99 0 9% area m2 0 4 4	5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 6.54 33354  March 21st time * area min*m2 0 269
.00         15%         85%         60         54         3,264         11.00         15%         85%         60         54         3,264           .00         19%         81%         60         52         3,110         12.00         19%         81%         60         52         3,110           .00         28%         74%         60         47         2,842         13.00         26%         74%         60         47         2,842           .00         57%         43%         60         28         1,651         14.00         57%         43%         60         28         1,851           .00         69%         31%         60         20         1,190         16.00         69%         31%         60         21         1,190           .00         69%         31%         60         25         1,498         17.00         61%         39%         60         25         1,498           .00         51%         49%         60         31         1,882         18.00         92%         8%         60         5         307           .00         10%         0%         60         0         0	15 (ISTIN no	IG STATI Shadow 10% 10% 10% 10% 10% 10% 10% 10% 10% 10%	In time (t time * ar	Sun time min min 600 600 600 600 600 600 600 600 600 60	Sun area m2	7.00 6.1 34038  85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 4,284 4,284 4,284 4,284 5,754 6,800 7.28 37128  64 March 21st time * area min*m2 0 269 1,421	m2  NEW ST  Time 24 Hr 6.00 7.00 10.00 11.00 11.00 11.00 15.00 16.00 17.00 18.00 19.00 Required Achieved Achieved Achieved	ATUS Shadow 4 sun ho 4 daily sur  ATUS Shadow 5 sy 5 sy 6 sy 100% 48% 48% 48% 48% 40% 55% 56% 100% 55% 48% 48% 48% 48% 48% 48% 48% 48% 48% 48	In time (t time * ar	Sun time min min 600 600 600 600 600 600 600 600 600 60	Sun area m2 0 6 6 355 388 699 733 3757 444 377 466 711 711 99 0 9% area m2 0 4 4	5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 6.54 33354  March 21st time * area min*m2 0 269
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0.00         19%         81%         60         52         3,110         12.00         19%         81%         60         52         3,110           0.00         26%         74%         60         47         2,842         13.00         26%         74%         60         47         2,842           0.00         57%         43%         60         28         1,651         14.00         57%         43%         60         28         1,651           0.00         77%         23%         60         15         883         15.00         77%         23%         60         15         883           0.00         69%         31%         60         20         1,190         16.00         69%         31%         60         20         1,190           0.00         61%         39%         60         25         1,498         17.00         61%         39%         60         25         1,498           0.00         51%         49%         60         31         1,882         18.00         92%         8%         60         5         307           0.00         100%         0%         60         0         0	15 KISTIN me 4 Hr 000 00 00 00 00 00 00 00 00 00 00 00 0	IG STATII Shadow % /6 /6 /6 /6 /6 /6 /6 /6 /6 /6 /6 /6 /6	In time (titime * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 335 38 69 73 37 44 37 71 71 71 0 % area	7.00 6.1 34038  855 March 21st time * area min*m2 0 3.577 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 4,284 4,284 4,284 6 0 2 8.00 7.28 37128  64 March 21st time * area min*m2 0 269 1,421 2,765	m2  NEW ST Time 24 Hr 6.00 7.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 Required Achieved	ATUS Shadow 100% 40% 40% 50% 50% 50% 50% 50% 50% 50% 50% 50% 5	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 355 38 69 73 357 444 377 466 711 71 9 0 0 9% area	5.42 30244  March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 510 0 2 7.000 6.54 33354  March 21st time * area min*m2 0 269 1,421 2,765
000         29%         74%         60         47         2,842         13.00         26%         74%         60         47         2,842           0.00         57%         43%         60         28         1,851         14.00         57%         43%         60         28         1,651           0.00         67%         23%         60         15         883         15.00         77%         23%         60         15         883           0.00         69%         31%         60         20         1,190         16.00         69%         31%         60         20         1,190           0.00         61%         39%         60         25         1,498         17.00         61%         39%         60         25         1,498           0.00         51%         49%         60         31         1,882         18.00         92%         8%         60         5         307           0.00         10%         0%         60         0         0         19.00         10%         0%         60         0         