



5065

Effect on Sunlight Reception Analysis Report

EFFECT on SUNLIGHT RECEPTION IN NEIGHBOURING AMENITY SPACES

Castlelake SHD

Castlelake,
Carrigtwohill,
Co. Cork

BAM

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A 5060-D One hourly overall site shadow – sunlight status illustrations	Attached
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1 Introduction

1.1 Report purpose

This report gives information on the effects of the proposed development on sunlight reception in existing neighbouring amenity spaces.

1.2 Instruction

DKPartnership (DKP) have been commissioned by BAM, to carry out the analysis and report for the proposed development at Carrigtwohill, Co. Cork.

1.3 Development description

The development will consist of the construction of a strategic housing development of 716 no. units and a 2 no. storey creche. The proposed development comprises 224 no. houses, 284 no. duplex units and 208 no. apartments. The two storey houses comprise 48 no. detached, 126 no. semi-detached and 50 no. terraced Houses containing 60 no. two bed units, 139 no. three bed units and 25 no. four bed units. The part-one to part-three storey duplex units are contained in 122 no. buildings providing 82 no. one bed units, 142 no. two bed units and 60 no. three bed units. There are 7 no. apartments blocks ranging in height from part-1 to part- 5 no. storeys.

- Block 1 is 4 no. storeys and contains 34 no. units (7 no. one bed units, 19 no. two bed units and 8 no. three bed units).
- Block 2 is part-1 to part-5 no. storeys and contains 42 no. units (15 no. one bed units, 20 no. two bed units and 7 no. three bed units).
- Block 3 is 5 no. storeys and contains 17 no. units (8 no. one bed units and 9 no. two bed units).
- Block 4 is 4 no. storeys and contains 13 no. units (6 no. one bed units and 7 no. two bed units).
- Block 5 is 4 no. storeys and contains 13 no. units (6 no. one bed units and 7 no. two bed units).
- Block 6 is 4 no. storeys and contains 13 no. units (6 no. one bed units and 7 no. two bed units).
- Block 7 is 5 no. storeys over basement and contains 76 no. units (23 no. one bed units, 41 no. two bed units and 12 no. three bed units).
- All blocks contain ancillary internal and external resident amenity space.

The proposed development also provides for: hard and soft landscaping; boundary treatments; public realm works; car parking; bicycle stores and shelters; bin stores; lighting; plant rooms; and all ancillary site development works above and below ground.

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.

2 Executive summary

2.1 Analysis conducted

This report details the effects on the sunlight/shadow status of existing neighbouring amenity spaces as a result of the new proposed developments and examines if these effects are within the limits of the recommendations of the relevant guidelines and standards.

2.2 Guidelines and standards applied

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

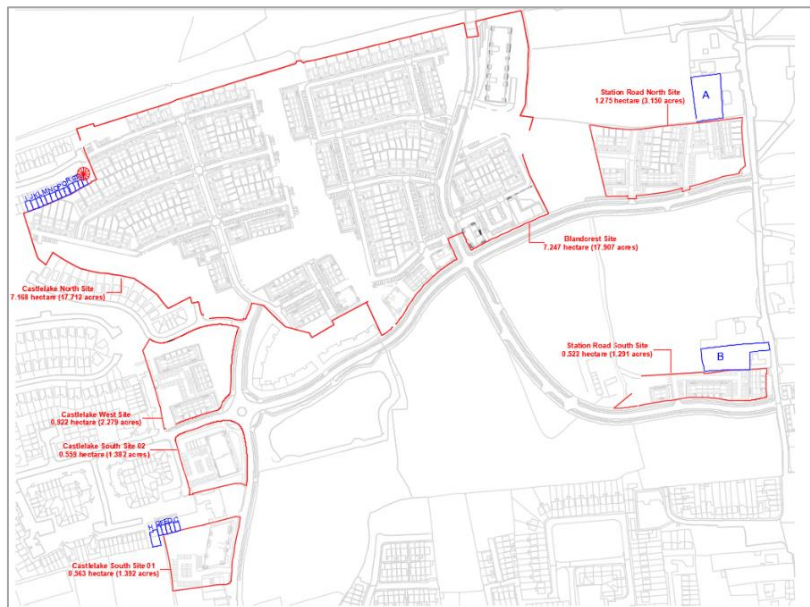
- The Building Research Establishment (BRE) report, "Site layout planning for daylight and sunlight – a guide to good practice (referred to as the BRE Report).
- British European Standard BS EN17037/EN17037 Day lighting standards and contains guidance on the minimum recommended levels of interior day 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 neighbouring amenity spaces. For "existing" amenity spaces any loss of sunlight should not be greater than 0.8 times its former size on March 21st.

2.4 Neighbouring amenity spaces shadow / 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 21st of March and that any loss of sunlight should not be greater than 0.8 (20% reduction) times its former size. From the calculation results we note that all of the selected existing amenity spaces received 2 hours of sunlight or more on at least 50% of the area before and after the introduction of the new development. Summary of results are as follows (see image 5.1 for receptor locations):



(For reference) Image 5.1: existing neighbouring amenity spaces

- Northeast receptor: Receptor A is a private dwelling with a green amenity / private garden area. Receptor A resulted in change factor of 0.93 meaning the new proposed development has a small effect on this amenity space's sunlight. This effect happens in the morning / afternoon hours of 08.00-15.00. The calculation findings are comfortably within BRE guidelines.
- West receptor: Receptor B is a private dwelling with a green amenity / private garden area. This receptor resulted in a change factor of 0.88 meaning the new proposed development has a small effect on this amenity space's

sunlight. This effect happens in the morning / afternoon hours of 08.00-15.00. The calculation findings are within BRE guidelines.

- Southwest receptors: Receptors C, D, E, F, G and H are part of the Fernbrook, Carrigtohill, Castlelake estate with private amenity / back garden areas. Receptors C to H resulted in change factor range of 0.93-0.97 meaning the new proposed development has a small effect on these amenity space's. This effect happens in the early morning hours of 07.00-10.00. The calculation findings are comfortably within BRE guidelines.
- Northwest receptors: Receptors I, J, K, L, M, N, O, P, Q, R, S, T, U and V are part of the Maple Ln, Carrigtohill, Castlelake estate with private amenity / back garden areas. Receptors I to V resulted in change factor range of 0.88-0.93 meaning the new proposed development has a small effect on these amenity spaces. This effect happens in the morning hours of 07.00-11.00. The calculation findings are also comfortably within BRE guidelines.

We conclude that the sunlight reception in the existing neighbouring amenity spaces after the introduction of the new development is in line 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.

2.5 Mitigation measures / actions

No mitigation measures anticipated.

