Lighting, Art + Science
Lighting and Electrical Consultants

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NBC Sports Fields
Obtrusive Lighting Assessment

Prepared by:

Lighting, Art and Science

for

Northern Beaches Council

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Table of Contents

1. INTRODUCTION

Northern Beaches Council has engaged Lighting, Art & Science to review the obtrusive lighting for the proposed Sports Field lighting schemes for three sites located within the Northern Beaches Council municipality. The three sites are listed below:

1. Tania Park, Balgowlah Heights
2. Passmore Reserve, Manly Vale
3. John Fisher Park, Curl Curl

The proposed lighting schemes were originally designed in September 2018 to Australian Standards: AS 2560.2.3-2007: *Sports Lighting Part 2.3: Specific Applications-Lighting for football (all codes)* and AS 4282-1997: *Control of the Obtrusive effects of outdoor lighting.*

The revised lighting schemes are dated October 12th, 2019.

This report reviews the revised calculations, which were based on the latest standards AS 2560.2.3-2007: *Sports Lighting Part 2.3: Specific Applications-Lighting for football (all codes) and* AS/NZS 4282:2019: *Control of the Obtrusive effects of outdoor lighting.*

Lighting, Art & Science assessed each site to confirm conformance with the most recent version of the obtrusive lighting standard: AS/NZS 4282:2019.

We have not evaluated the designs with respect to their conformance with AS2560.2.3.

2. PROPOSED LIGHTING SCHEME & SITE CONDITIONS

The proposed lighting scheme was developed by APEX Lighting.

2.1 Proposed Luminaire Details

The proposed luminaire for all three sites is the Philips Optivision LED (generation 2 or 3), 1300W or 1500W, 5700K, fitted with integral shields to help mitigate obtrusive light.

Generation 2 (image of luminaire with gear box)

Generation 3 (image of luminaire without gear box)

2.2 Tania Park, Balgowlah Heights

The lighting scheme for Tania Park comprises of 8 new poles of 20m and 22m height, with a total of 32 luminaires to illuminate the 2 fields to an approximate average of 100 lux. The design was based on generation 2 of the Philips Optivision LED luminaire.

Tania Park is located on Dobroyd Head. It is surrounded by a service road, Dobroyd Scenic Drive. Dobroyd Scenic Drive is not illuminated, with the exception of two streetlights at the intersections with Bareena Drive & Fisher Street. The fields are surrounded by scrubs, trees and bushland. On the north and west side of the site there are a number of residential streets.

2.3 Passmore Reserve, Manly Vale

The lighting scheme proposed for Passmore Park comprises of 8 new poles of 25m and 30m height, with a total of 29 luminaires to illuminate 3 fields to an approximate average of 100 lux. The design was based on generation 3 of the Philips Optivision LED luminaire.

Manly Creek and a number of illuminated sports fields are located north of the fields. On the east, Manly Vale Calabria Bowling Club is located. Next to the Bowling Club are a number of illuminated sports fields.

Warringah Golf Club lies to the north west of the fields. On the south side of the fields there is a school, and a number of residential streets, with local street lighting and pedestrian crossing lighting.

2.4 John Fisher Park, Curl Curl

The proposed lighting scheme for John Fisher Park comprises of 6 poles of 30m height. The proposal includes 50 luminaires to light 4 fields and 3 ovals (Frank Gray & Mike Pawley Ovals) to an approximate average of 100 lux. The design was based on generation 3 of the Philips Optivision LED luminaire.

The site is surrounded by Greendale Creek on the north, Weldon Oval to the east, residential properties and Freshwater Senior Campus on the south side, and commercial properties on local road Harbord Road to the west.

3. LIGHTING CATEGORIES

Australian Standard AS/NZS 4282:2019 recommends limits to control the obtrusive effects of outdoor lighting to environmentally sensitive areas, in particular residential areas. The standard recommends limits to light obtrusions as a benchmark of what a person living in an urban environment can be reasonably expected to tolerate as a result of an adjacent lighting installation.

There are a number of environmental zones used in the standard as per Table 1, which is an extract from table 3.1 of AS/NZS 4282:2019. The environmental zones are used to accommodate the different ambient light conditions.

We have made an assumption as to the relevant zone for each park and based our calculation on this.

Zones	Description	Examples
A0	Intrinsically dark	UNESCO Starlight Reserve, IDA Dark Sky Parks. Major optical observatories. No road lighting – unless specifically required by the road controlling authority
A1	Dark	Relatively uninhabited rural areas. No road lighting – unless specifically required by the road controlling authority
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas
A3	Medium district brightness	Suburban areas in towns and cities
A4	High district brightness	Town and city centres and commercial areas. Residential areas abutting commercial areas.

Table 1 Environmental Zones

4. UNITS OF MEASUREMENT

AS4282 uses several light technical parameters in the assessment.

AS4282 specifies different limits for the light technical parameters for the different ambient conditions (environmental zones). In addition, the standard nominates a curfew period where lower limits are applied. The default curfew period is between 11:00pm and 6:00am. The consent authority has the option to change the hours if required.

4.1 Luminous Flux

The ***Luminous Flux*** is a measure of the total amount of light that leaves a light source.

The luminous flux is the radiant flux that is emitted within the visible spectrum, between 380 (violet) and 740 (red) nanometres. The human eye does not have uniform sensitivity across the viable spectrum, and it is more sensitive to green and orange light than to blue and red light. The luminous flux is the product of the radiant flux and the sensitivity of the eye.

The luminous flux is measures in ***lumens*** (lm)

4.2 Illuminance

The ***Illuminance*** is a measure of the amount of light that falls on a surface. For obtrusive light the illuminance is calculated in the vertical plane and is an indicator of the light that is entering a building through the windows and illuminating the vertical surfaces within a room.

Illuminance is measured in ***lux*** (lumens/m2)

The illuminance assessment considers only the light resulting from direct illuminance from the installation; that is the light that comes directly from the light fittings.

In all installations there is also indirect light that is reflected off the ground, walls of buildings, objects in the lit area and in some cases reflections from clouds.

The standard only addresses direct illumination effects. This is due to the standard being designed to determine conformance or non-conformance and the difficulty of including consistent indirect lighting contributions.

Direct illumination can be readily and reliably calculated.

The indirect contribution is affected by colours (e.g. the colour of adjacent buildings), whether trees have leaves, the weather etc. Although the contributions from these indirect components are real, they cannot be reliably calculated. This makes it very difficult to make a quantitative assessment of the total impact of any installation.

The limits recommended in the standard are set with the understanding that they do not include the indirect component.

4.3 Luminous Intensity

Luminous Intensity is the light leaving a source in a given direction and is measured in ***candelas***. (lumens/steradian)

Luminous Intensity emitted by luminaires – This is an indicator of the brightness of the light source or the resulting glare. This is governed by the brightness of the light source, the glare control of the light fitting and the viewing angle.

Theoretically this affect does not reduce with distance; however, with a very small light source the perception will reduce as the image of the light on the eye becomes smaller than the size of the light receptors in the eye. In addition, if the distance is long enough there will be a reduction in the brightness due to the permeability of the air.

Although it is not a formal Glare Index, it was included as a simple indication of the glare caused by the lighting installation and an indication of the level of distraction or discomfort the lighting might cause. The luminous intensity relates to a specific direction and will depend on the light distribution of the light fitting and the direction of view.

Luminous intensity is not relevant in locations that do not have direct view of light.

The standard has two levels of conformance for luminous intensity. L1 relates to all new installations whereas L2 is allowed for legacy installations that are reusing existing poles.

AGi32, the industry standard lighting calculation program assess the luminous intensity at an angle 10 degrees below the horizontal. This means that if you are more that 200metres from a 35 metre high pole your viewing angle is above that 10 degree level. Many modern sports lights have a very sharp cut-off which means that the fitting may formally fail the AGI assessment, but in practice will not be a problem.

4.4 Luminance

The ***luminance*** is the light that leaves the area of a surface in all directions. It is measured in ***candela/m² (cd/m²***). The eye sees by distinguishing the difference in luminance between the different objects and surfaces.

AS/NZS4282 recommends limits on the luminance of lit vertical surfaces including signs.

Luminance is only required for lit vertical surfaces such as illuminated signs and is therefore not relevant in this situation.

4.5 Threshold Increment

Threshold increment – This is a measure of the disability glare that results from the light sources with particular application to the reading of signs, signals by the drivers of vehicles etc.

4.6 Upward Light Ratio (ULR)

Upward light ratio limits the light emitted into the sky to limit the impact on sky glow.

5. LIGHTING CONFORMANCE PARAMETERS AS/NZS 4282:2019

The standard specifies limits for a number of light technical parameters required to achieve conformance, per those outlined in the standards.

