



DOCUMENT: REPORT ON A NEW SPORTS LIGHTING INSTALLATION FOR GARDENS OVAL No.1

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Project Location: GARDENS OVAL No.1

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## 1.0 EXECUTIVE SUMMARY

A sports flood lighting installation to achieve a maintained horizontal illuminance of 600 Lux at the wicket and a maintained horizontal illuminance of 300 Lux for the entire oval can be achieved whilst complying with the requirements of Australian Standard for the Control of the Obtrusive Effects of Outdoor Lighting, AS4282 at Gardens Oval No.1

The recommended system is based on a four-pole scheme utilising metal halide luminaires with remote control gear trays to be housed in an enclosure at the base of each light pole.

## 2.0 BACKGROUND

NTBS Consulting Engineers Pty Ltd were engaged by AFLNT and NT Cricket to:

- Undertake a preliminary sports lighting design for Gardens Oval No.1
- Provide a report outlining the design principles and results
- Provide a brief description of the system and the works that would be required to be undertaken to achieve recommended lux levels at the playing surface for Australian Rules Football and Cricket, and
- Ultimately determine if the proposed installation would comply with the relevant Australian Standards.

## 3.0 STAKEHOLDERS

The following key stakeholders have been involved in the preliminary design process:

- City of Darwin Council
- AFLNT
- NT Cricket
- True North Strategic Communication

## 4.0 REFERENCE DOCUMENTATION & APPLICABLE STANDARDS

The following documentation has been used as a reference during the preliminary design process:

- AS/NZS 3000:2007 Electrical Installations – Wiring Rules
- AS/NZS 3008:2017 Electrical Installations – Selection of Cables
- AS 2560.1 Sports Lighting – General Principles
- AS2560.2.3 Sports Lighting – Lighting for Football
- AS 4282 – Control of The Obtrusive Effects of Outdoor Lighting
- Community Cricket Facility Guidelines – Guidance Note 4 – Floodlighting

## 5.0 DEFINITIONS

Luminous Flux: The measure of the quantity of light.

Lumen: The derived unit of luminous flux.

Illuminance: the luminous flux arriving at a surface divided by the area of the illuminated surface

Average Horizontal Illuminance: The arithmetic mean of the horizontal illuminance values determined for all of the points in either the calculation or measurement grid as applicable to the method of determination.

Lux: The SI (international system of units) unit of illuminance. (1 lux = 1 lumen/sq.m)

Luminaire: Equipment which houses the lamp and directs the light in desired directions. It includes items necessary for fixing, protecting and operating the lamp (i.e. the light fitting).

## 6.0 DESIGN CRITERIA

The following design criteria were established prior to commencing the preliminary sports lighting design:

- An average horizontal illuminance of 600 Lux at the square for cricket (client requirement)
- An average horizontal illuminance of 300 Lux for football (client requirement)
- A minimum horizontal uniformity of 0.7 (ratio between minimum and average illuminance)
- A minimum horizontal uniformity of 0.5 (ratio between minimum and maximum illuminance)
- A maximum allowable lux level on the vertical plane at the boundary of nearby residential buildings of 10 Lux

Refer to Attachment A, extract from AS 2560.2.3 which outlines Lighting Criteria for the various levels of football.

Refer to Attachment B, extract from Community Cricket Facility Guidelines for the various levels of cricket.

Refer to Attachment C, extract from AS 4282 – Control of The Obtrusive Effects of Outdoor Lighting for details pertaining to allowable lux levels at residential boundaries.

## 7.0 OVERVIEW OF DESIGN PROCEDURES AND OUTCOMES

***Note: The design outcomes stated in this report are estimates only based on a preliminary and non-exhaustive sports lighting design and are not to be used for tender or construction purposes.***

### Light Poles

A site inspection was carried out on the 10<sup>th</sup> of April 2017. It was determined that a four-pole scheme would be best suited to the oval due to the position of existing major features such as the grandstand, clubhouse and trees.