3 Geographical overview

3.1 Project overview

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

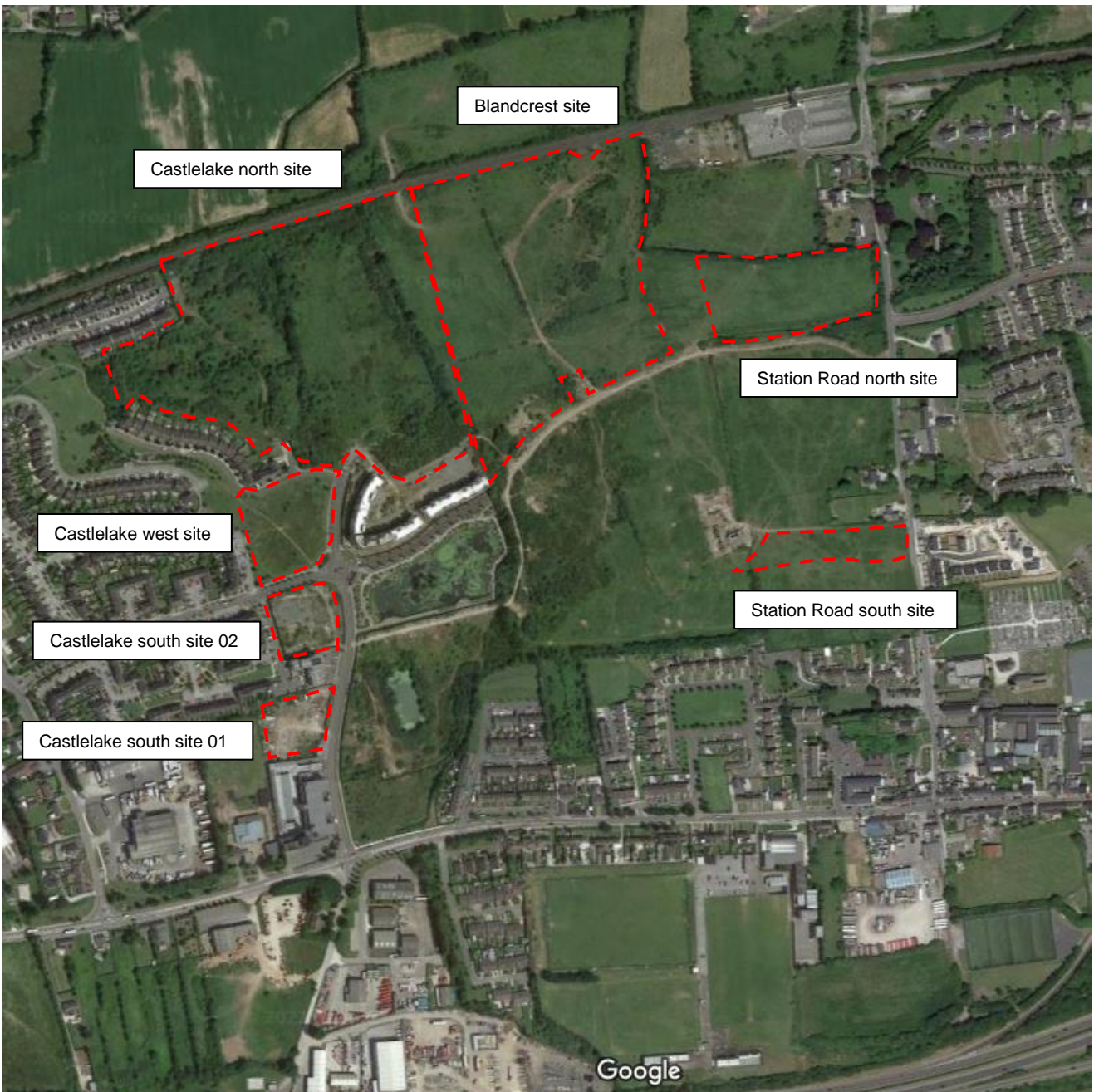


Image 3.1 Approximate proposed development site boundary

4 Approach and methodology

4.1 General approach

This report covers the effects on achieved sunlight reception in existing neighbouring amenity spaces as a result of the new proposed development.

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.

4.5 Criterion for effects on existing sunlight / shadow analysis

Acceptable criterion for effects on existing sunlight reception / shadow forming are as follows:

Analysis	Criteria on March 21 st	Acceptable sunlight reception parameters
Sunlight reception	Minimum sunlight reception in amenity spaces	At least 80% or 0.8 x it former sunlight reception.

Table 4.1

4.6 Sunlight reception / Overshadowing effects measured

The minimum sunlight requirement in this report measured in sunlight time 2 hours (120 minutes) multiplied by 50% area m² or the minimum requirement = 120 (min) * 0.5a (m²) = [] min·m².

The overshadowing/sun light assessment is executed in using a 3D model of the project 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.



5 Receptor selection and Calculation results - Existing neighbouring amenity spaces

5.1 Existing neighbouring amenity spaces

Image 5.1 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.

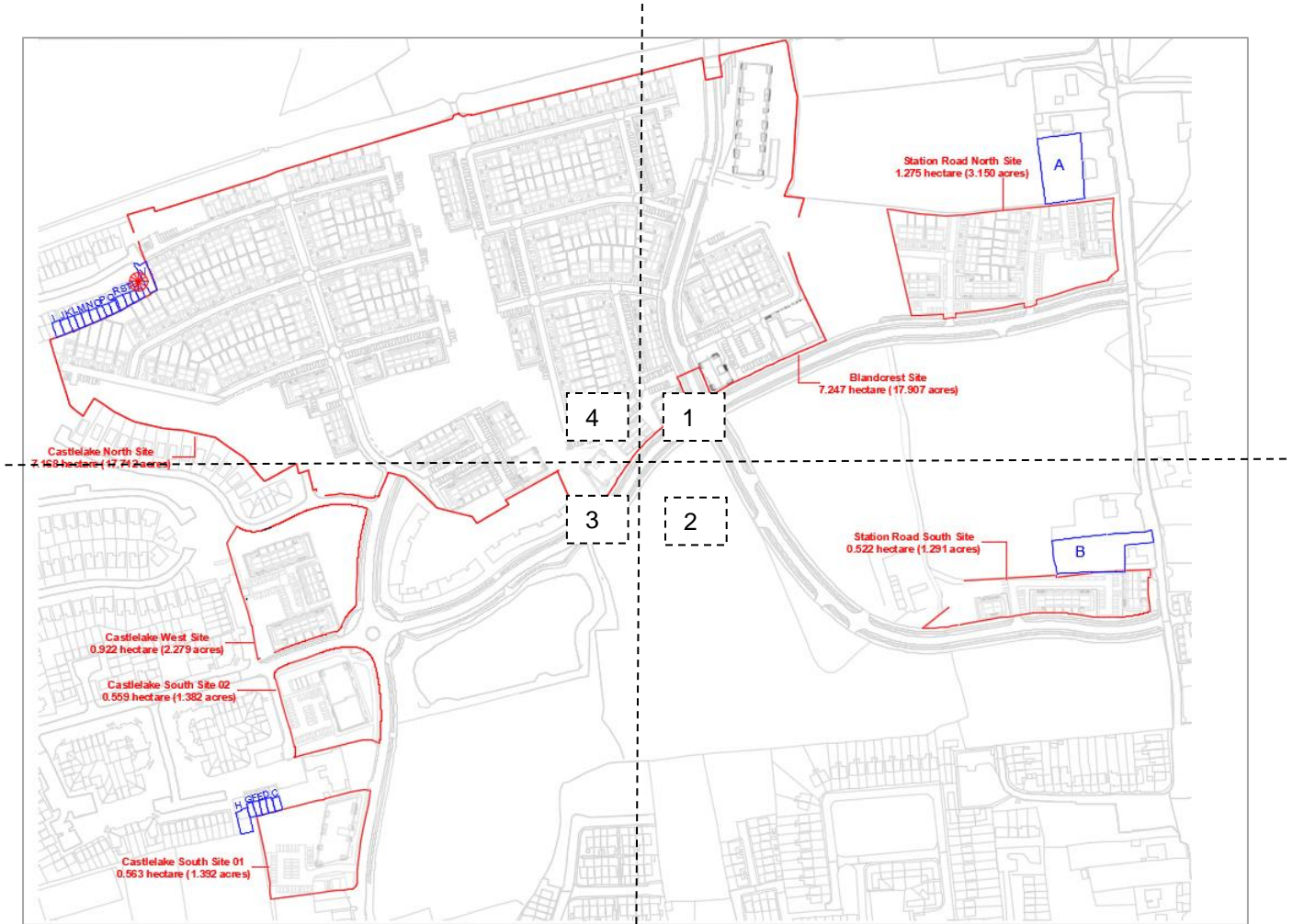


Image 5.1: existing neighbouring amenity spaces, overall view layout.