The pre-lodgement advice (PLM2018-0253) for the three sites states that "for all parks the operating hours are restricted to 9.30pm, and lights are shut off at that point". Therefore, all three sites were assessed to non-curfew L1 conditions.

5.1 Lighting technical parameters

We consider that all sites are located within or adjacent to A3 environmental zones, 'medium district brightness'

Tania Park however, has bushland surrounding Tania Park on two sides, so we have also applied the more sensitive A2 environmental zones, low district brightness.

Therefore, the proposed lighting for Passmore Reserve and John Fisher Park was assessed for an A3 environmental zone and Tania Park was assessed for an A2 environmental zone for AS/NZS 4282:2019.

Table 2 lists the applicable light parameters for the three sites:

Zones	Description	Vertical illuminance levels (Ev) – Non-curfew L1	Maximum luminous intensity per luminaire – Non-curfew L1	Threshold increment (TI)	Upward light ratio (ULR)
A2 (Tania Park)	Low district brightness	5 lux	7,500 cd	20% at default adaptation level of 0.2	0.01
A3 (Passmore Reserve & John Fisher Park	Medium district brightness	10 lux	12,500 cd	20% at default adaptation level of 1	0.02

Table 2: Environmental Zones Parameters

Refer to Appendix A, B and C for maps showing what parameters were assessed for each site.

6. AS/NZS 4282:2019 ASSESSMENT FINDINGS AND RECOMMENDATIONS

AGi32 software was used to demonstrate conformance with the parameters of AS/NZS 4282:2019.

Table 3 shows the results for conformance with AS/NZS 4282:2019.

Location	**Tania Park, Balgowlah Heights**	**Passmore Reserve, Manly Vale**	**John Fisher Park, Curl Curl**
Vertical Illuminance Levels (Ev) Non-curfew L1 conformance	**Yes**	**Yes**	**Yes**
Applicable Limit	5 lux	10 lux	10 lux
AGI32 Results (highest calculated value)	0.3 lux @ Heathcliff Av S	0.9 lux @ Campbell Pd 2A	2.5 lux @ Manuela/ Holloway
Maximum Luminous Intensity per luminaire Non-curfew L1 conformance	**Yes**	**Yes**	**Yes**
Applicable Limit	7,500 cd	12,500 cd	12,500 cd
AGI 32 Results (highest calculated value)	2,037 cd at Heathcliff Av S	3,719 cd @ 2A Campbell Pd	5,323 cd @ Manuela/ Holloway
Threshold Increment (TI) conformance	**Yes**	**Yes**	**Yes**
Applicable Limit	20% at default adaptation level of 0.2	20% at default adaptation level of 1	20% at default adaptation level of 1
AGI32 Result (highest calculated value)	12% @ Dobroyd Sc Dr	1% @ Quirk Pd N	2% @ Harbord Bowling S
Upward Light Ratio (ULR) conformance	**Yes**	**Yes**	**Yes**
Applicable Limit	0.01	0.02	0.02
AGI32 Result (highest calculated value)	0.001	0.000	0.000

Table 3: AS/NZS 4282:2019 assessment findings

7. LIGHTING EFFECTS ON SURROUNDS/WILDLIFE

We are not environmental consultants and as a result although we can assess the magnitude of the lighting impact on a specific area, we cannot determine the impact on a specific biota.

AS4282 does not specifically address the impacts of lighting on biota. The standard acknowledges that there may be an impact but that it is not possible to be specific as light has different impacts on different species and although the impact on some species has been extensively researched, very little is known about the majority of species.

As the environmental zones A0 to A2 relate to virtually uninhabited areas, the limits applied in AS4282 are principally for the protection of the environment and the sky.

For the purposes of assessing the impact on wildlife in surrounding bushland, the Vertical Illuminance was calculated at the boundary of the site itself, as well as 10m beyond the boundary. In addition to this a horizontal lighting calculation illustrated with isolines, demonstrates the horizontal light levels within a radius of 250m from the approximate centre of the fields. Note that in some instances the boundary of the site is not clear from the site drawings, and assumptions were made.

These two calculations provide an indication of the amount of light spilling beyond the illuminated area that may impact on wildlife in the surrounding bushland. Note that all calculations are based on the direct component of light only, excluding any reflected light. Nor do these calculations take into account any obstructions such as trees etc.

These additional calculation grids were assessed against the environmental zone applicable for each site. The selected environmental zones take into account the brightness of the district.

Note that these calculations are not required by AS/NZS 4282:2019. The results of these calculations do not determine conformance or non-conformance with the standard. However, they can be used an indication of spill light impacting surrounds/wildlife.

8. SURROUNDS ASSESSMENT FINDINGS AND RECOMMENDATIONS

Table 4 shows the results for the Vertical Illuminance calculations.

Location	Tania Park, Balgowlah Heights	Passmore Reserve, Manly Vale	John Fisher Park, Curl Curl
Vertical Illuminance Levels (Ev) Non-curfew L1 conformance @ site boundary	**Yes,** note 1	**Yes,** note 2	**Yes,** note 3
Applicable Limit	5 lux	10 lux	10 lux
AGI32 Results (highest calculated value)	1.6 lux	2.4 lux	3.1 lux
Vertical Illuminance Levels (Ev) Non-curfew L1 conformance @ 10 from site boundary	**Yes,** note 1	**Yes,** note 2	**Yes,** note 3
Applicable Limit	5 lux	10 lux	10 lux
AGI32 Results (highest calculated value)	1.2 lux	0.9 lux	1.1 lux

Note 1: The highest illuminance values occur in the area behind poles 7 and 8. The maximum calculated values fall well within the limits of the standard.

Note 2: The highest illuminance values occur near Manly Creek behind pole 8, and fall within the limits of the standard.

Note 4: It should be noted that all the values quoted for conformance are at the maximum point. The majority of the locations fall well within the limits of the standard.

Table 4: Surrounds assessment findings

9. CONCLUSIONS

All three sites were assessed against the limits of the latest standard of AS/NZS 4282:2019 to determine the impact of the proposed lighting schemes on the nearby residences and streets.

The revised calculations for Tania Park show conformance with environmental zone A2.

The revised calculations for Passmore Reserve, and John Fisher Park show conformance with environmental zone A3.

The impact of the proposed lighting scheme on its surrounds/wildlife was assessed by analysing Vertical Illuminance around the site. Lighting, Art & Science has not identified any areas of concern, and deem the impact of the proposed lighting installations on its surrounds to be minimal given the locations of these areas and the sites.

10. REFERENCES:

a) AS/NZS 4282:2019
b) AS 4282:1997
c) AS 2560.2.3

11. APPENDICES

Appendix A – Map Lighting Parameters Tania Park, Balgowlah Heights

Appendix B – Map Lighting Parameters Passmore Reserve, Manly Vale

Appendix C – Map Lighting Parameters John Fisher Park, Curl Curl

L160P-CL01-STD-P2 – Tania Park – AS/NZS 4282:2019 Calculations

L160P-CL01-SUR-P2 – Tania Park – Surrounds Calculations

L160P-CL02-STD-P2 – Passmore Reserve – AS/NZS 4282:2019 Calculations

L160P-CL02-SUR-P2 – Passmore Reserve – Surrounds Calculations

L160P-CL03-STD-P2 – John Fisher Park – AS/NZS 4282:2019 Calculations

L160P-CL03-SUR-P2 – John Fisher Park – Surrounds Calculations

11.1 Appendix A – Map Lighting Parameters Tania Park, Balgowlah Heights

LEGEND

- PROPOSED SPORTS FIELD LIGHTING
- VERTICAL ILLUMINANCE RESIDENTIAL DWELLINGS
- VERTICAL ILLUMINANCE BUSHLAND/SURROUNDS
- THRESHOLD INCREMENT LOCAL ROADS
- SERVICE ROAD (NOT INCLUDED IN THRESHOLD INCREMENT CALCULATIONS)

