DKPartnership Dublin Cork London
T : 01-813-1930 T : 064-664-1686
E : post@dkpartnership.com

5060 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

Raheen Housing Development

Proposed Residential Development

Ballykeeffe,
Raheen,
Co. Limerick

DW Raheen Developments Ltd

DKP-N16-5060-1P
2022-02-08

Document control

DKP project no: N16
DKP document no: 5060
Project file no: DKP-N16-5060

Circular		Issue >	1P#	1P
Clients	DW Raheen Developments Ltd		☑	☑
Architects	Gleeson McSweeney		☑	☑
Planning consultants	RW Nowlan & Associates		☑	☑

Issue	1P#	2021-11-24	Draft issue, for review
Issue	1P	2022-02-08	Issue for planning

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#	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

Contents

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 DW Raheen Developments Ltd, to carry out the analysis and report for the proposed development at Ballykeeffe, Raheen, Co. Limerick.

1.3 Development description

DW Raheen Developments Ltd. are seeking a ten year permission for a strategic housing development consisting of the provision of 384 residential house and apartment units on a ca. 10.44 hectare site located in Ballykeeffe, Raheen, Co. Limerick. The site is greenfield land that is enclosed by existing residential development to the south and east, the R510 to the west and open land to the north. Access to the site is provided by an existing entrance off a roundabout on the R510 regional road.

The proposed development will provide as follows:

- 202 no. housing units, comprising a variety of forms to include bungalows, detached, semi-detached and terraced houses. A mix of house sizes are proposed to include 20 no. two bedroom houses, 156 no. three bedroom houses and 26 no. four bedroom houses.
- 182 apartment and duplex units across 25 small scale blocks, 2 to 4 storeys in heights, throughout the development. The apartments and duplexes provide a mix of one, two, three and four bed units, comprising of 10 no. four bedroom duplex units, 10 no. three bedroom duplex units, 6 no. two bedroom duplex units, 18 no. three bedroom apartments, 92 no. two bedroom apartments and 46 no. one bedroom apartments.

The proposed development also includes;

- A childcare facility measuring 761.75m2, providing 79 childcare places (55 full time and 24 after school places), located at the south-western edge of the development.
- The provision of 377 no. car parking spaces and 311 secured bicycle parking spaces.
- The provision of 3 no. ESB sub-stations, ancillary services and infrastructure works including foul and surface water drainage, attenuation areas, landscaped public open spaces (approximately 29,500m2, or 28.2% of the total site area), landscaping, lighting, internal roads, cycle paths, and footpaths.

A Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) have been prepared in respect of the proposed development.

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 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 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 March. From the calculation results we note all of the new amenity spaces received more than the recommended sunlight. Calculation findings are summarised as follows (see image 5.1 for amenity locations):

Amenity area outlined in A was calculated to have 8.00 hours at 50% area.
Amenity area outlined in B was calculated to have 9.00 hours at 50% area.
Amenity area outlined in C was calculated to have 9.00 hours at 50% area.
Amenity area outlined in D was calculated to have 8.00 hours at 50% area.

We conclude that the new amenity spaces receive sunlight on 50% of the area is in line with the minimum 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/shadow 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 the majority of 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 for receptor locations):

- West receptors (Ard Aulin estate): Receptors 1 to 5 are residential dwellings with front gardens / back garden amenity spaces. These areas resulted in change factors ranging from 0.90-0.91 meaning the new proposed development has a small effect on theses amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 17.00-18.00. The results are comfortably within BRE guidelines.

- South receptors (Inis Mór and Inis Lua estate): Receptors 6 to 11 are residential dwellings with back garden amenity spaces. These areas resulted in change factors ranging from 0.98-1.00 meaning the new proposed development has a very small effect on theses amenity spaces shadow/sunlight. This effect happens in the early morning hours of 07.00-08.00. The results are comfortably within BRE guidelines. Receptor 6,7,8,9 & 11 has a change factor of 1.00 meaning the new proposed has no effect on these existing amenity spaces.

- East receptors (Inis Lua Close estate and Whitethorn estate): Receptors 12 to 19 are residential dwellings with back garden amenity spaces. These areas resulted in change factors ranging from 0.81-1.00 meaning the new proposed development has an effect on theses amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 16.00-18.00. The results are within BRE guidelines. Receptor 18 & 19 has a change factor of 1.00 meaning the new proposed has no effect on these existing amenity spaces.

- East receptors (Ballinvoher estate): Receptors 20 to 26 are residential dwellings with back garden amenity spaces. These areas resulted in change factors ranging from 0.99-1.00 meaning the new proposed development has a very small effect on theses amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 16.00-17.00. The results are within BRE guidelines. Receptor 20,21,22,24,25 & 26 & has a change factor of 1.00 meaning the new proposed has no effect on these existing spaces.

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

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 boundary

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.

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 spaces	Amenity space prevented from receiving any sunlight on March 21st	At least 50% of the amenity space should receive at least two hours of sunlight

Table 4.1

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

Type	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 21st 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.

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.

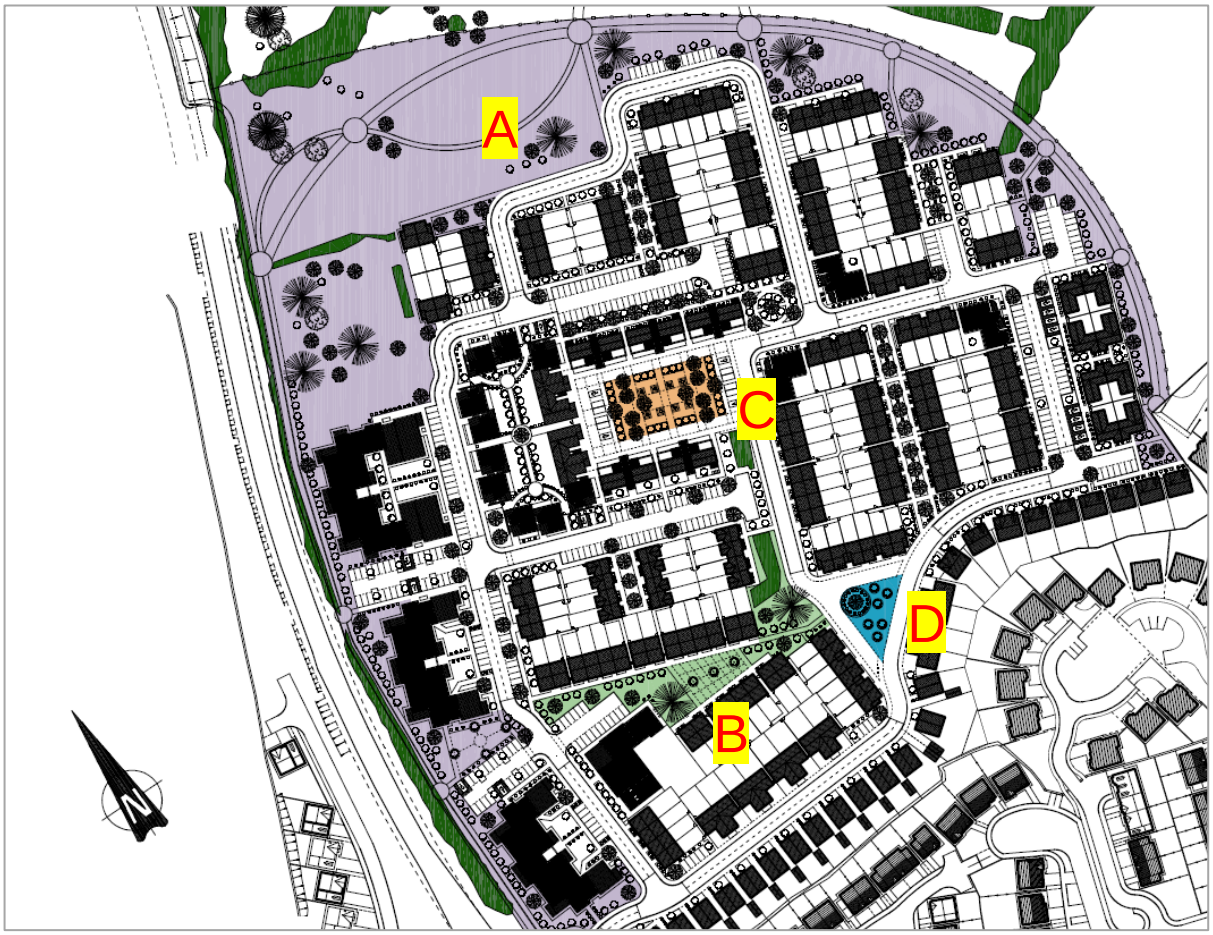


Image 5.1: new proposed amenity spaces

Receptor		Description	Area (ha)
A		Open amenity space	2.60
B		Open amenity space	0.20
C		Open amenity space	0.11
D		Open amenity space	0.04
		Total open amenity space	**2.95**

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 21st. 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 21st.