0           quired sun hours         © 5% area         5.00         Achieved sun hours on (hrs) <t< td=""><td>150 XXSTIN in the control of the con</td><td>IG STATI Shadow 10% 10% 10% 10% 10% 10% 10% 10% 10% 10%</td><td>In time (titime * ar ar</td><td>Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60</td><td>Sun area m2 0 6 6 3 55 4 4 4 37 7 1 0 0 8 w area C 2 4 6 6 5 4 6 6 5 4 6 6 5 4</td><td>7.00 6.1 34038  85 March 21st time * area min*m2 0 3.57 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0 2 8.00 7,28 37128  64 March 21st time * area min*m2 0 269 1,421 2,765 3,264</td><td>m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 19.00 10.00</td><td>ATUS Shadow 100% 59% 48% 59% 59% 59% 55% 49% 63% 48% 100% 40% 100% 100% 100% 100% 100% 100%</td><td>In time (t time and time) to time (t time) and time and t</td><td>Sun time min min min min min min min min min min</td><td>Sun area m2 0 6 6 355 38 69 73 3 757 44 37 76 71 71 71 9 0 0 9% area Sun area m2 0 4 4 6 5 4 6 5 4</td><td>5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.00 6,544 33354  March 21st time * area min*m2 0 269 1,421 2,765 3,264</td></t<>	150 XXSTIN in the control of the con	IG STATI Shadow 10% 10% 10% 10% 10% 10% 10% 10% 10% 10%	In time (titime * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 3 55 4 4 4 37 7 1 0 0 8 w area C 2 4 6 6 5 4 6 6 5 4 6 6 5 4	7.00 6.1 34038  85 March 21st time * area min*m2 0 3.57 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0 2 8.00 7,28 37128  64 March 21st time * area min*m2 0 269 1,421 2,765 3,264	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 19.00 10.00	ATUS Shadow 100% 59% 48% 59% 59% 59% 55% 49% 63% 48% 100% 40% 100% 100% 100% 100% 100% 100%	In time (t time and time) to time (t time) and time and t	Sun time min	Sun area m2 0 6 6 355 38 69 73 3 757 44 37 76 71 71 71 9 0 0 9% area Sun area m2 0 4 4 6 5 4 6 5 4	5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.00 6,544 33354  March 21st time * area min*m2 0 269 1,421 2,765 3,264
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.00     100%     0%     60     0     0     19.00     100%     0%     60     0     0       quired sun hours @ 50% area (hr)     2     Required sun hours @ 50% area (hr)     2       shieved sun hours on (hrs) @ 50% area     5.00     Achieved sun hours on (hrs) @ 50% area     5.00	15 XISTIN mo 00 000 000 000 000 000 000 000 000 0	IG STATI Shadow % / 100% 59% 69% 69% 69% 69% 69% 69% 69% 69% 69% 6	In time (titime * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 35 38 69 73 57 44 37 71 71 71 71 0 % area	7.00 6.1 34038  855 March 21st time * area min*m2 0 3577 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,2754 4,233 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 3,110 2,692 1,621 2,765 3,264 3,110 2,842 1,651 883 1,190	m2  NEW ST Time 24 Hr 6.00 7.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 19.00 19.00 18.00 19.0	ATUS Shadow %, 100% 59% 14% 33% 59% 14% 33% 48% 60% 100% 100% 100% 100% 100% 100% 100%	In time (t time * ar	Sun time min 600 600 600 600 600 600 600 600 600 60	Sun area m2 0 6 6 355 388 699 733 577 444 377 711 71 9 0 0 9% area	5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.000 6.54 33354  March 21st time * area min*m2 0 2699 1,421 2,765 3,264 3,110 2,842 1,651 883 1,190
quired sun hours @ 50% area (hr) 2 Required sun hours @ 50% area (hr) 2 shieved sun hours on (hrs) @ 50% area 5.00 Achieved sun hours on (hrs) @ 50% area 5.00	150 XISTIN me 4 Hr 000 000 000 000 000 000 000 000 000	IG STATU Shadow % 100% 100% 100% 100% 100% 100% 100% 1	In time (titime * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 3 55 38 8 69 9 73 3 74 44 37 71 71 71 0 6 8 2 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6	7.00 6.1 34038  85 March 21st time * area min*m2 0 3.57 2,091 2,295 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 4,284 0 2 8.00 7.28 37128  64 March 21st time * area min*m2 0 269 1,421 2,765 3,264 3,264 3,210 2,842 1,651 883 1,190 1,498	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 7.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 18.00 19.00 1	ATUS Shadow % 100% 55% 19% 48% 10% 33% 48% 10% 48% 10% 10% 10% 10% 10% 10% 10% 10% 10% 10	In time (t time * ar	Sun time min	Sun area m2 0 6 335 38 69 73 37 44 37 46 711 71 9 0 8 Sun area 24 46 54 54 54 54 54 28 15 20 25	5.42 30244  March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 510 0 2 7.00 6,54 33354  March 21st time * area min*m2 0 269 1,421 2,765 3,264 3,264 3,110 2,842 1,651 883 1,190 1,498
