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Frank Gray and Mike Pawley Ovals Lighting

Review of Environmental Factors

Draft Report

Prepared for Northern Beaches Council

22 January 2026

Biosis offices

New South Wales

Albury
Phone: (02) 6069 9200
Email: albury@biosis.com.au

Gosford
Phone: (02) 9101 8700
Email: gosford@biosis.com.au

Newcastle
Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Western Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Wollongong
Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

Victoria

Ballarat
Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

Melbourne
Phone: (03) 8686 4800
Email: melbourne@biosis.com.au

Wangaratta
Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

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Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work.

We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.

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1.1.1.1.2 Figures

Definitions

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BC Act	*Biodiversity Conservation Act 2016*
BCS	NSW Biodiversity Conservation and Science
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
CEMP	Construction Environmental Management Plan
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPHI	Department of Planning, Housing and Infrastructure
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021*
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FFA	Flora and Fauna Assessment
FM Act	*Fisheries Management Act 1994*
Impact area	Area shown on Figure 2 and the proposed impact area within the project area.
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
PCT	Plant Community Type
Project area	Area shown on Figure 1 and described in this REF
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SIC	Significant Impact Criteria
TEC	Threatened Ecological Communities
ToS	Test of Significance

WM Act	*Water Management Act 2000*

2 Introduction

2.1 Project overview

Biosis Pty Ltd was commissioned by Northern Beaches Council to prepare a Review of Environmental Factors (REF) for the proposed Frank Gray and Mike Pawley Ovals Lighting (the project).

Biosis understands that Council is proposing to install a new sportsground lighting system for the sports fields at Frank Gray and Mike Pawley Ovals. Additionally, a new shared path connection and associated pedestrian lighting are proposed between the Freshwater Campus carpark on Harbour Road to the new amenities building which will be located adjacent to the ovals. The study area comprises Frank Gray Oval and Mike Pawley Oval, a small portion in the northern section of Freshwater Campus school grounds and associated carpark, as well as the surrounding vegetation and Greendale Creek, which is located to the north of the sports fields. While the project design is yet to be finalised, the oval lighting is expected to comprise the installation of either seven or nine new lighting poles. Each pole will include a concrete footing, steel pole and Sylvania RAPTOR GEN 4 floodlight luminaires mounted at a height of approximately 28–32 metres (with four to five floodlights per pole). The poles will be positioned outside the boundaries of the cricket fields and will provide individually switched lighting for each oval. It is understood that trenching will be required for the installation of the electrical wiring and a construction compound will be established in the northeastern section of the project area as part of the proposed works. The lighting along the pathway will be a warm 2,700K and will incorporate light dimming to reduce brightness in times when pedestrian activity has reduced.

For the purposes of this assessment, Biosis have assumed that the oval lighting will comprise nine new poles as a worst-case scenario, and a 10-metre corridor around the perimeter for the ovals will be required to accommodate trenching, as well as an additional area to the north and north east to incorporate the amenities building and the proposed construction compound (the impact area).

A lighting assessment has been undertaken for the project and has been confirmed as compliant in accordance with the Australian Standard for Obtrusive Lights Evaluation.

The project is located:

- In the Northern Beaches Local Government Area.
- In the suburb of North Curl Curl, NSW, approximately 3 kilometres north of Manly.
- Directly south of Greendale Creek. Curl Curl Lagoon is located approximately 500 metres east and Curl Curl Beach is located approximately 1 kilometre east of the project area.
- Approximately 250 south of Abbott Road, 150 metres east of Harbord Road and 200 metres north of Brighton Street.
- In the Public Recreation (RE1) zone under the *Warringah Local Environmental Plan 2011*.

The locality of the project is shown in Figure 1.

The project area and proposed impact area is shown in Figure 2.

2.2 Regulatory framework and permissibility

Northern Beaches Council is both a public authority proponent and the determining authority (EP&A Act s. 5.1). Accordingly, the project is subject to Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Determining authorities have a duty to consider all matters affecting or likely to affect the environment by reason of that activity.

This REF has been developed to address the requirements at Part 5 of the EP&A Act and has been prepared in accordance with section 171 of the *Environmental Planning and Assessment Regulations 2021* (EP&A Regulations).

The project is permissible under the relevant legislation. The legal permissibility of the project is discussed in Section 5.1of this report.

2.2.1 Assessments and outcomes

The following assessments have been prepared to support this REF:

- An FFA that addresses Commonwealth and State biodiversity legislation.

Northern Beaches Council prepared a Development Application for lighting installation at these ovals in 2020. As part of the DA preparation, the following assessments were undertaken:

- Preliminary Site Investigation.
- Acid Sulfate Soil Assessment.
- Flora and Fauna Report.
- Obtrusive Lighting Assessment.
- Statement of Environmental Effects.

2.2.2 Outcomes of assessment

Plant Community Type (PCT) 4028 Estuarine Swamp Oak Twig-rush Forest and PCT 3969 Estuarine Reedland were recorded within the project area. Although some native vegetation corresponds to the TEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions,* the condition and floristic composition do not meet the listing criteria for the corresponding Endangered Ecological Community (EEC) under the EPBC Act.

No threatened flora species listed under the EPBC Act or BC Act were recorded during field surveys. Two threatened fauna species listed under the EPBC and eight threatened species listed under the BC Act were determined to have a moderate to high likelihood of occurrence within the project area including:

- Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (Vulnerable, BC Act)
- Greater Borad-nosed Bat *Scoteanax rueppelli*i (Vulnerable, BC Act)
- Grey-headed Flying Fox *Pteropus poliocephalus* (Vulnerable EPBC Act and BC Act)
- Large Bent-winged Bat *Miniopterus orianae orianae* (Vulnerable, BC Act)
- Large-eared Pied Bat *Chalinolobus dwyeri* (Endangered, EPBC Act and BC Act)
- Little Bent-wing Bat *Miniopterus australis* (Vulnerable, BC Act)

- Southern Myotis *Myotis macropus* (Vulnerable, BC Act)
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act)

Test of Significance (ToS) and Species Impact Criteria (SICs) assessments were carried out for these species due to potential impacts on foraging resources as a result of the proposed works. These assessments concluded that the proposal is unlikely to have a significant impact on these EPBC Act and/or BC Act listed fauna species.

Greendale Creek, a Strahler order 1 system, was recorded within the project area. This watercourse and associated riparian vegetation will not be directly impacted by the proposed works for the project.

The proposed works will not result in a significant effect on threatened species, populations or communities listed under the EPBC Act or BC Act. As such, consideration of the Biodiversity Offset Scheme (BOS) is not warranted and a Biodiversity Development Assessment Report (BDAR) is not required. A referral to the Commonwealth Minister for the Environment and Water is also not required.

2.3 Purpose of this Report

This REF assesses the likely environmental impacts of the project under the matters of consideration within Part 5, Division 5.1 of the EP&A Act.

Section 5.5 Duty to Consider Environmental Impact

1. *For the purpose of attaining the objects of this Act relating to the protection and enhancement of the environment, a determining authority in its consideration of an activity shall, notwithstanding any other provisions of this Act or the provisions of any other Act or of any instrument made under this or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.*
2. *(Repealed)*
3. *Without limiting subsection (1), a determining authority shall consider the effect of an activity on any wilderness area (within the meaning of the Wilderness Act 1987) in the locality in which the activity is intended to be carried on.*

The purpose of this REF is to assess the potential environmental impacts of the proposed lighting installation, which is prescribed by T&I SEPP as "development without consent" under Part 5, Division 5.1 of the EP&A Act, and to detail the management and mitigation management measures that are to be implemented.

Northern Beaches Council is the proponent and determining authority. This REF has been prepared in accordance with the requirements of all relevant NSW and Commonwealth legislation including the Guidelines for Division 5.1 assessments (DPHI 2022) (Division 5.1 Guidelines), issued pursuant to clause 170(1) of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

Summary of recommendations

The proposed works are not likely to have a significant impact on any facet of the environment, as long as the mitigation measures provided in Sections 7 and 8 are implemented.

An Environmental Impact Statement (EIS) is not required.

3 Description of activity

3.1 Project locality

The project is proposed at Frank Gray and Mike Pawley Ovals, located in North Curl Curl, NSW.

The locality of the project is shown in Figure 1.

The project area and proposed impact area is shown in Figure 2. The project area and surrounding lands are predominantly used for residential and recreational land uses.

The relevant attributes and regulatory controls for the impact area are summarised in Table 1.

Table 1 Site details

Site location and address	Mike Pawley Oval: Stirgess Avenue, North Curl Curl NSW 2096 Frank Gray Oval: 1 Abbott Road, North Curl Curl NSW 2096
Local Government Area (LGA)	Northern Beaches
Lot Deposited Plan (DP)	2DP225041 224DP752038 230DP752038 2DP539226
Land Zoning	Public Recreation RE1
Land Tenure	Public land
Land-use	Public oval
Water Catchment	Sydney Northern Beaches catchment area
Nearest waterway	Greendale Creek
IBRA Bioregion	Sydney Basin IBRA bioregion and Sydney Basin IBRA subregion

3.2 Proponent details

The key information about the proponent is set out in Table 2.

Table 2 Project details

Proponent name	Northern Beaches Council
Proponent's representative	Cameron Henry Park Assets – Planning, Design & Delivery
Proponent representative contact details	02 8495 5212 council@northernbeaches.nsw.gov.au

3.3 Proposed activity

The following activities are proposed as part of the project:

- Pre-construction:
  - Establishment of work area as defined by the impact area in Figure 2.
  - Installation of environmental protection measures i.e. erosion and sediment control measures.
  - Delivery of materials and equipment to designated laydown areas.
- Construction:
  - Establish access routes for machinery and vehicles.
  - Installation of screw piles for pole footings.
  - Trenching along oval perimeter for installation of underground electrical wiring.
  - Backfilling of trenches with excavated material.
  - Removal of unsuitable spoil for disposal at licensed facility.
  - Securing of lighting poles to footing bases and mounting of LEDs and fittings.
- Post-construction:
  - Removal of temporary infrastructure.
  - Reinstatement of disturbed areas.
  - Removal of all waste and surplus material.
- Equipment/plant proposed to be used during the works will include the following:
  - Trenching equipment.
  - Backhoe and/or excavator.
  - Franna crane or similar.
  - Light and/or medium rigid dump trucks.
  - Concrete agitator.
  - Light vehicles.

The lighting poles, trenching for electrical wiring, and construction compound area/s will be contained within the impact area as defined in Figure 2.

3.4 Project timeframes and working hours

The key project timeframes are summarised in Table 3.

Table 3 Project timeframes and working hours

Project feature	Details
Construction commencement	August 2026
Construction duration	Approximately two months.
Proposed working hours	Work hours are in accordance with the standard work hours described in the Interim Construction Noise Guideline (ICNG) (DECC 2009): • Monday to Friday 7.00 am to 6.00 pm • Saturday 8.00 am to 1.00 pm • No work on Sunday or public holidays

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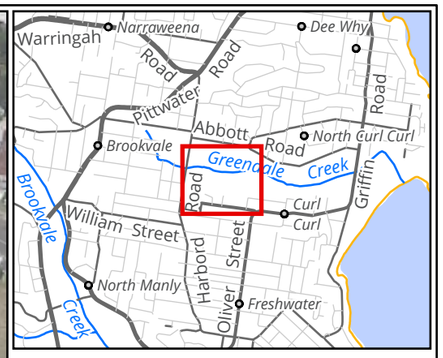
Figure 1 Location of the study area

Matter: 43625, Date: 20 January 2026,
Prepared for: JG, Prepared by: HL., Last edited by: jbeckius
Location: P:\43600s\43625\Mapping\
43625_PawleyOvals_LightingREF
Layout: 43625_F1_Locality

0 200 400 600 800 1,000
Metres
Scale 1:25,000@ A4, GDA2020 MGA Zone 56

N



Legend

- Project area
- Impact area

Figure 2 Impact area

0 20 40 60 80

Metres

Scale: 1:2,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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Matter: 43625, Date: 20 January 2026
Prepared by HL, Prepared for CHK, Last edited by: jbeckius
Location: P:\43600s\43625\Mapping\43625_PawleyOvals_LightingREF.aprx
Layout: 43625_REF_F2_ImpactArea

4 Reason for the activity

4.1 Project objectives

The purpose of the project is to enhance the use and availability of the Mike Pawley and Frank Gray Ovals to better meet the demand for recreational and sport field spaces in the North Curl Curl and the Northern Beaches LGA. The Northern Beaches Council's *Sportsground Strategic Directions Analysis* (Otrium Planning Group Pty Ltd 2017) identified a shortage of sports fields in the Northern Beaches LGA.

The project aligns with Action 1 of the Strategy, that is to *make better use of existing sportsgrounds to increase availability and resilience, including; irrigation, drainage, lighting, reconfiguration and re-allocation of fields.* The project will enhance the Mike Pawley and Frank Gray Ovals' recreational capacity by extending the hours of use and reducing the training load on the nearby Weldon Oval.

4.2 Options and alternatives

Northern Beaches Council has reviewed several project alternatives, including a do-nothing option.

Several approaches are explored in the *Sportsground Strategic Directions Analysis* including acquiring new land, converting open space or golf course land to sports fields, constructing synthetic surfaces, or undertaking no further assessment i.e. a 'do-nothing' scenario.

The do-nothing option would perpetuate the existing shortage of training capacity and continue to place pressure on grassed fields that are already overused, leading to declining quality and reduced availability.

Alternative approaches such as the development of new fields, would involve substantial land acquisition and disturbance, which is inconsistent with the John Fisher Park Plan of Management (Warringah Council 2001) principles that prioritise the sustainable enhancement of existing recreation areas.

Upgrading existing ovals with lighting therefore represents the most practical option with minimal intervention. It optimises existing assets, minimises environmental impacts, and aligns with Council's sustainability objectives.

5 Legislative context

This chapter provides an overview of key environmental legislation and government policy considered in this assessment.

5.1 Legal permissibility

The proposed activity is subject to Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Northern Beaches Council is both a public authority proponent and the determining authority (EP&A Act s. 5.1).

Under section 5.5 of the EP&A Act, determining authorities have a duty to consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. This REF has been developed to address the requirements of Part 5 of the EP&A Act and has been prepared in accordance with section 171 of the *Environmental Planning and Assessment Regulations 2021* (EP&A Regulations).

The activity has been assessed and is permissible under the relevant legislation listed below.

5.2 NSW legislative context

5.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act and EP&A Regulations were enacted to encourage the proper consideration and management of impacts of proposed development or land-use changes on the environment (both natural and built) and the community.

The EP&A Act provides the overarching structure for planning in NSW and is supported by the EP&A Regulations and other statutory environmental planning instruments (EPIs), such as State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs).

Legal permissibility

Pursuant to the *State Environmental Planning Policy (Transport and Infrastructure) 2021,* the activity is "Permitted Without Consent" (Div. 12, Section 2.73 of the EP&A Act 1979). The activity is instead captured under Part 5 of the Act, which relates to works prescribed by an environmental planning instrument as 'development without consent' when carried out by or on behalf of a public authority.

Council is a public authority constituted by or under an Act and so a "public authority" as defined in section 1.4 of the EP&A Act. Council is both the proponent and determining authority for the activity for the purposes of Division 5.1 of the EP&A Act. The activity has been assessed in accordance with sections 5.5, 5.6 and 5.7 of that Act by examining and taking into account to the fullest extent possible all matters which are likely to affect the environment. This REF concludes that the proposed activity is unlikely to have a significant impact on the environment.