Compliance guide		
☑	0%	Over /equal to
☑	5%	Within
!!	10%	Within
x	10%	In excess of

5.3 Proposed development amenity space calculation results

SUNLIGHT/SHADOW CALCULATION DATA

A Open amenity space **26,000** m2

NEW STATUS 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	95%	5%	60	1300	78,000
8.00	57%	43%	60	11180	670,800
9.00	38%	62%	60	16120	967,200
10.00	37%	63%	60	16380	982,800
11.00	35%	65%	60	16900	1,014,000
12.00	34%	66%	60	17160	1,029,600
13.00	36%	64%	60	16640	998,400
14.00	36%	64%	60	16640	998,400
15.00	39%	61%	60	15860	951,600
16.00	42%	58%	60	15080	904,800
17.00	53%	47%	60	12220	733,200
18.00	68%	32%	60	8320	499,200
19.00	100%	0%	60	0	0

Required sun hours @ 50% area 2
Achieved sun hours on @ 50% area 8.00
Achieved total sun time (hrs) 6.30
Achieved daily sun time * area 9828000

B Open amenity space **2,000** m2

NEW STATUS 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	96%	4%	60	80	4,800
8.00	47%	53%	60	1060	63,600
9.00	22%	78%	60	1560	93,600
10.00	18%	82%	60	1640	98,400
11.00	16%	84%	60	1680	100,800
12.00	16%	84%	60	1680	100,800
13.00	17%	83%	60	1660	99,600
14.00	18%	82%	60	1640	98,400
15.00	20%	80%	60	1600	96,000
16.00	25%	75%	60	1500	90,000
17.00	56%	44%	60	880	52,800
18.00	78%	22%	60	440	26,400
19.00	100%	0%	60	0	0

Required sun hours @ 50% area 2
Achieved sun hours on @ 50% area 9.00
Achieved total sun time (hrs) 7.71
Achieved daily sun time * area 925200

C Open amenity space **1,100** m2

NEW STATUS 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	96%	4%	60	44	2,640
8.00	29%	71%	60	781	46,860
9.00	16%	84%	60	924	55,440
10.00	10%	90%	60	990	59,400
11.00	9%	91%	60	1001	60,060
12.00	10%	90%	60	990	59,400
13.00	13%	87%	60	957	57,420
14.00	15%	85%	60	935	56,100
15.00	23%	77%	60	847	50,820
16.00	41%	59%	60	649	38,940
17.00	69%	31%	60	341	20,460
18.00	96%	4%	60	44	2,640
19.00	100%	0%	60	0	0

Required sun hours @ 50% area 2
Achieved sun hours on @ 50% area 9.00
Achieved total sun time (hrs) 7.73
Achieved daily sun time * area 510180

D Open amenity space **400** m2

NEW STATUS 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	95%	5%	60	20	1,200
8.00	77%	23%	60	92	5,520
9.00	27%	73%	60	292	17,520
10.00	16%	84%	60	336	20,160
11.00	11%	89%	60	356	21,360
12.00	9%	91%	60	364	21,840
13.00	9%	91%	60	364	21,840
14.00	9%	91%	60	364	21,840
15.00	9%	91%	60	364	21,840
16.00	18%	82%	60	328	19,680
17.00	78%	22%	60	88	5,280
18.00	96%	4%	60	16	960
19.00	100%	0%	60	0	0

Required sun hours @ 50% area 2
Achieved sun hours on @ 50% area 8.00
Achieved total sun time (hrs) 7.46
Achieved daily sun time * area 179040

5.4 Amenity spaces within the proposed development sunlight / shadow results conclusion

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

Amenity area outlined in A was calculated to have 8.00 hours at 50% area.
Amenity area outlined in B was calculated to have 9.00 hours at 50% area.
Amenity area outlined in C was calculated to have 9.00 hours at 50% area.
Amenity area outlined in D was calculated to have 8.00 hours at 50% area.

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

6 Receptor selection and calculation results – Existing neighbouring amenity spaces

6.1 Selected existing amenity spaces

Image 6.1 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 6.1: existing neighbouring amenity spaces

Receptor	Location / Address	Amenity description	~Area m^2
1	1 Ard Aulin, Skehacreggaun, Mungret, Limerick	Back garden space	200
2	2 Ard Aulin, Skehacreggaun, Mungret, Limerick	Front garden space	15
3	3 Ard Aulin, Skehacreggaun, Mungret, Limerick	Front garden space	35
4	4 Ard Aulin, Skehacreggaun, Mungret, Limerick	Front garden space	50
5	5 Ard Aulin, Skehacreggaun, Mungret, Limerick	Front garden space	50
6	38 Inis Mór, Father Russell Rd, Skehacreggaun, Limerick	Back garden space	250
7	24 Inis Mór, Bóthar an Athar Ruiséil, Skehacreggaun, Limerick	Back garden space	85
8	18 Inis Mór, Bóthar an Athar Ruiséil, Skehacreggaun, Limerick	Back garden space	80
9	71 Inis Lua, Bóthar an Athar Ruiséil, Skehacreggaun, Limerick	Back garden space	140
10	72 Inis Lua, Bóthar an Athar Ruiséil, Skehacreggaun, Limerick	Back garden space	150
11	73 Inis Lua, Bóthar an Athar Ruiséil, Skehacreggaun, Limerick	Back garden space	130
12	Inis Lua Close estate	Back garden space	130
13	Inis Lua Close estate	Back garden space	170
14	Inis Lua Close estate	Back garden space	180
15	Inis Lua Close estate	Back garden space	170
16	Inis Lua Close estate	Back garden space	150
17	Whitethorn estate	Back garden space	200
18	Whitethorn estate	Back garden space	190
19	Whitethorn estate	Back garden space	200
20	37 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	200
21	38 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	190
22	39 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	150

23	59 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	200
24	58 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	120
25	57 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	100
26	56 Ballinvoher, Bóthar an Athar Ruiséil, Gouldavoher, Limerick	Back garden space	90

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. 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
x	10% In excess of

6.3 Existing amenity spaces calculation results

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 large number of amenity spaces assessed in this report we have only shown the result tables of 2 no. amenity spaces (15 & 16). Relevant sunlight & shadow calculation results are summarised in the next section.