The mounting height of the proposed floodlight installation was calculated utilising the four-pole scheme as outlined in Australian Standards AS 2560.2.3 – Sports Lighting – Lighting for Football and also complies with Community Cricket Facility Guidelines – Guidance Note 4 – Floodlighting

The poles are required to be 32metres in height, shall be fabricated from steel and have a bored pier footing or similar. Careful consideration needs to be given to the final and exact location of each light pole during the detailed design and construction process with respect to existing features, structures and concealed services.

### Luminaires

The four-pole sports floodlighting system has been modelled on a professional lighting design software. The proposed luminaires are Thorn Champion 2000W Metal Halide Asymmetrical Floodlights complete with glare shields and rear visors. From the model, we have been able to determine the approximate number of luminaires required to meet the design criteria. Table 1 outlines the number of luminaires required to achieve the illuminance levels for various levels of play.

**Table 1**

Code	Level of Play	Average Horizontal Illuminance	No. of Luminaires
Football	Amateur/Semi Pro Training	50 Lux	16
	Amateur Club Competition	100 Lux	24
	Semi Professional Competition	300 Lux	60
	Professional Competition	500 Lux	72
Cricket	Non-body Contact Training	100 Lux	24
	Match Practice	300 Lux	60
	Non-televised Matches (Class 2)	600 Lux	80

**Control of Glare and the Obtrusive Effects of Light**

The proposed design has taken into account the effects of glare on both the players, spectators and residents in the surrounding area. The installation height of the luminaires has been calculated such that they comply with the parameters of glare as stated in Australian Standards AS 2560.2.3 – Sports Lighting – Lighting for Football.

The installation as a whole has been designed to comply with Australian Standards AS 4282 – Control of the Obtrusive Effects of Outdoor Lighting. Further consideration should be given to obtrusive light effects during the detailed design and construction process.

The proposed light fittings are supplied with a glare shield to prevent any unwanted light spill to the surrounding area. The lighting manufacturer has provided a secondary calculation to verify that the installation will comply with the requirements of AS 4282 – Control of the Obtrusive Effects of Outdoor Lighting, Refer to Attachment E for details.