Environmental Planning and Assessment Regulation 2021 (NSW)

Section 171(1) of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) requires the determining authority to take into account the environmental factors specified in the Division 5.1 Guidelines.

When considering the likely impact of an activity on the environment, the Division 5.1 Guidelines require the proponent and determining authority to take into account the factors outlined in Table 1 in section 3 of the Division 5.1 Guidelines. These are addressed in Section 7 of the REF.

In accordance with section 171(4) of the EP&A Regulation, an REF must be published on the determining authority's website or the NSW Planning Portal only if:

(a) the activity has an estimated development cost of more than $5 million, or

(b) the activity requires an approval or permit as referred to in any of the following provisions before it may be carried out—

(i) Fisheries Management Act 1994, sections 144, 200, 205 or 219,

(ii) Heritage Act 1977, section 57,

(iii) National Parks and Wildlife Act 1974, section 90,

(iv) Protection of the Environment Operations Act 1997, sections 47–49 or 122, or

(b1) the activity is development carried out under the State Environmental Planning Policy (Transport and Infrastructure) 2021, section 2.61A or 3.37A, or

(c) the determining authority considers that it is in the public interest to publish the review.

As the proposed activity has an estimated development cost of less than $5 million, this REF is not required to be published on Council's website or the NSW Planning Portal.

5.2.2 State Environmental Planning Policies and Local Environmental Plan(s)

SEPPs are environmental planning instruments made under the EP&A Act that outline policy objectives relevant to state or regional environmental planning issues. SEPPs that are relevant to the project are detailed below.

State Environmental Planning Policy (Transport and Infrastructure) 2021

The aim of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) is to facilitate the effective delivery of infrastructure across NSW.

Pursuant to Clause 2.73 under Division 12 of this SEPP, development for the purposes of lighting may be carried out by or on behalf of a public authority without consent on any land, and the project is therefore assessed under Part 5 of the EP&A Act. Lighting installation is permitted without consent provided "light spill and artificial sky glow is minimised per the Lighting for Roads and Public Spaces Standard". The lighting proposed is confirmed to meet these standards as per the lighting assessment provided in Appendix 1 and therefore can be installed without consent.

Consultation requirements under the T&I SEPP are described in Section 5.1.1.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

5.2.2.1 Chapter 2: Vegetation in non-rural areas

This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of NSW and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation by ensuring that the BOS will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that do not require development consent.

This chapter applies to land zoned RE1 Public Recreation in the Northern Beaches LGA as defined in Clause 2.3. Consent is required for clearance of vegetation within land zones and LGAs to which this chapters applies therefore this flora and fauna assessment has been prepared to meet the requirements of this chapter.

No direct impact (trimming or removal) is expected to occur to any native vegetation present within the project area. All impacts will be limited to the maintained exotic grasslands within the playing fields.

Considering the above, no further consideration is required.

5.2.2.2 Chapter 3: Koala Habitat Protection 2020

This chapter does not apply to any land zones within the Northern Beaches LGA, and thus no further consideration of this chapter is required.

5.2.2.3 Chapter 4: Koala Habitat Protection 2021

Chapter 4 Koala Habitat Protection aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

While the Northern Beaches Council LGA, is listed under Schedule 2, Chapter 4 of SEPP, meaning the LGA is subject to the requirements laid out in this chapter, the current assessment is being undertaken under Part 5 of the EP&A Act, and thus consideration of this chapter is not required.

State Environmental Planning Policy (Resilience and Hazards) 2021

5.2.2.4 Chapter 2: Coastal Management

The Resilience and Hazards SEPP aims to promote a co-ordinated approach to land use planning in the coastal zone of NSW in a manner consistent with the objects of the *Coastal Management Act 2016* (CM Act).

A small portion of the project area is located within a coastal environmental area as defined by this SEPP. As per Clause 2.10(1), land mapped as 'coastal environmental area' is subject to specific development controls.

Matters for consideration are:

- The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment. Refer to sections 7.1 and 7.2 of this REF and the FFA in Appendix 2.
- Coastal environmental values and natural coastal processes. The works occur within an existing disturbed area and will not affect coastal environmental values or natural coastal processes such as shoreline movement, tidal activity, or sediment transport.
- The water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1 (of the Resilience and Hazards SEPP). This consideration is not relevant to this REF as the project are does not form part of the marine estate.
- Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms. Refer to section 7.1 of this REF and the FFA in Appendix 2.
- Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability. This consideration is not relevant to this REF as the project is not located within the aforementioned areas.
- Aboriginal cultural heritage, practices and places. Refer to section 7.4 of this REF.

- The use of the surf zone. This consideration is not relevant to this REF as the project is not located within or has no impact on the surf zone.

Waringah Local Environmental Plan 2011

LEPs are created by Councils in consultation with their community and guide planning decisions for LGAs. They apply either to the whole or part of a LGA and make provision for the protection or utilisation of the environment through zoning of land and development controls.

According to section 5.12, the Waringah LEP 2011 does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority that is permitted to be carried out with or without development consent, under the TISEPP. Therefore, the TISEPP prevails over zoning controls and as such the proposal is permitted without consent.

While the LEP does not apply to these works, it can be considered and used to identify local constraints. The project area is zoned RE1 Public Recreation. The objectives of this zone are:

- *To enable land to be used for public open space or recreational purposes.*
- *To provide a range of recreational settings and activities and compatible land uses.*
- *To protect and enhance the natural environment for recreational purposes.*
- *To protect, manage and restore public land that is of ecological, scientific, cultural or aesthetic value.*
- *To prevent development that could destroy, damage or otherwise have an adverse effect on those values.*

5.2.3 Biodiversity Conservation Act 2016

The BC Act is the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species and communities and key threatening processes (KTPs). Impacts to threatened species and communities are assessed under section 7.3 of the BC Act.

Test of Significance

One TEC, *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (EEC, BC Act) was identified within the project area. As the project does not involve any direct impacts to native vegetation and all works will be restricted to areas of exotic vegetation, further assessment in the form of a ToS for impacts to the TEC is not required.

No threatened flora listed under the BC Act were detected within the project area. Potential habitat for eight threatened fauna species was identified, with these species considered to have a medium or greater likelihood of occurrence within the project area (including Grey-headed Flying-fox and seven species of threatened microbats). ToS were completed to assess the significance of impacts to each of these species (see Table 8). These assessments determined that the project will not significantly impact these species, as no habitat will be removed and potential impacts are limited to indirect light spill. Mitigation measures will further reduce these impacts.

Table 4 Summary of Tests of Significance

Scientific name	Common name	1	2	3	4	5	6	7	Significant effect?
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	No	No	No	No	No	No	No	No

Scientific name	Common name	1	2	3	4	5	6	7	Significant effect?
Miniopterus orianae, oceanensis	Large Bent-winged Bat	No	No	No	No	No	No	No	No
Chalinolobus dwyeri	Large-eared Pied Bat	No	No	No	No	No	No	No	No
Miniopterus australis	Little Bent-winged Bat	No	No	No	No	No	No	No	No
Myotis macropus	Southern Myotis	No	No	No	No	No	No	No	No
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	No	No	No	No	No	No	No	No
Scoteanax rueppellii	Greater Broad-nosed Bat	No	No	No	No	No	No	No	No
Pteropus poliocephalus	Grey Headed Flying-fox	No	No	No	No	No	No	No	No

Biodiversity Offsets Scheme

The proposed will not result in a significant effect on threatened species, populations or communities listed under the BC Act, and therefore, the BOS is not triggered and a BDAR or Species Impact Statement (SIS) is not required.

Threatened species and communities listed under the BC Act are discussed in Section 7.1 of this REF.

5.2.4 Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened biota, and critical habitats listed under the FM Act must be assessed in accordance with Part 7A of the FM Act as guided by section 1.7 of the EP&A Act.

The proposal will not involve any direct impacts to Greendale Creek or the associated riparian habitat and will not result in temporary or permanent blockages to fish passage, and therefore a permit is not required in accordance with section 219 of the FM Act. Further to this, formal notification to Fisheries NSW in accordance with Section 199 of the FM Act is also not required.

5.2.5 National Parks and Wildlife Act 1974

The main aim of the *National Parks and Wildlife Act 1974* (NPW Act) is to conserve the natural and cultural heritage of NSW. The NPW Act is responsible for the control and management of all national parks, historic sites, nature reserves, and Aboriginal areas in NSW (among others).

Under Section 90 of the NPW Act it is an offence to knowingly destroy, deface, damage or desecrate, or cause or permit the destruction, defacement, damage or desecration of an Aboriginal object or Aboriginal place, without the prior written consent from the Director General of NSW Department of Primary Industries and Environment (DPIE), of which the NSW Environment Energy and Science (EES) is part of.

Under Section 89A of the Act it is a requirement to notify the Director-General of the location of an Aboriginal object. Identified Aboriginal objects and sites are registered with NSW on the Aboriginal Heritage Information Management System (AHIMS). Procedures that are set out in the *National Parks and Wildlife Amendment Act 2010* include the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (due diligence code) (DECCW 2010a), the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (consultation requirements) (DECCW 2010b) and *The Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) (DECCW 2010c).

The main aim of the Act is to conserve the natural and cultural heritage of NSW. Where works will disturb Aboriginal objects, an Aboriginal Heritage Impact Permit (AHIP) is required. As the activity and impact area will occur on previously disturbed land subject to extensive disturbance (i.e. landfill), the site's archaeological potential is considered low. A review of AHIMS indicates no Aboriginal sites are located within the site. Therefore, the activity is unlikely to harm Aboriginal or historical objects, an AHIP under the NPW Act is not required.

5.2.6 *Heritage Act 1977*

The *Heritage Act 1977* makes provisions to conserve the environmental heritage of NSW. It provides for the identification and registration of items of state heritage significance, provides for the interim protection of items of state heritage significance, constitutes the Heritage Council of NSW and confers on it functions relating to the State's heritage. There are no State heritage items listed at the site and the site is not subject to an interim heritage order. Therefore, the provisions of this Act do not apply.

5.2.7 *Water Management Act 2000 and Water Management (General) Regulation 2018*

The WM Act provides for the sustainable and integrated management of waterfront land. Waterfront land is defined within the WM Act as the bed of any river, lake or estuary and any land within 40 metres of the riverbanks, lake shore or estuary mean high water mark. The WM Act is supported by a series of interpretation guidelines which provide design considerations and overarching management measures for works on waterfront land. These considerations and management measures should be considered when planning and undertaking the proposed works. To which the following guidelines are relevant:

- *Guidelines for watercourse crossings on waterfront land* (DPE 2022a).
- *Guidelines for outlet structures on waterfront land* (DPE 2022b).
- *Guidelines for laying pipes and cables in watercourses on waterfront land* (DPE 2022c).
- Guidelines *for instream works on waterfront land* (DPE 2022d).

One creek was identified within the project area, known as Greendale Creek.

Under the WM Act an approval is required to undertake controlled activities on waterfront land. However, as Council is a public authority, Council does not need to obtain a controlled activity approval from the Natural Resources Access Regulator for any controlled activities that it carries out in, on or under waterfront land. While Council is exempt from the controlled activity approval process, the design considerations and management measures detailed in the relevant WM Act guidelines should be considered.

5.2.8 Biosecurity Act 2015

The *Biosecurity Act 2015* outlines biosecurity risks and impacts, which in relation to the current assessment includes those risks and impacts associated with weeds. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within NSW or any part of the State.

The Act introduces the concept of priority weeds. A priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled or eradicated in the region. A local strategic plan here refers to a plan approved by the Minister under Division 2 of Part 4 of the *Local Land Services Act 2013.*

Two priority weeds have been recorded within the project area:

- Madeira Vine *Anredera cordifolia*

- Green Cestrum *Cestrum parqui*

To prevent biosecurity impacts from occurring as a result of the presence of the above listed priority weeds within the project area, all practical steps should be taken to control and eradicate the weeds from the project area as per the relevant biosecurity duties outlined above, or prior to or during any future vegetation removal.

5.3 Commonwealth

5.3.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act. Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to the Commonwealth Minister for the Environment and Water for assessment.

Two threatened species listed under the EPBC Act were recorded or assessed to have a medium or greater potential to occur within the project area, Grey-headed Flying Fox and Large-eared Pied Bat. Assessments against the Significant Impact Criteria (CoA 2013) have been prepared for threatened entities that are deemed likely to be subject to negative impacts and concluded that a significant impact is not likely to result from the proposed works.

Mitigation measures for the project including directing lights to prevent spill and limiting operation to before 9:30 pm, will be implemented to reduce potential negative impacts on fauna utilising the area. Directing light to minimise spill ensures that illumination to nearby vegetation and watercourses where fauna are most active is limited. Additionally, limiting the operation of lights reduces the exposure of wildlife to artificial lighting during the night when species are most active, helping to maintain natural behaviours and habitat use. Given the limited and indirect nature of potential impacts, the works are not expected to significantly affect the Grey-headed Flying-fox or Large-eared Pied Bat. The project will not result in population decline, habitat loss, or disruption to breeding or recovery.

On the basis of criteria outlined in Commonwealth of Australia (CoA 2013) it is considered unlikely that a significant impact on a Matter of NES would result from the project. A referral of the proposed action to the Australian Government Minister for the Environment and Water is not required.

6 Agency, community and stakeholder consultation

This section describes the agency, community and stakeholder consultation undertaken for the project.

6.1.1 Consultation under *State Environmental Planning Policy (Transport and Infrastructure) 2021*

Division 1 of the TISEPP recommends consultation with affected stakeholders Table 5.

Table 4 SEPP (Transport and Infrastructure) 2021 consultation requirements

TISEPP reference	Section	Is consultation required and with whom?
Section 2.10	**Impacts on council-related infrastructure or services** Consultation is required if the public authority is of the opinion that the development: a) Will have a substantial impact on stormwater management services provided by a Council, or b) Is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or c) Involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a Council, or d) Involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a Council, or e) Involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential, or f) Involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the *Roads Act 1993* (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).	Yes (b) Northern Beaches Council
Section 2.11	**Impacts on local heritage** Consultation is required if the development: g) Is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item in a way that is more than minor or inconsequential, and h) Is development that this Policy provides may be carried out without consent.	No
Section 2.12	**Impacts on flood liable land - Council** In this clause, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Flood Risk Management Manual: the management of flood liable land published by the NSW Government and as in force from time to time.	No
Section 2.13	**Impacts on flood liable land – State Emergency Service**	No

TISEPP reference	Section	Is consultation required and with whom?
	In this clause, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Flood Risk Management Manual: the management of flood liable land published by the NSW Government and as in force from time to time.	
Section 2.14	Impacts on Coastal Vulnerability land Development on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land.	No
Section 2.15	**Consultation with public authorities other than councils** Consultation is required if the development is: a) Adjacent to land reserved under the *National Parks and Wildlife Act 1974* or to land acquired under Part 11 of that Act—**the Office of Environment and Heritage**. b) On land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone (except for land reserved under the NPW Act—**the Office of Environment and Heritage**. c) Comprises a fixed or floating structure in or over navigable waters – **Transport for NSW**. d) May increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map—**the Director of the Observatory**. a. Note. The dark sky region is land within 200 kilometres of the Siding Spring Observatory. e) On defence communications facility buffer land within the meaning of section 5.15 of the Standard Instrument—**the Secretary of the Commonwealth Department of Defence**. a. Note. Defence communications facility buffer land is located around the defence communications facility near Morundah. See the Defence Communications Facility Buffer Map referred to in Clause 5.15 of Lockhart Local Environmental Plan 2012, Narrandera Local Environmental Plan 2013 and Urana Local Environmental Plan 2011. f) On land in a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017*—**the NSW Mine Subsidence Advisory**. g) On, or reasonably likely to have an impact on, a part of the Willandra Lakes Region World Heritage Property—**the World Heritage Advisory Committee and Heritage NSW**. h) Within a Western City operational area specified in the Western Parkland City Authority Act 2018, Schedule 2 with an estimated development cost of $30 million or more—**the Western Parkland City Authority constituted under that Act**.	No

6.1.2 Agency consultation

State agency consultation

No state agency consultation has been undertaken to date.