15 — 170 m2

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	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	84%	16%	60	27	1,632	7.00	84%	16%	60	27	1,632	0
8.00	80%	20%	60	34	2,040	8.00	80%	20%	60	34	2,040	0
9.00	84%	16%	60	27	1,632	9.00	84%	16%	60	27	1,632	0
10.00	80%	20%	60	34	2,040	10.00	80%	20%	60	34	2,040	0
11.00	76%	24%	60	41	2,448	11.00	76%	24%	60	41	2,448	0
12.00	69%	31%	60	53	3,162	12.00	69%	31%	60	53	3,162	0
13.00	68%	32%	60	54	3,264	13.00	68%	32%	60	54	3,264	0
14.00	55%	45%	60	77	4,590	14.00	55%	45%	60	77	4,590	0
15.00	47%	53%	60	90	5,406	15.00	47%	53%	60	90	5,406	0
16.00	40%	60%	60	102	6,120	16.00	40%	60%	60	102	6,120	0
17.00	21%	79%	60	134	8,058	17.00	21%	79%	60	134	8,058	0
18.00	26%	74%	60	126	7,548	18.00	95%	5%	60	9	510	-7,038
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					4.00	Achieved sun hours on (hrs) @ 50% area					3.00	
Achieved total sun time (hrs)					4.7	Achieved total sun time (hrs)					4.01	0.86
Achieved daily sun time * area					47940	Achieved daily sun time * area					40902	0.86

16 — 150 m2

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	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	95%	5%	60	8	450	7.00	95%	5%	60	8	450	0
8.00	23%	77%	60	116	6,930	8.00	23%	77%	60	116	6,930	0
9.00	53%	47%	60	71	4,230	9.00	53%	47%	60	71	4,230	0
10.00	65%	35%	60	53	3,150	10.00	65%	35%	60	53	3,150	0
11.00	64%	36%	60	54	3,240	11.00	64%	36%	60	54	3,240	0
12.00	65%	35%	60	53	3,150	12.00	65%	35%	60	53	3,150	0
13.00	66%	34%	60	51	3,060	13.00	66%	34%	60	51	3,060	0
14.00	69%	31%	60	47	2,790	14.00	69%	31%	60	47	2,790	0
15.00	71%	29%	60	44	2,610	15.00	71%	29%	60	44	2,610	0
16.00	71%	29%	60	44	2,610	16.00	71%	29%	60	44	2,610	0
17.00	38%	62%	60	93	5,580	17.00	38%	62%	60	93	5,580	0
18.00	18%	82%	60	123	7,380	18.00	89%	11%	60	17	990	-6,390
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					3.00	Achieved sun hours on (hrs) @ 50% area					2.00	
Achieved total sun time (hrs)					5.02	Achieved total sun time (hrs)					4.31	0.86
Achieved daily sun time * area					45180	Achieved daily sun time * area					38790	0.86

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, however, to limit the listing of the calculation tables in this report, we have summarised the relevant sunlight & shadow calculation data 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			NEW STATUS				COMMENTS
Area ID	m²	Sun Hr*m²	Sun Hr	SunHr 50%	Sun Hr*m²	Sun Hr	Sun Hr 50%	Change	
1	200	89640	7.47	10	80400	6.7	9	0.90	change factor well within guidelines
2	15	7695	8.55	9	7002	7.78	8	0.91	change factor well within guidelines
3	35	17955	8.55	9	16338	7.78	8	0.91	change factor well within guidelines
4	50	25650	8.55	9	23340	7.78	8	0.91	change factor well within guidelines
5	50	25650	8.55	9	23340	7.78	8	0.91	change factor well within guidelines
6	250	104250	6.95	8	104250	6.95	8	1.00	no change in existing shadow/sunlight
7	85	24990	4.9	7	24990	4.9	7	1.00	no change in existing shadow/sunlight
8	80	27792	5.79	8	27792	5.79	8	1.00	no change in existing shadow/sunlight
9	140	46116	5.49	7	46116	5.49	7	1.00	no change in existing shadow/sunlight
10	150	65790	7.31	11	63900	7.1	11	0.98	change factor well within guidelines
11	130	57018	7.31	11	57018	7.31	11	1.00	no change in existing shadow/sunlight
12	130	60684	7.78	8	58188	7.46	8	0.96	change factor well within guidelines
13	170	74562	7.31	7	59976	5.88	5	0.81	change factor within guidelines
14	180	67716	6.27	6	56484	5.23	5	0.84	change factor within guidelines
15	170	47940	4.7	4	40902	4.01	3	0.86	change factor within guidelines
16	150	45180	5.02	3	38790	4.31	2	0.86	change factor within guidelines
17	200	59520	4.96	5	58440	4.87	5	0.99	change factor well within guidelines
18	190	56202	4.93	5	56202	4.93	5	1.00	no change in existing shadow/sunlight
19	200	84000	7	7	84000	7	7	1.00	no change in existing shadow/sunlight
20	200	86400	7.2	8	86400	7.2	8	1.00	no change in existing shadow/sunlight
21	190	85044	7.46	9	85044	7.46	9	1.00	no change in existing shadow/sunlight
22	150	52290	5.81	6	52290	5.81	6	1.00	no change in existing shadow/sunlight
23	200	109320	9.11	10	108000	9	10	0.99	change factor well within guidelines
24	120	71856	9.98	12	71856	9.98	12	1.00	no change in existing shadow/sunlight
25	100	62580	10.43	12	62580	10.43	12	1.00	no change in existing shadow/sunlight
26	90	56160	10.4	11	56160	10.4	11	1.00	no change in existing shadow/sunlight

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

6.5 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 the majority of 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 for receptor locations):

(For reference) Image 6.1: existing neighbouring amenity spaces

- West receptors (Ard Aulin estate): Receptors 1 to 5 are residential dwellings with front gardens / back garden amenity spaces. These areas resulted in change factors ranging from 0.90-0.91 meaning the new proposed development has a small effect on theses amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 17.00-18.00. The results are comfortably within BRE guidelines.

- South receptors (Inis Mór and Inis Lua estate): Receptors 6 to 11 are residential dwellings with back garden amenity spaces. These areas resulted in change factors ranging from 0.98-1.00 meaning the new proposed development has a very small effect on theses amenity spaces shadow/sunlight. This effect happens in the early morning hours of 07.00-08.00. The results are comfortably within BRE guidelines. Receptor 6,7,8,9 & 11 has a change factor of 1.00 meaning the new proposed has no effect on these existing amenity spaces.

- East receptors (Inis Lua Close estate and Whitethorn estate): Receptors 12 to 19 are residential dwellings with back garden amenity spaces. These areas resulted in change factors ranging from 0.81-1.00 meaning the new proposed development has an effect on theses amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 16.00-18.00. The results are within BRE guidelines. Receptor 18 & 19 has a change factor of 1.00 meaning the new proposed has no effect on these existing amenity spaces.

- East receptors (Ballinvoher estate): Receptors 20 to 26 are residential dwellings with back garden amenity spaces. These areas resulted in change factors ranging from 0.99-1.00 meaning the new proposed development has a very small effect on theses amenity spaces shadow/sunlight. This effect happens in the late afternoon hours of 16.00-17.00. The results are within BRE guidelines. Receptor 20,21,22,24,25 & 26 & has a change factor of 1.00 meaning the new proposed has no effect on these existing spaces.