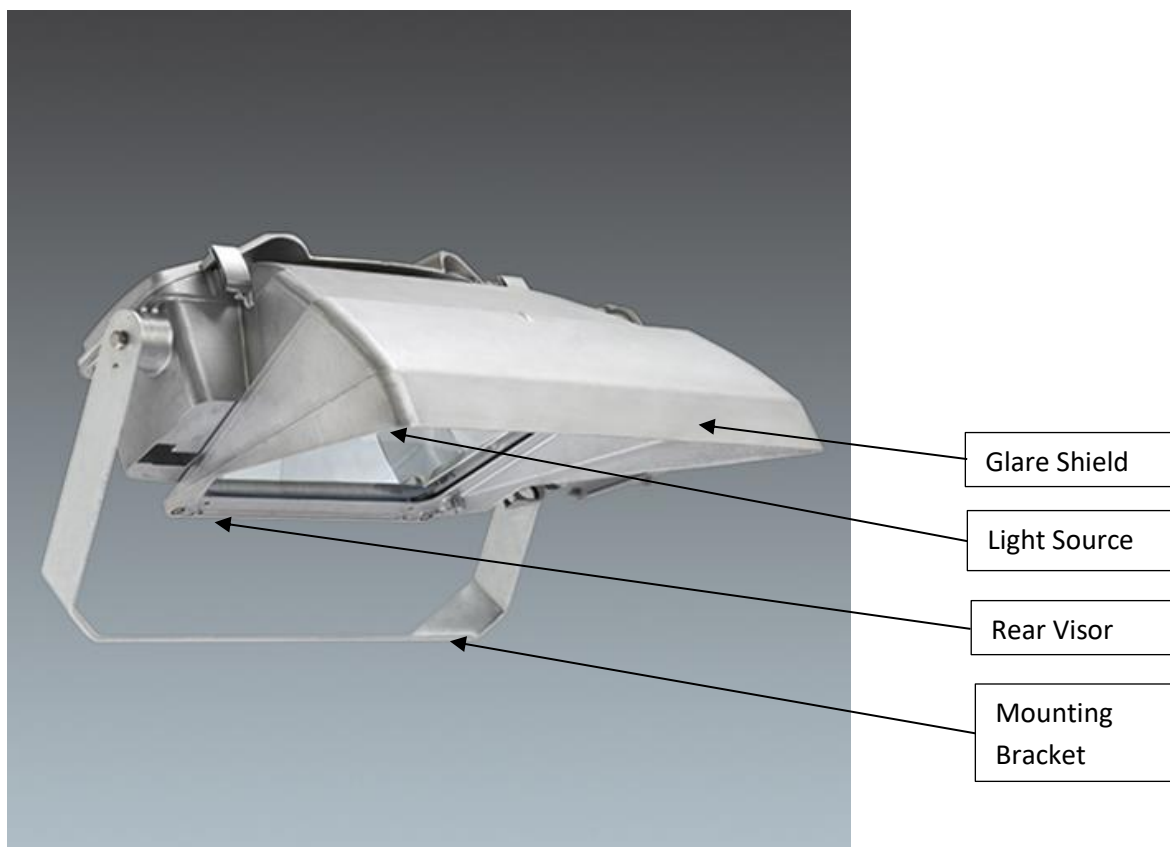


Image 1 – Thorn Champion 2000W Metal Halide Luminaire

The following images are simulated renders from the lighting design software.

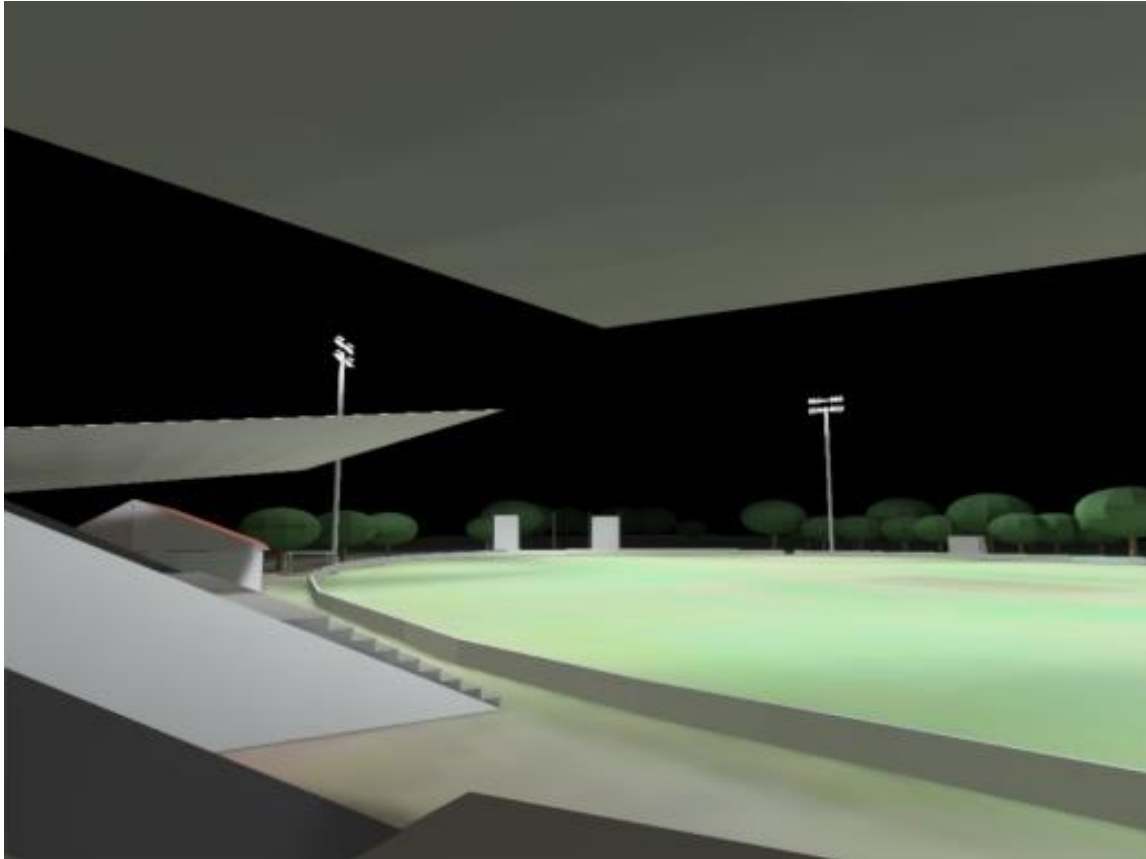


Image 2 – View from Tiger Brennan Stand towards Skycity End Goal Posts (600 Lux)