11.2 Appendix B – Map Lighting Parameters Passmore Reserve, Manly Vale

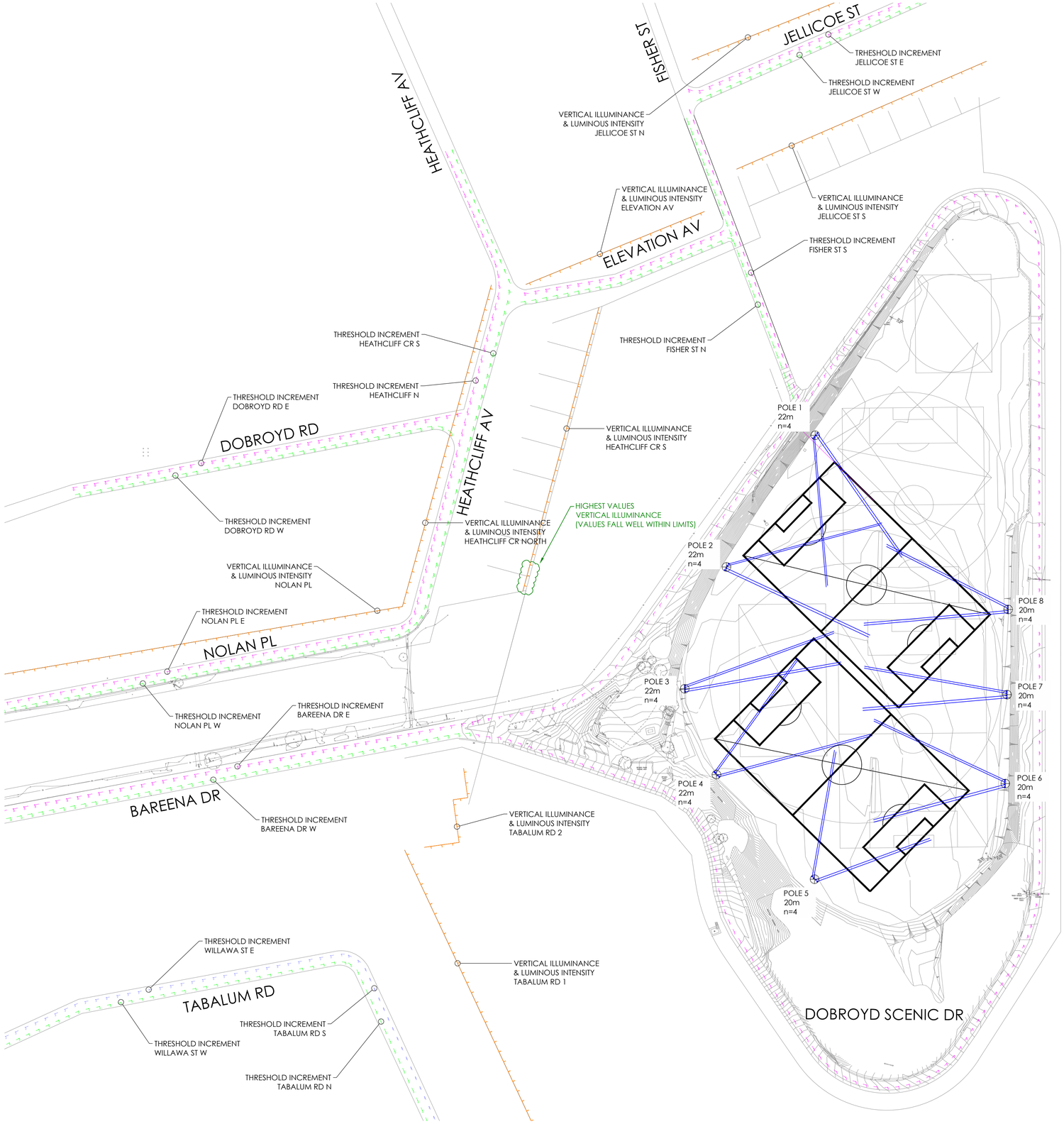
LEGEND

- PROPOSED SPORTS FIELD LIGHTING
- VERTICAL ILLUMINANCE RESIDENTIAL DWELLINGS
- VERTICAL ILLUMINANCE COMMERCIAL (SCHOOL -MACKELLAR GIRLS CAMPUS)
- VERTICAL ILLUMINANCE BUSHLAND/SURROUNDS
- THRESHOLD INCREMENT LOCAL ROADS
- EXISTING SPORTS FIELD LIGHTING
- EXISTING PLAYGROUND
- EXISTING CARPARK

11.3 Appendix C – Map Lighting Parameters John Fisher Park, Curl Curl

LEGEND

- PROPOSED SPORTS FIELD LIGHTING
- VERTICAL ILLUMINANCE RESIDENTIAL DWELLINGS
- VERTICAL ILLUMINANCE INDIVIDUAL RESIDENTIAL DWELLINGS
- VERTICAL ILLUMINANCE BUSHLAND/SURROUNDS
- VERTICAL ILLUMINANCE BOWLING CLUB
- THRESHOLD INCREMENT LOCAL ROADS
- EXISTING SPORTS FIELD LIGHTING



Luminaire Schedule				
Scene: Initial				
Symbol	Label	Qty	Description	Total Lamp Lumens
	BVP525 OUT T30 50K A-NB+LO_30	32	Apex OptiVision LED Gen2 3-Module Asymmetric Narrow Beam +LO 757	183011

Luminaire Location Summary 1				
Project: Pole 1				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
1	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00
2	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00
3	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00
4	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00

Luminaire Location Summary 2				
Project: Pole 2				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
5	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
6	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
7	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
8	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00

Luminaire Location Summary 3				
Project: Pole 3				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
9	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
10	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
11	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
12	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00

Luminaire Location Summary 4				
Project: Pole 4				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
13	BVP525 OUT T30 50K A-NB+LO_30	22.25	71	1.00
14	BVP525 OUT T30 50K A-NB+LO_30	22.25	71	1.00
15	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
16	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00

Luminaire Location Summary 5				
Project: Pole 5				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
17	BVP525 OUT T30 50K A-NB+LO_30	20.25	71	1.00
18	BVP525 OUT T30 50K A-NB+LO_30	20.25	71	1.00
19	BVP525 OUT T30 50K A-NB+LO_30	20.25	70	1.00
20	BVP525 OUT T30 50K A-NB+LO_30	20.25	70	1.00

Luminaire Location Summary 6				
Project: Pole 6				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
21	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00
22	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00
23	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
24	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00

Luminaire Location Summary 7				
Project: Pole 7				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
25	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
26	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
27	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
28	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00

Luminaire Location Summary 8				
Project: Pole 8				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
29	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
30	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
31	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00
32	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A2 - Low District Brightness, Non-Curfew L1
Filename: 18076-05-A Tania Park_LA+S
31/10/2019 1:42:49 PM

Illuminance

Maximum Allowable Value: 5 Lux

Calculations Tested (11):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_Nolan Pl_III_Seg1	PASS	0.0
ObtrusiveLight_Tabalum Rd_1_III_Seg1	PASS	0.1
ObtrusiveLight_Heathcliff Av_N_III_Seg1	PASS	0.1
ObtrusiveLight_Jellicoe St_N_III_Seg1	PASS	0.0
ObtrusiveLight_Tabalum Rd_2_III_Seg1	PASS	0.0
ObtrusiveLight_Tabalum Rd_2_III_Seg2	PASS	0.1
ObtrusiveLight_Tabalum Rd_2_III_Seg3	PASS	0.0
ObtrusiveLight_Tabalum Rd_2_III_Seg4	PASS	0.1
ObtrusiveLight_Heathcliff Av_S_III_Seg1	PASS	0.3
ObtrusiveLight_Elevation Av_III_Seg1	PASS	0.0
ObtrusiveLight_Jellicoe St_S_III_Seg1	PASS	0.0

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 7500 Cd

Calculations Tested (11):

Calculation Label	Test Results
ObtrusiveLight_Nolan Pl_Cd_Seg1	PASS
ObtrusiveLight_Tabalum Rd_1_Cd_Seg1	PASS
ObtrusiveLight_Heathcliff Av_N_Cd_Seg1	PASS
ObtrusiveLight_Jellicoe St_N_Cd_Seg1	PASS
ObtrusiveLight_Tabalum Rd_2_Cd_Seg1	PASS
ObtrusiveLight_Tabalum Rd_2_Cd_Seg2	PASS
ObtrusiveLight_Tabalum Rd_2_Cd_Seg3	PASS
ObtrusiveLight_Tabalum Rd_2_Cd_Seg4	PASS
ObtrusiveLight_Heathcliff Av_S_Cd_Seg1	PASS
ObtrusiveLight_Elevation Av_Cd_Seg1	PASS
ObtrusiveLight_Jellicoe St_S_Cd_Seg1	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (19):