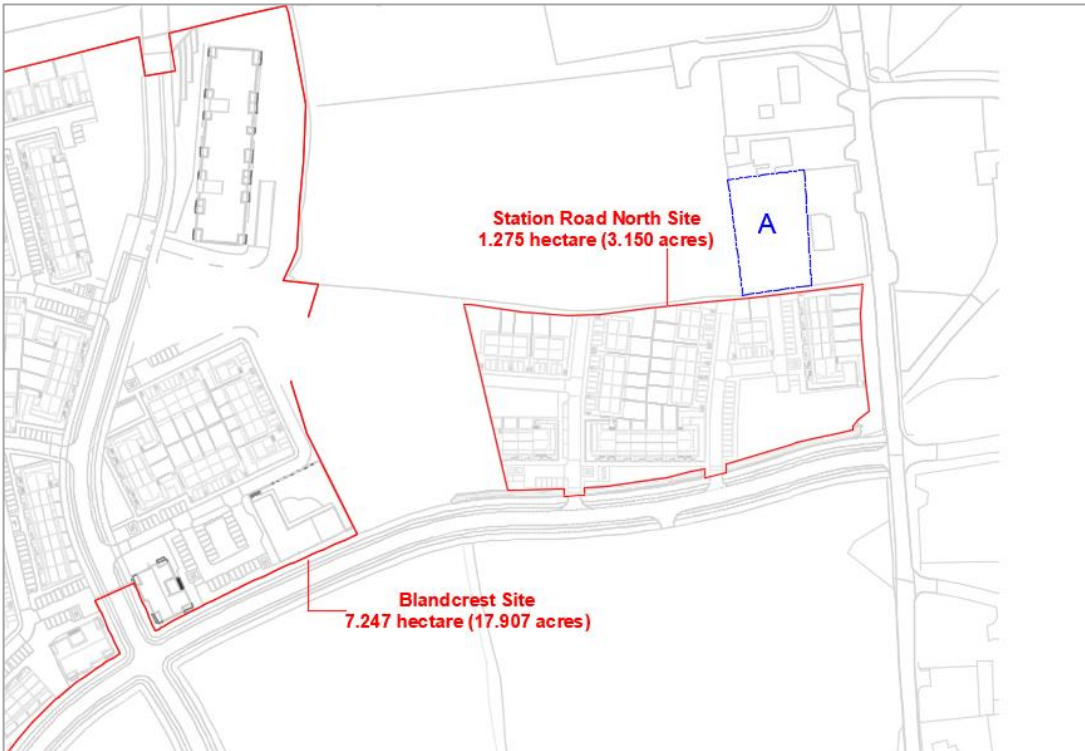


Image 5.2: Selected neighbouring receptors, view port (A), showing receptor 'A'

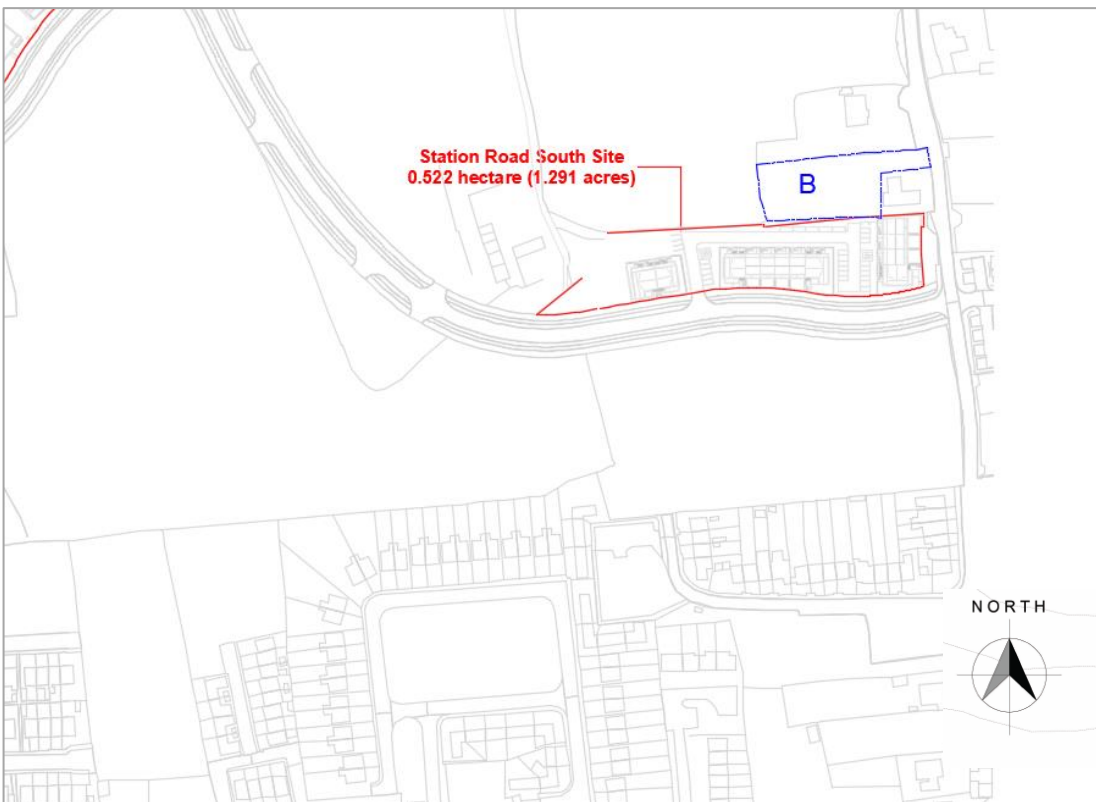


Image 5.3: Selected neighbouring receptors, view port (B), showing receptor 'B'



Image 5.4: Selected neighbouring receptors, view port (C), showing receptor 'C-H'



Image 5.5: Selected neighbouring receptors, view port (D), showing receptor 'I-V'





Receptor	Location / Address	Amenity description	Approx. Area m ²
A	Station Rd, Carrigtohill, Co. Cork	Private green space	1,700
B	Station Rd, Carrigtohill, Co. Cork	Private green space	1,750
C	7 Fernbrook, Carrigtohill, Castlelake, Co. Cork	Private green space	64
D	6 Fernbrook, Carrigtohill, Castlelake, Co. Cork	Private green space	61
E	5 Fernbrook, Carrigtohill, Castlelake, Co. Cork	Private green space	61
F	4 Fernbrook, Carrigtohill, Castlelake, Co. Cork	Private green space	61
G	3 Fernbrook, Carrigtohill, Castlelake, Co. Cork	Private green space	60
H	2 Fernbrook, Carrigtohill, Castlelake, Co. Cork	Private green space	180
I	43 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	80
J	42 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	78
K	41 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	61
L	40 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	60
M	39 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	70
N	38 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	67
O	37 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	53
P	36 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	53
Q	35 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	50
R	34 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	68
S	33 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	51
T	32 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	46
U	31 Maple Ln, Carrigtohill, Castlelake, Co. Cork	Private green space	43
V	Maple Ln, Carrigtohill, Castlelake, Co. Cork	Communal green space	200