Commonwealth agency consultation

No Commonwealth agency consultation has been undertaken. As the proposed activity will not impact upon Matters of National Environmental Significance (MNES) under the EPBC Act, consultation with the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required.

6.1.3 Community and stakeholder consultation

In 2020, Northern Beaches Council prepared a Development Application for the proposed lighting in the ovals. Community engagement was undertaken as part of this process. Overall, there was broad community support for the proposal, provided appropriate safeguards are implemented to protect residential and environmental amenity.

This draft REF will be exhibited on Council's website for community considerations to be included in the finalised version of the REF.

7 Environmental impact assessment

This section of the report described the existing environment within the project area, based on desktop information and assessments conducted to support this REF.

7.1 Biodiversity

As mentioned in Chapter 1, a Flora and Fauna Assessment (FFA) was prepared to assess the potential impacts of the proposed works on the biodiversity values within and around the proposed area (refer to Appendix 2). A site assessment was undertaken by Biosis on 21 October 2025.

Prior to completing the field investigation, information provided by Council as well as other key information was reviewed, including:

- Australian Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) BioNet Atlas of NSW Wildlife, for items listed under the BC Act.
- The NSW Department of Primary Industries (DPI) Spatial Data Portal for *Fisheries Management Act 1994* (FM Act) listed threatened species, populations and communities
- NSW DPI WeedWise database for priority weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Local Land Services (LLS) area.
- Existing vegetation mapping including the NSW State Vegetation Type Map (SVTM C2.0M2.1).
- Previous site reports including the *Freshwater Senior Campus Sportsground Lighting Flora and Fauna Assessment* (Biosis 2023).

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- *Environment Proection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Biodiversity Conservation Act 2016* (BC Act).
- *Water Management Act 2000* (WM Act).
- *Biosecurity Act 2015* (Biosecurity Act).
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP).
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP).
- *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP).
- *Warringah Development Control Plan 2011* (Warringah DCP).
- *Warringah Local Environment Plan 2011* (Warringah LEP).
- *AS 2560.2:2021Sports lighting, Part 2: Specific applications.*

- *AS/NZS 4282:2023 Australian Standard for Obtrusive Lights Evaluation.*
- *National Light Pollution guidelines for Wildlife* (DCCEEW 2023).

7.1.1 Existing Environment

7.1.1.1 Vegetation Communities

Vegetation communities observed are set out in Table 6.

Table 5 Summary of vegetation communities within the project area

Plant Community Type (PCT)	EPBC Act status	BC Act / FM Act status	Threatened Ecological Community (TEC) Status	Extent within project area
PCT 4028 Estuarine Swamp Oak Twig-rush Forest	N/A	N/A	**NSW BC Act:** PCT 4028 meets the requirement of the EEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* The landscape position, soil type and dominance of Swamp Oak confirm the listing of this community under the BC Act. **Commonwealth EPBC Act:** PCT 4028 does not meet the criteria for the EEC *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community.* Although the patch size meets the criteria for a small, continuous patch, native species comprise less than 50% and transformer species comprise less than 30% of total understorey vegetation cover (DoEE 2018).	A total of 0.50 ha of PCT 4028 occurs within the project area in low condition, and 0.04 ha present in a thinned condition.
PCT 3963 Estuarine Reedland	N/A	N/A	**NSW BC Act:** PCT 3963 meets the requirement of the EEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* The landscape position, soil type and dominance of Common Reed confirm the listing of this community under the BC Act. **Commonwealth EPBC Act:** PCT 3963 does not meet the criteria for the EEC *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* as the patch size is less than 0.5 ha (DoEE 2018).	Approximately 0.35 ha of PCT 3963 was recorded within the project area.
N/A – Planted Native Vegetation (does not conform to a PCT)	N/A	N/A	N/A	Approximately 0.91 ha of Planted Native Vegetation was recorded within the project area.

Plant Community Type (PCT)	EPBC Act status	BC Act / FM Act status	Threatened Ecological Community (TEC) Status	Extent within project area
N/A – Exotic Vegetation (does not conform to a PCT)	N/A	N/A	N/A	Approximately 4.58 ha of Exotic Vegetation was recorded within the project area.

7.1.1.2 Terrestrial species and habitats

36 threatened flora species and 141 threatened fauna species were recorded or predicted within 5km of the project area.

Three threatened flora species were identified as potentially having habitat in the project area.

Eleven threatened fauna species were identified as potentially having habitat in the project area. No other threatened flora or fauna species listed under the EPBC Act or BC Act were recorded during the field survey.

All native and exotic species recorded during the fauna assessment are listed in Appendix 2. Unless of particular note, these species are not discussed further.

An assessment of habitat values is provided in Table 7 for threatened flora species and for threatened fauna species. These tables discuss areas of habitat value and potential impact for all species with a medium or greater likelihood of occurrence and determine the need for a Test of Significance (ToS) for species listed under the BC Act, or Significant Impact Criteria (SIC) Assessment for species listed under the EPBC Act.

7.1.1.3 Aquatic species and habitats

Aquatic habitat within the project area is limited to Greendale Creek which is a first order Strahler watercourse located in the northern section of the project area (Strahler 1964). This watercourse was stagnant with limited flow at the time of the field investigation and traverses an area of low condition native vegetation mapped as PCT 3963. Greendale Creek flows into the Tasman Sea, the closest major waterbody, located approximately 1.7 kilometres to the east.

A culvert was present facilitating water flow, however the water quality appears to be in a poor condition, with visible orange-discolouration and surface film. This likely results from the degraded nature of the surrounding vegetation and sedimentation accumulation which is characteristic of urban-influenced creek lines. Greendale Creek within the project area is not mapped as Key Fish Habitat on the Fisheries Spatial Data Portal (DPI 2025). However, sections of the creek downstream of the project area, where is joins with the Curl Curl lagoon are mapped as Key Fish Habitat.

7.1.1.4 Weeds, pests and exotic and invasive species

Two priority weeds have been recorded within the project area:

- Madeira Vine *Anredera cordifolia*
- Green Cestrum *Cestrum parqui*

To prevent biosecurity impacts from occurring as a result of the presence of the above listed priority weeds within the project area, all practical steps should be taken to control and eradicated the weeds from the project area as per the relevant biosecurity duties outlined above, or prior to or during any future vegetation removal.

7.1.2 Potential Impacts

The installation of new sportsground lighting has the potential to introduce light spill into the darker riparian areas of Greendale Creek and contribute to broader cumulative light pollution across Sydney. Whilst exotic vegetation will be removed, no native vegetation communities will be directly affected and all vegetation impacts are confined to previously maintained areas. No threatened flora were recorded, whilst several threatened fauna species may occur in the project area, such as microbats species and Grey-headed Flying Fox, assessments found that the project is unlikely to significantly affect their populations.

Potential ecological impacts relate primarily to artificial light which may alter bat abundance and diversity, disrupt foraging behaviour, shift species' resource use, and influence predator-prey dynamics. However, it is concluded that these changes are unlikely to be substantial and no further assessment is required. Greendale Creek and its riparian vegetation will remain undisturbed. Although the site compound is located within a mapped Coastal Environmental Area, no ground disturbance is proposed.

7.1.3 Safeguards and Mitigation Measures

Mitigation measures relating to biodiversity are outlined in Table 8 below.

Table 6 Safeguards and mitigation measures – Biodiversity

Measure	Timing	Responsibility
Lighting modules are to be fitted with shields to minimise light spill and pointed downwards to minimise contribution to sky-glow. Some lighting may need to remain uncovered/angled skywards to allow for illumination during ball sports in accordance with AS 2560.2:2021 Sports lighting, Part 2: Specific applications (Standards Australia Limited 2021) (all codes). Use of these unshielded lights is to be minimised as much as possible.	Design	Northern Beaches Council
Lighting levels are to be adjusted to match minimum level of illuminance required for the sport and level of competition in play. Lighting should be programmed to meet these various requirements and switched off when not required.	Design	Northern Beaches Council
During the installation of the lighting towers, minimise disturbance to any native vegetation surrounding to the fullest extent practicable.	Construction	Contractor
A luminosity assessment should be undertaken following installation of the proposed lighting works to ensure consistency with the modelled lighting output and compliance with AS 4282 *Control of the Obtrusive Effects of Outdoor Lighting* (Standards Australia 2023). Assessment should include measures of luminous flux and illuminance under the different lighting setups required for the various types of sports and competition levels to ensure lighting levels do not exceed the minimum requirements.	Post-construction	Northern Beaches Council
Where possible, any trees to be retained should be protected in accordance with Australian Standard AS4970 – 2009 Protection of trees on development sites, during construction, operation and decommissioning of the site compound.	Construction Post-construction	Contractor
In the unlikely event that unexpected threatened species are identified during the project, works should cease and an ecologist contacted.	Construction	Contractor
Two priority weeds within the Northern Beaches Council LGA were identified within the project area. Soil transportation should be minimised within, into or out of the project area to reduce the spread of weeds.	Construction	Contractor

Measure	Timing	Responsibility
The northwest section of the project area is located within the Coastal Environmental Area. Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values.	Construction	Contractor

7.2 Hydrology and water

7.2.1 Existing Environment

The project area is within the Gosford Lagoons and Sydney Northern Beaches catchment area.

Greendale Creek is located within the northern section of the project area and exists as a first order Strahler watercourse. Greendale Creek flows west to east through a highly urban and industrial catchment area into Curl Curl Lagoon at the coastline. Curl Curl Lagoon is located approximately 500 metres east of the project area and comprises an intermittently open and closed coastal estuary which discharges into the Tasman Sea at Curl Curl beach.

In proximity to the project area Greendale Creek has been straightened, narrowed and the bank level increased as a result of filling and construction works commencing in the 1950s. Upstream reaches of the creek have been concreted and now function as stormwater channels.

These changes to the creek have altered its morphology and catchment and have resulted in the waterway becoming degraded over time. Water quality in Greendale Creek and Curl Curl Lagoon is generally poor as a result of urbanisation, stormwater pollutants, and leachate inflow from adjacent fill and construction.

Precipitation at the project area is expected to infiltrate surface soils at a rate reflective of the permeability of the underlying soils and be directed to localised drainage infrastructure. In periods of heavy or prolonged rainfall and following surface soil saturation, excess water movement is expected to be directed through localised drainage infrastructure and along the topographic gradient discharging into Greendale Creek to the north.

The water table at the project area sits at approximately 2.7 – 3.2 metres below the current surface.

7.2.2 Potential Impacts

Impacts to hydrology and water are anticipated to be restricted to the construction phase of the project. Once the lighting has been installed, it is not expected that there will be any long-term impacts to the hydrology, surface soil saturation or stormwater drainage of the project area and surrounds.

Potential impacts during construction may include sedimentation to local drainage infrastructure, Greendale Creek and Curl Curl Lagoon due to soil disturbance during construction and construction vehicle movement. The trenching for electrical services and footings of the proposed light infrastructure may encounter groundwater seepage due to the shallow groundwater depth underlying the project area.

7.2.3 Safeguards and Mitigation Measures

Mitigation measures relating to hydrology are outlined in Table 9 below.

Table 7 Safeguards and mitigation measures – Water

Measure	Timing	Responsibility
Ensure machinery access routes are located away from waterbodies such as Greendale Creek and Curl Curl Lagoon.	Pre-construction / Construction	Northern Beaches Council Contractor
Soil stockpiles are to be placed away from, and ideally downslope of receiving water bodies such as Greendale Creek.	Construction	Contractor
Appropriate sedimentation and erosion controls are to be implemented prior to works commencing and maintained at all times during works, including sedimentation fencing and stockpile covers.	Pre-construction / Construction	Contractor
Cover any areas of bare earth post-construction (i.e. with jute mesh or similar) to minimise erosion and sedimentation until the groundcover has been stabilised with vegetation.	Post-construction	Contractor
Excavation areas are to be backfilled and re-stabilised immediately to prevent inflow of groundwater.	Construction	Contractor
If groundwater seepage is encountered during trenching, works are to cease temporarily until appropriate dewatering methods are implemented in accordance with the *Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004).	Construction	Contractor

7.3 Landforms, geology and soils

7.3.1 Existing Environment

The project area is located within the low-lying coastal floodplain of Curl Curl, immediately south of Greendale Creek and west of Curl Curl Lagoon. The landform is a flat, reclaimed estuarine plain with an elevation of approximately 4 metres AHD, gently sloping eastwards towards the lagoon (JBS&G 2019a).

The project area was historically a wetland and estuarine flat, characterised by waterlogged soils and native swamp vegetation. In 1951, the land was repurposed for waste disposal, and large-scale filling operations. These reclamation works straightened the alignment of Gardendale Creek and raised the ground level to its current form (Warringah Council 2001). Subsequent grading and landscaping works through the 1960s and 1970s established the present, even surface that accommodate the existing sports fields.

Beneath the ovals, the natural ground comprises Holocene alluvial and estuarine sediments including fine sands, silts, and clays deposited under tidal and lagoonal conditions. These materials often contain iron-oxide mottling, organic binding, and shell fragments indicative of former brackish environments (JBS&G 2019a).

The natural soils are overlain by a heterogenous fill layer that was emplaced during historical reclamation works. This fill includes mixed sandy and clayey material containing sandstone fragments, soil, and remnants of construction and domestic waste. The depth of fill varies across the park but typically ranges between two and several metres. Bedrock is exposed within the site, and groundwater occurs at shallow depth, hydraulically connected to the adjacent creek and lagoon systems (JBS&G 2019b).

Surface soils consist of reworked topsoil and compacted fill with a sandy to silty texture that drains readily but may become waterlogged during prolonged wet periods. Subsurface materials comprise mottled brown to orange sands and sandy clays that transition into undisturbed estuarine sediments at depth (JBS&G 2019a).

The site is mapped within a Class 4 – 5 Acid Sulfate Soil risk zone, meaning potential acid sulfate soils may occur below 2 metres near the creek margin. However, field sampling and testing undertaken by JBS&G in 2019 confirmed that no actual or potential acid sulfate soils are present within the upper 1 metre of the profile. Recorded pH values were above 5.5 and sulfide concentrations were below detection limits, confirming negligible acid generation potential (JBS&G 2019a).

7.3.2 Potential Impacts

The proposed activity has the potential cause temporary, localised impacts on the soil and geology of the project area. Ground disturbance will occur as a result of excavation for the installation of the poles and concrete footing, shallow trenching for electrical wiring, and the movement of machinery and construction vehicles during installation. This temporary disturbance to surface soils leads to increased risk of erosion, sedimentation, and compaction. Due to the existing soil characteristics of the project area, periods of rainfall during installation may contribute to sedimentation into adjacent stormwater drains and Greendale Creek to the north.

Soil compaction from vehicle and machinery movement may result in minor changes to surface topography, particularly under wet conditions. This may temporarily alter surface drainage patterns until reinstatement. Excavation activities beyond a depth of 1 metre may expose sulfidic material and lead to soil acidification. Additionally, the stockpiling of excavated materials increases the risk of dust generation which may generate amenity impacts.