Calculation Label	Adaptation Luminance	Test Results
ObtrusiveLight_TI_Willawa St_E	0.2	PASS
ObtrusiveLight_TI_Willawa St_W	0.2	PASS
ObtrusiveLight_TI_Tabalum Rd_N	0.2	PASS
ObtrusiveLight_TI_Tabalum Rd_S	0.2	PASS
ObtrusiveLight_TI_Dobroyd Rd_E	0.2	PASS
ObtrusiveLight_TI_Dobroyd Rd_W	0.2	PASS
ObtrusiveLight_TI_Nolan Pl_E	0.2	PASS
ObtrusiveLight_TI_Heathcliff_N	0.2	PASS
ObtrusiveLight_TI_Heathcliff_S	0.2	PASS
ObtrusiveLight_TI_Elevation Av_W	0.2	PASS
ObtrusiveLight_TI_Elevation Av_E	0.2	PASS
ObtrusiveLight_TI_Fisher St_N	0.2	PASS
ObtrusiveLight_TI_Fisher St_S	0.2	PASS
ObtrusiveLight_TI_Bareena Dr_E	0.2	PASS
ObtrusiveLight_TI_Nolan Pl_W	0.2	PASS
ObtrusiveLight_TI_Bareena Dr_W	0.2	PASS
ObtrusiveLight_TI_Jellicoe St_E	0.2	PASS
ObtrusiveLight_TI_Jellicoe St_W	0.2	PASS
ObtrusiveLight_TI_Dobroyd Sc Dr	0.2	PASS

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 1.0 %

Calculated UWLR: 0.1 %
Test Results: PASS

Issue	Amendment	Date
P1	PRELIMINARY ISSUE	25-09-19
P2	PRELIMINARY ISSUE	01-11-19

N

0 10 20 30 40 50 100m

1:1000@A1

Notes:
1. Vertical Illuminance & Luminous Intensity calculation grid heights: 1.5 - 30m.
2. Threshold Increment calculations height: 1.5m.
3. A light loss factor of 1.0 is used to show initial light values.
4. Floodlight reference tilt is noted as 'tilt'. Substract 30° from tilt value to get the tilt of the visor.

Lead Consultant
BBF TOWN PLANNERS

Client
NBC

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Project NBC SPORTSFIELDS
TANIA PARK, BALGOWLAH HEIGHTS

Drawing OBTRUSIVE LIGHTING ASSESSMENT
AS/NSZ 4282:2019 CALCULATIONS

Drawn CVZ | Approv. RM | Date SEP 2019 | Scale 1:1000@A1

Project No L160P | Drawing No CL-01 STD | Rev P2

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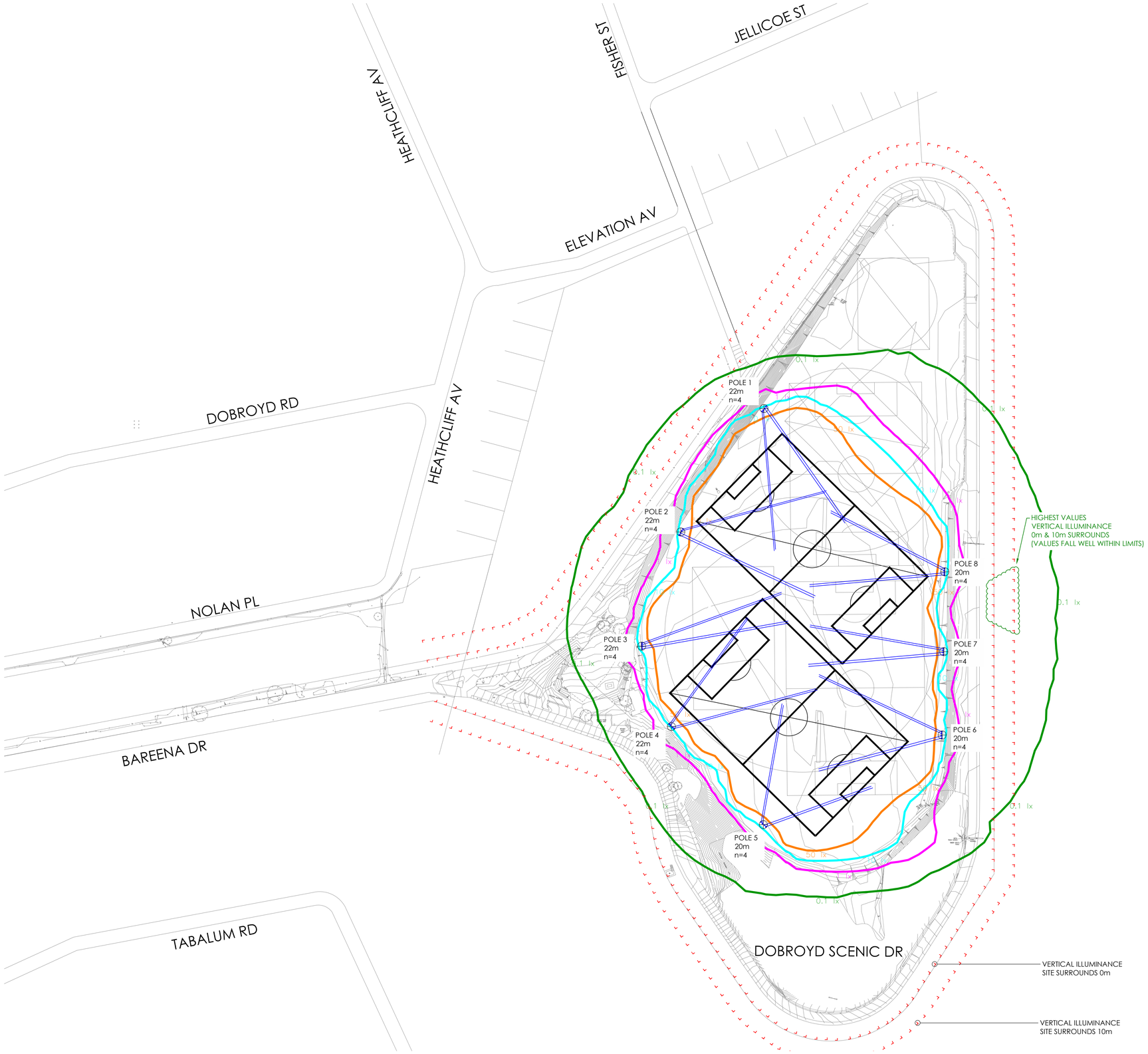

Luminaire Schedule				
Scene: Initial				
Symbol	Label	Qty	Description	Total Lamp Lumens
	BVP525 OUT T30 50K A-NB+LO_30	32	Apex OptiVision LED Gen2 3-Module Asymmetric Narrow Beam +LO 757	183011

Luminaire Location Summary 1				
Project: Pole 1				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
1	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00
2	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00
3	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00
4	BVP525 OUT T30 50K A-NB+LO_30	22.25	72	1.00

Luminaire Location Summary 2				
Project: Pole 2				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
5	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
6	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
7	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
8	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00

Luminaire Location Summary 3				
Project: Pole 3				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
9	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
10	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
11	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
12	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00

Luminaire Location Summary 4				
Project: Pole 4				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
13	BVP525 OUT T30 50K A-NB+LO_30	22.25	71	1.00
14	BVP525 OUT T30 50K A-NB+LO_30	22.25	71	1.00
15	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00
16	BVP525 OUT T30 50K A-NB+LO_30	22.25	73	1.00

Luminaire Location Summary 5				
Project: Pole 5				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
17	BVP525 OUT T30 50K A-NB+LO_30	20.25	71	1.00
18	BVP525 OUT T30 50K A-NB+LO_30	20.25	71	1.00
19	BVP525 OUT T30 50K A-NB+LO_30	20.25	70	1.00
20	BVP525 OUT T30 50K A-NB+LO_30	20.25	70	1.00

Luminaire Location Summary 6				
Project: Pole 6				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
21	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00
22	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00
23	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
24	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00

Luminaire Location Summary 7				
Project: Pole 7				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
25	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
26	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
27	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
28	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00

Luminaire Location Summary 8				
Project: Pole 8				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
29	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
30	BVP525 OUT T30 50K A-NB+LO_30	20.25	73	1.00
31	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00
32	BVP525 OUT T30 50K A-NB+LO_30	20.25	72	1.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A2 - Low District Brightness, Non-Curfew L1
Filename: 18076-05-A Tania Park_LA+S
31/10/2019 1:48:50 PM

Illuminance

Maximum Allowable Value: 5 Lux
Calculations Tested (52):

Calculation Label	Test Results	Max Illum
ObtrusiveLight_Site_Surrounds_10_Ill_Seg1	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg2	PASS	0.2
ObtrusiveLight_Site_Surrounds_10_Ill_Seg3	PASS	0.4
ObtrusiveLight_Site_Surrounds_10_Ill_Seg4	PASS	0.7
ObtrusiveLight_Site_Surrounds_10_Ill_Seg5	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg6	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg7	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg8	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg9	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg10	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg11	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg12	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg13	PASS	1.2
ObtrusiveLight_Site_Surrounds_10_Ill_Seg14	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg15	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg16	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg17	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg18	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg19	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg20	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg21	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg22	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg23	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg24	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg25	PASS	0.4
ObtrusiveLight_Site_Surrounds_10_Ill_Seg26	PASS	0.4
ObtrusiveLight_Site_Surrounds_10_Ill_Seg27	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg1	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg2	PASS	0.3
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg3	PASS	0.5
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg4	PASS	0.9
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg5	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg6	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg7	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg8	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg9	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg10	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg11	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg12	PASS	1.6
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg13	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg14	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg15	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg16	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg17	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg18	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg19	PASS	0.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg20	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg21	PASS	0.3
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg22	PASS	0.4
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg23	PASS	0.5
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg24	PASS	0.5
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg25	PASS	0.3

Issue	Amendment	Date
P1	PRELIMINARY ISSUE	25-09-19
P2	PRELIMINARY ISSUE	01-11-19

N

0 10 20 30 40 50 100m

1:1000@A1

Notes:
1. Vertical Illuminance calculation grid heights: 1.5 - 30m.
2. A light loss factor of 1.0 is used to show initial light values.
3. Floodlight reference tilt is noted as 'tilt'. Substract 30° from tilt value to get the tilt of the visor.