hieved sun hours on (hrs) @ 50% area 5.00 Achieved sun hours on (hrs) @ 50% area 5.00	15 (ISTIN ne Hr DO) (IS	IG STATI Shadow 10% 10% 10% 10% 10% 10% 10% 10% 10% 10%	In time (titime * ar	Sun time min	Sun area m2 0 0 6 6 35 38 8 69 9 73 3 55 7 7 444 37 7 1 71 71 0 0 8 4 area m2 2 0 0 4 4 24 4 6 6 4 5 2 2 5 3 3 1	7.00 6.1 34038  85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0 2 8.00 7,28 37128  64 March 21st time * area min*m2 2,699 1,421 2,765 2,765 3,264 3,264 3,110 2,842 1,651 883 1,190 1,488	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 Required Achieved	ATUS Shadow 6,0 100% 55% 19% 64% 10% 64% 10% 65% 66% 63% 63% 63% 63% 65% 65% 65% 65% 65% 65% 65% 69% 69% 69% 69% 69% 69% 69% 69%	In time (t time * ar	Sun time min min min 600 600 600 600 600 600 600 600 600 60	Sun area m2 0 6 6 355 388 699 733 387 577 444 377 466 771 71 9 0 0 9% area m2 0 4 4 24 4 54 54 54 54 52 20 25 5 5	5.424 30244  March 21st 0 0 357 4,1313 4,386 4,1313 4,386 510 0 2,295 4,1313 4,386 4,284 510 0 0 2,295 4,133 4,284 510 0 0 2,244 4,233 4,284 510 0 0 2,244 4,233 4,284 510 0 0 2,244 510 0 0 2,244 510 0 0 2,244 510 0 0 2,244 6,54 6,54 6,54 6,54 6,54 6,54 6,54 6,
hieved sun hours on (hrs) @ 50% area 5.00 Achieved sun hours on (hrs) @ 50% area 5.00	15 ISTIN 100 000 000 000 000 000 000 000 000 00	IG STATI Shadow 10% 10% 10% 10% 10% 10% 10% 10% 10% 10%	In time (titime * ar	Sun time min	Sun area m2 0 0 6 6 35 38 8 69 9 73 3 55 7 7 444 37 7 1 71 71 0 0 8 4 area m2 2 0 0 4 4 24 4 6 6 4 5 2 2 5 3 3 1	7.00 6.1 34038  85 March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0 2 8.00 7,28 37128  64 March 21st time * area min*m2 2,699 1,421 2,765 2,765 3,264 3,264 3,110 2,842 1,651 883 1,190 1,488	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 Required Achieved	ATUS Shadow 6,0 100% 55% 19% 64% 10% 64% 10% 65% 66% 63% 63% 63% 63% 65% 65% 65% 65% 65% 65% 65% 69% 69% 69% 69% 69% 69% 69% 69%	In time (t time * ar	Sun time min min min 600 600 600 600 600 600 600 600 600 60	Sun area m2 0 6 6 355 388 699 733 387 577 444 377 466 771 71 9 0 0 9% area m2 0 4 4 24 4 54 54 54 54 52 20 25 5 5	5.42 30244  March 21st time * area min*m2 0 357 2,091 4,131 4,386 3,417 2,652 2,244 2,754 4,233 4,284 510 0 2 7.00 6,544 33354  March 21st time * area min*m2 2,765 3,264 3,264 3,110 2,765 3,264 3,110 2,1651 883 1,190 1,488 307
	15 ISTIN 100 00 00 00 00 00 00 00 00 00 00 00 00	d total su daily sun daily sun list state with the	In time (titime * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 0 6 6 35 38 8 69 9 73 3 55 7 7 444 37 7 1 71 71 0 0 8 4 area m2 2 0 0 4 4 24 4 6 6 4 5 2 2 5 3 3 1	7.00 6.1 34038  85 March 21st time * area min*m2 0 3.577 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 4,284 4,284 4,284 4,284 4,284 1,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 4,284 1,656 3,110 2,842 1,656 3,110 2,842 1,656 1,498 1,882 0	m2  NEW ST Time 24 Hr 6.00 7.00 10.00 11.00 12.00 13.00 14.00 19.00  Required Achieved  m2  NEW ST Time 24 Hr 6.00 7.00 18.00 19.00 19.00  m2  NEW ST Time 24 Hr 6.00 7.00 10.00 11.	ATUS Shadow 90% 1007 1008 30% 100% 1008 1008 1008 1008 1008 1008 10	In time (t time * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 355 388 699 733 387 577 444 377 466 771 71 9 0 0 9% area m2 0 4 4 24 4 54 54 54 54 52 20 25 5 5	5.42 30244  March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 510 0 2 7.00 6.54 33354  March 21st time * area min*m2 0
	15 ISTIN IN I	IG STATI Shadow 96 100% 198 14% 168 169 169 169 169 169 169 169 169 169 169	In time (titime * ar	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 6 6 35 38 8 69 9 73 3 75 7 44 37 7 1 71 71 71 0 8 3 8 8 8 15 5 4 4 7 28 8 15 5 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7.00 6.1 34038  85 March 21st time * area min*m2 0 3.57 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 4,284 0 2 8.00 7.28 37128  84 March 21st time * area min*m2 0 269 1,421 2,765 3,264 3,264 3,110 2,842 1,651 883 1,190 1,498 1,882 0	m2  NEW ST Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00 7.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 17.00 18.00 18.00 19.00 19.00 19.00 19.00 19.00 18.00 18.00 18.00 18.00 19.00 18.00 19.00 18.00 18.00 19.00 18.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00 19.00	ATUS Shadow % 100% 59% 14% 33% 59% 55% 19% 48% 14% 33% 48% 17% 16% 90% 15% 15% 15% 15% 15% 15% 15% 15% 19% 53% 53% 53% 53% 53% 53% 53% 53% 53% 53	In time (t time * ar	Sun time min	Sun area m2 0 6 6 355 38 69 73 3 757 444 37 466 711 71 9 0 0 9% area 24 46 54 54 54 54 52 0 0 25 5 5 0 0	5.42 30244  March 21st time * area min*m2 0 357 2,091 2,295 4,131 4,386 3,417 2,652 2,244 4,233 4,284 510 0 2 7.000 6.54 33354  March 21st time * area min*m2 0 269 1,421 2,765 3,264 3,264 3,210 2,842 1,651 3,110 2,842 1,651 3,110 0 0

17 Existin	G STATUS	S			March 21st	NEW S	TATUS				March 21st	
	Shadow S		Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	tim
4 Hr	% / 9		min	m2	min*m2	24 Hr	%	/%	min	m2	min*m2	
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	
7.00	92%	8%	60	6	355	7.00	92%	8%	60	6	355	
3.00	39%	61%	60	45	2,708	8.00	39%	61%	60	45	2,708	
9.00	30%	70%	60	52	3,108	9.00	30%		60	52	3,108	
10.00	16%	84%	60	62	3,730	10.00	16%	84%	60	62	3,730	
11.00	15%	85%	60	63	3,774	11.00	15%	85%	60	63	3,774	
12.00	15%	85%	60	63	3,774	12.00	15%	85%	60	63	3,774	
13.00	27%	73%	60	54	3,241	13.00	27%		60	54	3,241	
14.00	55%	45%	60	33	1,998	14.00	55%		60	33	1,998	
15.00	72%	28%	60	21	1,243	15.00	72%		60	21	1,243	
16.00	68%	32%	60	24	1,421	16.00	68%		60	24	1,421	
17.00	49%	51%	60	38	2,264	17.00	49%		60	38	2,264	
18.00	28%	72%	60	53	3,197	18.00	92%	8%	60	6	355	-3
19.00	100%	0%	60	0	3,197	19.00	100%		60	0	0	7.