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

5061

Appendix A

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

Raheen Housing Development

Proposed Residential Development

Ballykeeffe,
Raheen,
Co. Limerick

DW Raheen Developments Ltd

DKP-N16-5060-1P
2022-02-08

Document control

DKP project no: N16
DKP document no: 5061
Project file no: DKP-N16-5061

Circular		Issue >	1P#	1P
Clients	DW Raheen Developments Ltd		☑	☑
Architects	Gleeson McSweeney		☑	☑
Planning consultants	RW Nowlan & Associates		☑	☑

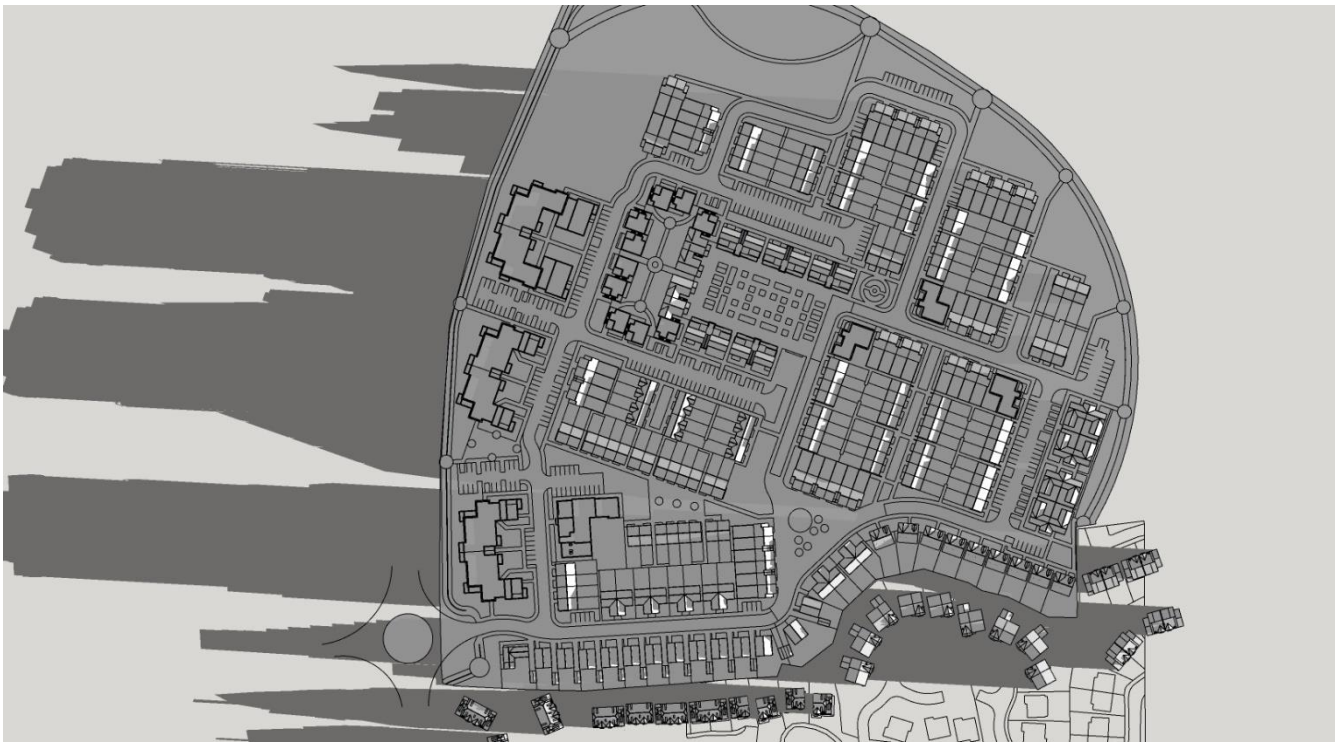
Issue	1P#	2021-11-24	Draft issue
Issue	1P	2022-02-08	Issue for planning

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#	201	208	201
1P	201	208	201

07.00 - March 21st



08.00 - March 21st

09.00 - March 21st

10.00 - March 21st

11.00 - March 21st

12.00 - March 21st

13.00 - March 21st

14.00 - March 21st

15.00 - March 21st

16.00 - March 21st

17.00 - March 21st

18.00 - March 21st

5062

Appendix B

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

Raheen Housing Development

Proposed Residential Development

Ballykeeffe,
Raheen,
Co. Limerick

DW Raheen Developments Ltd

DKP-N16-5062-1P
2022-02-08

Document control

DKP project no: N16
DKP document no: 5062
Project file no: DKP-N16-5062

Circular		Issue >	1P#	1P
Clients	DW Raheen Developments Ltd		☑	☑
Architects	Gleeson McSweeney		☑	☑
Planning consultants	RW Nowlan & Associates		☑	☑

Issue	1P#	2021-11-24	Draft issue
Issue	1P	2022-02-08	Issue for planning

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

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

1 — **200** m2

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	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	17%	83%	60	166	9,960	7.00	94%	6%	60	12	720	-9,240
8.00	21%	79%	60	158	9,480	8.00	21%	79%	60	158	9,480	0
9.00	26%	74%	60	148	8,880	9.00	26%	74%	60	148	8,880	0
10.00	34%	66%	60	132	7,920	10.00	34%	66%	60	132	7,920	0
11.00	38%	62%	60	124	7,440	11.00	38%	62%	60	124	7,440	0
12.00	45%	55%	60	110	6,600	12.00	45%	55%	60	110	6,600	0
13.00	56%	44%	60	88	5,280	13.00	56%	44%	60	88	5,280	0
14.00	44%	56%	60	112	6,720	14.00	44%	56%	60	112	6,720	0
15.00	43%	57%	60	114	6,840	15.00	43%	57%	60	114	6,840	0
16.00	39%	61%	60	122	7,320	16.00	39%	61%	60	122	7,320	0
17.00	39%	61%	60	122	7,320	17.00	39%	61%	60	122	7,320	0
18.00	51%	49%	60	98	5,880	18.00	51%	49%	60	98	5,880	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)	7.47	Achieved total sun time (hrs)	6.7	0.90
Achieved daily sun time * area	89640	Achieved daily sun time * area	80400	0.90

2 — **15** m2

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	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	18%	82%	60	12	738	7.00	95%	5%	60	1	45	-693
8.00	6%	94%	60	14	846	8.00	6%	94%	60	14	846	0
9.00	6%	94%	60	14	846	9.00	6%	94%	60	14	846	0
10.00	6%	94%	60	14	846	10.00	6%	94%	60	14	846	0
11.00	6%	94%	60	14	846	11.00	6%	94%	60	14	846	0
12.00	6%	94%	60	14	846	12.00	6%	94%	60	14	846	0
13.00	6%	94%	60	14	846	13.00	6%	94%	60	14	846	0
14.00	28%	72%	60	11	648	14.00	28%	72%	60	11	648	0
15.00	37%	63%	60	9	567	15.00	37%	63%	60	9	567	0
16.00	59%	41%	60	6	369	16.00	59%	41%	60	6	369	0
17.00	77%	23%	60	3	207	17.00	77%	23%	60	3	207	0
18.00	90%	10%	60	2	90	18.00	90%	10%	60	2	90	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)	8.55	Achieved total sun time (hrs)	7.78	0.91
Achieved daily sun time * area	7695	Achieved daily sun time * area	7002	0.91

3 — **35** m2

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	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	18%	82%	60	29	1,722	7.00	95%	5%	60	2	105	-1,617
8.00	6%	94%	60	33	1,974	8.00	6%	94%	60	33	1,974	0
9.00	6%	94%	60	33	1,974	9.00	6%	94%	60	33	1,974	0
10.00	6%	94%	60	33	1,974	10.00	6%	94%	60	33	1,974	0
11.00	6%	94%	60	33	1,974	11.00	6%	94%	60	33	1,974	0
12.00	6%	94%	60	33	1,974	12.00	6%	94%	60	33	1,974	0
13.00	6%	94%	60	33	1,974	13.00	6%	94%	60	33	1,974	0
14.00	28%	72%	60	25	1,512	14.00	28%	72%	60	25	1,512	0
15.00	37%	63%	60	22	1,323	15.00	37%	63%	60	22	1,323	0
16.00	59%	41%	60	14	861	16.00	59%	41%	60	14	861	0
17.00	77%	23%	60	8	483	17.00	77%	23%	60	8	483	0
18.00	90%	10%	60	4	210	18.00	90%	10%	60	4	210	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)	8.55	Achieved total sun time (hrs)	7.78	0.91
Achieved daily sun time * area	17955	Achieved daily sun time * area	16338	0.91