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Project NBC SPORTSFIELDS
TANIA PARK, BALGOWLAH HEIGHTS

Drawing OBTRUSIVE LIGHTING ASSESSMENT
SURROUNDS CALCULATIONS

Drawn CVZ | Approv. RM | Date SEP 2019 | Scale 1:1000@A1

Project No L160P | Drawing No CL-01 SUR | Rev P2

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Luminaire Schedule				
Scene: Initial				
Symbol	Label	Qty	Description	Total Lamp Lumens
	BVP527 OUT T30 50K A35-NB +LO	7	Apex OptiVision LED Gen3 3 module 5700 K BVP527 OUT T30 50K A35-NB +LO	212481
	BVP527 OUT T30 50K A35-NB +BL	22	Apex OptiVision LED Gen3 3 module 5700 K	212481

Luminaire Location Summary 1				
Project: Pole 1				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
1	BVP527 OUT T30 50K A35-NB +BL	25.25	68	1.00
2	BVP527 OUT T30 50K A35-NB +BL	25.25	68	1.00

Luminaire Location Summary 2				
Project: Pole 2				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
3	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00
4	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00

Luminaire Location Summary 3				
Project: Pole 3				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
5	BVP527 OUT T30 50K A35-NB +BL	30.25	67	1.00
6	BVP527 OUT T30 50K A35-NB +BL	30.25	67	1.00
7	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00
8	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
9	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00

Luminaire Location Summary 4				
Project: Pole 4				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
10	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00
11	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
12	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00
13	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
14	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00

Luminaire Location Summary 5				
Project: Pole 5				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
15	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00
16	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00

Luminaire Location Summary 6				
Project: Pole 6				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
17	BVP527 OUT T30 50K A35-NB +LO	25.25	69	1.00
18	BVP527 OUT T30 50K A35-NB +LO	25.25	69	1.00
19	BVP527 OUT T30 50K A35-NB +LO	25.25	69	1.00

Luminaire Location Summary 7				
Project: Pole 7				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
20	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
21	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
22	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
23	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
24	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00

Luminaire Location Summary 8				
Project: Pole 8				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
25	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00
26	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
27	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
28	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00
29	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A3 - Medium District Brightness, Non-Curfew L1
Filename: 18076-06-A Passmore Reserve_LA+S
1/11/2019 9:27:42 AM

Illuminance

Maximum Allowable Value: 10 Lux

Calculations Tested (11):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_Campbell Pd 2A_1_Ill_Seg1	PASS	0.9
ObtrusiveLight_Campbell Pd_S_Ill_Seg1	PASS	0.5
ObtrusiveLight_Campbell Pd_N_Ill_Seg1	PASS	0.2
ObtrusiveLight_Campbell Pd_N_Ill_Seg2	PASS	0.4
ObtrusiveLight_Campbell Pd 2A_2_Ill_Seg1	PASS	0.6
ObtrusiveLight_Campbell Pd 2A_2_Ill_Seg2	PASS	0.8
ObtrusiveLight_Campbell Pd 2A_2_Ill_Seg3	PASS	0.4
ObtrusiveLight_Campbell Pd 2A_2_Ill_Seg4	PASS	0.1
ObtrusiveLight_Campbell Pd_Mack_Ill_Seg1	PASS	0.5
ObtrusiveLight_Manly Bowling_Ill_Seg1	PASS	0.2
ObtrusiveLight_Manly Bowling_Ill_Seg2	PASS	0.1

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 12500 Cd

Calculations Tested (11):

Calculation Label	Test Results
ObtrusiveLight_Campbell Pd 2A_1_Cd_Seg1	PASS
ObtrusiveLight_Campbell Pd_S_Cd_Seg1	PASS
ObtrusiveLight_Campbell Pd_N_Cd_Seg1	PASS
ObtrusiveLight_Campbell Pd_N_Cd_Seg2	PASS
ObtrusiveLight_Campbell Pd 2A_2_Cd_Seg1	PASS
ObtrusiveLight_Campbell Pd 2A_2_Cd_Seg2	PASS
ObtrusiveLight_Campbell Pd 2A_2_Cd_Seg3	PASS
ObtrusiveLight_Campbell Pd 2A_2_Cd_Seg4	PASS
ObtrusiveLight_Campbell Pd_Mack_Cd_Seg1	PASS
ObtrusiveLight_Manly Bowling_Cd_Seg1	PASS
ObtrusiveLight_Manly Bowling_Cd_Seg2	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (4):

Calculation Label	Adaptation Luminance	Test Results
ObtrusiveLight_TI_Campbell Pd_E	1	PASS
ObtrusiveLight_TI_Campbell Pd_W	1	PASS
ObtrusiveLight_TI_Quirk Rd_N	1	PASS
ObtrusiveLight_TI_Quirk Rd_S	1	PASS

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 2.0 %

Calculated UWLR: 0.0 %
Test Results: PASS

Issue	Amendment	Date
P1	PRELIMINARY ISSUE	25-09-19
P2	PRELIMINARY ISSUE	01-11-19

N

0 10 20 30 40 50 100m

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Notes:
1. Vertical Illuminance & Luminous Intensity calculation grid heights: 1.5 - 30m.
2. Threshold Increment calculations height: 1.5m.
3. A light loss factor of 1.0 is used to show initial light values.
4. Floodlight reference tilt is noted as 'tilt'. Substract 30° from tilt value to get the tilt of the visor. All luminaires are tilted with visor at 37°.

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Project NBC SPORTSFIELDS
PASSMORE RESERVE, BALGOWLAH HEIGHTS