	sun hours (			0	2		d sun hour				2	
Achieved Achieved	l sun hour I total sun daily sun ti	rs on (hi time (h	rs) @ 50º rs)	% area	8.00 6.94 30813.6	Achiev Achiev	ed sun ho ed total su ed daily sur	urs on (h un time (h	rs) @ 50 irs)	% area	7.00 6.3 27972	
40												
18 Existin	G STATUS	S			85 March 21st	m2 NEW S	TATUS				March 21st	(
Time	Shadow S		Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time
24 Hr	% / 9		min	m2	min*m2	24 Hr		/ %	min	m2	min*m2	n
6.00	100%	0%	60	0	0	6.00	100%		60	0	0	- 0
			60	17					60	17	1.020	
7.00	80%	20%			1,020	7.00	80%				,	
8.00	18%	82%	60	70	4,182	8.00	18%	82%	60	70	4,182	
9.00	5%	95%	60	81	4,845	9.00	5%		60	81	4,845	
10.00	5%	95%	60	81	4,845	10.00	5%		60	81	4,845	
11.00	5%	95%	60	81	4,845	11.00	5%	95%	60	81	4,845	
12.00	5%	95%	60	81	4,845	12.00	5%	95%	60	81	4,845	
13.00	5%	95%	60	81	4,845	13.00	5%	95%	60	81	4,845	
14.00	5%	95%	60	81	4,845	14.00	5%	95%	60	81	4,845	
15.00	5%	95%	60	81	4,845	15.00	10%	90%	60	77	4,590	
16.00	5%	95%	60	81	4,845	16.00	32%	68%	60	58	3,468	
17.00	5%	95%	60	81	4,845	17.00	83%		60	14	867	4
18.00	15%	85%	60	72	4,335	18.00	88%		60	10	612	-3
19.00	100%	0%	60	0	4,333	19.00	100%		60	0	012	_
	l sun hour	rs on (hi	rs) @ 50°	% area							9.00	
Achieved	l total sun daily sun ti			, , , , , , , , , , , , , , , , , , , ,	11.00 10.42 53142	Achiev	ed sun ho ed total su ed daily sur	ın time (h	irs)	70 area	8.59 43809	
Achieved Achieved 19 EXISTING	daily sun ti	ime * are	a	Sun area	10.42 53142	Achieve Achieve m2	ed total su	ın time (h	nrs) ea	Sun area	8.59	
Achieved Achieved 19 EXISTING	daily sun ti	ime * are	a		10.42 53142 68 March 21st	Achieve Achieve m2	ed total sund daily su	un time (h n time * ar	nrs) ea		8.59 43809 March 21st	time
Achieved Achieved 19 EXISTING Time 24 Hr	daily sun ti	ime * are	Sun time	Sun area	10.42 53142 68 March 21st time * area	Achieve Achieve m2	ed total sund daily su	un time (h n time * ar Sunlight	nrs) ea Sun time	Sun area	8.59 43809 March 21st time * area	time
Achieved Achieved 19 EXISTING Firme 24 Hr	G STATUS Shadow S	ime * are	Sun time	Sun area m2	10.42 53142 68 March 21st time * area min*m2	Achieve m2  NEW S Time 24 Hr	ed total su d daily sur TATUS Shadow %	un time (h n time * ar	sun time	Sun area m2	8.59 43809 March 21st time * area min*m2	time
19 EXISTING Time 24 Hr 63.00	G STATUS Shadow S % / 9	s Sunlight :	Sun time min 60	Sun area m2	10.42 53142 68 March 21st time * area min*m2	M2 NEW S Time 24 Hr 6.00	ed total sud daily sur  TATUS Shadow % 100%	sunlight	Sun time	Sun area m2 0	8.59 43809 March 21st time * area min*m2	time
19 EXISTING Fime 24 Hr 3.00 7.00	G STATUS Shadow S % / 9 100%	s SS Sunlight 4 W	Sun time min 60	Sun area m2 0	10.42 53142 68 March 21st time * area min*m2 0 326	M2 NEW S Time 24 Hr 6.00 7.00	ed total sud daily sure  TATUS  Shadow  %  100%  92%	Sunlight / % 8% 24%	Sun time min 60 60	Sun area m2 0 5	8.59 43809 March 21st time * area min*m2 0 326	time
Achieved  19 EXISTING Time 24 Hr 6.00 7.00 8.00	daily sun ti	S Sunlight : 6 % % % % % % % % % % % % % % % % % %	Sun time min 60 60 60 60	Sun area m2 0 5 16 48	10.42 53142 688 March 21st time * area min*m2 0 326 979 2,897	M2 NEW S Time 24 Hr 6.00 7.00 8.00 9.00	TATUS Shadow % 100% 92% 76% 29%	Sunlight / %  0% 8% 24% 71%	Sun time min 60 60 60 60	Sun area m2 0 5 16 48	8.59 43809 March 21st time * area min*m2 0 326 979 2,897	time
19 EXISTING Time 24 Hr 6.00 7.00 8.00 9.00	daily sun ti  G STATUS Shadow S % / 9 100% 92% 76% 29% 18%	S Sunlight : %  0% 8% 24% 71% 82%	Sun time min 60 60 60 60 60	Sun area m2 0 5 16 48 56	10.42 53142 68 March 21st time * area min*m2 0 326 979 2,897 3,346	M2 NEW S Time 24 Hr 6.00 7.00 8.00 9.00 10.00	ed total sund daily sund daily sund daily sund daily sund daily sund the sund daily sund	Sunlight / %  0% 8% 24% 71% 82%	Sun time min 60 60 60 60 60	Sun area m2 0 5 16 48	8.59 43809 March 21st time * area min*m2 0 326 979 2,897 3,346	time