4 — **50** m2

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	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	18%	82%	60	41	2,460	7.00	95%	5%	60	3	150	-2,310
8.00	6%	94%	60	47	2,820	8.00	6%	94%	60	47	2,820	0
9.00	6%	94%	60	47	2,820	9.00	6%	94%	60	47	2,820	0
10.00	6%	94%	60	47	2,820	10.00	6%	94%	60	47	2,820	0
11.00	6%	94%	60	47	2,820	11.00	6%	94%	60	47	2,820	0
12.00	6%	94%	60	47	2,820	12.00	6%	94%	60	47	2,820	0
13.00	6%	94%	60	47	2,820	13.00	6%	94%	60	47	2,820	0
14.00	28%	72%	60	36	2,160	14.00	28%	72%	60	36	2,160	0
15.00	37%	63%	60	32	1,890	15.00	37%	63%	60	32	1,890	0
16.00	59%	41%	60	21	1,230	16.00	59%	41%	60	21	1,230	0
17.00	77%	23%	60	12	690	17.00	77%	23%	60	12	690	0
18.00	90%	10%	60	5	300	18.00	90%	10%	60	5	300	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)	8.55	Achieved total sun time (hrs)	7.78	0.91
Achieved daily sun time * area	25650	Achieved daily sun time * area	23340	0.91

5 — **50** m2

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	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	18%	82%	60	41	2,460	7.00	95%	5%	60	3	150	-2,310
8.00	6%	94%	60	47	2,820	8.00	6%	94%	60	47	2,820	0
9.00	6%	94%	60	47	2,820	9.00	6%	94%	60	47	2,820	0
10.00	6%	94%	60	47	2,820	10.00	6%	94%	60	47	2,820	0
11.00	6%	94%	60	47	2,820	11.00	6%	94%	60	47	2,820	0
12.00	6%	94%	60	47	2,820	12.00	6%	94%	60	47	2,820	0
13.00	6%	94%	60	47	2,820	13.00	6%	94%	60	47	2,820	0
14.00	28%	72%	60	36	2,160	14.00	28%	72%	60	36	2,160	0
15.00	37%	63%	60	32	1,890	15.00	37%	63%	60	32	1,890	0
16.00	59%	41%	60	21	1,230	16.00	59%	41%	60	21	1,230	0
17.00	77%	23%	60	12	690	17.00	77%	23%	60	12	690	0
18.00	90%	10%	60	5	300	18.00	90%	10%	60	5	300	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)	8.55		Achieved total sun time (hrs)	7.78	0.91
Achieved daily sun time * area	25650		Achieved daily sun time * area	23340	0.91

6 — **250** m2

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	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	96%	4%	60	10	600	7.00	96%	4%	60	10	600	0
8.00	84%	16%	60	40	2,400	8.00	84%	16%	60	40	2,400	0
9.00	29%	71%	60	178	10,650	9.00	29%	71%	60	178	10,650	0
10.00	21%	79%	60	198	11,850	10.00	21%	79%	60	198	11,850	0
11.00	14%	86%	60	215	12,900	11.00	14%	86%	60	215	12,900	0
12.00	13%	87%	60	218	13,050	12.00	13%	87%	60	218	13,050	0
13.00	16%	84%	60	210	12,600	13.00	16%	84%	60	210	12,600	0
14.00	18%	82%	60	205	12,300	14.00	18%	82%	60	205	12,300	0
15.00	18%	82%	60	205	12,300	15.00	18%	82%	60	205	12,300	0
16.00	38%	62%	60	155	9,300	16.00	38%	62%	60	155	9,300	0
17.00	69%	31%	60	78	4,650	17.00	69%	31%	60	78	4,650	0
18.00	89%	11%	60	28	1,650	18.00	89%	11%	60	28	1,650	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)	6.95		Achieved total sun time (hrs)	6.95	1.00
Achieved daily sun time * area	104250		Achieved daily sun time * area	104250	1.00

7 — **85** m2

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	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	96%	4%	60	3	204	7.00	96%	4%	60	3	204	0
8.00	86%	14%	60	12	714	8.00	86%	14%	60	12	714	0
9.00	79%	21%	60	18	1,071	9.00	79%	21%	60	18	1,071	0
10.00	58%	42%	60	36	2,142	10.00	58%	42%	60	36	2,142	0
11.00	48%	52%	60	44	2,652	11.00	48%	52%	60	44	2,652	0
12.00	48%	52%	60	44	2,652	12.00	48%	52%	60	44	2,652	0
13.00	48%	52%	60	44	2,652	13.00	48%	52%	60	44	2,652	0
14.00	48%	52%	60	44	2,652	14.00	48%	52%	60	44	2,652	0
15.00	40%	60%	60	51	3,060	15.00	40%	60%	60	51	3,060	0
16.00	36%	64%	60	54	3,264	16.00	36%	64%	60	54	3,264	0
17.00	31%	69%	60	59	3,519	17.00	31%	69%	60	59	3,519	0
18.00	92%	8%	60	7	408	18.00	92%	8%	60	7	408	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	7.00		Achieved sun hours on (hrs) @ 50% area	7.00	
Achieved total sun time (hrs)	4.9		Achieved total sun time (hrs)	4.9	1.00
Achieved daily sun time * area	24990		Achieved daily sun time * area	24990	1.00

8 — **80** m2

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	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	95%	5%	60	4	240	7.00	95%	5%	60	4	240	0
8.00	78%	22%	60	18	1,056	8.00	78%	22%	60	18	1,056	0
9.00	59%	41%	60	33	1,968	9.00	59%	41%	60	33	1,968	0
10.00	51%	49%	60	39	2,352	10.00	51%	49%	60	39	2,352	0
11.00	48%	52%	60	42	2,496	11.00	48%	52%	60	42	2,496	0
12.00	48%	52%	60	42	2,496	12.00	48%	52%	60	42	2,496	0
13.00	48%	52%	60	42	2,496	13.00	48%	52%	60	42	2,496	0
14.00	48%	52%	60	42	2,496	14.00	48%	52%	60	42	2,496	0
15.00	40%	60%	60	48	2,880	15.00	40%	60%	60	48	2,880	0
16.00	36%	64%	60	51	3,072	16.00	36%	64%	60	51	3,072	0
17.00	31%	69%	60	55	3,312	17.00	31%	69%	60	55	3,312	0
18.00	39%	61%	60	49	2,928	18.00	39%	61%	60	49	2,928	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)	5.79		Achieved total sun time (hrs)	5.79	1.00
Achieved daily sun time * area	27792		Achieved daily sun time * area	27792	1.00

9 — **140** m2

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	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	95%	5%	60	7	420	7.00	95%	5%	60	7	420	0
8.00	96%	4%	60	6	336	8.00	96%	4%	60	6	336	0
9.00	67%	33%	60	46	2,772	9.00	67%	33%	60	46	2,772	0
10.00	45%	55%	60	77	4,620	10.00	45%	55%	60	77	4,620	0
11.00	45%	55%	60	77	4,620	11.00	45%	55%	60	77	4,620	0
12.00	28%	72%	60	101	6,048	12.00	28%	72%	60	101	6,048	0
13.00	28%	72%	60	101	6,048	13.00	28%	72%	60	101	6,048	0
14.00	43%	57%	60	80	4,788	14.00	43%	57%	60	80	4,788	0
15.00	49%	51%	60	71	4,284	15.00	49%	51%	60	71	4,284	0
16.00	51%	49%	60	69	4,116	16.00	51%	49%	60	69	4,116	0
17.00	49%	51%	60	71	4,284	17.00	49%	51%	60	71	4,284	0
18.00	55%	45%	60	63	3,780	18.00	55%	45%	60	63	3,780	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	7.00	Achieved sun hours on (hrs) @ 50% area	7.00	
Achieved total sun time (hrs)	5.49	Achieved total sun time (hrs)	5.49	1.00
Achieved daily sun time * area	46116	Achieved daily sun time * area	46116	1.00