7.3.3 Safeguards and Mitigation Measures

Mitigation measures relating to geology and soils are outlined in Table 10 below.

Table 8 Safeguards and mitigation measures – Landforms, geology and soils

Measure	Timing	Responsibility
Use of screw piles of lighting poles to avoid significant soil excavation.	Design	Northern Beaches Council
Restrict excavation, trenching, and vehicle movement to defined impact area within previously disturbed area.	Construction	Contractor
Implement erosion and sediment controls in accordance with the *Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004).	Pre-construction	Contractor
Schedule installation during periods of dry weather and avoid undertaking works during or immediately following significant rainfall events to minimise erosion and sediment runoff	Construction	Contractor
Ensure soil stockpiles are located away from drainage lines and Greendale Creek. Cover or stabilise stockpiles to prevent dust and sediment movement.	Construction	Contractor
Return excavated soils to trenches. Unsuitable excavated soils are to be disposed of in an appropriately licensed facility.	Construction Post-construction	Contractor
Undertake regular site inspections to ensure erosion and sediment controls remain effective, particularly after periods of rainfall.	Construction	Contractor
Restabilise disturbed areas as soon as practicable following disturbance.	Post-construction	Contractor

7.4 Historic and Aboriginal Cultural Heritage

7.4.1 Existing Environment

A search of the Aboriginal Heritage Information Management System (AHIMS) database confirmed there are no Aboriginal archaeological sites in the project area. The closest sites are located approximately 1.5 kilometres to the east of the project area.

A search of the Historic Heritage Information Management System (HHIMS) database confirmed there are no historic heritage sites in the project area. The closest sites are located approximately 4.5 kilometres to the west of the project area.

The project area comprises previously disturbed and modified land which has been subject to multiple phases of filling and grading. As such, the project area has been vastly altered from its natural state including the diversion of Greendale Creek. Given this high level of disturbance, the potential for Aboriginal heritage to be present is considered low negligible.

7.4.2 Potential Impacts

As no Aboriginal items are recorded in the project area and the impact area is located entirely within previously modified soils and disturbed ground, it is unlikely that the proposed lighting installation will impact any known or potential heritage values. Potential impacts are therefore limited to the unexpected discovery of archaeological material during excavation or trenching works.

7.4.3 Safeguards and Mitigation Measures

Mitigation measures relating to heritage are outlined in Table 14 below.

Table 9 Safeguards and mitigation measures – heritage

Measure	Timing	Responsibility
All works will be undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a)	Construction	Contractor
If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Project Manager contacted immediately, and the *Standard Management Procedure – Unexpected Heritage Items* (Roads and Maritime Services 2015) will be followed. Heritage NSW and relevant Aboriginal representatives will be notified.	Construction	Contractor
Records of any heritage inspections or discoveries will be maintained.	Construction	Contractor

7.5 Access and traffic

7.5.1 Existing Environment

Access to the project area is provided via Harbord Road to the west and Stirgess Avenue to the south-east. Public car parking is provided off Stirgess Avenue. Public transport is provided to the project area via the 176 and 177 bus lines which have bus stops along Abbott Road approximately 200 metres north of the project area.

7.5.2 Potential Impacts

The construction phase of the project is likely to have a localised impact on the local area due to increased traffic flow and use of the local street network by construction vehicles.

Increased recreational use of the Mike Pawley and Frank Gray Ovals is likely to marginally increase the overall traffic flow to and from the project area and increase parking demand in the local area, especially after sunset when the lighting will enable extended use of the ovals. It is noted the carpark at the adjacent Freshwater Senior Campus will be available between 4pm to 9.30pm on weekdays, 8am to 6pm on weekends and 8.00am to 9.30pm during school and public holidays. This will relieve demand on other street and public parking in the area.

7.5.3 Safeguards and Mitigation Measures

Mitigation measures relating to access and traffic are outlined in Table 17 below.

Table 10 Safeguards and mitigation measures – Access and traffic

Measure	Timing	Responsibility
Ensure designated parking is provided for construction vehicles that does not congest or impact the local street network.	Pre-construction / Construction	Client
Schedule large construction vehicles to undertake travel to and from the project area outside of peak traffic periods.	Construction	Client
Council to secure an agreement with the Freshwater Senior Campus car park for nighttime car parking, to reduce parking pressure on the local area.	Post-construction	Client

7.6 Noise and vibration

7.6.1 Existing Environment

Access to the project area is via Harbord Road. The broader John Fisher Park is used for recreational activities including sporting, playgrounds, walking, and community events. The park is comprised of numerous sensitive receivers including residential areas to the north and south, the Freshwater Senior Campus to the south west of the ovals, and the Harbord Bowling and Recreation Club to the east.

7.6.2 Potential Impacts

The proposed activity may generate short-term noise and vibration impacts during the installation process. The transportation of machinery, use of equipment such as excavators, screw-pile installation, and the movement of personnel to and from the site will all contribute to increased levels of noise and vibration. The activity will involve low-intensity machinery such as a small excavator, trenching machine, and light vehicles for delivery. This machinery will not be operated in close proximity to one another which will ensure noise emissions are kept below the highly noise-affected threshold of 75 dB(A) as identified in the *NSW EPA Interim Construction Noise Guidelines* (DECC 2009).

Lighting will enable extended use of the ovals after sunset, which could extend noise impacts to nearby residential receivers. However, lighting is already provided at the adjacent Weldon Oval and, therefore, the area is already subject to nighttime noise from recreational sources. It is noted that Council's standard terms and conditions for open spaces prohibits noisy activities after 10pm unless council has granted prior approval.

7.6.3 Safeguards and Mitigation Measures

Mitigation measures relating to biodiversity are outlined in Table 18 below.

Table 11 Safeguards and mitigation measures – Noise and vibration

Measure	Timing	Responsibility
Restrict construction activities to standard daytime hours of 7am – 6pm Monday to Friday; 8am – 1pm Saturday and avoiding work on Sundays or public holidays. Where out-of-hours works are required a Noise and Vibration Management Plan will be prepared and implemented in consultation with sensitive receivers.	Construction	Contractor
Schedule equipment operation to avoid concurrent use in close proximity.	Construction	Contractor
Ensure nearby residents and businesses are notified of works at least five days prior to works commencing. Inform of construction schedule including timing, duration, nature of works, contact details for site supervisor and process for registering and resolving complaints.	Pre-construction	Northern Beaches Council
Maintain equipment in good condition fitted with appropriate mufflers and silencers.	Construction	Contractor
Position stationary machinery away from residential boundaries where practicable.	Construction	Contractor
Sequence higher-noise activities e.g. trenching to occur intermittently and allow periods of respite between operations.	Construction	Contractor
Maintain complaints register to record community feedback and review work practices as required if complaints are received.	Construction	Contractor
Brief on-site personnel on noise and vibration management requirements during inductions, including switching off idling engines.	Construction	Contractor

7.7 Public and visual amenity

7.7.1 Existing Environment

The project area is located within existing recreational assets, being the Mike Pawley and Frank Gray Ovals. The project area is located in close proximity to several existing recreational assets, including the Denzil Joyce Oval, John Fisher Park, Josh Fisher netball courts, Curl Curl youth and community centre, Weldon Oval, Stirgess Reserve, Harbord Bowling and Recreation Club, and other park / reserves associated with the Curl Curl Lagoon, Greendale Creek or Curl Curl beach.

Sensitive uses in proximity to the site include existing recreational parks / reserves, the Northern Beaches Secondary College, Greendale Creek, Curl Curl Lagoon and Curl Curl beach.

7.7.2 Potential Impacts

The project will not detrimentally impact the recreational use of the project area and surrounds, as it does not intend to change the current use of the land. The project will enhance the Mike Pawley and Frank Gray Ovals recreational capacity by extending the hours of use and reducing the training load on the nearby Weldon Oval.

The project is likely to have a visual impact through the construction and operation phases, via construction of lighting poles and trenching for electrical services.

The construction phase of the project will create minor landscape character and visual impact through the removal of groundcover vegetation, undertaking trenching works and erection of construction exclusion.

However, these impacts would be temporary and minor as the impact area around each pole and the trenching impact area would be reinstated and revegetated post construction.

The long-term impacts from erection of the lighting poles are anticipated to be minor as the visual impact of the lighting poles is considered appropriate for the highly urbanised local area and several parks in the immediate vicinity already support sport field lighting (i.e. Denzil Joyce Oval and John Fisher Park). The light spill created by the project may have a negative impact on nearby residential areas.

The project will benefit the local community by increasing the overall usage of the Mike Pawley and Frank Gray Ovals, whilst also reducing the training load on the nearby Weldon Oval. The project will help meet the local community's demand for more sports fields. The lighting will also provide an increased sense of safety for those using or transiting through the ovals at night.

7.7.3 Safeguards and Mitigation Measures

Mitigation measures relating to biodiversity are outlined in Table 20 below.

Table 12 Safeguards and mitigation measures – Public and visual amenity

Measure	Timing	Responsibility
Ensure the project complies with all Australian standards and best practise guidelines for obtrusive light and safe lighting levels for sporting use i.e: • AS/NZS 1158 Lighting for roads and public spaces, AS 2560 Sports lighting • AS/NZS 4282:2023 Control of the obtrusive effects of outdoor lighting (Standards Australia 2023). • The NSW Public Lighting Code (NSW Department of Climate Change, Energy, the Environment and Water) • The National Light Pollution Guidelines for Wildlife (Commonwealth Department of Climate Change, Energy, the Environment and Water).	Design	Northern Beaches Council
Inform local residents of temporary landscape character and visual impacts from the project.	Pre-Construction	Northern Beaches Council Contractor
Undertake post-construction reinstatement and revegetation of the impact areas around each pole to minimise amenity impacts.	Post Construction	Contractor
Lights will be restricted for use within the following hours to limit light spill: • Monday – Saturday until 9:30pm (dim pathway lights will remain on until 10pm to facilitate safe exit). • No use of lights on Sundays after 6pm. • Periodic use for approved bookings or sporting allocations. These times can be extended, including on Sunday, for special events and non-sport uses. Council will assess applications and notify the community of use during these times.	Post-Construction	Northern Beaches Council

7.8 Air quality and emissions

7.8.1 Existing Environment

The project area is located within a developed urban area close to the coast. Primary sources of emissions are from the nearby roads such as Harbord Road, Stirgess Avenue and Abbott Road. There are no major industrial sources of pollution in the vicinity. Sensitive receivers include residential dwellings to the south and east of the ovals as well as the school campus in the south west. These receivers may experience temporary, short-term reductions in air quality as a result of the installation process.

7.8.2 Potential Impacts

The proposed activity will temporarily generate dust during excavation, trenching and vehicle movements. Additionally, equipment and machinery used for the installation process including excavators, trenching machines, and light vehicles will generate minor exhaust emissions. These impacts are not considered to be significant due to the small scale of works over a short period of time. Dust and emissions are expected to remain well below nuisance of health-based criteria as defined by the EPA's *Local Government Air Quality Toolkit: Construction Sites Guidance Notes* (DCCEEW 2024).

7.8.3 Safeguards and Mitigation Measures

Mitigation measures relating to biodiversity are outlined in Table 19 below.

Table 13 Safeguards and mitigation measures – Air quality and emissions

Measure	Timing	Responsibility
Schedule excavation, trenching, and backfilling activities during periods of low wind and dry weather.	Construction	Contractor
Suppress dust emissions using water sprays or light wetting of exposed surfaces, stockpiles, and access tracks during dry or windy conditions.	Construction	Contractor
Ensure stockpiles are covered and stabilised.	Construction	Contractor
Vehicles and equipment will be maintained in good working order and will be restricted to designated access routes.	Construction	Contractor
Adhere to 10 km/h vehicle speed limits within the project area.		
Vehicles will not to be left idling.	Construction	Contractor
Trenches will be promptly backfilled and compacted to minimise exposure of disturbed soils.	Construction	Contractor

8 Summary of safeguards and mitigation measures

The mitigation measures outlined in Table 23 are recommended to mitigate against potential impacts of the project.

Table 14 Summary of mitigation measures

Environmental component	Potential impacts	Mitigation
General	Non-compliance with this REF	• Prepare a Construction Environmental Management Plan (CEMP) that details all relevant mitigation measures from this REF. • All project staff are to be inducted/advised of any site environmental sensitivities and relevant mitigation measures prior to works commencing. • Works are to be kept within the assessed impact areas identified in Figure 2.
Biodiversity	Removal of 1.84 hectares of exotic vegetation, light spill and light pollution, potential impacts on fauna behaviour	• Use shielded, downward-directed lighting to minimise spill and sky-glow; limit use of any unshielded lights required for sports compliance. • Program lighting to the minimum levels needed for each sporting event and switch off when not in use. • Minimise disturbance to surrounding native vegetation during lighting tower installation. • Undertake a post-installation luminosity assessment to confirm compliance and ensure lighting levels do not exceed requirements. • Protect retained trees during construction and operation of the site compound. • Stop work and consult with an ecologist if any unexpected threatened species are encountered. • Minimise soil movement to reduce the spread of priority weeds. • Install appropriate erosion and sediment controls to prevent indirect impacts on waterways and biodiversity.
Hydrology, flooding and water quality	Localised runoff, sedimentation and potential groundwater seepage during excavation.	• Locate access and stockpiles away from waterbodies i.e. Greendale Creek and Curl Curl Lagoon. • Install sediment and erosion controls i.e. silt fence, sandbags, inlet protection consistent with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004). • Avoid works during or after periods of heavy rainfall. • Backfill trenches and stabilise surfaces promptly. • If groundwater seepage is encountered during trenching, temporarily cease works until appropriate dewatering methods are implemented in accordance with the *Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004).

Environmental component	Potential impacts	Mitigation
Soils and erosion	Localised soil disturbance, erosion, sedimentation, compaction	• Use of screw piles of lighting poles to avoid significant soil excavation. • Restrict works to defined impact area identified in Figure 2. • Implement erosion and sediment controls in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004). • Avoid works during or immediately after significant rain. • Locate stockpiles away from drainage lines and Greendale Creek. Stabilise disturbed ground immediately after works. • Cover and manage stockpiles to prevent runoff. • Return excavated soils to trenches. Unsuitable excavated soils are to be disposed of in an appropriately licensed facility. • Undertake regular site inspections to ensure erosion and sediment controls remain effective, particularly after periods of rainfall. • Reuse excavated material onsite where suitable and avoid works during heavy rainfall. • Restabilise disturbed areas as soon as practicable following disturbance.
Historic and Aboriginal heritage	Unexpected discovery of Aboriginal heritage items	• If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Project Manager contacted immediately. • Records of any heritage inspections or discoveries will be maintained.
Access and traffic	Minor temporary disruption to site access and vehicle movements.	• Ensure designated parking is provided for construction vehicles that does not congest or impact the local street network. • Schedule deliveries to avoid school and sporting peak times. • Council to secure an agreement with the Freshwater Senior Campus car park for nighttime car parking, to reduce parking pressure on the local area.
Noise and Vibration	Temporary construction noise and minor vibration to nearby receivers.	• Restrict construction to the hours of 7am – 6pm Monday to Friday, 8am – 1pm on Saturday, and avoid Sundays and public holidays. • Avoid concurrent operation of equipment i.e. excavator, trenching machine. • Maintain plant in good working order with functional mufflers and use broadband reversing alarms. • Notify sensitive receivers at least five days before commencing works. • Position stationary machinery away from residential boundaries where practicable. • Sequence higher-noise activities e.g. trenching to occur intermittently and allow periods of respite between operations. • Maintain a complaints register and response procedure.