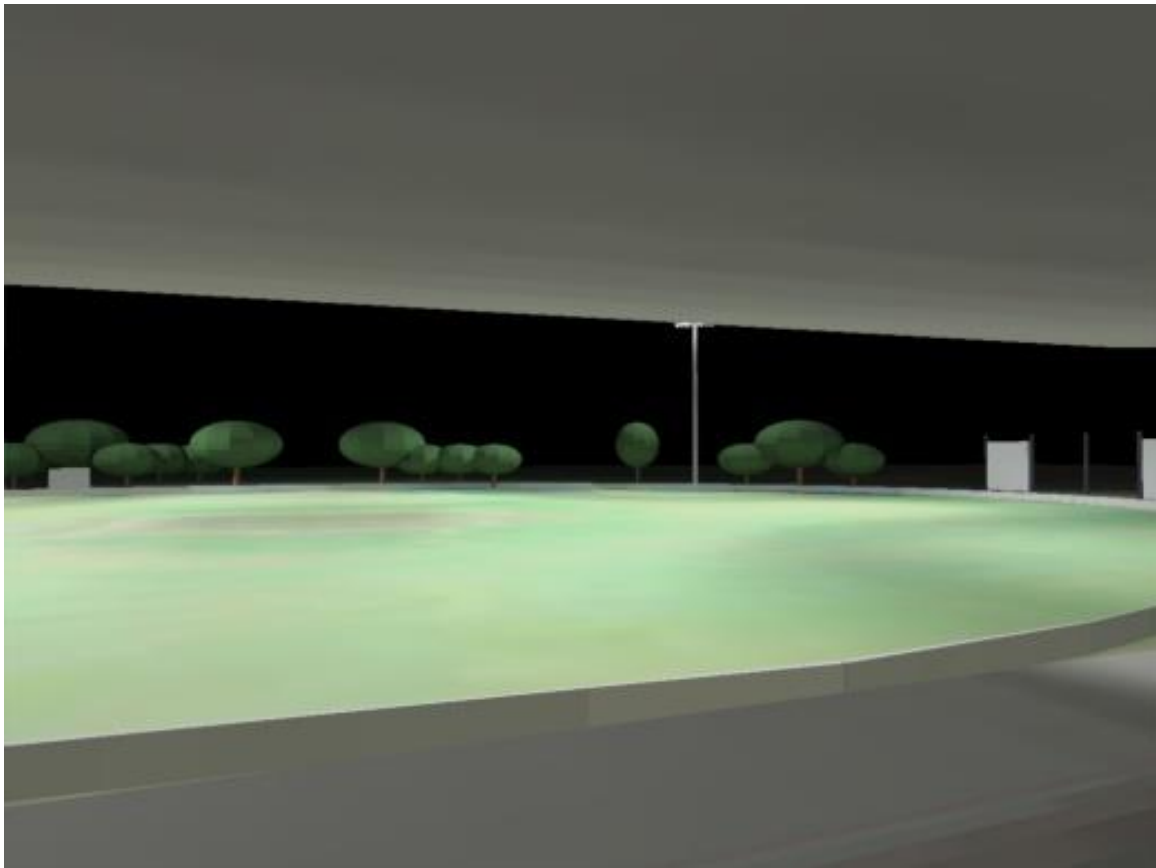


Image 3 – View from Tiger Brennan Stand towards CBD End Goal Posts (600 Lux)