19 EXISTING Fime 24 Hr 5.00 7.00 3.00 10.00	G STATUS Shadow S % / 9 100% 92% 76% 29% 18% 5%	S Sunlight : %  0% 8% 24% 71% 82% 95%	Sun time min 60 60 60 60 60 60	Sun area m2 0 5 16 48 56	10.42 53142 68 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876	MEW S Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	ed total sured daily sured dai	Sunlight / %	Sun time min 60 60 60 60 60	Sun area m2 0 5 16 48 56	8.59 43809 March 21st time * area min*m2 0 3266 979 2,897 3,346 3,876	time
19 EXISTING Time 24 Hr 6.00 7.00 8.00 10.00 11.00	G STATUS Shadow S % / 9 100% 92% 76% 29% 18% 5%	S Sunlight : % 0% 8% 24% 71% 82% 95%	Sun time min 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65	10.42 53142 68 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876	Achieve  MEW S  Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00	TATUS Shadow % 100% 92% 76% 29% 18% 5%	Sunlight / %	Sun time min 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65	8.59 43809 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876	time
19 EXISTING Time 24 Hr 6.00 7.00 8.00 10.00 11.00 12.00 13.00	daily sun ti  G STATUS Shadow S 96 / 9 100% 92% 76% 29% 18% 5% 5%	S Sunlight : %  0% 8% 24% 71% 82% 95% 95%	Sun time min 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65	10.42 53142 68 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876	Achieve m2  NEW S  Time 24 Hr 6.00  8.00  9.00  10.00  11.00  12.00  13.00	TATUS Shadow % 100% 92% 76% 29% 18% 5% 5%	Sunlight / %  Swallight / %  0%  8%  24%  71%  82%  95%  95%	Sun time min 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 55 166 488 56 65 65 65	8.59 43809 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876	time
19 EXISTING Time 24 Hr 6.00 7.00 8.00 9.00 11.00 11.00 12.00 13.00 14.00	daily sun ti  G STATUS Shadow S 96 / 9 100% 92% 76% 29% 18% 5% 5% 5%	S Sunlight : %  0% 8% 24% 71% 82% 95% 95% 95%	Sun time min 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65	10.42 53142 688 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876	m2  NEW S Time 24 Hr 6.00 7.00 8.00 10.00 11.00 12.00 13.00 14.00	TATUS Shadow % 100% 92% 76% 29% 18% 5% 5%	Sunlight / %  0% 88% 71% 82% 95% 95% 95%	Sun time min 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65 65	8.59 43809 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876 3,876	time
19 EXISTING Time 24 Hr 6.00 7.00 8.00 9.00 11.00 11.00 12.00 13.00 14.00 15.00	daily sun ti  G STATUS Shadow S % / 9 100% 92% 76% 29% 18% 5% 5% 5% 5%	88 Sunlight : % 0% 8% 24% 71% 82% 95% 95% 95% 95%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65 65 65 65	10.42 53142 68 March 21st time * area min*m2 0 326 979 2,897 3,876 3,876 3,876 3,876	m2  NEW S  Time 24 Hr  6.00  7.00  8.00  9.00  11.00  12.00  13.00  14.00  15.00	TATUS Shadow % 100% 92% 76% 5% 5% 5% 11%	Sunlight / %  Sunlight / %  0%  24%  24%  32%  95%  95%  95%  95%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65 65 65 61	8.59 43809 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876 3,876 3,876 3,876	time
19 EXISTING Time 24 Hr 6.00 7.00 8.00 9.00 11.00 11.00 12.00 13.00 14.00 15.00	daily sun ti  G STATUS Shadow S 96 / 9 100% 92% 76% 29% 18% 5% 5% 5%	S Sunlight : %  0% 8% 24% 71% 82% 95% 95% 95%	Sun time min 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 16 48 56 65 65 65 65 65 65	10.42 53142 688 March 21st time * area min*m2 0 326 979 2,897 3,346 3,876 3,876	m2  NEW S  Time 24 Hr 6.00 7.00 8.00 10.00 11.00 12.00 13.00 14.00	TATUS Shadow % 100% 92% 76% 29% 18% 5% 5%	Sunlight / %  Sunlight / %  0%  24%  24%  32%  95%  95%  95%  95%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	Sun area m2 0 5 5 166 488 56 65 65 65 61 40	8.59 43809 March 21st time * area min*m2 0 326 979 2.897 3.346 3.876 3.876 3.876 3.876	time
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me Sh		IS				NEW ST					March
Hr		Sunlight	Sun time	Sun area	time * area	Time		Sunlight	Sun time	Sun area	time * a
	% /		min	m2	min*m2	24 Hr		/ %	min	m2	min*
00	100%	0%	60	0	0	6.00	100%	0%	60	0	
.00	92%	8%	60	5	326	7.00	92%	8%	60	5	32
.00	85%	15%	60	10	612	8.00	85%		60	10	61
.00	68%	32%	60	22	1,306	9.00	68%	32%	60	22	1,30
0.00	11%	89%	60	61	3,631	10.00	11%	89%	60	61	3,63
1.00	5%	95%	60	65	3,876	11.00	5%	95%	60	65	3,87
2.00	5%	95%	60	65	3,876	12.00	5%	95%	60	65	3,87
3.00	5%	95%	60	65	3,876	13.00	5%	95%	60	65	3,87