Environmental component	Potential impacts	Mitigation
		• Brief on-site personnel on noise and vibration management requirements during inductions, including switching off idling engines.
Public and visual amenity	Temporary visual and access impacts during construction; minor long-term change from lighting infrastructure.	• Ensure compliance with Australian standards and best practise guidelines for obtrusive light and safe lighting levels for sporting use. • Ensure residents are informed of the proposed activity and schedule. • Undertake post-construction reinstatement and revegetation of the impact areas around each pole to minimise amenity impacts. • Comply with light operation hours as outlined in section 7.7.3.
Air quality and emissions	Localised dust generation and vehicle exhaust emissions.	• Schedule excavation, trenching, and backfilling activities during periods of low wind and dry weather. • Apply water to exposed surfaces and stockpiles during dry or windy conditions. • Cover or stabilise stockpiles and immediately backfill trenches. • Vehicles and equipment will be maintained in good working order and will be restricted to designated access routes. • Enforce vehicle speed limits of 10 km/h. • Vehicles will not to be left idling. • Maintain machinery to manufacturer standards and avoid unnecessary idling. Trenches will be promptly backfilled and compacted to minimise exposure of disturbed soils.

9 Conclusion and determination

The proposed works are considered to have a minimal environmental impact if all mitigation measures in Table 23 are implemented.

Assessments have been completed and can be summarised as follows:

- Biodiversity: As the project does not trigger the BOS as it is:
  - Unlikely to result in a significant impact on threatened species, populations or communities listed under the EPBC Act, BC Act or the FM Act.
  - Unlikely to impact on SEPP related areas mapped within the Biodiversity Values Map.
- Water: Minor, short-erm risks of sedimentation and runoff during construction will be managed through erosion and sediment controls. No long-term hydrological impacts are expected.
- Landform, geology and soils: Soil disturbance will be minimal and managed through stabilisation and erosion controls.
- Heritage: No impacts to Aboriginal and non-Aboriginal cultural heritage items is likely to occur. No further archaeological work is required in the project area due to being assessed as having low archaeological potential.
- Access and traffic: Construction traffic will be short-term and low impact, using existing access points. Operational traffic will remain consistent with current field use.
- Community infrastructure: The project will improve existing sporting facilities and support extended, safer community use consistent with Council objectives.

The following documentation and consultation is required:

- Prepare a CEMP that details all relevant mitigation measures from this REF.
- Prepare a Soil and Erosion Management Plan (to form part of the CEMP) in accordance with the 'Blue Book' (Landcom 2004).
- Consult with identified stakeholders in Chapter 5.

The proposed works are not likely to have a significant impact on any facet of the environment if recommended mitigation measures are implemented, and therefore an EIS is not required.

9.1 Assessor declaration

I as the assessor have considered all environmental impacts and safeguards to the best of my knowledge.

This REF provides a true and fair review of the activity in relation to its likely effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the project, and provides sufficient information to determine whether there is likely to be a significant impact on the environment as a result of the project

Table 15 Assessor declaration

Assessor details	
Name	XXX
Position	XXX
Company	Biosis Pty Ltd
Qualifications	XXX
Contact details	XXX@biosis.com.au
Signature and date	DAY MONTH YEAR

9.2 Determiner declaration and approval

I have reviewed the REF and any attached documents and am satisfied that the assessment has been prepared by a reasonably qualified person and a suitable assessment was undertaken for the proposed project. I consider that the project will not have a significant impact and approve that the project can proceed subject to the controls outlined in this REF.

Table 16 Determiner declaration

Determiner details	
Name	
Position	
Company	
Contact details	
Signature and date	

10 References

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Appendices

Appendix 1 Light assessment of proposed works

The luminaire specified for this project is the Sylvania RAPTOR GEN 4 floodlight.

For technical information on this product, please select the weblink below or via the QR code above.

https://au.schreder.com/en/products/raptor4-sports-floodlighting

REPORT CONTENTS:

This report provides for the following:
* Client brief
* A sports lighting solution for 4 Australian Rules fields. (2 senior and 2 junior).
* This design acknowledges the relevant sections from :-
  - Australian Standard AS2560.1:2018, Sports Lighting - General principles
  - Australian Standard AS2560.2:2021, Sports Lighting 2.6 'Football (all codes)'

CLIENT BRIEF:

* Australian Rules fields (2 senior and 2 junior) to be lit to amateur level competition (150 lux client request).
* Fields to be individually switched.
* Use new poles in locations determined by the design procedure. (outside the boundaries of cricket fields)
* Light source to have a correlated colour temperature (CCT) of 4000K
* Designed to comply with the requirements of AS2560.2:2021
* AS/NZS4282-2023 Obtrusive Light Evaluation, assess for: Pre-Curfew A3 (with an upward waste ratio of 0 - client requirement)
* AS/NZS4282 Compliance statement required

DISCLAIMER:

1. CAD drawings and/or accurate site dimensions, were not supplied with the design brief. Position and size of the fields and the location of the existing poles used of this design solution are indicative only and we therefore provide this calculation as a close estimate of expected lighting levels. Prior to installation, all calculations should be confirmed with accurate site measurements, preferably a surveyed CAD drawing with relevant field markings and surrounding residential boundaries.

2. This scheme is subject to the accuracies and tolerances of lighting systems described within Australian Standard AS/NZSS3827, Lighting System Performance Accuracies and Tolerances.

3. The contractor must confirm pole location details 2 weeks prior to the date of installation of the footings. This will allow for any required fine tuning of the design and finalisation of luminaire aiming details.

Luminaire Schedule

Scenario: All

Symbol	Qty	Description	Lum. Watts	Total Watts	LLF
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1232	2464	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Right Side Shield	1232	2464	0.900

Design certified by

Peter Jones FIES Aus&NZ
Membership no. 2678

SYLVANIA Schréder
Experts in lightability™

Schreder Australia Pty Ltd
Bldg 4A Parklands Estate 21-23 South St
Rydalmere NSW 2116 Australia
T 1300 489 780
www.sylvania-schreder.com
ABN 17 604 331 937

REV	DATE	COMMENTS	DESIGNER
R0	23/05/2025	Original design	PJ
R1	12/06/2025	Addition of 2 junior feilds	PJ
R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

TITLE
Overall site plan

REES SPORTS LIGHTING

REVISION
R1

SHEET
A3

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

DOCUMENT NO.
0255326-01_R1.AGI

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

This Sports Lighting Assessment is based on the Light Technical Parameters and Guidelines from Australian Standard AS2560.2:2021, "Sports Lighting Part 2 Specific Applications".

The lighting design is to comply with the requirements of Section 2.6, Football (all codes) - Amateur level competition.

The Light Technical Parameters (LTP) are as follows:

* Average horizontal maintained illuminance: 100lux
* Minimum horizontal uniformity U1 (Min/Ave): 0.50
* Minimum horizontal uniformity U2 (Min/Max): 0.30
* Maximum uniformity gradient per 5m: 2
* Maximum glare rating (GR): 50

The dimensions for the Field of Play (FOP) for the fields has been taken as:-
- Frank Grey Oval (Senior Field 1) as 147m x 105m
- Frank Grey Oval (Junior Field 1) as 120m x 120m
- Mike Pawley Oval (Senior Field 2) as 172m x 96m
- Mike Pawley Oval Junior Field 2) as 120m x 120m

Calculation grid points are established in a horizontal plane, covering the field of play, in accordance with Figure 2.6.1(a). This being a grid of size 5m x 5m at the level of the playing surface, with points at the perimeter no greater than half a grid spacing from the boundary.

The luminaire heights used in this design acknowledges the height recommendations within Table 2.6.2 from AS2560.2:2021. This assessment does not take into consideration the topography of the site. An analysis of the site topography should be considered when determining the actual heights of each pole.

Glare rating has been calculated at observer positions in accordance with Figure 2.6.7 from AS2560.2:2021. We have used a surface reflectance of 25% for a natural grass surface, as specified in AS2560.1:2018, Table 2.3.

This assessment does not take into consideration the effect of topography or the obstructive effect from buildings, trees, fences etc.

Light Loss Factor (LLF): RAPTOR GEN 4

A Light Loss Factor (LLF), accounting for LED lumen and dirt depreciation, of 0.9 has been used for all RAPTOR GEN 4 luminaires.
This is derived from a combination of the following:

* Luminaire Dirt Depreciation (LDD) - 0.92, based on a 72-month cleaning cycle (per AS2560.1:2018 Table 4.1)
* Lamp Lumen Depreciation (LLD) - 0.981 (L97.1) @ 17,000 burning hours.

Luminaire Arrangement:

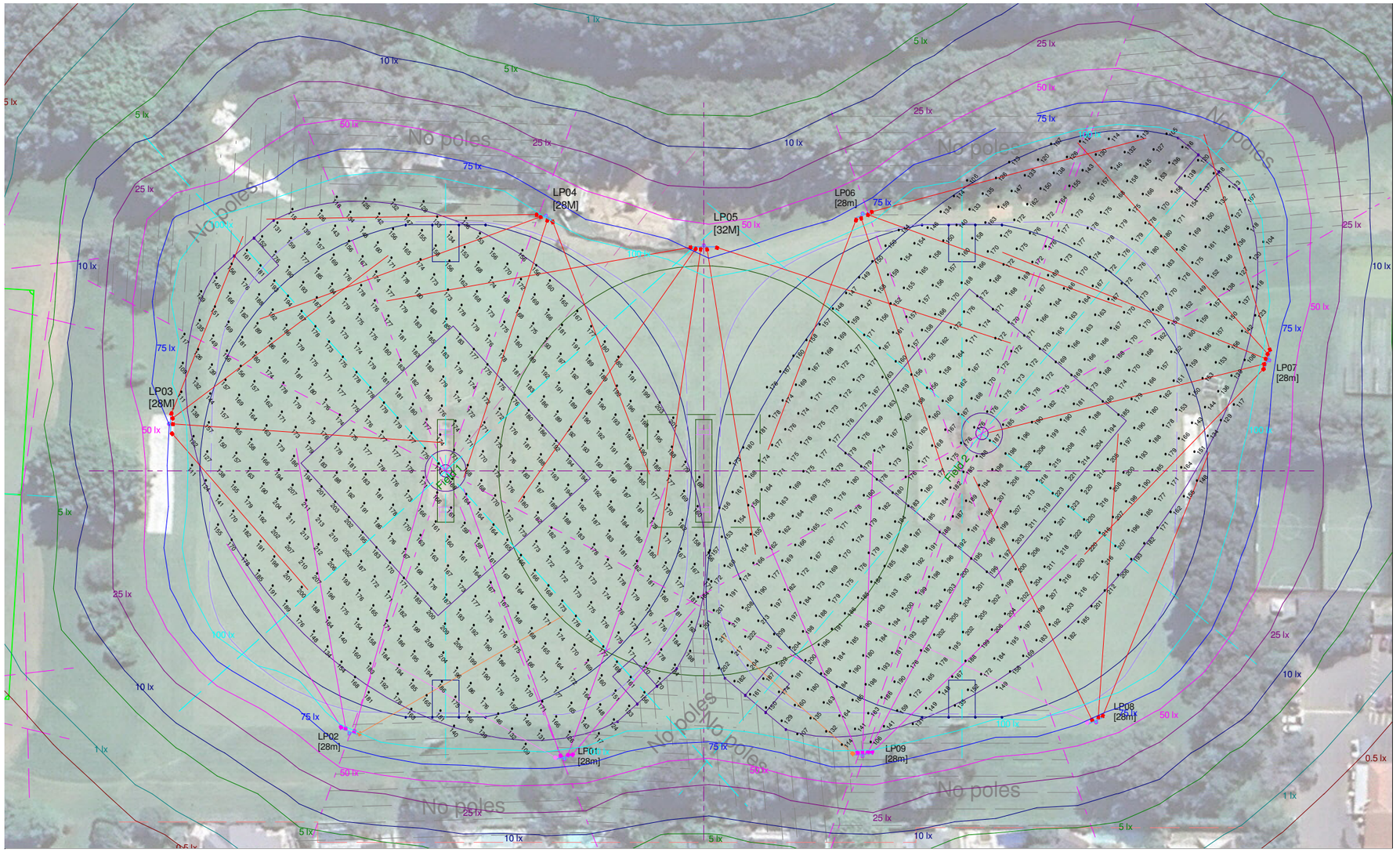
Light poles labelled LP01 to LP09 are new poles. (Refer diagram opposite)

* Light pole LP01 - 4 x Raptors 1200W mounted at 28m
* Light pole LP02 - 4 x Raptors 1200W mounted at 28m
* Light pole LP03 - 4 x Raptors 1200W mounted at 28m
* Light pole LP04 - 4 x Raptors 1200W mounted at 28m
* Light pole LP05 - 5 x Raptors 1200W mounted at 32m
* Light pole LP06 - 4 x Raptors 1200W mounted at 28m
* Light pole LP07 - 5 x Raptors 1200W mounted at 28m
* Light pole LP08 - 4 x Raptors 1200W mounted at 28m
* Light pole LP09 - 5 x Raptors 1200W mounted at 28m

All luminaires are recommended to have a minimum spacing of 1m apart, centre to centre.

We recommend the mounting centre of the over-slung luminaires are tabbed forward of the cross arm, approx 150mm, to minimise rear module obstruction by the cross arm, and the mounting centre of the under-slung luminaires are tabbed backwards from the cross arm, approx 150mm.

Note: If there is a likelihood that the lighting system will be, at a future time, upgraded to a higher level or extended to cover other fields, then consideration should be given to installation of poles and electrical power reticulation that can supports this at the initial stages.



Senior fields

Luminaire Schedule					
Scenario: All					
Symbol	**Qty**	**Description**	**Lum. Watts**	**Total Watts**	**LLF**
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1232	2464	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Right Side Shield	1232	2464	0.900

Calculation Summary							
Project: 1 Principle playing area							
Scenario: All							
Label	**Description**	**Avg**	**Max**	**Min**	**Min/Avg**	**Min/Max**	**UG**
Eh_Snr-AR_01	Horizontal plane illuminance on the PPA of Senior Australian rules field No:1 at 0m agl	173.40	213	109	0.63	0.51	1.32
Eh_Snr-AR_02	Horizontal plane illuminance on the PPA of Senior Australian rules field No:2 at 0m agl	172.37	223	104	0.60	0.47	1.44

Design certified by
Peter Jones FIES Aus&NZ
Membership no. 2678

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REV	DATE	COMMENTS	DESIGNER
R0	23/05/2025	Original design	PJ
R1	12/06/2025	Addition of 2 junior feilds	PJ
R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

TITLE
Horizontal plan illuminance: Both fields 'on'

Lighting Up Australia's Future
REES SPORTS LIGHTING

DOCUMENT NO.
0255326-01_R1.AGI

REVISION
R1

SHEET
A3

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

This Sports Lighting Assessment is based on the Light Technical Parameters and Guidelines from Australian Standard AS2560.2:2021, "Sports Lighting Part 2 Specific Applications".

The lighting design is to comply with the requirements of Section 2.6, Football (all codes) - Amateur level competition.