10 — **150** m2

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	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	95%	5%	60	8	450	7.00	95%	5%	60	8	450	0
8.00	31%	69%	60	104	6,210	8.00	31%	69%	60	104	6,210	0
9.00	38%	62%	60	93	5,580	9.00	38%	62%	60	93	5,580	0
10.00	37%	63%	60	95	5,670	10.00	37%	63%	60	95	5,670	0
11.00	37%	63%	60	95	5,670	11.00	37%	63%	60	95	5,670	0
12.00	38%	62%	60	93	5,580	12.00	38%	62%	60	93	5,580	0
13.00	38%	62%	60	93	5,580	13.00	38%	62%	60	93	5,580	0
14.00	40%	60%	60	90	5,400	14.00	40%	60%	60	90	5,400	0
15.00	35%	65%	60	98	5,850	15.00	35%	65%	60	98	5,850	0
16.00	30%	70%	60	105	6,300	16.00	34%	66%	60	99	5,940	-360
17.00	25%	75%	60	113	6,750	17.00	31%	69%	60	104	6,210	-540
18.00	25%	75%	60	113	6,750	18.00	36%	64%	60	96	5,760	-990
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	11.00	Achieved sun hours on (hrs) @ 50% area	11.00	
Achieved total sun time (hrs)	7.31	Achieved total sun time (hrs)	7.1	0.98
Achieved daily sun time * area	65790	Achieved daily sun time * area	63900	0.98

11 — **130** m2

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	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	95%	5%	60	7	390	7.00	95%	5%	60	7	390	0
8.00	31%	69%	60	90	5,382	8.00	31%	69%	60	90	5,382	0
9.00	38%	62%	60	81	4,836	9.00	38%	62%	60	81	4,836	0
10.00	37%	63%	60	82	4,914	10.00	37%	63%	60	82	4,914	0
11.00	37%	63%	60	82	4,914	11.00	37%	63%	60	82	4,914	0
12.00	38%	62%	60	81	4,836	12.00	38%	62%	60	81	4,836	0
13.00	38%	62%	60	81	4,836	13.00	38%	62%	60	81	4,836	0
14.00	40%	60%	60	78	4,680	14.00	40%	60%	60	78	4,680	0
15.00	35%	65%	60	85	5,070	15.00	35%	65%	60	85	5,070	0
16.00	30%	70%	60	91	5,460	16.00	30%	70%	60	91	5,460	0
17.00	25%	75%	60	98	5,850	17.00	25%	75%	60	98	5,850	0
18.00	25%	75%	60	98	5,850	18.00	25%	75%	60	98	5,850	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	11.00	Achieved sun hours on (hrs) @ 50% area	11.00	
Achieved total sun time (hrs)	7.31	Achieved total sun time (hrs)	7.31	1.00
Achieved daily sun time * area	57018	Achieved daily sun time * area	57018	1.00

12 — **130** m2

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	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	96%	4%	60	5	312	7.00	96%	4%	60	5	312	0
8.00	96%	4%	60	5	312	8.00	96%	4%	60	5	312	0
9.00	84%	16%	60	21	1,248	9.00	84%	16%	60	21	1,248	0
10.00	58%	42%	60	55	3,276	10.00	58%	42%	60	55	3,276	0
11.00	19%	81%	60	105	6,318	11.00	19%	81%	60	105	6,318	0
12.00	13%	87%	60	113	6,786	12.00	13%	87%	60	113	6,786	0
13.00	4%	96%	60	125	7,488	13.00	4%	96%	60	125	7,488	0
14.00	4%	96%	60	125	7,488	14.00	4%	96%	60	125	7,488	0
15.00	4%	96%	60	125	7,488	15.00	4%	96%	60	125	7,488	0
16.00	11%	89%	60	116	6,942	16.00	11%	89%	60	116	6,942	0
17.00	15%	85%	60	111	6,630	17.00	21%	79%	60	103	6,162	-468
18.00	18%	82%	60	107	6,396	18.00	44%	56%	60	73	4,368	-2,028
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)	7.78	Achieved total sun time (hrs)	7.46	0.96
Achieved daily sun time * area	60684	Achieved daily sun time * area	58188	0.96

13 — **170** m2

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	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	96%	4%	60	7	408	7.00	96%	4%	60	7	408	0
8.00	96%	4%	60	7	408	8.00	96%	4%	60	7	408	0
9.00	84%	16%	60	27	1,632	9.00	84%	16%	60	27	1,632	0
10.00	84%	16%	60	27	1,632	10.00	84%	16%	60	27	1,632	0
11.00	53%	47%	60	80	4,794	11.00	53%	47%	60	80	4,794	0
12.00	13%	87%	60	148	8,874	12.00	13%	87%	60	148	8,874	0
13.00	9%	91%	60	155	9,282	13.00	9%	91%	60	155	9,282	0
14.00	4%	96%	60	163	9,792	14.00	4%	96%	60	163	9,792	0
15.00	4%	96%	60	163	9,792	15.00	4%	96%	60	163	9,792	0
16.00	4%	96%	60	163	9,792	16.00	15%	85%	60	145	8,670	-1,122
17.00	4%	96%	60	163	9,792	17.00	65%	35%	60	60	3,570	-6,222
18.00	18%	82%	60	139	8,364	18.00	89%	11%	60	19	1,122	-7,242
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	7.00	Achieved sun hours on (hrs) @ 50% area	5.00	
Achieved total sun time (hrs)	7.31	Achieved total sun time (hrs)	5.88	0.81
Achieved daily sun time * area	74562	Achieved daily sun time * area	59976	0.81

14 — **180** m2

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	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	95%	5%	60	9	540	7.00	95%	5%	60	9	540	0
8.00	95%	5%	60	9	540	8.00	95%	5%	60	9	540	0
9.00	95%	5%	60	9	540	9.00	95%	5%	60	9	540	0
10.00	87%	13%	60	23	1,404	10.00	87%	13%	60	23	1,404	0
11.00	71%	29%	60	52	3,132	11.00	71%	29%	60	52	3,132	0
12.00	54%	46%	60	83	4,968	12.00	54%	46%	60	83	4,968	0
13.00	17%	83%	60	149	8,964	13.00	17%	83%	60	149	8,964	0
14.00	16%	84%	60	151	9,072	14.00	16%	84%	60	151	9,072	0
15.00	8%	92%	60	166	9,936	15.00	8%	92%	60	166	9,936	0
16.00	8%	92%	60	166	9,936	16.00	8%	92%	60	166	9,936	0
17.00	8%	92%	60	166	9,936	17.00	39%	61%	60	110	6,588	-3,348
18.00	19%	81%	60	146	8,748	18.00	92%	8%	60	14	864	-7,884
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	6.00	Achieved sun hours on (hrs) @ 50% area	5.00	
Achieved total sun time (hrs)	6.27	Achieved total sun time (hrs)	5.23	0.84
Achieved daily sun time * area	67716	Achieved daily sun time * area	56484	0.84

15 — **170** m2

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	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	84%	16%	60	27	1,632	7.00	84%	16%	60	27	1,632	0
8.00	80%	20%	60	34	2,040	8.00	80%	20%	60	34	2,040	0
9.00	84%	16%	60	27	1,632	9.00	84%	16%	60	27	1,632	0
10.00	80%	20%	60	34	2,040	10.00	80%	20%	60	34	2,040	0
11.00	76%	24%	60	41	2,448	11.00	76%	24%	60	41	2,448	0
12.00	69%	31%	60	53	3,162	12.00	69%	31%	60	53	3,162	0
13.00	68%	32%	60	54	3,264	13.00	68%	32%	60	54	3,264	0
14.00	55%	45%	60	77	4,590	14.00	55%	45%	60	77	4,590	0
15.00	47%	53%	60	90	5,406	15.00	47%	53%	60	90	5,406	0
16.00	40%	60%	60	102	6,120	16.00	40%	60%	60	102	6,120	0
17.00	21%	79%	60	134	8,058	17.00	21%	79%	60	134	8,058	0
18.00	26%	74%	60	126	7,548	18.00	95%	5%	60	9	510	-7,038
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	4.00	Achieved sun hours on (hrs) @ 50% area	3.00	
Achieved total sun time (hrs)	4.7	Achieved total sun time (hrs)	4.01	0.86
Achieved daily sun time * area	47940	Achieved daily sun time * area	40902	0.86