Drawing OBTRUSIVE LIGHTING ASSESSMENT
AS/NZS 4282:2019 CALCULATIONS

Drawn CVZ Approv. RM Date SEP 2019 Scale 1:1000@A1

Project No L160P Drawing No CL-02 STD Rev P2

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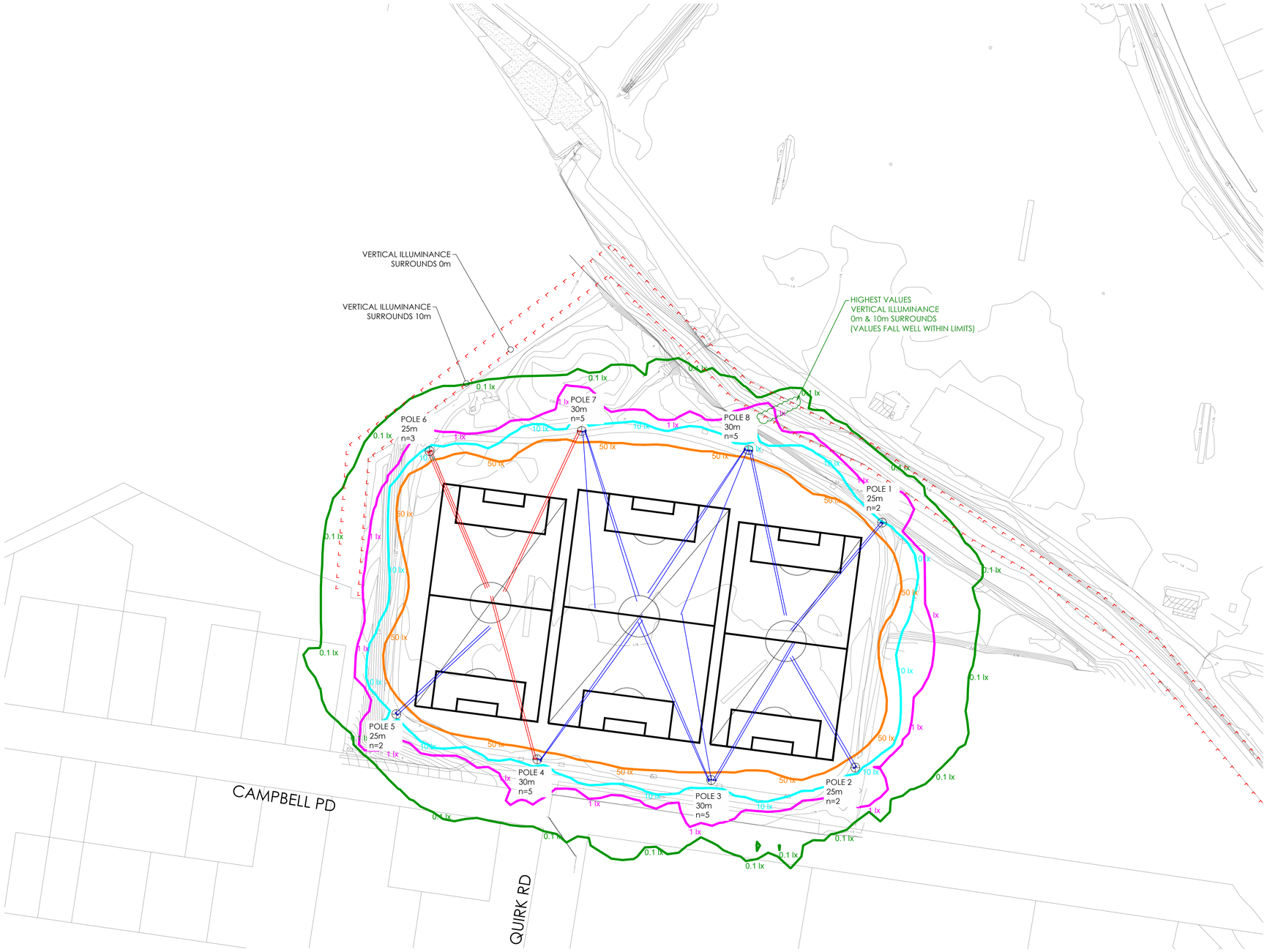

Luminaire Schedule

Scene: Initial

Symbol	Label	Qty	Description	Total Lamp Lumens
	BVP527 OUT T30 50K A35-NB +LO	7	Apex OptiVision LED Gen3 3 module 5700 K BVP527 OUT T30 50K A35-NB +LO	212481
	BVP527 OUT T30 50K A35-NB +BL	22	Apex OptiVision LED Gen3 3 module 5700 K	212481

Luminaire Location Summary 1

Project: Pole 1

Scene: Initial

LumNo	Label	Z	Tilt	LLF
1	BVP527 OUT T30 50K A35-NB +BL	25.25	68	1.00
2	BVP527 OUT T30 50K A35-NB +BL	25.25	68	1.00

Luminaire Location Summary 2

Project: Pole 2

Scene: Initial

LumNo	Label	Z	Tilt	LLF
3	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00
4	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00

Luminaire Location Summary 3

Project: Pole 3

Scene: Initial

LumNo	Label	Z	Tilt	LLF
5	BVP527 OUT T30 50K A35-NB +BL	30.25	67	1.00
6	BVP527 OUT T30 50K A35-NB +BL	30.25	67	1.00
7	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00
8	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
9	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00

Luminaire Location Summary 4

Project: Pole 4

Scene: Initial

LumNo	Label	Z	Tilt	LLF
10	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00
11	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
12	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00
13	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
14	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00

Luminaire Location Summary 5

Project: Pole 5

Scene: Initial

LumNo	Label	Z	Tilt	LLF
15	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00
16	BVP527 OUT T30 50K A35-NB +BL	25.25	66	1.00

Luminaire Location Summary 6

Project: Pole 6

Scene: Initial

LumNo	Label	Z	Tilt	LLF
17	BVP527 OUT T30 50K A35-NB +LO	25.25	69	1.00
18	BVP527 OUT T30 50K A35-NB +LO	25.25	69	1.00
19	BVP527 OUT T30 50K A35-NB +LO	25.25	69	1.00

Luminaire Location Summary 7

Project: Pole 7

Scene: Initial

LumNo	Label	Z	Tilt	LLF
20	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
21	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
22	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
23	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
24	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00

Luminaire Location Summary 8

Project: Pole 8

Scene: Initial

LumNo	Label	Z	Tilt	LLF
25	BVP527 OUT T30 50K A35-NB +BL	29.7	69	1.00
26	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
27	BVP527 OUT T30 50K A35-NB +BL	30.25	69	1.00
28	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00
29	BVP527 OUT T30 50K A35-NB +BL	30.25	68	1.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A3 - Medium District Brightness, Non-Curfew L
Filename: 18076-06-A Passmore Reserve_LA+S
31/10/2019 7:42:57 AM

Illuminance

Maximum Allowable Value: 10 Lux

Calculations Tested (23):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_Site_Surrounds_10_Ill_Seg1	PASS	0.4
ObtrusiveLight_Site_Surrounds_10_Ill_Seg2	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg3	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg4	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg5	PASS	0.9
ObtrusiveLight_Site_Surrounds_10_Ill_Seg6	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg7	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg8	PASS	0.0
ObtrusiveLight_Site_Surrounds_10_Ill_Seg9	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg1	PASS	1.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg2	PASS	0.6
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg3	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg4	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg5	PASS	0.6
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg6	PASS	2.4
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg7	PASS	1.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg8	PASS	2.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg9	PASS	0.3
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg10	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg11	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg12	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg13	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg14	PASS	0.0

Issue	Amendment	Date
P1	PRELIMINARY ISSUE	25-09-19
P2	PRELIMINARY ISSUE	01-11-19

N

0 10 20 30 40 50 100m

1:1000@A1

Notes:
1. Vertical Illuminance calculation grid heights: 1.5 - 30m.
2. A light loss factor of 1.0 is used to show initial light values.
3. Floodlight reference tilt is noted as 'tilt'. Substract 30° from tilt value to get the tilt of the visor. All luminaires are tilted with visor at 37°.

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Project NBC SPORTSFIELDS
PASSMORE RESERVE, BALGOWLAH HEIGHTS

Drawing OBTRUSIVE LIGHTING ASSESSMENT
SURROUNDS CALCULATIONS

Drawn CVZ Approv. RM Date SEP 2019 Scale 1:1000@A1

Project No L160P Drawing No CL-02 SUR Rev P2

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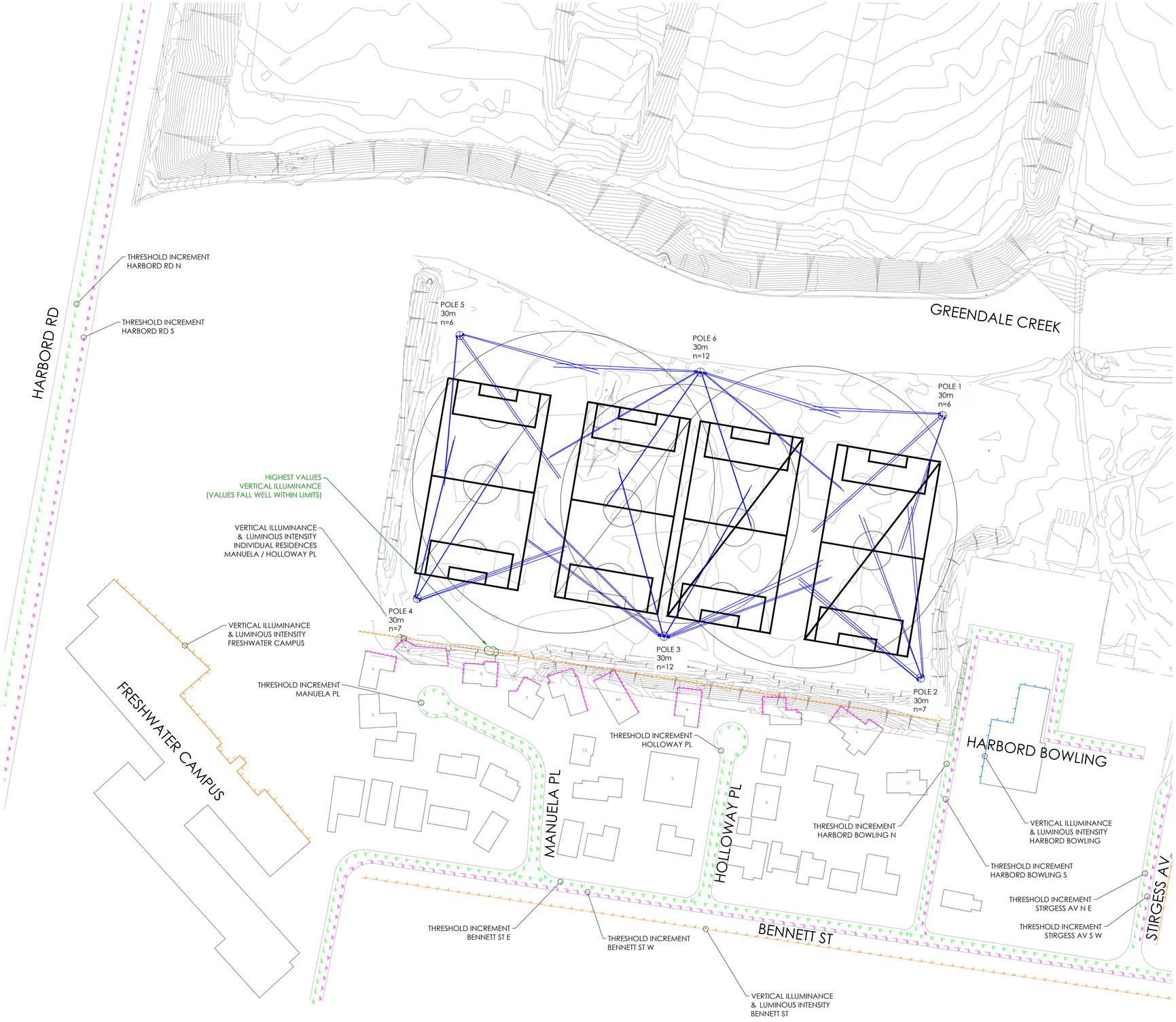