Table 5.1: existing neighbouring amenity spaces

5.2 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

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

5.3 Existing amenity spaces calculation results

SUNLIGHT/SHADOW CALCULATION DATA

A						1,700 m ²	NEW STATUS						change	
EXISTING STATUS						March 21st	NEW STATUS						March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area		
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²		
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0		
7.00	93%	7%	60	119	7,140	7.00	93%	7%	60	119	7,140	7,140		
8.00	65%	35%	60	595	35,700	8.00	69%	31%	60	527	31,620	-4,080		
9.00	42%	58%	60	986	59,160	9.00	53%	47%	60	799	47,940	-11,220		
10.00	38%	62%	60	1054	63,240	10.00	46%	54%	60	918	55,080	-8,160		
11.00	19%	81%	60	1377	82,620	11.00	28%	72%	60	1224	73,440	-9,180		
12.00	16%	84%	60	1428	85,680	12.00	27%	73%	60	1241	74,460	-11,220		
13.00	16%	84%	60	1428	85,680	13.00	26%	74%	60	1258	75,480	-10,200		
14.00	15%	85%	60	1445	86,700	14.00	24%	76%	60	1292	77,520	-9,180		
15.00	18%	82%	60	1394	83,640	15.00	22%	78%	60	1326	79,560	-4,080		
16.00	21%	79%	60	1343	80,580	16.00	21%	79%	60	1343	80,580	0		
17.00	29%	71%	60	1207	72,420	17.00	29%	71%	60	1207	72,420	0		
18.00	44%	56%	60	952	57,120	18.00	44%	56%	60	952	57,120	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 @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	10.00	Achieved sun hours on (hrs) @ 50% area	9.00
Achieved total sun time (hrs)	7.84	Achieved total sun time (hrs)	7.18
Achieved daily sun time * area	799680	Achieved daily sun time * area	732360
			0.92
			0.92

B						1,760 m ²	NEW STATUS						change	
EXISTING STATUS						March 21st	NEW STATUS						March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area		
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²		
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0		
7.00	93%	7%	60	123	7,350	7.00	93%	7%	60	123	7,350	7,350		
8.00	84%	16%	60	280	16,800	8.00	90%	10%	60	175	10,500	-6,300		
9.00	61%	39%	60	683	40,950	9.00	78%	22%	60	385	23,100	-17,850		
10.00	37%	63%	60	1103	66,150	10.00	56%	44%	60	770	46,200	-19,950		
11.00	21%	79%	60	1383	82,950	11.00	34%	66%	60	1155	69,300	-13,650		
12.00	9%	91%	60	1593	95,550	12.00	21%	79%	60	1383	82,950	-12,600		
13.00	8%	92%	60	1610	96,600	13.00	19%	81%	60	1418	85,050	-11,550		
14.00	0%	100%	60	1750	105,000	14.00	18%	82%	60	1435	86,100	-18,900		
15.00	0%	100%	60	1750	105,000	15.00	9%	91%	60	1593	95,550	-9,450		
16.00	0%	100%	60	1750	105,000	16.00	0%	100%	60	1750	105,000	0		
17.00	19%	81%	60	1418	85,050	17.00	19%	81%	60	1418	85,050	0		
18.00	36%	64%	60	1120	67,200	18.00	36%	64%	60	1120	67,200	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 @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	9.00	Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	8.32	Achieved total sun time (hrs)	7.27
Achieved daily sun time * area	873600	Achieved daily sun time * area	763350
			0.88
			0.88

C						64 m ²	NEW STATUS						change	
EXISTING STATUS						March 21st	NEW STATUS						March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area		
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²		
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0		
7.00	92%	8%	60	5	307	7.00	98%	2%	60	1	77	-230		
8.00	77%	23%	60	15	883	8.00	98%	2%	60	1	77	-806		
9.00	55%	45%	60	29	1,728	9.00	89%	11%	60	7	422	-1,306		
10.00	19%	81%	60	52	3,110	10.00	19%	81%	60	52	3,110	3,110		
11.00	19%	81%	60	52	3,110	11.00	19%	81%	60	52	3,110	0		
12.00	16%	84%	60	54	3,226	12.00	16%	84%	60	54	3,226	0		
13.00	9%	91%	60	58	3,494	13.00	9%	91%	60	58	3,494	0		
14.00	0%	100%	60	64	3,840	14.00	0%	100%	60	64	3,840	0		
15.00	0%	100%	60	64	3,840	15.00	0%	100%	60	64	3,840	0		
16.00	24%	76%	60	49	2,918	16.00	24%	76%	60	49	2,918	0		
17.00	29%	71%	60	45	2,726	17.00	29%	71%	60	45	2,726	0		
18.00	60%	40%	60	26	1,536	18.00	60%	40%	60	26	1,536	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 @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00	Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	8	Achieved total sun time (hrs)	7.39
Achieved daily sun time * area	30720	Achieved daily sun time * area	28378
			0.93
			0.93

D						61 m ²	NEW STATUS						change	
EXISTING STATUS						March 21st	NEW STATUS						March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area		
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²		
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0		
7.00	92%	8%	60	5	293	7.00	98%	2%	60	1	73	-220		
8.00	77%	23%	60	14	842	8.00	98%	2%	60	1	73	-769		
9.00	55%	45%	60	27	1,647	9.00	89%	11%	60	7	403	-1,244		
10.00	19%	81%	60	49	2,965	10.00	19%	81%	60	49	2,965	2,965		
11.00	19%	81%	60	49	2,965	11.00	19%	81%	60	49	2,965	0		
12.00	16%	84%	60	51	3,074	12.00	16%	84%	60	51	3,074	0		
13.00	9%	91%	60	56	3,331	13.00	9%	91%	60	56	3,331	0		
14.00	0%	100%	60	61	3,660	14.00	0%	100%	60	61	3,660	0		
15.00	0%	100%	60	61	3,660	15.00	0%	100%	60	61	3,660	0		
16.00	24%	76%	60	46	2,782	16.00	24%	76%	60	46	2,782	0		
17.00	29%	71%	60	43	2,599	17.00	29%	71%	60	43	2,599	0		
18.00	60%	40%	60	24	1,464	18.00	60%	40%	60	24	1,464	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 @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00	Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	8	Achieved total sun time (hrs)	7.39
Achieved daily sun time * area	29280	Achieved daily sun time * area	27047
			0.93
			0.93



E							61 m ²
EXISTING STATUS							March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	92%	8%	60	5	293		
8.00	77%	23%	60	14	842		
9.00	55%	45%	60	27	1,647		
10.00	19%	81%	60	49	2,965		
11.00	19%	81%	60	49	2,965		
12.00	16%	84%	60	51	3,074		
13.00	9%	91%	60	56	3,331		
14.00	0%	100%	60	61	3,660		
15.00	0%	100%	60	61	3,660		
16.00	24%	76%	60	46	2,782		
17.00	29%	71%	60	43	2,599		
18.00	60%	40%	60	24	1,464		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 8
 Achieved daily sun time * area 29280

NEW STATUS							March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area		time * area	
24 Hr	% / %		min	m ²	min*m ²		min*m ²	
6.00	100%	0%	60	0	0	0	0	
7.00	98%	2%	60	1	73	0	-220	
8.00	98%	2%	60	1	73	0	-769	
9.00	89%	11%	60	7	403	0	-1,244	
10.00	19%	81%	60	49	2,965	0	0	
11.00	19%	81%	60	49	2,965	0	0	
12.00	16%	84%	60	51	3,074	0	0	
13.00	9%	91%	60	56	3,331	0	0	
14.00	0%	100%	60	61	3,660	0	0	
15.00	0%	100%	60	61	3,660	0	0	
16.00	24%	76%	60	46	2,782	0	0	
17.00	29%	71%	60	43	2,599	0	0	
18.00	60%	40%	60	24	1,464	0	0	
19.00	100%	0%	60	0	0	0	0	

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 7.39 0.93
 Achieved daily sun time * area 27047 0.93