16 — **150** m2

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	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	95%	5%	60	8	450	7.00	95%	5%	60	8	450	0
8.00	23%	77%	60	116	6,930	8.00	23%	77%	60	116	6,930	0
9.00	53%	47%	60	71	4,230	9.00	53%	47%	60	71	4,230	0
10.00	65%	35%	60	53	3,150	10.00	65%	35%	60	53	3,150	0
11.00	64%	36%	60	54	3,240	11.00	64%	36%	60	54	3,240	0
12.00	65%	35%	60	53	3,150	12.00	65%	35%	60	53	3,150	0
13.00	66%	34%	60	51	3,060	13.00	66%	34%	60	51	3,060	0
14.00	69%	31%	60	47	2,790	14.00	69%	31%	60	47	2,790	0
15.00	71%	29%	60	44	2,610	15.00	71%	29%	60	44	2,610	0
16.00	71%	29%	60	44	2,610	16.00	71%	29%	60	44	2,610	0
17.00	38%	62%	60	93	5,580	17.00	38%	62%	60	93	5,580	0
18.00	18%	82%	60	123	7,380	18.00	89%	11%	60	17	990	-6,390
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	3.00	Achieved sun hours on (hrs) @ 50% area	2.00	
Achieved total sun time (hrs)	5.02	Achieved total sun time (hrs)	4.31	0.86
Achieved daily sun time * area	45180	Achieved daily sun time * area	38790	0.86

17 — **200** m2

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	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	95%	5%	60	10	600	7.00	95%	5%	60	10	600	0
8.00	22%	78%	60	156	9,360	8.00	22%	78%	60	156	9,360	0
9.00	23%	77%	60	154	9,240	9.00	23%	77%	60	154	9,240	0
10.00	34%	66%	60	132	7,920	10.00	34%	66%	60	132	7,920	0
11.00	46%	54%	60	108	6,480	11.00	46%	54%	60	108	6,480	0
12.00	45%	55%	60	110	6,600	12.00	45%	55%	60	110	6,600	0
13.00	53%	47%	60	94	5,640	13.00	53%	47%	60	94	5,640	0
14.00	66%	34%	60	68	4,080	14.00	66%	34%	60	68	4,080	0
15.00	70%	30%	60	60	3,600	15.00	70%	30%	60	60	3,600	0
16.00	78%	22%	60	44	2,640	16.00	78%	22%	60	44	2,640	0
17.00	85%	15%	60	30	1,800	17.00	85%	15%	60	30	1,800	0
18.00	87%	13%	60	26	1,560	18.00	96%	4%	60	8	480	-1,080
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	5.00	Achieved sun hours on (hrs) @ 50% area	5.00	
Achieved total sun time (hrs)	4.96	Achieved total sun time (hrs)	4.87	0.99
Achieved daily sun time * area	59520	Achieved daily sun time * area	58440	0.99

18 — **190** m2

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	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	72%	28%	60	53	3,192	7.00	72%	28%	60	53	3,192	0
8.00	26%	74%	60	141	8,436	8.00	26%	74%	60	141	8,436	0
9.00	19%	81%	60	154	9,234	9.00	19%	81%	60	154	9,234	0
10.00	24%	76%	60	144	8,664	10.00	24%	76%	60	144	8,664	0
11.00	29%	71%	60	135	8,094	11.00	29%	71%	60	135	8,094	0
12.00	47%	53%	60	101	6,042	12.00	47%	53%	60	101	6,042	0
13.00	67%	33%	60	63	3,762	13.00	67%	33%	60	63	3,762	0
14.00	65%	35%	60	67	3,990	14.00	65%	35%	60	67	3,990	0
15.00	70%	30%	60	57	3,420	15.00	70%	30%	60	57	3,420	0
16.00	95%	5%	60	10	570	16.00	95%	5%	60	10	570	0
17.00	96%	4%	60	8	456	17.00	96%	4%	60	8	456	0
18.00	97%	3%	60	6	342	18.00	97%	3%	60	6	342	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	5.00	Achieved sun hours on (hrs) @ 50% area	5.00	
Achieved total sun time (hrs)	4.93	Achieved total sun time (hrs)	4.93	1.00
Achieved daily sun time * area	56202	Achieved daily sun time * area	56202	1.00

19 — **200** m2

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	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	80%	20%	60	40	2,400	7.00	80%	20%	60	40	2,400	0
8.00	17%	83%	60	166	9,960	8.00	17%	83%	60	166	9,960	0
9.00	4%	96%	60	192	11,520	9.00	4%	96%	60	192	11,520	0
10.00	4%	96%	60	192	11,520	10.00	4%	96%	60	192	11,520	0
11.00	6%	94%	60	188	11,280	11.00	6%	94%	60	188	11,280	0
12.00	8%	92%	60	184	11,040	12.00	8%	92%	60	184	11,040	0
13.00	14%	86%	60	172	10,320	13.00	14%	86%	60	172	10,320	0
14.00	23%	77%	60	154	9,240	14.00	23%	77%	60	154	9,240	0
15.00	68%	32%	60	64	3,840	15.00	68%	32%	60	64	3,840	0
16.00	84%	16%	60	32	1,920	16.00	84%	16%	60	32	1,920	0
17.00	96%	4%	60	8	480	17.00	96%	4%	60	8	480	0
18.00	96%	4%	60	8	480	18.00	96%	4%	60	8	480	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	7.00	Achieved sun hours on (hrs) @ 50% area	7.00	
Achieved total sun time (hrs)	7	Achieved total sun time (hrs)	7	1.00
Achieved daily sun time * area	84000	Achieved daily sun time * area	84000	1.00

20 — **200** m2

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	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	96%	4%	60	8	480	7.00	96%	4%	60	8	480	0
8.00	95%	5%	60	10	600	8.00	95%	5%	60	10	600	0
9.00	73%	27%	60	54	3,240	9.00	73%	27%	60	54	3,240	0
10.00	21%	79%	60	158	9,480	10.00	21%	79%	60	158	9,480	0
11.00	15%	85%	60	170	10,200	11.00	15%	85%	60	170	10,200	0
12.00	13%	87%	60	174	10,440	12.00	13%	87%	60	174	10,440	0
13.00	12%	88%	60	176	10,560	13.00	12%	88%	60	176	10,560	0
14.00	5%	95%	60	190	11,400	14.00	5%	95%	60	190	11,400	0
15.00	4%	96%	60	192	11,520	15.00	4%	96%	60	192	11,520	0
16.00	4%	96%	60	192	11,520	16.00	4%	96%	60	192	11,520	0
17.00	48%	52%	60	104	6,240	17.00	48%	52%	60	104	6,240	0
18.00	94%	6%	60	12	720	18.00	94%	6%	60	12	720	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)	7.2	Achieved total sun time (hrs)	7.2	1.00
Achieved daily sun time * area	86400	Achieved daily sun time * area	86400	1.00