The Light Technical Parameters (LTP) are as follows:

* Average horizontal maintained illuminance: 100lux
* Minimum horizontal uniformity U1 (Min/Ave): 0.50
* Minimum horizontal uniformity U2 (Min/Max): 0.30
* Maximum uniformity gradient per 5m: 2
* Maximum glare rating (GR): 50

The dimensions for the Field of Play (FOP) for the fields has been taken as:-
- Frank Grey Oval (Senior Field 1) as 147m x 105m
- Frank Grey Oval (Junior Field 1) as 120m x 120m
- Mike Pawley Oval (Senior Field 2) as 172m x 96m
- Mike Pawley Oval Junior Field 2) as 120m x 120m

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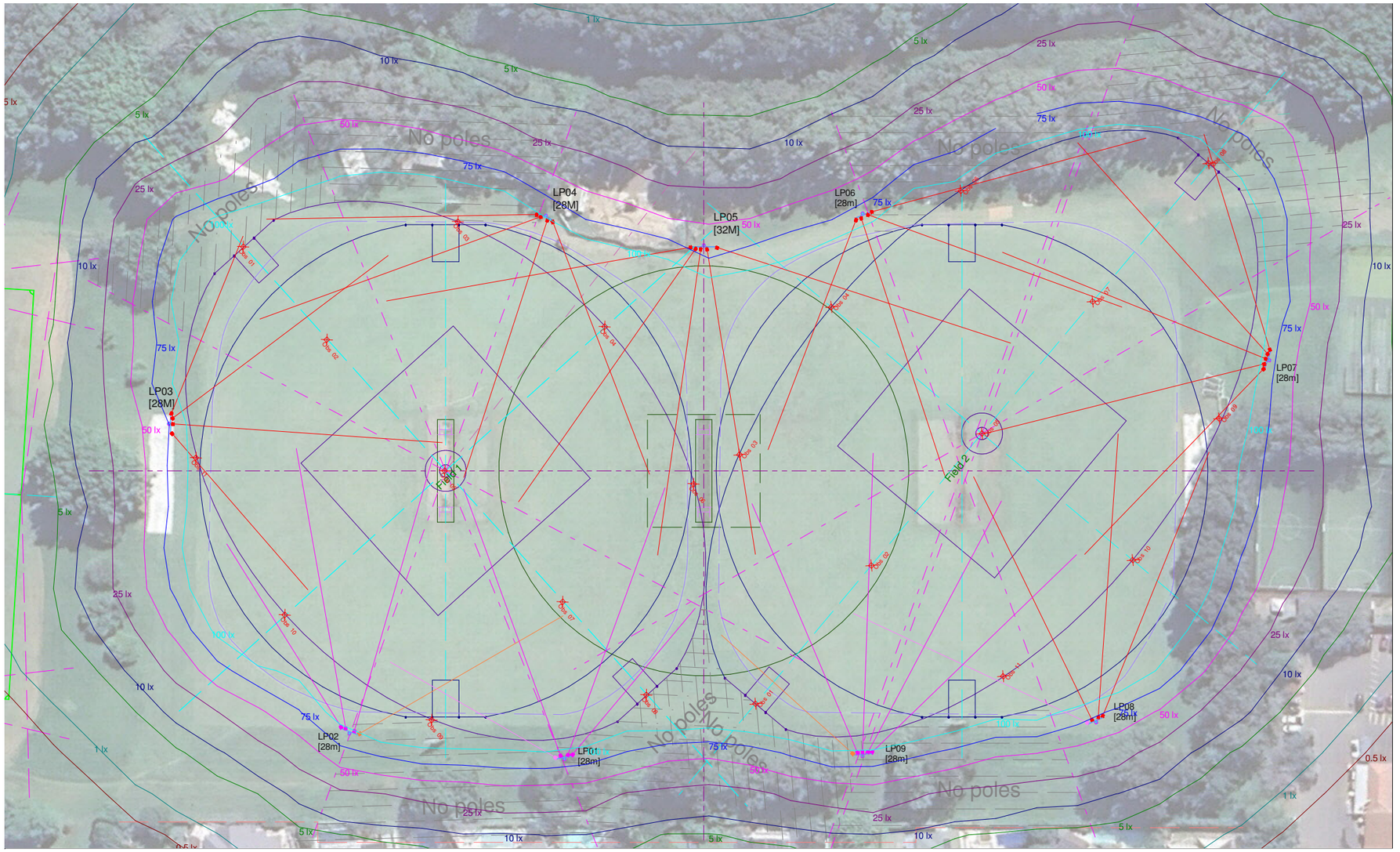

Senior fields

Glare Calculation - Senior field No:1			
Project: 2 Glare			
Scenario: All			
Label	**Obs Label**	**Reflect.**	**Max**
GR_Snr-AR_01	Obs 01	0.25	43
GR_Snr-AR_01	Obs 02	0.25	43
GR_Snr-AR_01	Obs 03	0.25	28
GR_Snr-AR_01	Obs 04	0.25	30
GR_Snr-AR_01	Obs 05	0.25	42
GR_Snr-AR_01	Obs 06	0.25	39
GR_Snr-AR_01	Obs 07	0.25	37
GR_Snr-AR_01	Obs 08	0.25	31
GR_Snr-AR_01	Obs 09	0.25	28
GR_Snr-AR_01	Obs 10	0.25	35
GR_Snr-AR_01	Obs 11	0.25	37

Glare Calculation - Senior field No:2			
Project: 2 Glare			
Scenario: All			
Label	**Obs Label**	**Reflect.**	**Max**
GR_Snr-AR_02	Obs 01	0.25	32
GR_Snr-AR_02	Obs 02	0.25	41
GR_Snr-AR_02	Obs 03	0.25	41
GR_Snr-AR_02	Obs 04	0.25	31
GR_Snr-AR_02	Obs 05	0.25	46
GR_Snr-AR_02	Obs 06	0.25	37
GR_Snr-AR_02	Obs 07	0.25	41
GR_Snr-AR_02	Obs 08	0.25	41
GR_Snr-AR_02	Obs 09	0.25	38
GR_Snr-AR_02	Obs 10	0.25	43
GR_Snr-AR_02	Obs 11	0.25	31

Design certified by

Peter Jones FIES Aus&NZ
Membership no. 2678

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Experts in lightability™

Schréder Australia Pty Ltd
Bldg 4A Parklands Estate 21-23 South St
Rydalmere NSW 2116 Australia
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www.sylvania-schreder.com
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REV	DATE	COMMENTS	DESIGNER
R0	23/05/2025	Original design	PJ
R1	12/06/2025	Addition of 2 junior fields	PJ
R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

TITLE
Horizontal plan illuminance: Both fields 'on'

REVISION R1

SHEET A3

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

DOCUMENT NO.
0255326-01_R1.AGI

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

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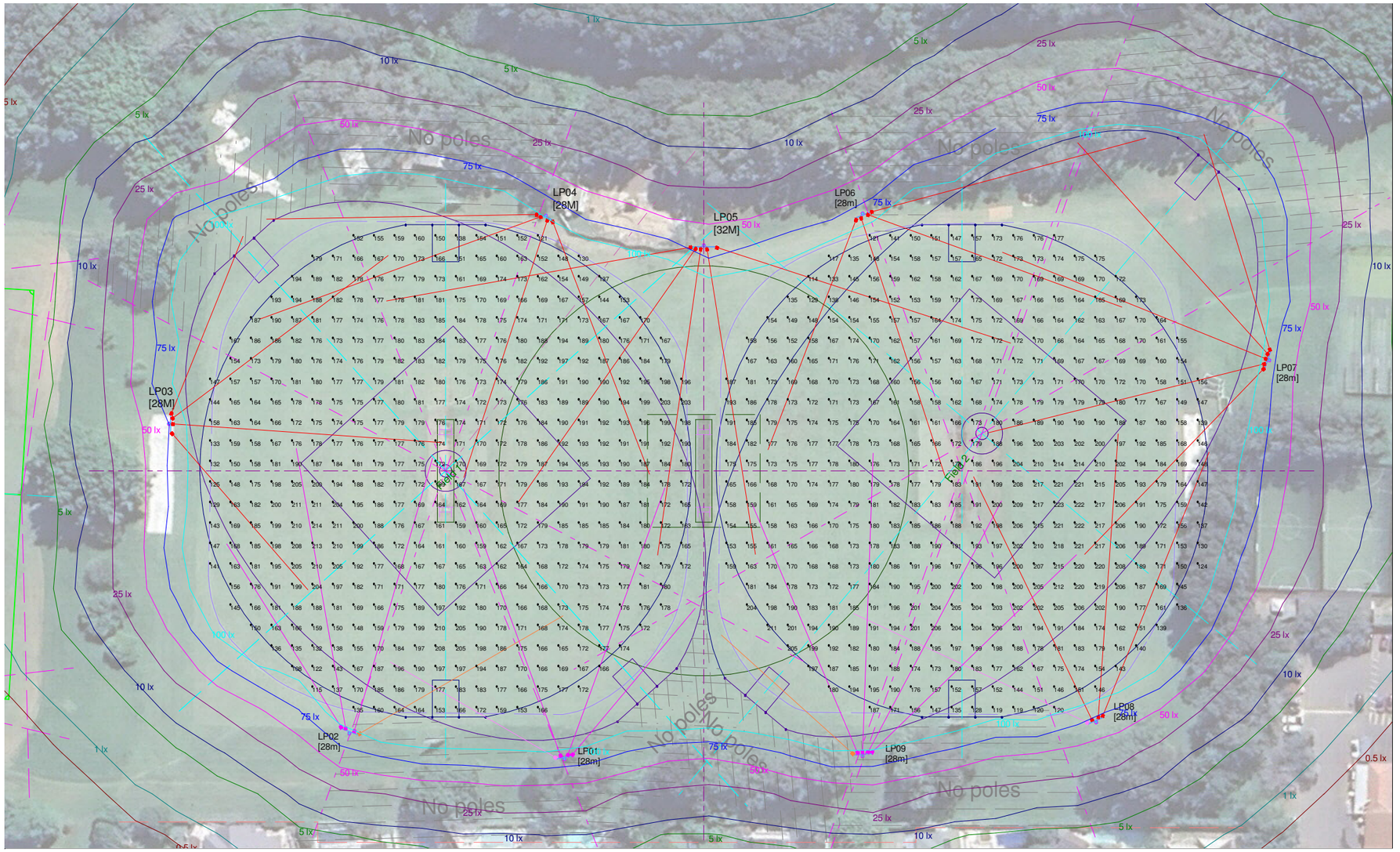

Junior fields

Luminaire Schedule					
Scenario: All					
Symbol	**Qty**	**Description**	**Lum. Watts**	**Total Watts**	**LLF**
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1232	2464	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Right Side Shield	1232	2464	0.900

Calculation Summary								
Project: 1 Principle playing area								
Scenario: All								
Label	**Description**	**Avg**	**Max**	**Min**	**Min/Avg**	**Min/Max**	**UG**
Eh_Jnr-AR_01	Horizontal plane illuminance on the PPA of Junior Australian rules field No:1 at 0m agl	175.49	214	108	0.62	0.50	1.26
Eh_Jnr-AR_02	Horizontal plane illuminance on the PPA of Junior Australian rules field No:2 at 0m agl	175.54	223	114	0.65	0.51	1.28

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REV	DATE	COMMENTS	DESIGNER
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R2			
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R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

TITLE
Horizontal plan illuminance: Both fields 'on'

REES SPORTS LIGHTING

DOCUMENT NO.
0255326-01_R1.AGI

REVISION
R1

SHEET
A3

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

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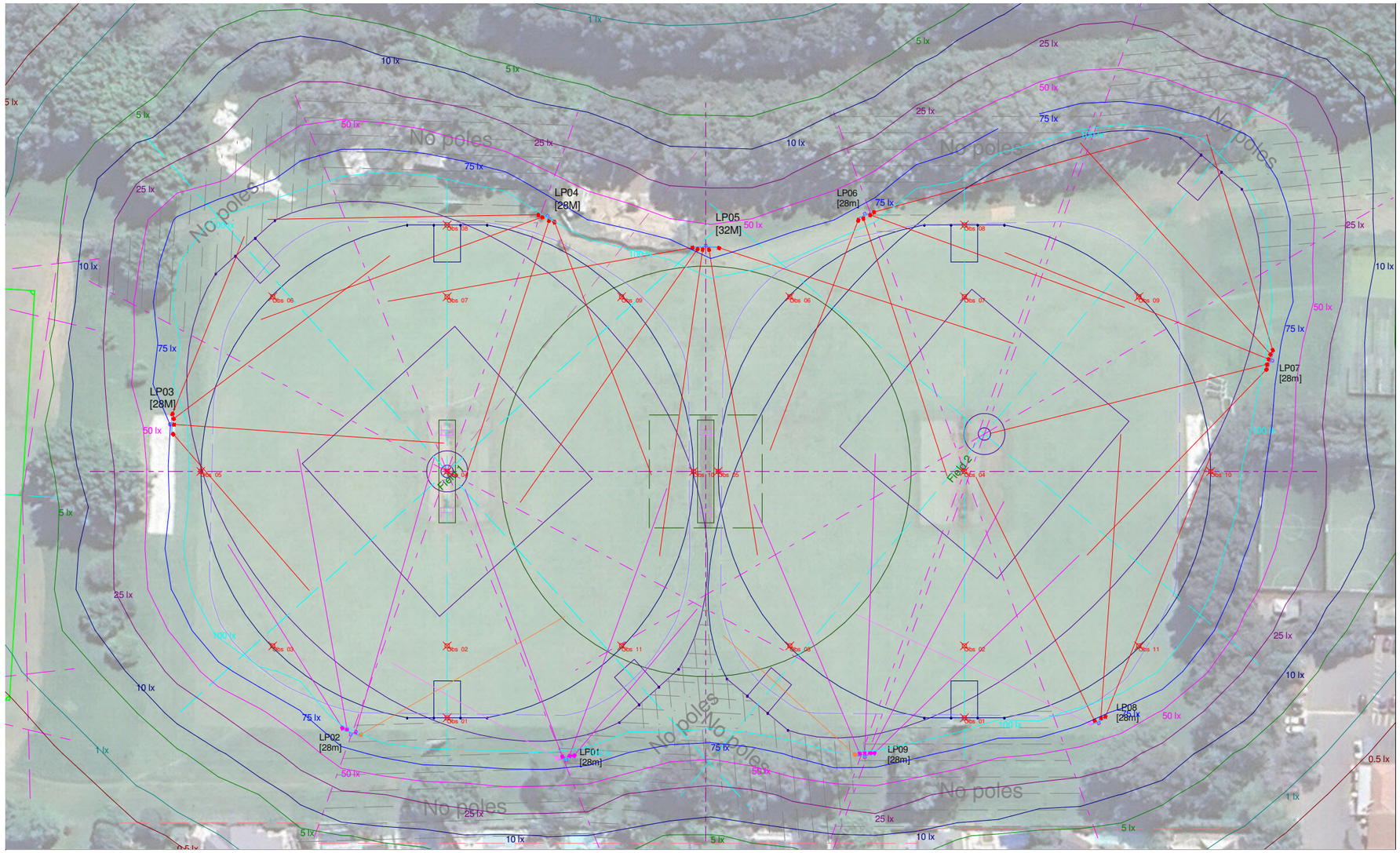

Junior fields

Glare Calculation - Junior field No:1			
Project: 2 Glare			
Scenario: All			
Label	**Obs Label**	**Reflect.**	**Max**
GR_Jnr-AR_01	Obs 01	0.25	23
GR_Jnr-AR_01	Obs 02	0.25	35
GR_Jnr-AR_01	Obs 03	0.25	30
GR_Jnr-AR_01	Obs 04	0.25	42
GR_Jnr-AR_01	Obs 05	0.25	38
GR_Jnr-AR_01	Obs 06	0.25	44
GR_Jnr-AR_01	Obs 07	0.25	39
GR_Jnr-AR_01	Obs 08	0.25	34
GR_Jnr-AR_01	Obs 09	0.25	25
GR_Jnr-AR_01	Obs 10	0.25	41
GR_Jnr-AR_01	Obs 11	0.25	34