F							61 m ²
EXISTING STATUS							March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	92%	8%	60	5	293		
8.00	77%	23%	60	14	842		
9.00	55%	45%	60	27	1,647		
10.00	19%	81%	60	49	2,965		
11.00	19%	81%	60	49	2,965		
12.00	16%	84%	60	51	3,074		
13.00	9%	91%	60	56	3,331		
14.00	0%	100%	60	61	3,660		
15.00	0%	100%	60	61	3,660		
16.00	24%	76%	60	46	2,782		
17.00	29%	71%	60	43	2,599		
18.00	60%	40%	60	24	1,464		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 8
 Achieved daily sun time * area 29280

NEW STATUS							March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area		time * area	
24 Hr	% / %		min	m ²	min*m ²		min*m ²	
6.00	100%	0%	60	0	0	0	0	
7.00	98%	2%	60	1	73	0	-220	
8.00	98%	2%	60	1	73	0	-769	
9.00	79%	21%	60	13	769	0		
10.00	19%	81%	60	49	2,965	0	0	
11.00	19%	81%	60	49	2,965	0	0	
12.00	16%	84%	60	51	3,074	0	0	
13.00	9%	91%	60	56	3,331	0	0	
14.00	0%	100%	60	61	3,660	0	0	
15.00	0%	100%	60	61	3,660	0	0	
16.00	24%	76%	60	46	2,782	0	0	
17.00	29%	71%	60	43	2,599	0	0	
18.00	60%	40%	60	24	1,464	0	0	
19.00	100%	0%	60	0	0	0	0	

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 7.49 0.94
 Achieved daily sun time * area 27413 0.94

G							60 m ²
EXISTING STATUS							March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	92%	8%	60	5	288		
8.00	77%	23%	60	14	828		
9.00	55%	45%	60	27	1,620		
10.00	19%	81%	60	49	2,916		
11.00	19%	81%	60	49	2,916		
12.00	16%	84%	60	50	3,024		
13.00	9%	91%	60	55	3,276		
14.00	0%	100%	60	60	3,600		
15.00	0%	100%	60	60	3,600		
16.00	24%	76%	60	46	2,736		
17.00	29%	71%	60	43	2,556		
18.00	60%	40%	60	24	1,440		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 8
 Achieved daily sun time * area 28800

NEW STATUS							March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area		time * area	
24 Hr	% / %		min	m ²	min*m ²		min*m ²	
6.00	100%	0%	60	0	0	0	0	
7.00	98%	2%	60	1	72	0	-216	
8.00	98%	2%	60	1	72	0	-756	
9.00	78%	22%	60	13	792	0	-828	
10.00	19%	81%	60	49	2,916	0	0	
11.00	19%	81%	60	49	2,916	0	0	
12.00	16%	84%	60	50	3,024	0	0	
13.00	9%	91%	60	55	3,276	0	0	
14.00	0%	100%	60	60	3,600	0	0	
15.00	0%	100%	60	60	3,600	0	0	
16.00	24%	76%	60	46	2,736	0	0	
17.00	29%	71%	60	43	2,556	0	0	
18.00	60%	40%	60	24	1,440	0	0	
19.00	100%	0%	60	0	0	0	0	

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 7.5 0.94
 Achieved daily sun time * area 27000 0.94

H							180 m ²
EXISTING STATUS							March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	92%	8%	60	14	864		
8.00	77%	23%	60	41	2,484		
9.00	55%	45%	60	81	4,860		
10.00	19%	81%	60	146	8,748		
11.00	19%	81%	60	146	8,748		
12.00	16%	84%	60	151	9,072		
13.00	9%	91%	60	164	9,828		
14.00	0%	100%	60	180	10,800		
15.00	0%	100%	60	180	10,800		
16.00	24%	76%	60	137	8,208		
17.00	29%	71%	60	128	7,668		
18.00	60%	40%	60	72	4,320		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 8
 Achieved daily sun time * area 86400

NEW STATUS							March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area		time * area	
24 Hr	% / %		min	m ²	min*m ²		min*m ²	
6.00	100%	0%	60	0	0	0	0	
7.00	98%	2%	60	4	216	0	-648	
8.00	98%	2%	60	4	216	0	-2,268	
9.00	55%	45%	60	81	4,860	0	0	
10.00	19%	81%	60	146	8,748	0	0	
11.00	19%	81%	60	146	8,748	0	0	
12.00	16%	84%	60	151	9,072	0	0	
13.00	9%	91%	60	164	9,828	0	0	
14.00	0%	100%	60	180	10,800	0	0	
15.00	0%	100%	60	180	10,800	0	0	
16.00	24%	76%	60	137	8,208	0	0	
17.00	29%	71%	60	128	7,668	0	0	
18.00	60%	40%	60	72	4,320	0	0	
19.00	100%	0%	60	0	0	0	0	

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 7.73 0.97
 Achieved daily sun time * area 83484 0.97



I 80 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	4	240		
8.00	77%	23%	60	18	1,104		
9.00	48%	52%	60	42	2,496		
10.00	18%	82%	60	66	3,936		
11.00	16%	84%	60	67	4,032		
12.00	16%	84%	60	67	4,032		
13.00	9%	91%	60	73	4,368		
14.00	9%	91%	60	73	4,368		
15.00	15%	85%	60	68	4,080		
16.00	38%	62%	60	50	2,976		
17.00	45%	55%	60	44	2,640		
18.00	65%	35%	60	28	1,680		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	9.00
Achieved total sun time (hrs)	7.49
Achieved daily sun time * area	35952

NEW STATUS						March 21st		change
Time	Shadow	Sunlight	Sun time	Sun area	time * area			time * area
24 Hr	% / %		min	m ²	min*m ²			min*m ²
6.00	100%	0%	60	0	0			0
7.00	98%	2%	60	2	96			-144
8.00	90%	10%	60	8	480			-624
9.00	90%	10%	60	8	480			-2,016
10.00	37%	63%	60	50	3,024			-912
11.00	27%	73%	60	58	3,504			-528
12.00	21%	79%	60	63	3,792			-240
13.00	9%	91%	60	73	4,368			0
14.00	9%	91%	60	73	4,368			0
15.00	15%	85%	60	68	4,080			0
16.00	38%	62%	60	50	2,976			0
17.00	45%	55%	60	44	2,640			0
18.00	65%	35%	60	28	1,680			0
19.00	100%	0%	60	0	0			0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	6.56
Achieved daily sun time * area	31488

J 78 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	4	234		
8.00	77%	23%	60	18	1,076		
9.00	48%	52%	60	41	2,434		
10.00	18%	82%	60	64	3,838		
11.00	16%	84%	60	66	3,931		
12.00	16%	84%	60	66	3,931		
13.00	9%	91%	60	71	4,259		
14.00	9%	91%	60	71	4,259		
15.00	15%	85%	60	66	3,978		
16.00	38%	62%	60	48	2,902		
17.00	45%	55%	60	43	2,574		
18.00	65%	35%	60	27	1,638		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	9.00
Achieved total sun time (hrs)	7.49
Achieved daily sun time * area	35053.2

NEW STATUS						March 21st		change
Time	Shadow	Sunlight	Sun time	Sun area	time * area			time * area
24 Hr	% / %		min	m ²	min*m ²			min*m ²
6.00	100%	0%	60	0	0			0
7.00	98%	2%	60	2	94			-140
8.00	90%	10%	60	8	468			-608
9.00	90%	10%	60	8	468			-1,966
10.00	37%	63%	60	49	2,948			-889
11.00	27%	73%	60	57	3,416			-515
12.00	19%	81%	60	63	3,791			-140
13.00	9%	91%	60	71	4,259			0
14.00	9%	91%	60	71	4,259			0
15.00	15%	85%	60	66	3,978			0
16.00	38%	62%	60	48	2,902			0
17.00	45%	55%	60	43	2,574			0
18.00	65%	35%	60	27	1,638			0
19.00	100%	0%	60	0	0			0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	6.58
Achieved daily sun time * area	30794