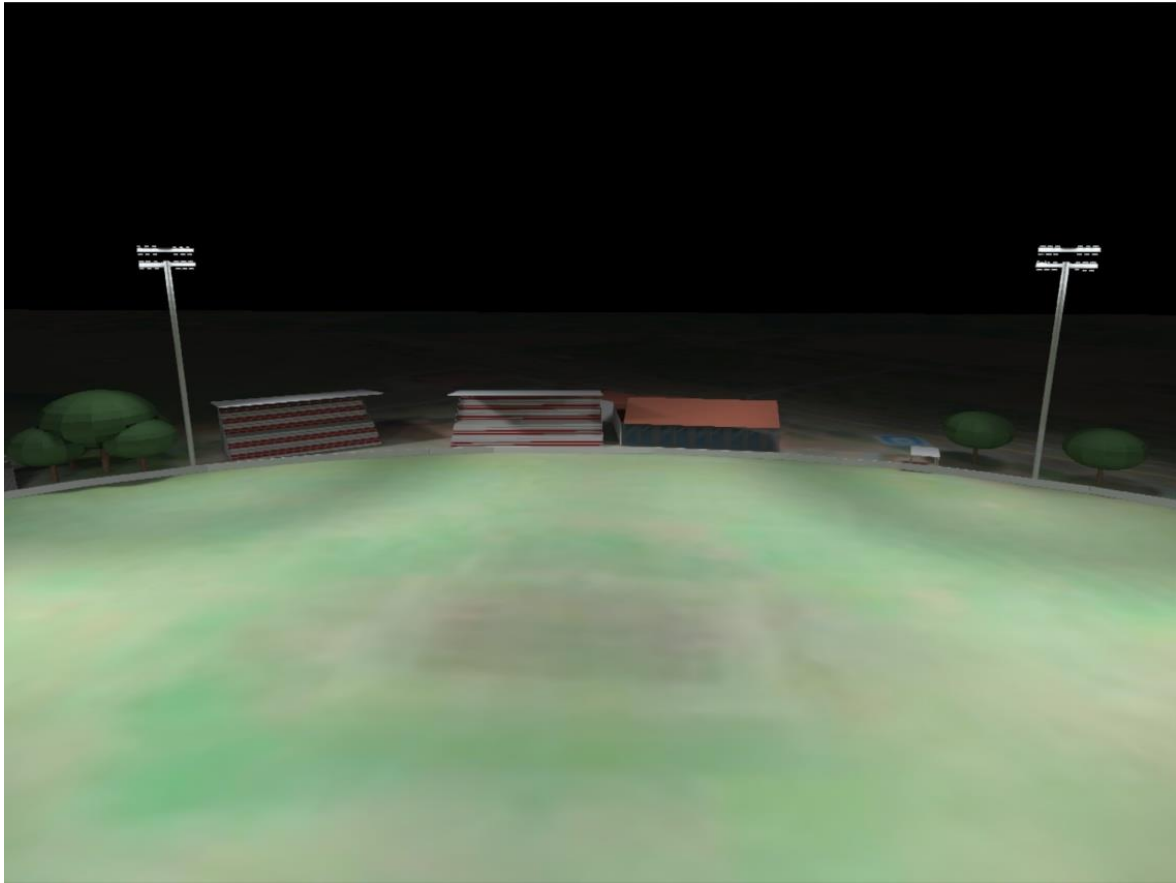


Image 4 – Aerial View from Gardens Road Side of Oval No.1 (600 Lux)