Glare Calculation - Junior field No:2			
Project: 2 Glare			
Scenario: All			
Label	**Obs Label**	**Reflect.**	**Max**
GR_Jnr-AR_02	Obs 01	0.25	21
GR_Jnr-AR_02	Obs 02	0.25	32
GR_Jnr-AR_02	Obs 03	0.25	35
GR_Jnr-AR_02	Obs 04	0.25	47
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GR_Jnr-AR_02	Obs 09	0.25	40
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GR_Jnr-AR_02	Obs 11	0.25	35

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REV	DATE	COMMENTS	DESIGNER
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R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

TITLE
Horizontal plan illuminance: Both fields 'on'

REVISION R1

SHEET A3

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

DOCUMENT NO.
0255326-01_R1.AGI

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

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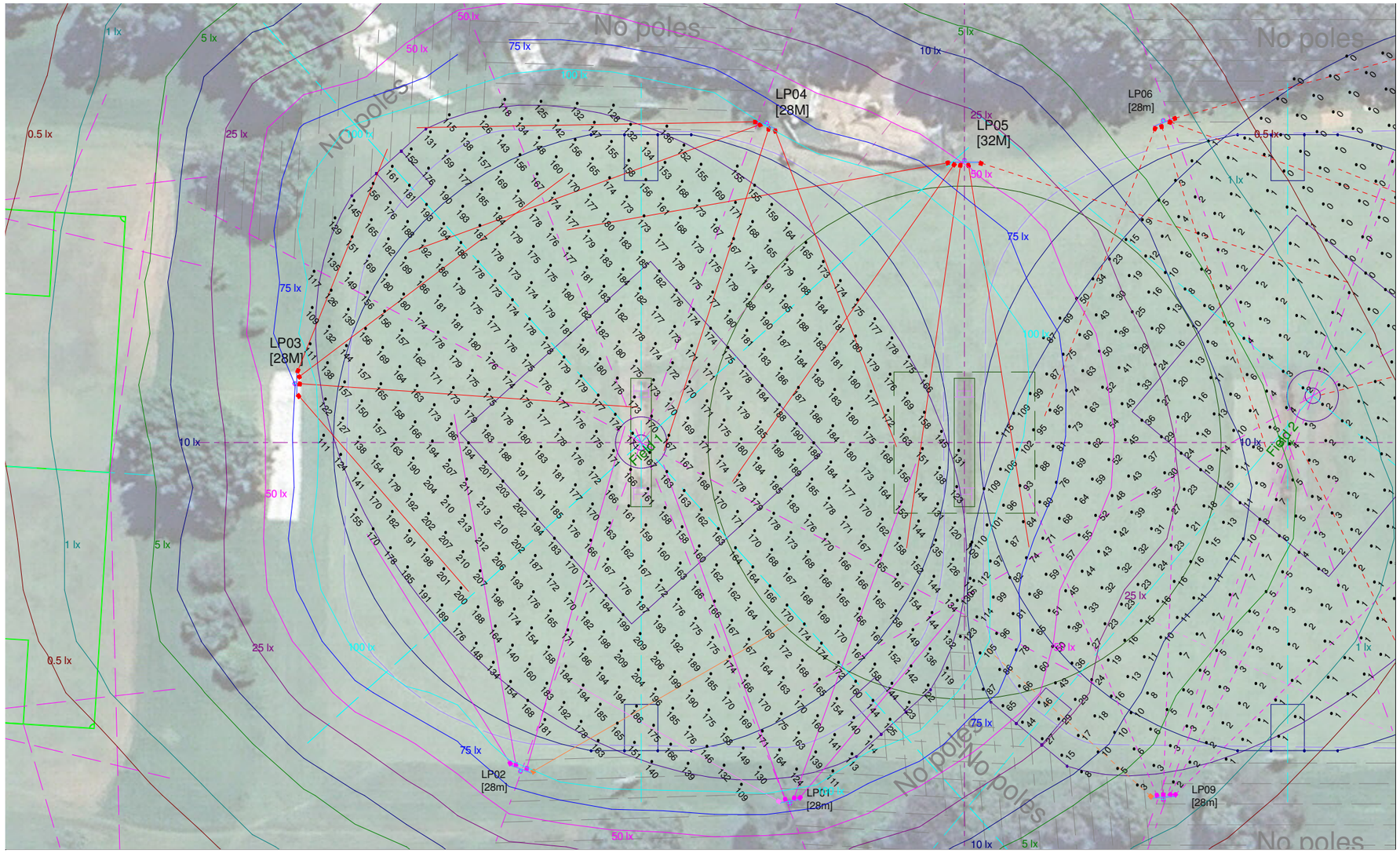

Senior field No:1

Luminaire Schedule					
Scenario: AFL field 1					
Symbol	**Qty**	**Description**	**Lum. Watts**	**Total Watts**	**LLF**
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Calculation Summary								
Project: 1 Principle playing area								
Scenario: AFL field 1								
Label	**Description**	**Avg**	**Max**	**Min**	**Min/Avg**	**Min/Max**	**UG**
Eh_Snr-AR_01	Horizontal plane illuminance on the PPA of Senior Australian rules field No:1 at 0m agl	169.11	213	109	0.64	0.51	1.32
Eh_Snr-AR_02	Horizontal plane illuminance on the PPA of Senior Australian rules field No:2 at 0m agl	13.91	130	0	0.00	0.00	3.00

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PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

TITLE
Horizontal plan illuminance: Field No:1 'on'

REES SPORTS LIGHTING

CONTACT
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DOCUMENT NO.
0255326-01_R1.AGI

REVISION
R0

SHEET
A3

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

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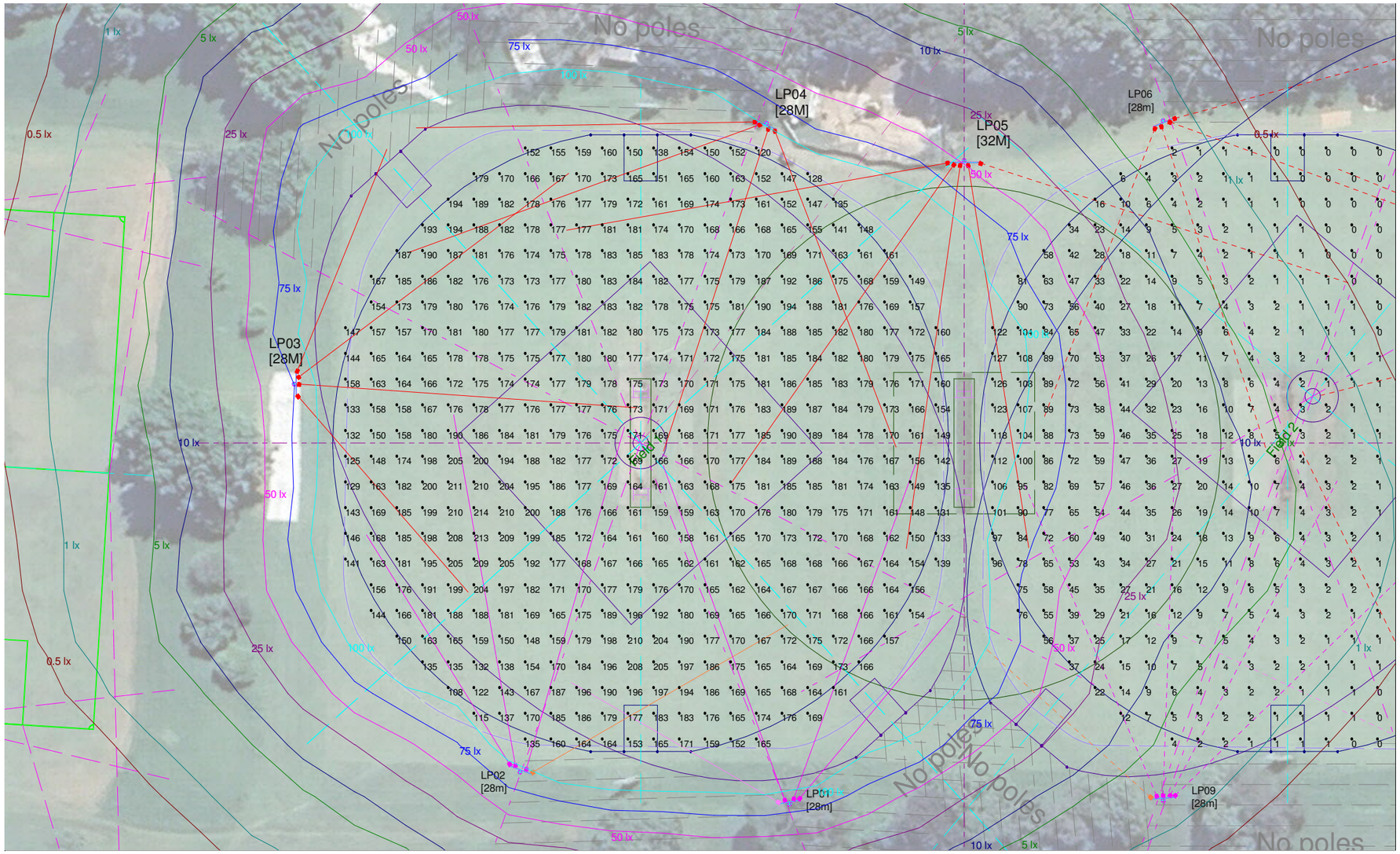

Junior field No:1

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Scenario: AFL field 1					
Symbol	**Qty**	**Description**	**Lum. Watts**	**Total Watts**	**LLF**
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1232	2464	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Right Side Shield	1232	2464	0.900

Calculation Summary							
Project: 1 Principle playing area							
Scenario: AFL field 1							
Label	**Description**	**Avg**	**Max**	**Min**	**Min/Avg**	**Min/Max**	**UG**
Eh_Jnr-AR_01	Horizontal plane illuminance on the PPA of Junior Australian rules field No:1 at 0m agl	172.22	214	108	0.63	0.50	1.27
Eh_Jnr-AR_02	Horizontal plane illuminance on the PPA of Junior Australian rules field No:2 at 0m agl	15.51	127	0	0.00	0.00	2.12

Design certified by
Peter Jones FIES Aus&NZ
Membership no. 2678

SYLVANIA Schréder
Experts in lightability™
Schréder Australia Pty Ltd
Bldg 4A Parklands Estate 21-23 South St
Rydalmere NSW 2116 Australia
T 1300 489 780
www.sylvania-schreder.com
ABN 17 604 331 937

REV	DATE	COMMENTS	DESIGNER
R0	23/05/2025	Original design	PJ
R1	12/06/2025	Addition of 2 junior feilds	PJ
R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

TITLE
Horizontal plan illuminance: Field No:1 'on'

REES SPORTS LIGHTING

REVISION R1
SHEET A3
DOCUMENT NO. 0255326-01_R1.AGI

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

This Sports Lighting Assessment is based on the Light Technical Parameters and Guidelines from Australian Standard AS2560.2:2021, "Sports Lighting Part 2 Specific Applications".

The lighting design is to comply with the requirements of Section 2.6, Football (all codes) - Amateur level competition.

The Light Technical Parameters (LTP) are as follows:

* Average horizontal maintained illuminance: 100lux
* Minimum horizontal uniformity U1 (Min/Ave): 0.50
* Minimum horizontal uniformity U2 (Min/Max): 0.30
* Maximum uniformity gradient per 5m: 2
* Maximum glare rating (GR): 50

The dimensions for the Field of Play (FOP) for the fields has been taken as:-
- Frank Grey Oval (Senior Field 1) as 147m x 105m
- Frank Grey Oval (Junior Field 1) as 120m x 120m
- Mike Pawley Oval (Senior Field 2) as 172m x 96m
- Mike Pawley Oval Junior Field 2) as 120m x 120m

Calculation grid points are established in a horizontal plane, covering the field of play, in accordance with Figure 2.6.1(a). This being a grid of size 5m x 5m at the level of the playing surface, with points at the perimeter no greater than half a grid spacing from the boundary.

The luminaire heights used in this design acknowledges the height recommendations within Table 2.6.2 from AS2560.2:2021. This assessment does not take into consideration the topography of the site. An analysis of the site topography should be considered when determining the actual heights of each pole.

Glare rating has been calculated at observer positions in accordance with Figure 2.6.7 from AS2560.2:2021. We have used a surface reflectance of 25% for a natural grass surface, as specified in AS2560.1:2018, Table 2.3.

This assessment does not take into consideration the effect of topography or the obstructive effect from buildings, trees, fences etc.

Light Loss Factor (LLF): RAPTOR GEN 4

A Light Loss Factor (LLF), accounting for LED lumen and dirt depreciation, of 0.9 has been used for all RAPTOR GEN 4 luminaires.
This is derived from a combination of the following:

* Luminaire Dirt Depreciation (LDD) - 0.92, based on a 72-month cleaning cycle (per AS2560.1:2018 Table 4.1)
* Lamp Lumen Depreciation (LLD) - 0.981 (L97.1) @ 17,000 burning hours.