K 61 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	3	183		
8.00	77%	23%	60	14	842		
9.00	48%	52%	60	32	1,903		
10.00	18%	82%	60	50	3,001		
11.00	16%	84%	60	51	3,074		
12.00	16%	84%	60	51	3,074		
13.00	9%	91%	60	56	3,331		
14.00	9%	91%	60	56	3,331		
15.00	15%	85%	60	52	3,111		
16.00	38%	62%	60	38	2,269		
17.00	45%	55%	60	34	2,013		
18.00	65%	35%	60	21	1,281		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	9.00
Achieved total sun time (hrs)	7.49
Achieved daily sun time * area	27413.4

NEW STATUS						March 21st		change
Time	Shadow	Sunlight	Sun time	Sun area	time * area			time * area
24 Hr	% / %		min	m ²	min*m ²			min*m ²
6.00	100%	0%	60	0	0			0
7.00	98%	2%	60	1	73			-110
8.00	90%	10%	60	6	366			-476
9.00	90%	10%	60	6	366			-1,537
10.00	34%	66%	60	40	2,416			-586
11.00	21%	79%	60	48	2,891			-183
12.00	19%	81%	60	49	2,965			-110
13.00	9%	91%	60	56	3,331			0
14.00	9%	91%	60	56	3,331			0
15.00	15%	85%	60	52	3,111			0
16.00	38%	62%	60	38	2,269			0
17.00	45%	55%	60	34	2,013			0
18.00	65%	35%	60	21	1,281			0
19.00	100%	0%	60	0	0			0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	6.67
Achieved daily sun time * area	24412

L 60 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	3	180		
8.00	77%	23%	60	14	828		
9.00	48%	52%	60	31	1,872		
10.00	18%	82%	60	49	2,952		
11.00	16%	84%	60	50	3,024		
12.00	16%	84%	60	50	3,024		
13.00	9%	91%	60	55	3,276		
14.00	9%	91%	60	55	3,276		
15.00	15%	85%	60	51	3,060		
16.00	38%	62%	60	37	2,232		
17.00	45%	55%	60	33	1,980		
18.00	65%	35%	60	21	1,260		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	9.00
Achieved total sun time (hrs)	7.49
Achieved daily sun time * area	26964

NEW STATUS						March 21st		change
Time	Shadow	Sunlight	Sun time	Sun area	time * area			time * area
24 Hr	% / %		min	m ²	min*m ²			min*m ²
6.00	100%	0%	60	0	0			0
7.00	98%	2%	60	1	72			-108
8.00	90%	10%	60	6	360			-468
9.00	90%	10%	60	6	360			-1,512
10.00	18%	82%	60	49	2,952			0
11.00	16%	84%	60	50	3,024			0
12.00	16%	84%	60	50	3,024			0
13.00	9%	91%	60	55	3,276			0
14.00	9%	91%	60	55	3,276			0
15.00	15%	85%	60	51	3,060			0
16.00	38%	62%	60	37	2,232			0
17.00	45%	55%	60	33	1,980			0
18.00	65%	35%	60	21	1,260			0
19.00	100%	0%	60	0	0			0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	6.91
Achieved daily sun time * area	24876



M 70 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	4	210		
8.00	77%	23%	60	16	966		
9.00	48%	52%	60	36	2,184		
10.00	18%	82%	60	57	3,444		
11.00	16%	84%	60	59	3,528		
12.00	16%	84%	60	59	3,528		
13.00	9%	91%	60	64	3,822		
14.00	9%	91%	60	64	3,822		
15.00	15%	85%	60	60	3,570		
16.00	38%	62%	60	43	2,604		
17.00	45%	55%	60	39	2,310		
18.00	65%	35%	60	25	1,470		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 31458

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %		min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	84	84	-126
8.00	90%	10%	60	7	420	420	-546
9.00	88%	12%	60	8	504	504	-1,680
10.00	18%	82%	60	57	3,444	3,444	0
11.00	16%	84%	60	59	3,528	3,528	0
12.00	16%	84%	60	59	3,528	3,528	0
13.00	9%	91%	60	64	3,822	3,822	0
14.00	9%	91%	60	64	3,822	3,822	0
15.00	15%	85%	60	60	3,570	3,570	0
16.00	38%	62%	60	43	2,604	2,604	0
17.00	45%	55%	60	39	2,310	2,310	0
18.00	65%	35%	60	25	1,470	1,470	0
19.00	100%	0%	60	0	0	0	0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.93
 Achieved daily sun time * area 29106

N 67 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	3	201		
8.00	77%	23%	60	15	925		
9.00	48%	52%	60	35	2,090		
10.00	18%	82%	60	55	3,296		
11.00	16%	84%	60	56	3,377		
12.00	16%	84%	60	56	3,377		
13.00	9%	91%	60	61	3,658		
14.00	9%	91%	60	61	3,658		
15.00	15%	85%	60	57	3,417		
16.00	38%	62%	60	42	2,492		
17.00	45%	55%	60	37	2,211		
18.00	65%	35%	60	23	1,407		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 30109.8

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %		min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	80	80	-121
8.00	90%	10%	60	7	402	402	-523
9.00	88%	12%	60	8	482	482	-1,608
10.00	18%	82%	60	55	3,296	3,296	0
11.00	16%	84%	60	56	3,377	3,377	0
12.00	16%	84%	60	56	3,377	3,377	0
13.00	9%	91%	60	61	3,658	3,658	0
14.00	9%	91%	60	61	3,658	3,658	0
15.00	15%	85%	60	57	3,417	3,417	0
16.00	38%	62%	60	42	2,492	2,492	0
17.00	45%	55%	60	37	2,211	2,211	0
18.00	65%	35%	60	23	1,407	1,407	0
19.00	100%	0%	60	0	0	0	0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.93
 Achieved daily sun time * area 27859

O 58 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	3	159		
8.00	77%	23%	60	12	731		
9.00	48%	52%	60	28	1,654		
10.00	18%	82%	60	43	2,608		
11.00	16%	84%	60	45	2,671		
12.00	16%	84%	60	45	2,671		
13.00	9%	91%	60	48	2,894		
14.00	9%	91%	60	48	2,894		
15.00	15%	85%	60	45	2,703		
16.00	38%	62%	60	33	1,972		
17.00	45%	55%	60	29	1,749		
18.00	65%	35%	60	19	1,113		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 23818.2

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %		min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	64	64	-95
8.00	90%	10%	60	5	318	318	-413
9.00	86%	14%	60	7	445	445	-1,208
10.00	18%	82%	60	43	2,608	2,608	0
11.00	16%	84%	60	45	2,671	2,671	0
12.00	16%	84%	60	45	2,671	2,671	0
13.00	9%	91%	60	48	2,894	2,894	0
14.00	9%	91%	60	48	2,894	2,894	0
15.00	15%	85%	60	45	2,703	2,703	0
16.00	38%	62%	60	33	1,972	1,972	0
17.00	45%	55%	60	29	1,749	1,749	0
18.00	65%	35%	60	19	1,113	1,113	0
19.00	100%	0%	60	0	0	0	0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.95
 Achieved daily sun time * area 22101

P 53 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m ²	min*m ²		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	3	159		
8.00	77%	23%	60	12	731		
9.00	48%	52%	60	28	1,654		
10.00	18%	82%	60	43	2,608		
11.00	16%	84%	60	45	2,671		
12.00	16%	84%	60	45	2,671		
13.00	9%	91%	60	48	2,894		
14.00	9%	91%	60	48	2,894		
15.00	15%	85%	60	45	2,703		
16.00	38%	62%	60	33	1,972		
17.00	45%	55%	60	29	1,749		
18.00	65%	35%	60	19	1,113		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 23818.2