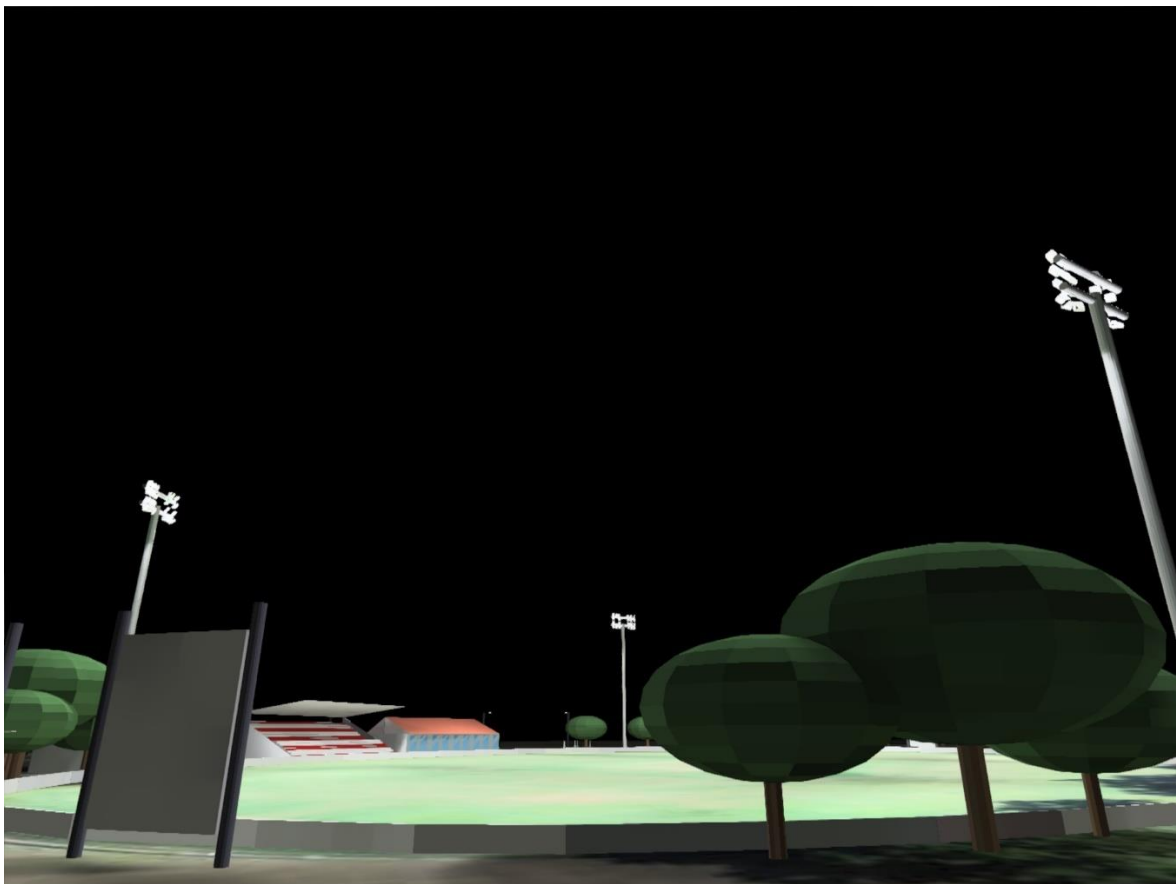


Image 5 – View of Oval No.1 from Gardens Road (600 Lux)





Image 6 – View of Oval No.1 from (approximate) Junction of Gilruth Avenue and Gardens Road