21 — **190** m2

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	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	96%	4%	60	8	456	7.00	96%	4%	60	8	456	0
8.00	85%	15%	60	29	1,710	8.00	85%	15%	60	29	1,710	0
9.00	28%	72%	60	137	8,208	9.00	28%	72%	60	137	8,208	0
10.00	26%	74%	60	141	8,436	10.00	26%	74%	60	141	8,436	0
11.00	28%	72%	60	137	8,208	11.00	28%	72%	60	137	8,208	0
12.00	27%	73%	60	139	8,322	12.00	27%	73%	60	139	8,322	0
13.00	27%	73%	60	139	8,322	13.00	27%	73%	60	139	8,322	0
14.00	24%	76%	60	144	8,664	14.00	24%	76%	60	144	8,664	0
15.00	9%	91%	60	173	10,374	15.00	9%	91%	60	173	10,374	0
16.00	4%	96%	60	182	10,944	16.00	4%	96%	60	182	10,944	0
17.00	4%	96%	60	182	10,944	17.00	4%	96%	60	182	10,944	0
18.00	96%	4%	60	8	456	18.00	96%	4%	60	8	456	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	9.00	
Achieved total sun time (hrs)	7.46	Achieved total sun time (hrs)	7.46	1.00
Achieved daily sun time * area	85044	Achieved daily sun time * area	85044	1.00

22 — **150** m2

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	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	89%	11%	60	17	990	7.00	89%	11%	60	17	990	0
8.00	93%	7%	60	11	630	8.00	93%	7%	60	11	630	0
9.00	96%	4%	60	6	360	9.00	96%	4%	60	6	360	0
10.00	90%	10%	60	15	900	10.00	90%	10%	60	15	900	0
11.00	69%	31%	60	47	2,790	11.00	69%	31%	60	47	2,790	0
12.00	18%	82%	60	123	7,380	12.00	18%	82%	60	123	7,380	0
13.00	11%	89%	60	134	8,010	13.00	11%	89%	60	134	8,010	0
14.00	17%	83%	60	125	7,470	14.00	17%	83%	60	125	7,470	0
15.00	17%	83%	60	125	7,470	15.00	17%	83%	60	125	7,470	0
16.00	17%	83%	60	125	7,470	16.00	17%	83%	60	125	7,470	0
17.00	17%	83%	60	125	7,470	17.00	17%	83%	60	125	7,470	0
18.00	85%	15%	60	23	1,350	18.00	85%	15%	60	23	1,350	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	6.00	Achieved sun hours on (hrs) @ 50% area	6.00	
Achieved total sun time (hrs)	5.81	Achieved total sun time (hrs)	5.81	1.00
Achieved daily sun time * area	52290	Achieved daily sun time * area	52290	1.00

23 — **200** m2

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	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	68%	32%	60	64	3,840	7.00	68%	32%	60	64	3,840	0
8.00	48%	52%	60	104	6,240	8.00	48%	52%	60	104	6,240	0
9.00	15%	85%	60	170	10,200	9.00	15%	85%	60	170	10,200	0
10.00	6%	94%	60	188	11,280	10.00	6%	94%	60	188	11,280	0
11.00	6%	94%	60	188	11,280	11.00	6%	94%	60	188	11,280	0
12.00	6%	94%	60	188	11,280	12.00	6%	94%	60	188	11,280	0
13.00	6%	94%	60	188	11,280	13.00	6%	94%	60	188	11,280	0
14.00	6%	94%	60	188	11,280	14.00	6%	94%	60	188	11,280	0
15.00	9%	91%	60	182	10,920	15.00	9%	91%	60	182	10,920	0
16.00	9%	91%	60	182	10,920	16.00	15%	85%	60	170	10,200	-720
17.00	14%	86%	60	172	10,320	17.00	19%	81%	60	162	9,720	-600
18.00	96%	4%	60	8	480	18.00	96%	4%	60	8	480	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	10.00	
Achieved total sun time (hrs)	9.11	Achieved total sun time (hrs)	9	0.99
Achieved daily sun time * area	109320	Achieved daily sun time * area	108000	0.99

24 — **120** m2

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	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	35%	65%	60	78	4,680	7.00	35%	65%	60	78	4,680	0
8.00	49%	51%	60	61	3,672	8.00	49%	51%	60	61	3,672	0
9.00	15%	85%	60	102	6,120	9.00	15%	85%	60	102	6,120	0
10.00	6%	94%	60	113	6,768	10.00	6%	94%	60	113	6,768	0
11.00	6%	94%	60	113	6,768	11.00	6%	94%	60	113	6,768	0
12.00	6%	94%	60	113	6,768	12.00	6%	94%	60	113	6,768	0
13.00	6%	94%	60	113	6,768	13.00	6%	94%	60	113	6,768	0
14.00	6%	94%	60	113	6,768	14.00	6%	94%	60	113	6,768	0
15.00	6%	94%	60	113	6,768	15.00	6%	94%	60	113	6,768	0
16.00	6%	94%	60	113	6,768	16.00	6%	94%	60	113	6,768	0
17.00	14%	86%	60	103	6,192	17.00	14%	86%	60	103	6,192	0
18.00	47%	53%	60	64	3,816	18.00	47%	53%	60	64	3,816	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	12.00	Achieved sun hours on (hrs) @ 50% area	12.00	
Achieved total sun time (hrs)	9.98	Achieved total sun time (hrs)	9.98	1.00
Achieved daily sun time * area	71856	Achieved daily sun time * area	71856	1.00

25 — **100** 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	29%	71%	60	71	4,260
8.00	16%	84%	60	84	5,040
9.00	6%	94%	60	94	5,640
10.00	6%	94%	60	94	5,640
11.00	6%	94%	60	94	5,640
12.00	6%	94%	60	94	5,640
13.00	6%	94%	60	94	5,640
14.00	6%	94%	60	94	5,640
15.00	6%	94%	60	94	5,640
16.00	6%	94%	60	94	5,640
17.00	15%	85%	60	85	5,100
18.00	49%	51%	60	51	3,060
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	12.00
Achieved total sun time (hrs)	10.43
Achieved daily sun time * area	62580

NEW STATUS					March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	29%	71%	60	71	4,260	0
8.00	16%	84%	60	84	5,040	0
9.00	6%	94%	60	94	5,640	0
10.00	6%	94%	60	94	5,640	0
11.00	6%	94%	60	94	5,640	0
12.00	6%	94%	60	94	5,640	0
13.00	6%	94%	60	94	5,640	0
14.00	6%	94%	60	94	5,640	0
15.00	6%	94%	60	94	5,640	0
16.00	6%	94%	60	94	5,640	0
17.00	15%	85%	60	85	5,100	0
18.00	49%	51%	60	51	3,060	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr)	2	
Achieved sun hours on (hrs) @ 50% area	12.00	
Achieved total sun time (hrs)	10.43	1.00
Achieved daily sun time * area	62580	1.00

26 — **90** 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	29%	71%	60	64	3,834
8.00	16%	84%	60	76	4,536
9.00	6%	94%	60	85	5,076
10.00	6%	94%	60	85	5,076
11.00	6%	94%	60	85	5,076
12.00	6%	94%	60	85	5,076
13.00	6%	94%	60	85	5,076
14.00	6%	94%	60	85	5,076
15.00	6%	94%	60	85	5,076
16.00	6%	94%	60	85	5,076
17.00	15%	85%	60	77	4,590
18.00	52%	48%	60	43	2,592
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr)	2
Achieved sun hours on (hrs) @ 50% area	11.00
Achieved total sun time (hrs)	10.4
Achieved daily sun time * area	56160

NEW STATUS					March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	29%	71%	60	64	3,834	0
8.00	16%	84%	60	76	4,536	0
9.00	6%	94%	60	85	5,076	0
10.00	6%	94%	60	85	5,076	0
11.00	6%	94%	60	85	5,076	0
12.00	6%	94%	60	85	5,076	0
13.00	6%	94%	60	85	5,076	0
14.00	6%	94%	60	85	5,076	0
15.00	6%	94%	60	85	5,076	0
16.00	6%	94%	60	85	5,076	0
17.00	15%	85%	60	77	4,590	0
18.00	52%	48%	60	43	2,592	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr)	2	
Achieved sun hours on (hrs) @ 50% area	11.00	
Achieved total sun time (hrs)	10.4	1.00
Achieved daily sun time * area	56160	1.00