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %		min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	64	64	-95
8.00	90%	10%	60	5	318	318	-413
9.00	86%	14%	60	7	445	445	-1,208
10.00	18%	82%	60	43	2,608	2,608	0
11.00	16%	84%	60	45	2,671	2,671	0
12.00	16%	84%	60	45	2,671	2,671	0
13.00	9%	91%	60	48	2,894	2,894	0
14.00	9%	91%	60	48	2,894	2,894	0
15.00	15%	85%	60	45	2,703	2,703	0
16.00	38%	62%	60	33	1,972	1,972	0
17.00	45%	55%	60	29	1,749	1,749	0
18.00	65%	35%	60	19	1,113	1,113	0
19.00	100%	0%	60	0	0	0	0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.95
 Achieved daily sun time * area 22101



Q 50 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	95%	5%	60	3	150		-90
8.00	77%	23%	60	12	690		-390
9.00	48%	52%	60	26	1,560		-1,140
10.00	18%	82%	60	41	2,460		0
11.00	16%	84%	60	42	2,520		0
12.00	16%	84%	60	42	2,520		0
13.00	9%	91%	60	46	2,730		0
14.00	9%	91%	60	46	2,730		0
15.00	15%	85%	60	43	2,550		0
16.00	38%	62%	60	31	1,860		0
17.00	45%	55%	60	28	1,650		0
18.00	65%	35%	60	18	1,050		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 22470

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	time * area
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	60		-90
8.00	90%	10%	60	5	300		-390
9.00	86%	14%	60	7	420		-1,140
10.00	18%	82%	60	41	2,460		0
11.00	16%	84%	60	42	2,520		0
12.00	16%	84%	60	42	2,520		0
13.00	9%	91%	60	46	2,730		0
14.00	9%	91%	60	46	2,730		0
15.00	15%	85%	60	43	2,550		0
16.00	38%	62%	60	31	1,860		0
17.00	45%	55%	60	28	1,650		0
18.00	65%	35%	60	18	1,050		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.95 0.93
 Achieved daily sun time * area 20850 0.93

R 68 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	95%	5%	60	3	204		-122
8.00	77%	23%	60	16	938		-490
9.00	48%	52%	60	35	2,122		-1,550
10.00	18%	82%	60	56	3,346		0
11.00	16%	84%	60	57	3,427		0
12.00	16%	84%	60	57	3,427		0
13.00	9%	91%	60	62	3,713		0
14.00	9%	91%	60	62	3,713		0
15.00	15%	85%	60	58	3,468		0
16.00	38%	62%	60	42	2,530		0
17.00	45%	55%	60	37	2,244		0
18.00	65%	35%	60	24	1,428		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 30559.2

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	time * area
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	82		-122
8.00	89%	11%	60	7	449		-490
9.00	86%	14%	60	10	571		-1,550
10.00	18%	82%	60	56	3,346		0
11.00	16%	84%	60	57	3,427		0
12.00	16%	84%	60	57	3,427		0
13.00	9%	91%	60	62	3,713		0
14.00	9%	91%	60	62	3,713		0
15.00	15%	85%	60	58	3,468		0
16.00	38%	62%	60	42	2,530		0
17.00	45%	55%	60	37	2,244		0
18.00	65%	35%	60	24	1,428		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.96 0.93
 Achieved daily sun time * area 28397 0.93

S 51 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	95%	5%	60	3	153		-92
8.00	77%	23%	60	12	704		-367
9.00	48%	52%	60	27	1,591		-1,163
10.00	18%	82%	60	42	2,509		0
11.00	16%	84%	60	43	2,570		0
12.00	16%	84%	60	43	2,570		0
13.00	9%	91%	60	46	2,785		0
14.00	9%	91%	60	46	2,785		0
15.00	15%	85%	60	43	2,601		0
16.00	38%	62%	60	32	1,897		0
17.00	45%	55%	60	28	1,683		0
18.00	65%	35%	60	18	1,071		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 22919.4

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	time * area
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	61		-92
8.00	89%	11%	60	6	337		-367
9.00	86%	14%	60	7	428		-1,163
10.00	18%	82%	60	42	2,509		0
11.00	16%	84%	60	43	2,570		0
12.00	16%	84%	60	43	2,570		0
13.00	9%	91%	60	46	2,785		0
14.00	9%	91%	60	46	2,785		0
15.00	15%	85%	60	43	2,601		0
16.00	38%	62%	60	32	1,897		0
17.00	45%	55%	60	28	1,683		0
18.00	65%	35%	60	18	1,071		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.96 0.93
 Achieved daily sun time * area 21298 0.93

T 46 m²

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	95%	5%	60	2	138		-83
8.00	77%	23%	60	11	635		-331
9.00	48%	52%	60	24	1,435		-1,049
10.00	18%	82%	60	38	2,263		0
11.00	16%	84%	60	39	2,318		0
12.00	16%	84%	60	39	2,318		0
13.00	9%	91%	60	42	2,512		0
14.00	9%	91%	60	42	2,512		0
15.00	15%	85%	60	39	2,346		0
16.00	38%	62%	60	29	1,711		0
17.00	45%	55%	60	25	1,518		0
18.00	65%	35%	60	16	966		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 9.00
 Achieved total sun time (hrs) 7.49
 Achieved daily sun time * area 20672.4

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	time * area
24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	55		-83
8.00	89%	11%	60	5	304		-331
9.00	86%	14%	60	6	386		-1,049
10.00	18%	82%	60	38	2,263		0
11.00	16%	84%	60	39	2,318		0
12.00	16%	84%	60	39	2,318		0
13.00	9%	91%	60	42	2,512		0
14.00	9%	91%	60	42	2,512		0
15.00	15%	85%	60	39	2,346		0
16.00	38%	62%	60	29	1,711		0
17.00	45%	55%	60	25	1,518		0
18.00	65%	35%	60	16	966		0
19.00	100%	0%	60	0	0		0

Required sun hours @ 50% area (hr) 2
 Achieved sun hours on (hrs) @ 50% area 8.00
 Achieved total sun time (hrs) 6.96 0.93
 Achieved daily sun time * area 19210 0.93



U 43 m2

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m2	min*m2		
6.00	100%	0%	60	0	0		
7.00	95%	5%	60	2	129		
8.00	77%	23%	60	10	593		
9.00	48%	52%	60	22	1,342		
10.00	18%	82%	60	35	2,116		
11.00	16%	84%	60	36	2,167		
12.00	16%	84%	60	36	2,167		
13.00	9%	91%	60	39	2,348		
14.00	9%	91%	60	39	2,348		
15.00	15%	85%	60	37	2,193		
16.00	38%	62%	60	27	1,600		
17.00	45%	55%	60	24	1,419		
18.00	65%	35%	60	15	903		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	9.00
Achieved total sun time (hrs)	7.49
Achieved daily sun time * area	19324.2

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	1	52	52	-77
8.00	89%	11%	60	5	284	284	-310
9.00	86%	14%	60	6	361	361	-980
10.00	18%	82%	60	35	2,116	2,116	0
11.00	16%	84%	60	36	2,167	2,167	0
12.00	16%	84%	60	36	2,167	2,167	0
13.00	9%	91%	60	39	2,348	2,348	0
14.00	9%	91%	60	39	2,348	2,348	0
15.00	15%	85%	60	37	2,193	2,193	0
16.00	38%	62%	60	27	1,600	1,600	0
17.00	45%	55%	60	24	1,419	1,419	0
18.00	65%	35%	60	15	903	903	0
19.00	100%	0%	60	0	0	0	0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	8.00
Achieved total sun time (hrs)	6.96
Achieved daily sun time * area	17957