4.00	5%	95%	60	65	3,876	14.00	5%	95%	60	65	3,876
5.00	5%	95%	60	65	3,876	15.00	5%	95%	60	65	3,876
6.00	5%	95%	60	65	3,876	16.00	44%	56%	60	38	2,285
7.00	5%	95%	60	65	3,876	17.00	83%	17%	60	12	694
8.00	19%	81%	60	55	3,305	18.00	88%	12%	60	8	490
	100%	0%	60	0	2	19.00	100%		60	0	(
lequired sur schieved si schieved to schieved dai	un hou otal sui	urs on (h n time (h	ırs) @ 50 ırs)	% area	9.00 8.9 36312	Achieved Achieved	d sun ho d total su	s @ 50% ours on (h un time (l n time * an	ırs) @ 50 ırs)	0% area	7.00 7.04 7.04 28723
22						m2					
XISTING S					March 21st	NEW ST					March 21s
		Sunlight		Sun area	time * area	Time		Sunlight		Sun area	time * area
4 Hr	% /		min	m2	min*m2	24 Hr		/%	min	m2	min*m2
	100%	0%	60	0	0	6.00	100%		60	0	C
.00	92%	8%	60	5	326	7.00	92%		60	5	326
.00	85%	15%	60	10	612	8.00	85%	15%	60	10	612
.00	68%	32%	60	22	1,306	9.00	68%	32%	60	22	1,306
0.00	11%	89%	60	61	3,631	10.00	11%		60	61	3,631
1.00	5%	95%	60	65	3,876	11.00	5%		60	65	3,876
2.00	5%	95%	60	65	3,876	12.00	5%		60	65	3,876
3.00	5%	95%	60	65	3,876	13.00	5%	95%	60	65	3,876
4.00	5%	95%	60	65	3,876	14.00	5%	95%	60	65	3,876
5.00	5%	95%	60	65	3,876	15.00	5%	95%	60	65	3,876
6.00	5%	95%	60	65	3,876	16.00	44%	56%	60	38	2,285
7.00	5%	95%	60	65	3,876	17.00	83%		60	12	694
8.00	19%	81%	60	55	3,305	18.00	88%		60	8	490
9.00	100%	0%	60	0	0	19.00	100%	0%	60	0	C
equired sur				0/ 0	2			s @ 50%		)0/ a	7.00
chieved su				70 area	9.00			urs on (h	,	o area	7.00
chieved to chieved dai					8.9 36312			un time (1 n time * ar			7.04 28723
23 XISTING S ime Sh	STATU				68	m2 NEW ST					
	nadow	IS Sunlight	Sun time	Sun area	March 21st time * area	Time		Sunlight	Sun time	Sun area	time * area
4 Hr	% /	Sunlight %	min	m2	time * area min*m2	Time 24 Hr	Shadow %	/%	min	m2	time * area min*m2
.00	% / 100%	Sunlight % 0%	min 60	m2 0	time * area min*m2	Time 24 Hr 6.00	Shadow % 100%	/ % 0%	min 60	m2 0	time * area min*m2
.00	% / 100% 92%	Sunlight % 0% 8%	min 60 60	m2 0 5	time * area min*m2 0 326	Time 24 Hr 6.00 7.00	Shadow % 100% 92%	/ % 0% 8%	min 60 60	m2 0 5	time * area min*m2 0 326
	% / 100%	Sunlight % 0%	min 60 60 60	m2 0 5 10	time * area min*m2	Time 24 Hr 6.00	Shadow % 100%	/ % 0%	min 60 60	m2 0 5	March 21st time * area min*m2 0 326 612
.00	% / 100% 92%	Sunlight % 0% 8%	min 60 60	m2 0 5	time * area min*m2 0 326	Time 24 Hr 6.00 7.00	Shadow % 100% 92%	/ % 0% 8% 15%	min 60 60	m2 0 5	time * area min*m2 0 326
.00 .00 .00 .00	% / 100% 92% 85%	Sunlight % 0% 8% 15%	min 60 60 60	m2 0 5 10 22 61	time * area min*m2 0 326 612	Time 24 Hr 6.00 7.00 8.00	% 100% 92% 85%	/ %  0%  8%  15%  32%	60 60 60 60 60	m2 0 5 10 22 61	time * area min*m2 0 326 612 1,306 3,631
.00 .00 .00 .00	% / 100% 92% 85% 68%	Sunlight % 0% 8% 15% 32%	min 60 60 60 60 60	m2 0 5 10 22	time * area min*m2 0 326 612 1,306	Time 24 Hr 6.00 7.00 8.00 9.00	% 100% 92% 85% 68%	/ %  0%  8%  15%  32%  89%	min 60 60 60 60 60	m2 0 5 10 22 61 65	time * area min*m2 0 326 612 1,306
00 00 00 00 00 0.00 1.00	% / 100% 92% 85% 68% 11%	Sunlight % 0% 8% 15% 32% 89%	60 60 60 60 60	m2 0 5 10 22 61	time * area min*m2 0 326 612 1,306 3,631	Time 24 Hr 6.00 7.00 8.00 9.00 10.00	Shadow % 100% 92% 85% 68% 11%	/ %  0% 8% 15% 32% 89% 95%	60 60 60 60 60	m2 0 5 10 22 61	time * area min*m2 0 326 612 1,306 3,631 3,876
.00 .00 .00 .00 .00 0.00 1.00	% / 100% 92% 85% 68% 11%	Sunlight %  0% 8% 15% 32% 89% 95%	min 60 60 60 60 60	m2 0 5 10 22 61 65	time * area min*m2 0 326 612 1,306 3,631 3,876	Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	Shadow % . 100% 92% 85% 68% 11% 5%	/ %  0%  8%  15%  32%  89%  95%	min 60 60 60 60 60	m2 0 5 10 22 61 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876
.00	% / 100% 92% 85% 68% 11% 5%	Sunlight %  0% 8%  15% 32% 89% 95%	60 60 60 60 60 60 60	m2 0 5 10 22 61 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876	Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00	\$\frac{100\%}{200}\$ \$100\%\$ \$92\%\$ \$85\%\$ \$68\%\$ \$11\%\$ \$5\%\$	/ %  0%  8%  15%  32%  89%  95%  95%	min 60 60 60 60 60 60	m2 0 5 10 22 61 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876