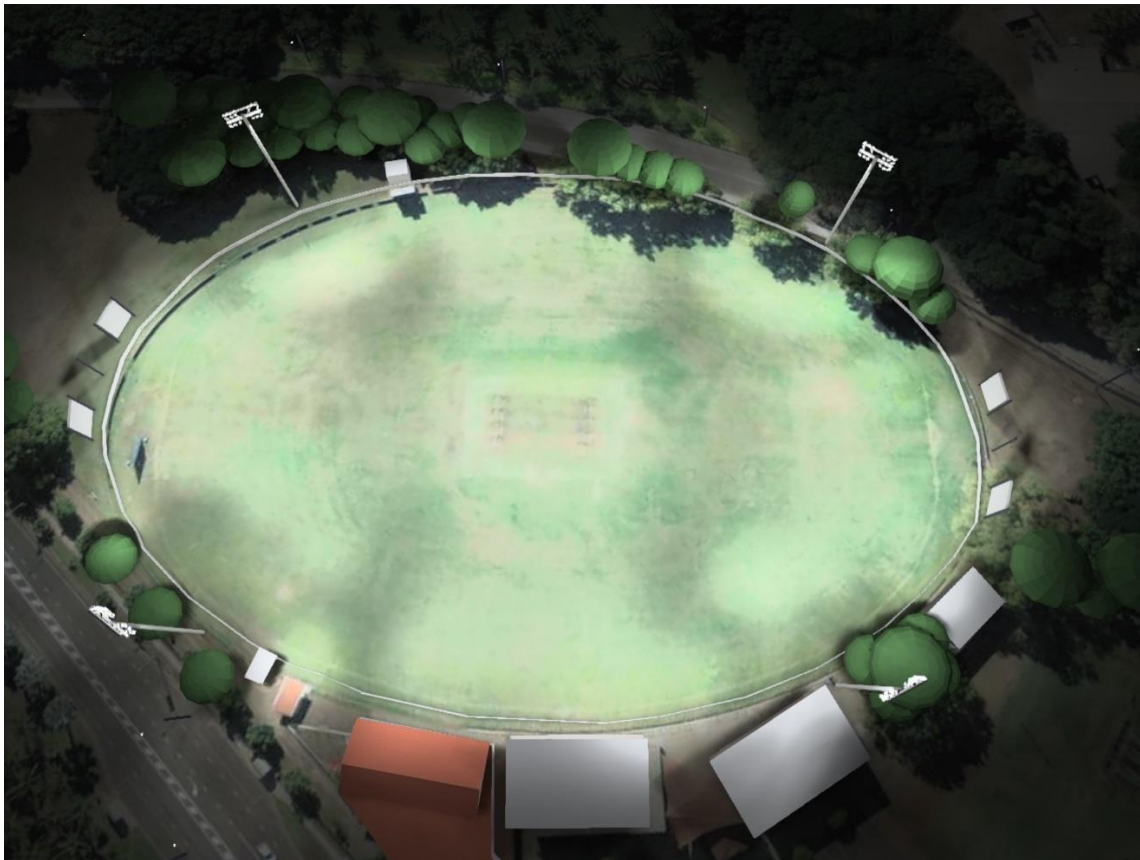


Image 7 – Aerial View



## 8.0 EXISTING OUTDOOR LIGHTING WITHIN THE VICINITY

A survey of the existing outdoor lighting installations in the vicinity of Gardens Oval was undertaken at 9pm on 10<sup>th</sup> of May 2017. Lux levels were recorded from the existing installations at ground level. The following table outlines the current lux levels.

**Table 2**

Location	Average Horizontal Illuminance
Gardens Road	8 Lux
Gilruth Avenue	12 Lux
Chin Quan Road	8 Lux
Gardens Tennis Courts	160 Lux

The recorded existing lux levels were modelled with the proposed sports lighting system to provide an indication of the overall view and impact the sports lighting system will have on the area.