V 200 m2

EXISTING STATUS						March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	time * area		
24 Hr	% / %		min	m2	min*m2		
6.00	100%	0%	60	0	0		
7.00	94%	6%	60	12	720		
8.00	71%	29%	60	58	3,480		
9.00	27%	73%	60	146	8,760		
10.00	12%	88%	60	176	10,560		
11.00	0%	100%	60	200	12,000		
12.00	0%	100%	60	200	12,000		
13.00	8%	92%	60	184	11,040		
14.00	18%	82%	60	164	9,840		
15.00	39%	61%	60	122	7,320		
16.00	60%	40%	60	80	4,800		
17.00	71%	29%	60	58	3,480		
18.00	85%	15%	60	30	1,800		
19.00	100%	0%	60	0	0		

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	7.00
Achieved total sun time (hrs)	7.15
Achieved daily sun time * area	85800

NEW STATUS March 21st change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0	0
7.00	98%	2%	60	4	240	240	-480
8.00	96%	4%	60	8	480	480	-3,000
9.00	69%	31%	60	62	3,720	3,720	-5,040
10.00	15%	85%	60	170	10,200	10,200	-360
11.00	0%	100%	60	200	12,000	12,000	0
12.00	0%	100%	60	200	12,000	12,000	0
13.00	8%	92%	60	184	11,040	11,040	0
14.00	18%	82%	60	164	9,840	9,840	0
15.00	39%	61%	60	122	7,320	7,320	0
16.00	60%	40%	60	80	4,800	4,800	0
17.00	71%	29%	60	58	3,480	3,480	0
18.00	85%	15%	60	30	1,800	1,800	0
19.00	100%	0%	60	0	0	0	0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	6.00
Achieved total sun time (hrs)	6.41
Achieved daily sun time * area	76920



5.4 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 summarised in table 5.2 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

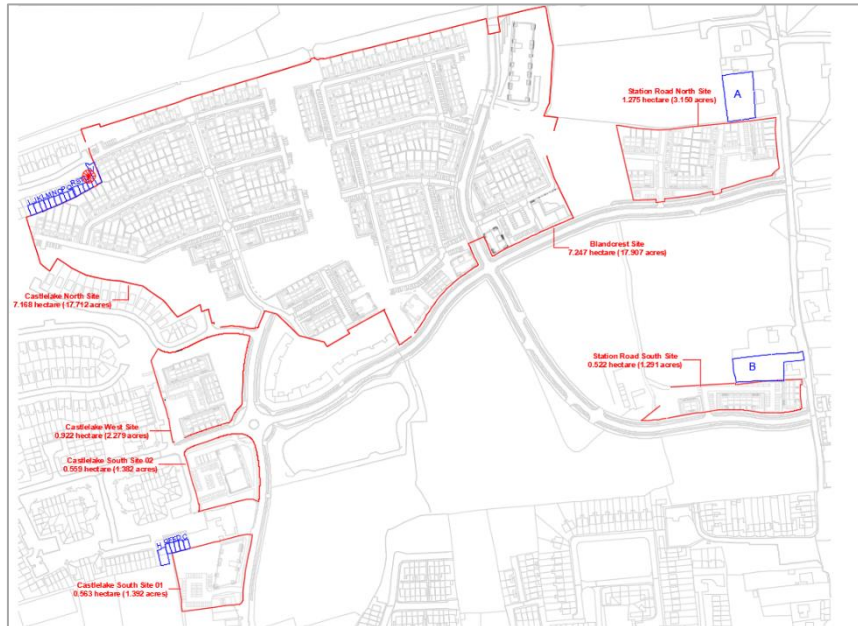
Area ID	m ²	EXISTING STATUS			NEW STATUS			Change	COMMENTS
		Sun Hr*m ²	Sun Hr	SunHr 50%	Sun Hr*m ²	Sun Hr	Sun Hr 50%		
A	1700	799680	7.84	10	732360	7.18	9	0.92	change factor well within guidelines
B	1750	873600	8.32	9	763350	7.27	8	0.88	change factor well within guidelines
C	64	30720	8	8	28377.6	7.39	8	0.93	change factor well within guidelines
D	61	29280	8	8	27047.4	7.39	8	0.93	change factor well within guidelines
E	61	29280	8	8	27047.4	7.39	8	0.93	change factor well within guidelines
F	61	29280	8	8	27413.4	7.49	8	0.94	change factor well within guidelines
G	60	28800	8	8	27000	7.5	8	0.94	change factor well within guidelines
H	180	86400	8	8	83484	7.73	8	0.97	change factor well within guidelines
I	80	35952	7.49	9	31488	6.56	8	0.88	change factor well within guidelines
J	78	35053.2	7.49	9	30794.4	6.58	8	0.88	change factor well within guidelines
K	61	27413.4	7.49	9	24412.2	6.67	8	0.90	change factor well within guidelines
L	60	26964	7.49	9	24876	6.91	8	0.93	change factor well within guidelines
M	70	31458	7.49	9	29106	6.93	8	0.93	change factor well within guidelines
N	67	30109.8	7.49	9	27858.6	6.93	8	0.93	change factor well within guidelines
O	53	23818.2	7.49	9	22101	6.95	8	0.93	change factor well within guidelines
P	53	23818.2	7.49	9	22101	6.95	8	0.93	change factor well within guidelines
Q	50	22470	7.49	9	20850	6.95	8	0.93	change factor well within guidelines
R	68	30559.2	7.49	9	28396.8	6.96	8	0.93	change factor well within guidelines
S	51	22919.4	7.49	9	21297.6	6.96	8	0.93	change factor well within guidelines
T	46	20672.4	7.49	9	19209.6	6.96	8	0.93	change factor well within guidelines
U	43	19324.2	7.49	9	17956.8	6.96	8	0.93	change factor well within guidelines
V	200	85800	7.15	7	76920	6.41	6	0.90	change factor well within guidelines

Table 5.2: existing neighbouring amenity spaces, summary table of results



5.5 Existing neighbouring amenity spaces shadow/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 21st of March and that any loss of sunlight should not be greater than 0.8 (20% reduction) times its former size. From the calculation results we note that all of the selected existing amenity spaces received 2 hours of sunlight or more on at least 50% of the area before and after the introduction of the new development. Summary of results are as follows (see image 5.1 for receptor locations):



(For reference) Image 5.1: existing neighbouring amenity spaces

- Northeast receptor: Receptor A is a private dwelling with a green amenity / private garden area. Receptor A resulted in change factor of 0.93 meaning the new proposed development has a small effect on this amenity space's sunlight. This effect happens in the morning / afternoon hours of 08.00-15.00. The calculation findings are comfortably within BRE guidelines.
- West receptor: Receptor B is a private dwelling with a green amenity / private garden area. This receptor resulted in a change factor of 0.88 meaning the new proposed development has a small effect on this amenity space's sunlight. This effect happens in the morning / afternoon hours of 08.00-15.00. The calculation findings are within BRE guidelines.
- Southwest receptors: Receptors C, D, E, F, G and H are part of the Fernbrook, Carrigtohill, Castlelake estate with private amenity / back garden areas. Receptors C to H resulted in change factor range of 0.93-0.97 meaning the new proposed development has a small effect on these amenity space's. This effect happens in the early morning hours of 07.00-10.00. The calculation findings are comfortably within BRE guidelines.
- Northwest receptors: Receptors I, J, K, L, M, N, O, P, Q, R, S, T, U and V are part of the Maple Ln, Carrigtohill, Castlelake estate with private amenity / back garden areas. Receptors I to V resulted in change factor range of 0.88-0.93 meaning the new proposed development has a small effect on these amenity spaces. This effect happens in the morning hours of 07.00-11.00. The calculation findings are also comfortably within BRE guidelines.

We conclude that the sunlight reception in the existing neighbouring amenity spaces after the introduction of the new development is in line 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.