.00 .00 .00 .00 .00 0.00 1.00 2.00	% / 100% 92% 85% 68% 11% 5% 5%	Sunlight %  0% 8% 15% 32% 89% 95% 95%	min 60 60 60 60 60 60 60	m2 0 5 10 22 61 65 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876 3,876	Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00	Shadow	/ %  0% 8% 15% 32% 89% 95% 95% 95%	min 60 60 60 60 60 60 60	m2 0 5 10 22 61 65 65 65 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876 3,876
.00 .00 .00 .00 .00 0.00 1.00 2.00 3.00 4.00	% / 100% 92% 85% 68% 11% 5% 5% 5%	Sunlight % 0% 8% 15% 32% 89% 95% 95% 95%	min 60 60 60 60 60 60 60 60	m2 0 5 10 22 61 65 65 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876 3,876	Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00	Shadow %	/ %  0%  8%  15%  32%  89%  95%  95%  95%  95%	min 60 60 60 60 60 60 60 60	m2 0 5 10 22 61 65 65 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876 3,876
.00 .00 .00 .00 .00 0.00 1.00 2.00 3.00 4.00 5.00	% / 100% 92% 85% 68% 11% 5% 5% 5% 5%	Sunlight %  0% 8% 15% 32% 89% 95% 95% 95% 95%	min 60 60 60 60 60 60 60 60	m2 0 5 10 22 61 65 65 65 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876 3,876 3,876	Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00	Shadow %	0% 8% 15% 32% 89% 95% 95% 95% 95% 95%	min 60 60 60 60 60 60 60 60	m2 0 5 10 22 61 65 65 65 65	time * area min*m2 0 326 612 1,306 3,631 3,876 3,876 3,876 2,285
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24 (STING S She) 2000 (SO) (SO) (SO) (SO) (SO) (SO) (SO) (SO)	96 / 100% 92% 92% 68% 68% 5% 5% 5% 100% 85% 110% 92% 85% 69% 95% 95% 95% 95% 95% 95% 95% 95% 95% 9	Sunlight %  0% 15% 32% 15% 95% 95% 95% 95% 95% 10% 0%  88% 15% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 5 5 6 5 6 5 6 5 6 5 6 5 6 5 6 5 6 5	time * area min*m2 0 3266 612 1,306 3,631 3,876 3,876 3,876 3,876 3,876 3,876 3,876 3,876 3,876 3,876 3,876 3,876 3,876 4,845 4,845 4,845 4,845 4,845 4,845 4,845	Time 24 Hr 6.00 7.00 8.00 9.00 10.00 15.00 16.00 17.00 8.01 1.00 15.00 16.00 17.00 18.00 19.00 18.00 19.00 10.00 11.00 15.00 16.00 17.00 18.00 10.00 11.00 15.00 16.00 17.00 18.00 10.00 17.00 18.00 10.00 17.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 18.00 19.00 19.00 19.00 18.00 19.00 1	\$\frac{1}{2}\$ Shadow \( \frac{9}{6}\$ \) \$\frac{9}{6}\$ \$\fr	7 % 0% 8% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95	min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 5 5 100 222 611 65 655 655 655 655 655 655 655 655	time * area min*ma*  Garage March 1,300 min*ma*  3,876 min*ma*  3,876 min*ma*  3,876 min*ma*  March 21s min*ma*  4,845 min*ma*  6,612 min*ma*

24 Hr 3.00 10 7.00 9 3.00 8	TATUS dow Sunligh %/%									
24 Hr 6.00 10 7.00 9 8.00 8	-			March 21st	NEW S	TATUS				March 21s
6.00 10 7.00 9 8.00 8	0/ / 0/	t Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area
7.00 §	70 / 70	min	m2	min*m2	24 Hr	% /	1%	min	m2	min*m2
8.00	00% 0%	60	0	0	6.00	100%	0%	60	0	0
	92% 89	60	7	408	7.00	92%	8%	60	7	408
9.00	35% 15%	60	13	765	8.00	85%	15%	60	13	765
	68% 32%	60	27	1,632	9.00	68%	32%	60	27	1,632
10.00	11% 89%	60	76	4,539	10.00	11%	89%	60	76	4,539
11.00	5% 95%	60	81	4,845	11.00	5%	95%	60	81	4,845
12.00	5% 95%	60	81	4,845	12.00	5%	95%	60	81	4,845
13.00	5% 95%	60	81	4,845	13.00	5%	95%	60	81	4,845
14.00	5% 95%	60	81	4,845	14.00	5%	95%	60	81	4,845
15.00	5% 95%	60	81	4,845	15.00	5%	95%	60	81	4,845
16.00	5% 95%		81	4.845	16.00	42%	58%	60	49	2.958
17.00	5% 95%		81	4,845	17.00	48%	52%	60	44	2,652
	19% 819		69	4,131	18.00	88%	12%	60	10	612
	00% 09		0	0	19.00	100%	0%	60	0	0
	cup time *	rpa		45390	Achieve	d daily sun	time * ar	ea		37791
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26 Existing st	TATUS			<b>85</b> March 21st	m2 NEW S	TATUS				March 21st
26 EXISTING ST	「ATUS dow Sunligh	t Sun time	Sun area	85 March 21st time * area	m2  NEW S	TATUS Shadow	Sunlight	Sun time	Sun area	March 21st time * area
26 EXISTING ST Time Shad	FATUS dow Sunligh %/%	t Sun time min	m2	85 March 21st time * area min*m2	m2 NEW S <sup>*</sup> Time 24 Hr	FATUS Shadow %	Sunlight	Sun time	m2	March 21st time * area min*m2