Luminaire Schedule				
Scene: Initial				
Symbol	Label	Qty	Description	Total Lamp Lumens
	BVP527 OUT T30 50K A35-NB +LO	50	Apex OptiVision LED Gen3 3 module 5700 K	212481

Luminaire Location Summary 1
Project: Pole 1
Scene: Initial

LumNo	Label	Z	Tilt	LLF
1	BVP527 OUT T30 50K A35-NB +LO	29.7	64	1.00
2	BVP527 OUT T30 50K A35-NB +LO	30.25	64	1.00
3	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
4	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
5	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00
6	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00

Luminaire Location Summary 2
Project: Pole 2
Scene: Initial

LumNo	Label	Z	Tilt	LLF
7	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
8	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
9	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
10	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
11	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
12	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
13	BVP527 OUT T30 50K A35-NB +LO	29.7	68	1.00

Luminaire Location Summary 3
Project: Pole 3
Scene: Initial

LumNo	Label	Z	Tilt	LLF
14	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
15	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
16	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
17	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
18	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
19	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
20	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
21	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
22	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
23	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
24	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
25	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00

Luminaire Location Summary 4
Project: Pole 4
Scene: Initial

LumNo	Label	Z	Tilt	LLF
26	BVP527 OUT T30 50K A35-NB +LO	29.7	68	1.00
27	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
28	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
29	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
30	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
31	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
32	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00

Luminaire Location Summary 5
Project: Pole 5
Scene: Initial

LumNo	Label	Z	Tilt	LLF
33	BVP527 OUT T30 50K A35-NB +LO	30.25	67	1.00
34	BVP527 OUT T30 50K A35-NB +LO	29.7	67	1.00
35	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
36	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
37	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00
38	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00

Luminaire Location Summary 6
Project: Pole 6
Scene: Initial

LumNo	Label	Z	Tilt	LLF
39	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00
40	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00
41	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
42	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
43	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
44	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
45	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
46	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
47	BVP527 OUT T30 50K A35-NB +LO	29.7	71	1.00
48	BVP527 OUT T30 50K A35-NB +LO	30.25	71	1.00
49	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00
50	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A3 - Medium District Brightness, Non-Curfew L1
Filename: 18076-07-A John Fisher Park_LA+S
31/10/2019 12:14:31 PM

Illuminance

Maximum Allowable Value: 10 Lux

Calculations Tested (19):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_Manuela Holloway_III_Seg1	PASS	2.5
ObtrusiveLight_Freshwater Campus_III_Seg1	PASS	0.1
ObtrusiveLight_Freshwater Campus_III_Seg2	PASS	0.0
ObtrusiveLight_Freshwater Campus_III_Seg3	PASS	0.1
ObtrusiveLight_Freshwater Campus_III_Seg4	PASS	0.0
ObtrusiveLight_Freshwater Campus_III_Seg5	PASS	0.1
ObtrusiveLight_Freshwater Campus_III_Seg6	PASS	0.0
ObtrusiveLight_Freshwater Campus_III_Seg7	PASS	0.1
ObtrusiveLight_Freshwater Campus_III_Seg8	PASS	0.0
ObtrusiveLight_Freshwater Campus_III_Seg9	PASS	0.1
ObtrusiveLight_Freshwater Campus_III_Seg10	PASS	0.0
ObtrusiveLight_Freshwater Campus_III_Seg11	PASS	0.1
ObtrusiveLight_Bennett St_III_Seg1	PASS	0.1
ObtrusiveLight_Stirgess Av_III_Seg1	PASS	0.0
ObtrusiveLight_Stirgess Av_III_Seg2	PASS	0.0
ObtrusiveLight_Harbord Bowling_III_Seg1	PASS	0.2
ObtrusiveLight_Harbord Bowling_III_Seg2	PASS	0.2
ObtrusiveLight_Harbord Bowling_III_Seg3	PASS	0.3
ObtrusiveLight_Harbord Bowling_III_Seg4	PASS	0.1

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 12500 Cd

Calculations Tested (20):

Calculation Label	Test Results
ObtrusiveLight_Manuela Holloway_Cd_Seg1	PASS
ObtrusiveLight_Armourin St_Cd_Seg1	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg1	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg2	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg3	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg4	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg5	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg6	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg7	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg8	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg9	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg10	PASS
ObtrusiveLight_Freshwater Campus_Cd_Seg11	PASS
ObtrusiveLight_Bennett St_Cd_Seg1	PASS
ObtrusiveLight_Stirgess Av_Cd_Seg1	PASS
ObtrusiveLight_Stirgess Av_Cd_Seg2	PASS
ObtrusiveLight_Harbord Bowling_Cd_Seg1	PASS
ObtrusiveLight_Harbord Bowling_Cd_Seg2	PASS
ObtrusiveLight_Harbord Bowling_Cd_Seg3	PASS
ObtrusiveLight_Harbord Bowling_Cd_Seg4	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (10):

Calculation Label	Adaptation Luminance	Test Results
ObtrusiveLight_TI_Manuela Pl	1	PASS
ObtrusiveLight_TI_Holloway Pl	1	PASS
ObtrusiveLight_TI_Harbord Bowl_N	1	PASS
ObtrusiveLight_TI_Harbord Bowl_S	1	PASS
ObtrusiveLight_TI_Bennett St_E	1	PASS
ObtrusiveLight_TI_Bennett St_W	1	PASS
ObtrusiveLight_TI_Stirgess Av_NE	1	PASS
ObtrusiveLight_TI_Stirgess Av_SW	1	PASS
ObtrusiveLight_TI_Harbord Rd_N	1	PASS
ObtrusiveLight_TI_Harbord Rd_S	1	PASS

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 2.0 %

Calculated UWLR: 0.0 %
Test Results: PASS

Issue	Amendment	Date
P1	PRELIMINARY ISSUE	25-09-19
P2	PRELIMINARY ISSUE	01-11-19

N

0 10 20 30 40 50 100m 1:1000@A1

Notes:
1. Vertical Illuminance & Luminous Intensity calculation grid heights: 1.5 - 30m.
2. Vertical Illuminance & Luminous Intensity calculation grid heights for individual houses: 1.5 - 10m.
3. Threshold Increment calculations height: 1.5m
4. A light loss factor of 1.0 is used to show initial light values.
5. Floodlight reference tilt is noted as 'tilt'. Substract 30° from tilt value to get the tilt of the visor.