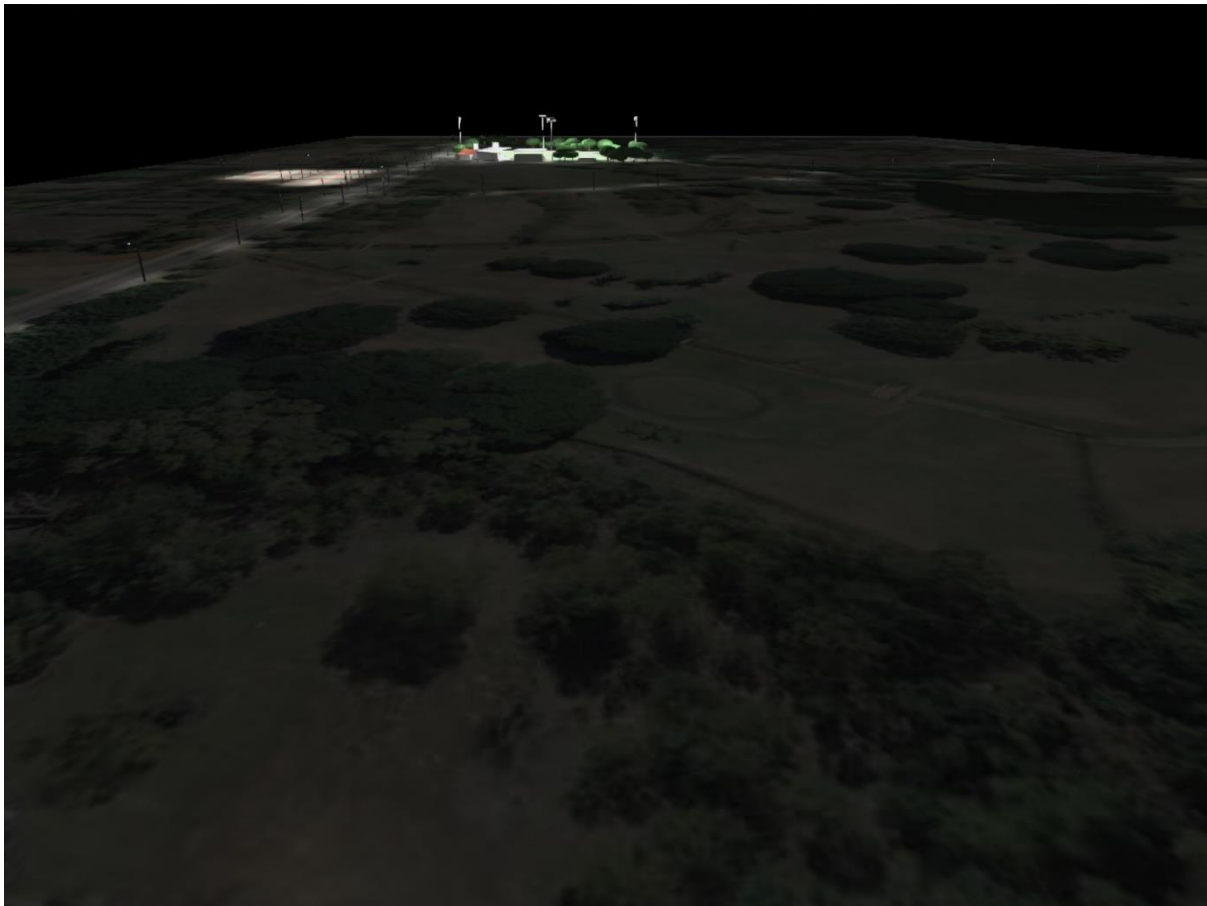


Image 8 – View of Existing and Proposed Lighting Systems from (approximate) Smith Street (600 Lux)

Refer also to the artists impressions and Luminaire manufacturers calculations in the attachments section for further images.

## 9.0 HOURS OF OPERATION

AFLNT and NT Cricket have given preliminary advice regarding the frequency and duration the sports lighting system would potentially be used for a typical week as follows:

**Table 3**

**AFL – Hours of Operation (Wet Season)**

	Day						
	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
	6pm to 9pm	6pm to 9pm	6pm to 9pm	6pm to 9pm	6pm to 9pm	6pm to 9pm	Not in Use
Lux Level	100 Lux (training)	100 Lux (training)	100 Lux (training)	100 Lux (training)	100 Lux (training)	300 Lux (match)	0 Lux

**Table 4**

**Cricket – Hours of Operation (Dry Season)**

	Day						
	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
	6pm to 9pm	6pm to 9pm	6pm to 9pm	6pm to 9pm	6pm to 9pm	Not in Use	Not in Use
Lux Level	100 Lux (training)	100 Lux (training)	100 Lux (training)	100 Lux (training)	600 Lux (match)	0 Lux	0 Lux

A basic lighting control system would be installed near the clubhouse to enable the new sports lights to be switched to the lux levels for the particular event being undertaken.

A minimum of 3No. switching arrangements is recommended as follows:

- 100lux for AFL amateur club competition.
- 300lux for AFL semi-professional competition.
- 600lux for regional and local level cricket competition.

## 10.0 COST ESTIMATION

A budget cost estimate has been carried out for the proposed lighting installation, the estimated cost of works is \$1,200,000 + GST.

The following items were included in the budget cost estimate;

Light fittings, Lighting Towers, Submains Cabling, Trenching, Structural Footings, Switchboards, Lighting Controls and Labour.

## 11.0 ATTACHMENTS

- 11.1 Attachment A – extract from AS 2560.2.3
- 11.2 Attachment B – extract from Community Cricket Facility Guidelines
- 11.3 Attachment C – extract from AS 4282 – Control of The Obtrusive Effects of Outdoor Lighting
- 11.4 Attachment D – Site Plan
- 11.5 Attachment E – Thorn Lighting Design and Calculation of the Effects of Obtrusive Light
- 11.6 Attachment F – Luminaire Technical Data Sheet
- 11.7 Attachment G – Light Pole 3D Model
- 11.8 Attachment H – Artists Impression Day time
- 11.9 Attachment J – Artists Impression Night time