26 EXISTING ST Fime Shace 24 Hr	FATUS dow Sunligh % / %	t Sun time min 6 60	m2 0	85 March 21st time * area min*m2	m2 <b>NEW S</b> * Time 24 Hr 6.00	FATUS Shadow % /	Sunlight %	Sun time min 60	m2 0	March 21st time * area min*m2
26 EXISTING ST Time Shad 24 Hr 6.00 10	FATUS  dow Sunligh  % / %  00% 09  32% 89	t Sun time min 6 60 6 60	m2 0 7	85 March 21st time * area min*m2 0 408	m2  NEW S  Time 24 Hr 6.00 7.00	Shadow % / 100% 92%	Sunlight %	Sun time min 60 60	m2 0 7	March 21st time * area min*m2 0 408
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26 EXISTING ST Time Shad 24 Hr 5.00 10 7.00 9 8.00 8	FATUS  dow Sunligh  % / %  00% 09  22% 89  35% 159  329	t Sun time min 6 60 60 60 60 60 60	m2 0 7 13 27	85 March 21st time * area min*m2 0 408 765 1,632	m2  NEW S' Time 24 Hr 6.00 7.00 8.00 9.00	FATUS Shadow % 1 100% 92% 85% 68%	Sunlight 5 % 0% 8% 15% 32%	Sun time min 60 60 60 60	m2 0 7 13 27	March 21st time * area min*m2 0 408 765 1,632
26 EXISTING ST Filme Shad 24 Hr 6.00 10 7.00 9 8.00 8 9.00 6	FATUS  dow Sunligh % / %  00%	t Sun time min 6 60 60 60 60 60 60 60	m2 0 7 13 27 76	85 March 21st time * area min*m2 0 408 765 1,632 4,539	m2  NEW S' Time 24 Hr 6.00 7.00 8.00 9.00 10.00	TATUS Shadow % / 100% 92% 85% 68% 11%	Sunlight 7 % 0% 8% 15% 32% 89%	Sun time min 60 60 60 60 60	m2 0 7 13 27 76	March 21st time * area min*m2 0 408 765 1,632 4,539
26 EXISTING ST Time Shad 24 Hr 6.00 10 7.00 9 8.00 8 9.00 6 10.00 7	FATUS  Sunligh % / %  00% 09,92% 89,92% 88,95% 159,688 329,958 11% 899,55% 959,959	t Sun time min 6 60 60 60 60 60 60 60 60 60 60 60 60 6	m2 0 7 13 27 76 81	85 March 21st time * area min*m2 0 408 765 1,632 4,539 4,845	m2 NEW S' Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00	TATUS Shadow % / 100% 92% 85% 68% 111% 5%	Sunlight '%'  0%' 8%' 15%' 32%' 89%' 95%'	Sun time min 60 60 60 60 60 60 60	m2 0 7 13 27 76 81	March 21st time * area min*m2 0 408 765 1,632 4,539 4,845
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26  EXISTING S1  Shace 24 Hr  Shace 24 Hr  Shace 26 Hr  Shace 26 Hr  Shace 26 Hr  Shace 27 Hr  S	FATUS  stow Sunlight % / %  000% 09  322% 89  35% 159  588% 329  111% 899  55% 959  55% 959  55% 959	t Sun time min 6 60 60 60 60 60 60 60 60 60 60 60 60 6	m2 0 7 13 27 76 81 81	85 March 21st time * area min*m2 0 408 765 1,632 4,539 4,845 4,845 4,845	m2  NEW S  Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00	Shadow % / 100% 100% 85% 68% 111% 5% 5% 5%	Sunlight '%  0%  8%  15%  32%  89%  95%  95%	Sun time min 60 60 60 60 60 60 60 60 60 60	m2 0 7 13 27 76 81 81 81	March 21st time * area min*m2 0 408 765 1,632 4,539 4,845 4,845 4,845
26 EXISTING S1 Time Shace 24 Hr 6.00 11(7.00 8.80.00 8.80.00 8.80.00 8.10.00 11.00 11.0	TATUS  Sunligh % / %  00% 09,322% 89,322% 159,328% 159,55% 159,55% 959,55% 959,55% 959,95%	t Sun time min 6 60 60 60 60 60 60 60 60 60 60 60 60 6	m2 0 7 13 27 76 81 81 81	85 March 21st time * area min*m2 0 408 7655 1,632 4,539 4,845 4,845 4,845 4,845	NEW S' Time 24 Hr 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00	Shadow % / 100% 100% 85% 68% 111% 5% 5% 5%	Sunlight '%'  0%' 8%' 15%' 32%' 89%' 95%' 95%' 95%'	Sun time min 60 60 60 60 60 60 60 60 60 60	m2 0 7 13 27 76 81 81 81	March 21st time * area min*m2 0 408 765 1,632 4,539 4,845 4,845 4,845
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26 EXISTING S1 Filme Shad 24 Hr 6.000 11 6.000 8 8.000 8 11.000 11 11.000 12.000 13.000 14 14.000 15.000 16.000 17.000	FATUS  flow Sunlight % / %  00%  09, / %  89, 32%  89, 35%  159, 389, 329, 11%  89, 959, 55%  959, 55%  959, 55%  959, 55%  959, 55%  959, 55%	t Sun time min 6 60 60 60 60 60 60 60 60 60 60 60 60 6	m2 0 7 13 27 76 81 81 81 81 81 81	85 March 21st time * area min*m2 0 408 765 1,632 4,539 4,845 4,845 4,845 4,845 4,845	MEW S' Time 24 Hr 6.00 7.00 8.00 9.00 11.00 12.00 13.00 14.00 15.00 16.00	Shadow % / 100% 92% 85% 68% 11% 5% 5% 5% 5% 5%	Sunlight  '%  0%  8%  15%  32%  89%  95%  95%  95%  95%  95%  95%  89%	Sun time min 60 60 60 60 60 60 60 60 60 60 60 60 60	m2 0 0 7 13 27 76 81 81 81 81 81 76	March 21st time * area min*m² 0 408 765 1,632 4,539 4,845 4,845 4,845 4,845 4,845

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