Lead Consultant
BBF TOWN PLANNERS

Client
NBC

Lighting, Art & Science
Lighting Consultants, Electrical Engineers
Level 1, 41 Hume St, Crows Nest NSW 2065
p: +61 2 9436 0998 e: mail@laands.com.au

Project NBC SPORTSFIELDS
JOHN FISHER PARK, MANLY VALE

Drawing OBTRUSIVE LIGHTING ASSESSMENT
AS/NZS 4282:2019 CALCULATIONS

Drawn CVZ | Approv. RM | Date SEP 2019 | Scale 1:1000@A1

Project No L160P | Drawing No CL-03 STD | Rev P2

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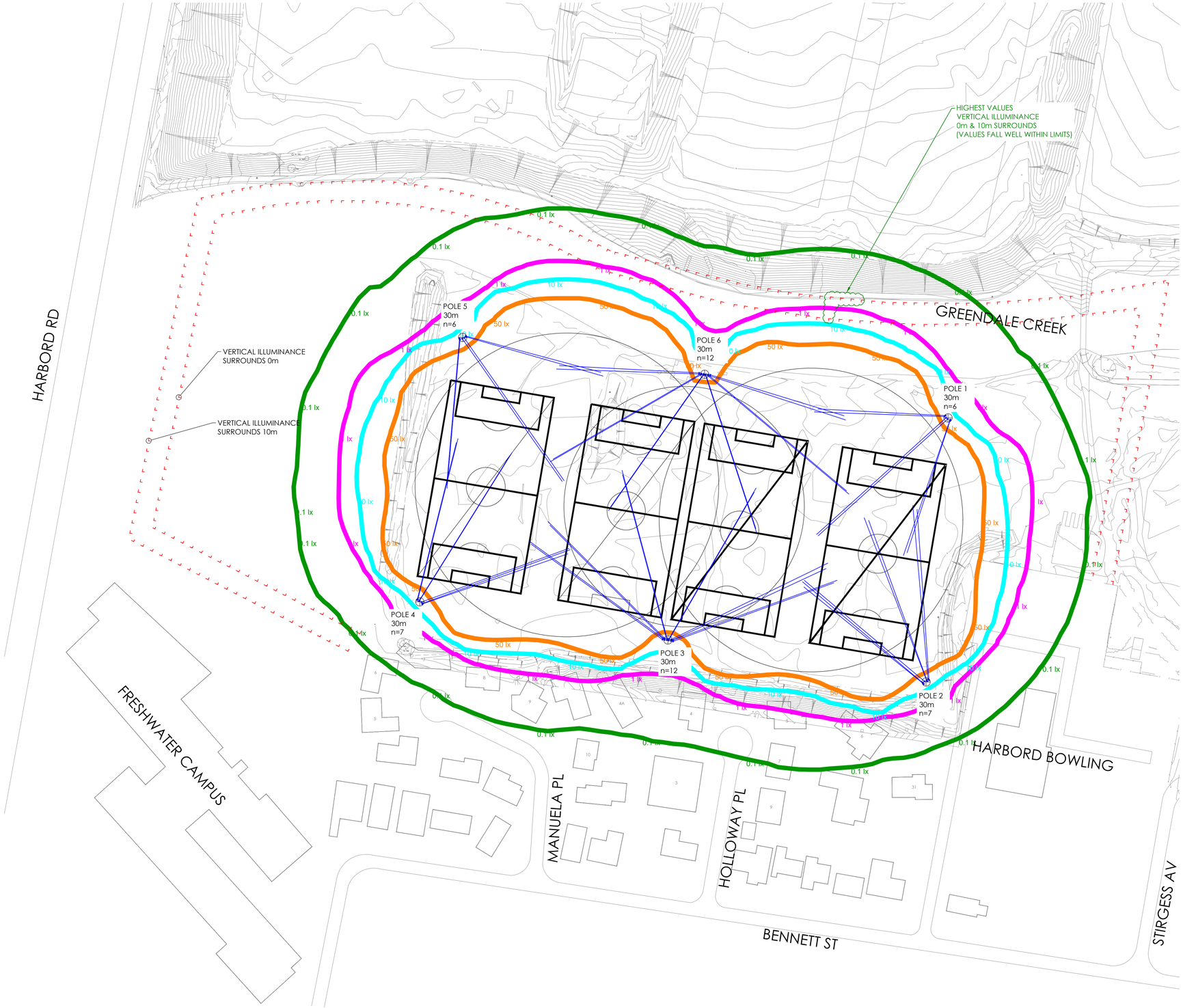

Luminaire Schedule				
Scene: Initial				
Symbol	Label	Qty	Description	Total Lamp Lumens
	BVP527 OUT T30 50K A35-NB +LO	50	Apex OptiVision LED Gen3 3 module 5700 K	212481

Luminaire Location Summary 1				
Project: Pole 1				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
1	BVP527 OUT T30 50K A35-NB +LO	29.7	64	1.00
2	BVP527 OUT T30 50K A35-NB +LO	30.25	64	1.00
3	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
4	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
5	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00
6	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00

Luminaire Location Summary 2				
Project: Pole 2				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
7	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
8	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
9	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
10	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
11	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
12	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
13	BVP527 OUT T30 50K A35-NB +LO	29.7	68	1.00

Luminaire Location Summary 3				
Project: Pole 3				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
14	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
15	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
16	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
17	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
18	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
19	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
20	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
21	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
22	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
23	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
24	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
25	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00

Luminaire Location Summary 4				
Project: Pole 4				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
26	BVP527 OUT T30 50K A35-NB +LO	29.7	68	1.00
27	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
28	BVP527 OUT T30 50K A35-NB +LO	30.25	68	1.00
29	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
30	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
31	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
32	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00

Luminaire Location Summary 5				
Project: Pole 5				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
33	BVP527 OUT T30 50K A35-NB +LO	30.25	67	1.00
34	BVP527 OUT T30 50K A35-NB +LO	29.7	67	1.00
35	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
36	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
37	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00
38	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00

Luminaire Location Summary 6				
Project: Pole 6				
Scene: Initial				
LumNo	Label	Z	Tilt	LLF
39	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00
40	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00
41	BVP527 OUT T30 50K A35-NB +LO	30.25	70	1.00
42	BVP527 OUT T30 50K A35-NB +LO	29.7	70	1.00
43	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
44	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
45	BVP527 OUT T30 50K A35-NB +LO	30.25	69	1.00
46	BVP527 OUT T30 50K A35-NB +LO	29.7	69	1.00
47	BVP527 OUT T30 50K A35-NB +LO	29.7	71	1.00
48	BVP527 OUT T30 50K A35-NB +LO	30.25	71	1.00
49	BVP527 OUT T30 50K A35-NB +LO	29.7	66	1.00
50	BVP527 OUT T30 50K A35-NB +LO	30.25	66	1.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A3 - Medium District Brightness, Non-Curfew L1
Filename: 18076-07-A John Fisher Park_LA+S
31/10/2019 9:38:50 AM

Illuminance

Maximum Allowable Value: 10 Lux

Calculations Tested (35):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg1	PASS	0.3
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg2	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg3	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg4	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg5	PASS	0.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg6	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg7	PASS	0.3
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg8	PASS	0.4
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg9	PASS	0.6
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg10	PASS	1.7
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg11	PASS	2.0
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg12	PASS	2.9
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg13	PASS	3.1
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg14	PASS	0.9
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg15	PASS	0.2
ObtrusiveLight_Site_Surrounds_0m_Ill_Seg16	PASS	0.4
ObtrusiveLight_Site_Surrounds_10_Ill_Seg1	PASS	0.2
ObtrusiveLight_Site_Surrounds_10_Ill_Seg2	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg3	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg4	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg5	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg6	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg7	PASS	0.2
ObtrusiveLight_Site_Surrounds_10_Ill_Seg8	PASS	0.2
ObtrusiveLight_Site_Surrounds_10_Ill_Seg9	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg10	PASS	0.5
ObtrusiveLight_Site_Surrounds_10_Ill_Seg11	PASS	0.8
ObtrusiveLight_Site_Surrounds_10_Ill_Seg12	PASS	0.9
ObtrusiveLight_Site_Surrounds_10_Ill_Seg13	PASS	0.8
ObtrusiveLight_Site_Surrounds_10_Ill_Seg14	PASS	1.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg15	PASS	1.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg16	PASS	0.8
ObtrusiveLight_Site_Surrounds_10_Ill_Seg17	PASS	0.3
ObtrusiveLight_Site_Surrounds_10_Ill_Seg18	PASS	0.1
ObtrusiveLight_Site_Surrounds_10_Ill_Seg19	PASS	0.3

Issue	Amendment	Date
P1	PRELIMINARY ISSUE	25-09-19
P2	PRELIMINARY ISSUE	01-11-19

N

0 10 20 30 40 50 100m

1:1000@A1

Notes:
1. Vertical Illuminance calculation grid heights: 1.5 - 30m.
2. A light loss factor of 1.0 is used to show initial light values.
3. Floodlight reference tilt is noted as 'tilt'. Substract 30° from tilt value to get the tilt of the visor.

Lead Consultant
BBF TOWN PLANNERS

Client
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Project NBC SPORTSFIELDS
JOHN FISHER PARK, MANLY VALE

Drawing OBTRUSIVE LIGHTING ASSESSMENT
SURROUNDS CALCULATIONS

Drawn CVZ Approv. RM Date SEP 2019 Scale 1:1000@A1

Project No L160P Drawing No CL-03 SUR Rev P2

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