Luminaire Arrangement:

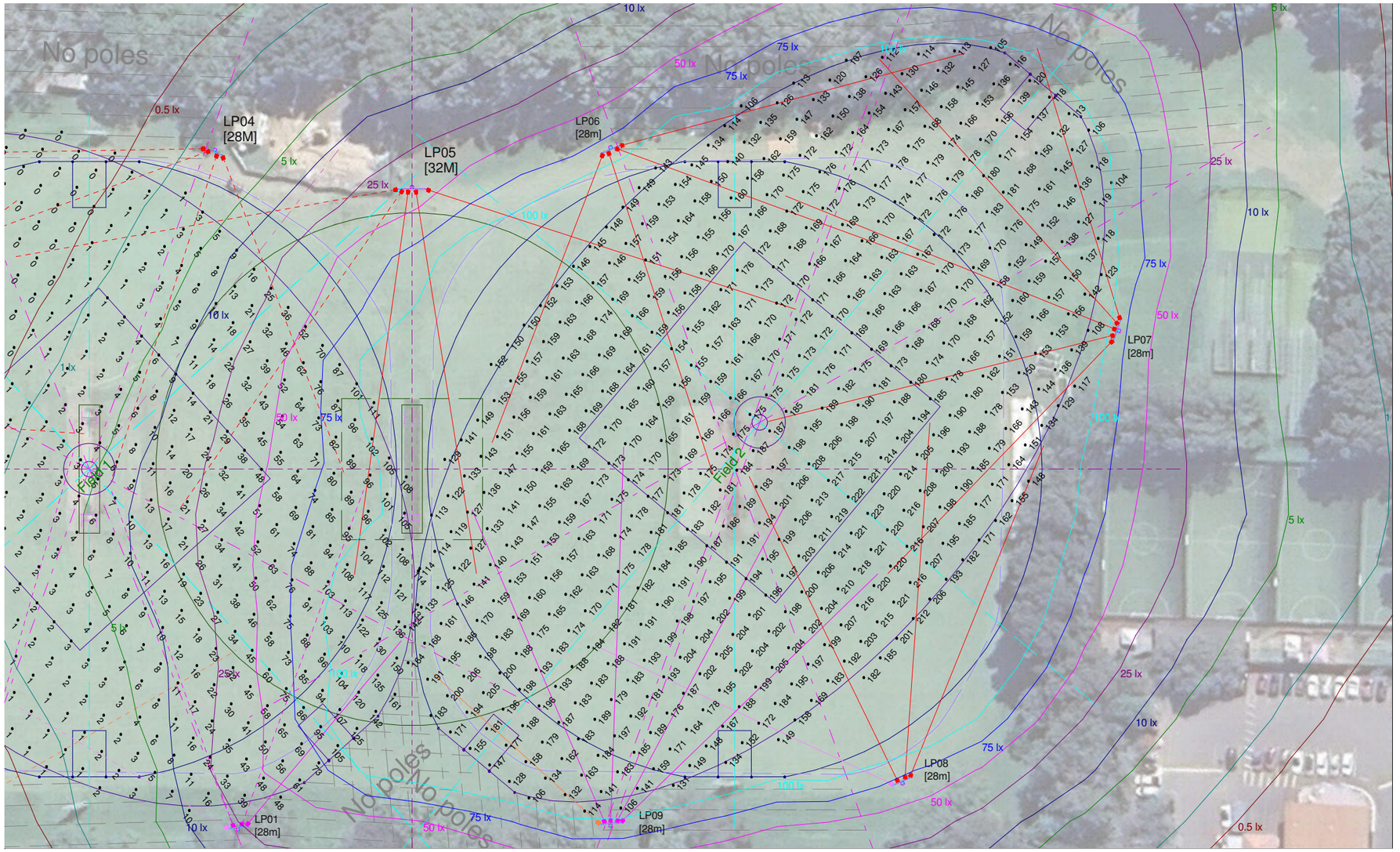
Light poles labelled LP01 to LP09 are new poles. (Refer diagram opposite)

* Light pole LP01 - 4 x Raptors 1200W mounted at 28m
* Light pole LP02 - 4 x Raptors 1200W mounted at 28m
* Light pole LP03 - 4 x Raptors 1200W mounted at 28m
* Light pole LP04 - 4 x Raptors 1200W mounted at 28m
* Light pole LP05 - 5 x Raptors 1200W mounted at 32m
* Light pole LP06 - 4 x Raptors 1200W mounted at 28m
* Light pole LP07 - 5 x Raptors 1200W mounted at 28m
* Light pole LP08 - 4 x Raptors 1200W mounted at 28m
* Light pole LP09 - 5 x Raptors 1200W mounted at 28m

All luminaires are recommended to have a minimum spacing of 1m apart, centre to centre.

We recommend the mounting centre of the over-slung luminaires are tabbed forward of the cross arm, approx 150mm, to minimise rear module obstruction by the cross arm, and the mounting centre of the under-slung luminaires are tabbed backwards from the cross arm, approx 150mm.

Note: If there is a likelihood that the lighting system will be, at a future time, upgraded to a higher level or extended to cover other fields, then consideration should be given to installation of poles and electrical power reticulation that can supports this at the initial stages.



Senior field No:2

Luminaire Schedule					
Scenario: AFL field 2					
Symbol	**Qty**	**Description**	**Lum. Watts**	**Total Watts**	**LLF**
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1232	2464	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Right Side Shield	1232	2464	0.900

Calculation Summary							
Project: 1 Principle playing area							
Scenario: AFL field 2							
Label	**Description**	**Avg**	**Max**	**Min**	**Min/Avg**	**Min/Max**	**UG**
Eh_Snr-AR_01	Horizontal plane illuminance on the PPA of Senior Australian rules field No:1 at 0m agl	20.60	161	0	0.00	0.00	3.00
Eh_Snr-AR_02	Horizontal plane illuminance on the PPA of Senior Australian rules field No:2 at 0m agl	168.80	223	104	0.62	0.47	1.44

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Bldg 4A Parklands Estate 21-23 South St
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REV	DATE	COMMENTS	DESIGNER
R0	23/05/2025	Original design	PJ
R1	12/06/2025	Addition of 2 junior fields	PJ
R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

TITLE
Horizontal plan illuminance: Field No:2 'on'

REVISION
R1

SHEET
A3

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

DOCUMENT NO.
0255326-01_R1.AGI

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

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The Light Technical Parameters (LTP) are as follows:

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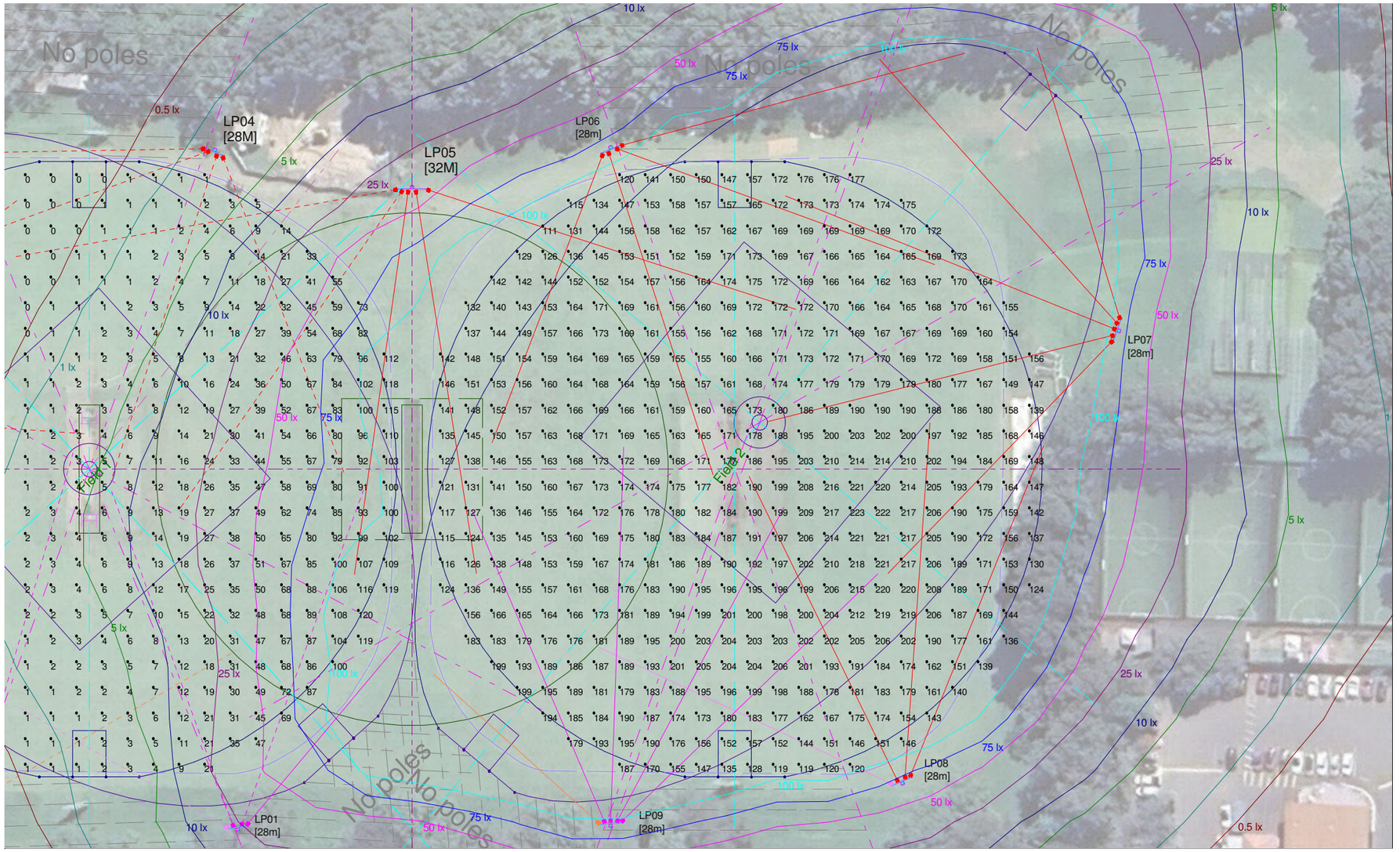

Junior field No:2

Luminaire Schedule
Scenario: AFL field 2

Symbol	Qty	Description	Lum. Watts	Total Watts	LLF
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1232	2464	0.900
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Calculation Summary
Project: 1 Principle playing area
Scenario: AFL field 2

Label	Description	Avg	Max	Min	Min/Avg	Min/Max	UG
Eh_Jnr-AR_01	Horizontal plane illuminance on the PPA of Junior Australian rules field No:1 at 0m agl	17.90	120	0	0.00	0.00	2.83
Eh_Jnr-AR_02	Horizontal plane illuminance on the PPA of Junior Australian rules field No:2 at 0m agl	171.33	223	111	0.65	0.50	1.28

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R0	23/05/2025	Original design	PJ
R1	12/06/2025	Addition of 2 junior feilds	PJ
R2			
R3			
R4			
R5			

PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

TITLE
Horizontal plan illuminance: Field No:2 'on'

Lighting Up Australia's Future
REES SPORTS LIGHTING

DOCUMENT NO.
0255326-01_R1.AGI

REVISION
R1

SHEET
A3

DESIGN NOTES: SPORTS LIGHTING ASSESSMENT

2.6 FOOTBALL: Australian Rules

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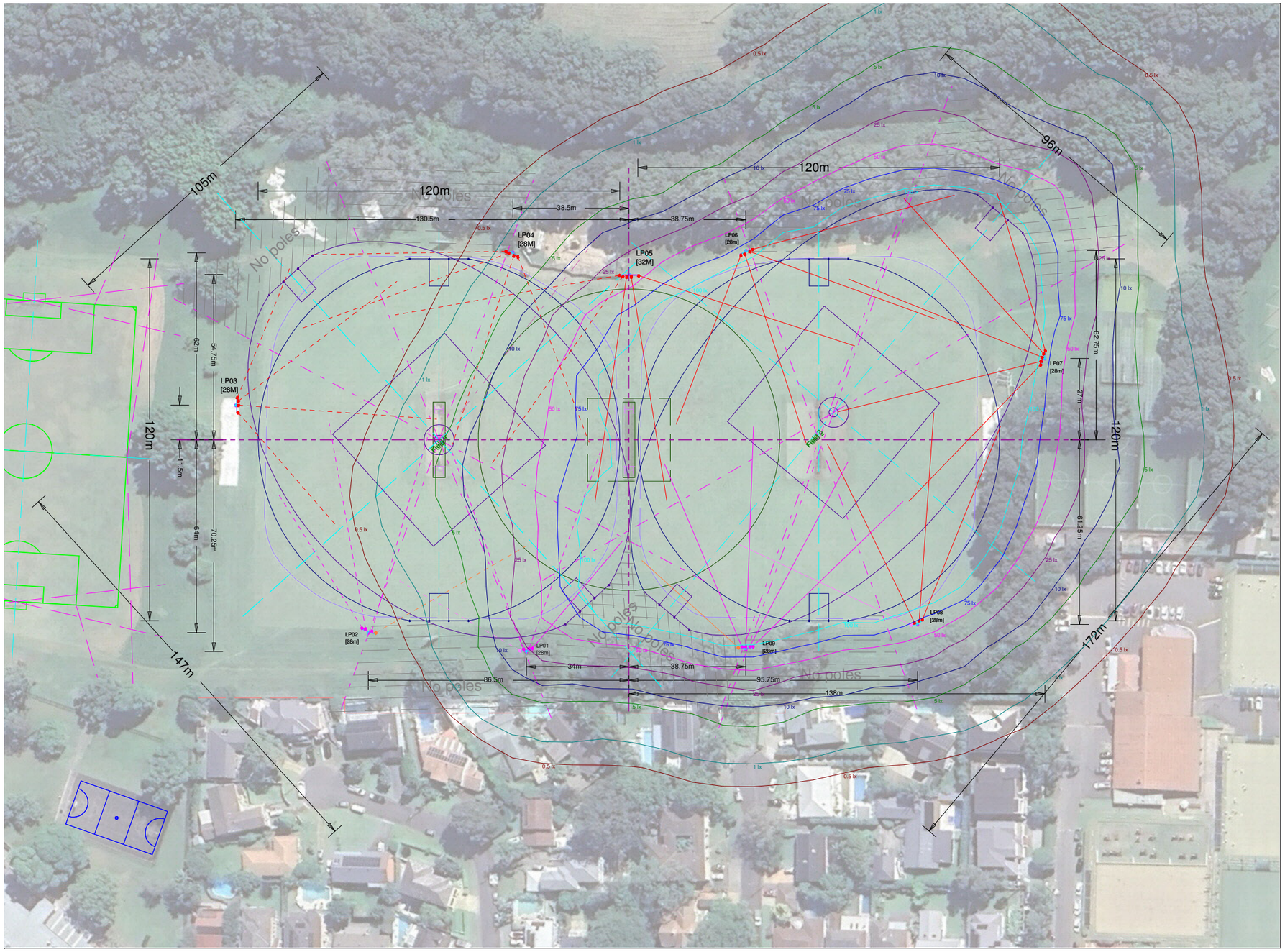

Dimensions

Luminaire Schedule					
Scenario: AFL field 2					
Symbol	**Qty**	**Description**	**Lum. Watts**	**Total Watts**	**LLF**
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1243	31075	0.900
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1232	12320	0.900
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PROJECT
Frank Gray & Mike Pawley Ovals,
North Curl Curl NSW.

TITLE
Dimensions

REES SPORTS LIGHTING

REVISION
R1

SHEET
A3

CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

DOCUMENT NO.
0255326-01_R1.AGI

DESIGN NOTES: OBTRUSIVE LIGHT ASSESSMENT

The Obtrusive Light assessment is based on the light limiting parameters and guidelines from the Australian Standard AS/NZS4282:2023 "Control of the obtrusive effects of outdoor lighting".

To claim compliance with the Standard, calculations must comply with the following light limiting parameters:

* Spill light (Illuminance (lux))
* Luminous Intensity At Vertical Planes (Candelas (cd))
* Threshold Increment (TI)
* Upward Light Ratio (ULR)

Refer to image opposite for all assumed spill light, luminous intensity and threshold increment boundaries.

Calculations are initial (LLF = 1), representing the worst-case scenario and assume Pre-curfew conditions in accordance with AS/NZS4282:2023.

This calculation has assumed the site to fall within environmental category, Zone A3, as per Table 3.1 within AS/NZS4282:2023.

The relevant light technical parameters for spill light, threshold increment and upward light ratio are taken from Table 3.2 within AS/NZS4282:2023. Refer to next page for light technical parameters.

The relevant light technical parameters for luminous intensity are taken from Table 3.3 within AS/NZS4282:2023. All luminaires are aimed to comply with LEVEL 1 control limits. Refer to next page for light technical parameters.

Calculations use a scaled aerial image to estimate assumed property boundaries and roadways. A surveyed drawing, highlighting property boundaries and surrounding roadways, should always be used to verify calculation locations.

This obtrusive lighting assessment is based solely on the proposed lighting scheme and does not take into account the obtrusive effects of any existing lighting.

See following page for relevant definitions and calculation parameters taken from AS/NZS4282:2023.

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A3 - Medium District Brightness, Non-Curfew L1
Filename: 0255326-01_R1
12/06/2025 1:26:46 PM

Illuminance

Maximum Allowable Value: 10 Lux

Calculations Tested (5):

Calculation Label	Test Results	Max. Illum.
OL_01_Ill_Seg1	PASS	3
OL_01_Ill_Seg2	PASS	3
OL_01_Ill_Seg3	PASS	9
OL_01_Ill_Seg4	PASS	4
OL_01_Ill_Seg5	PASS	8

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 12500 Cd

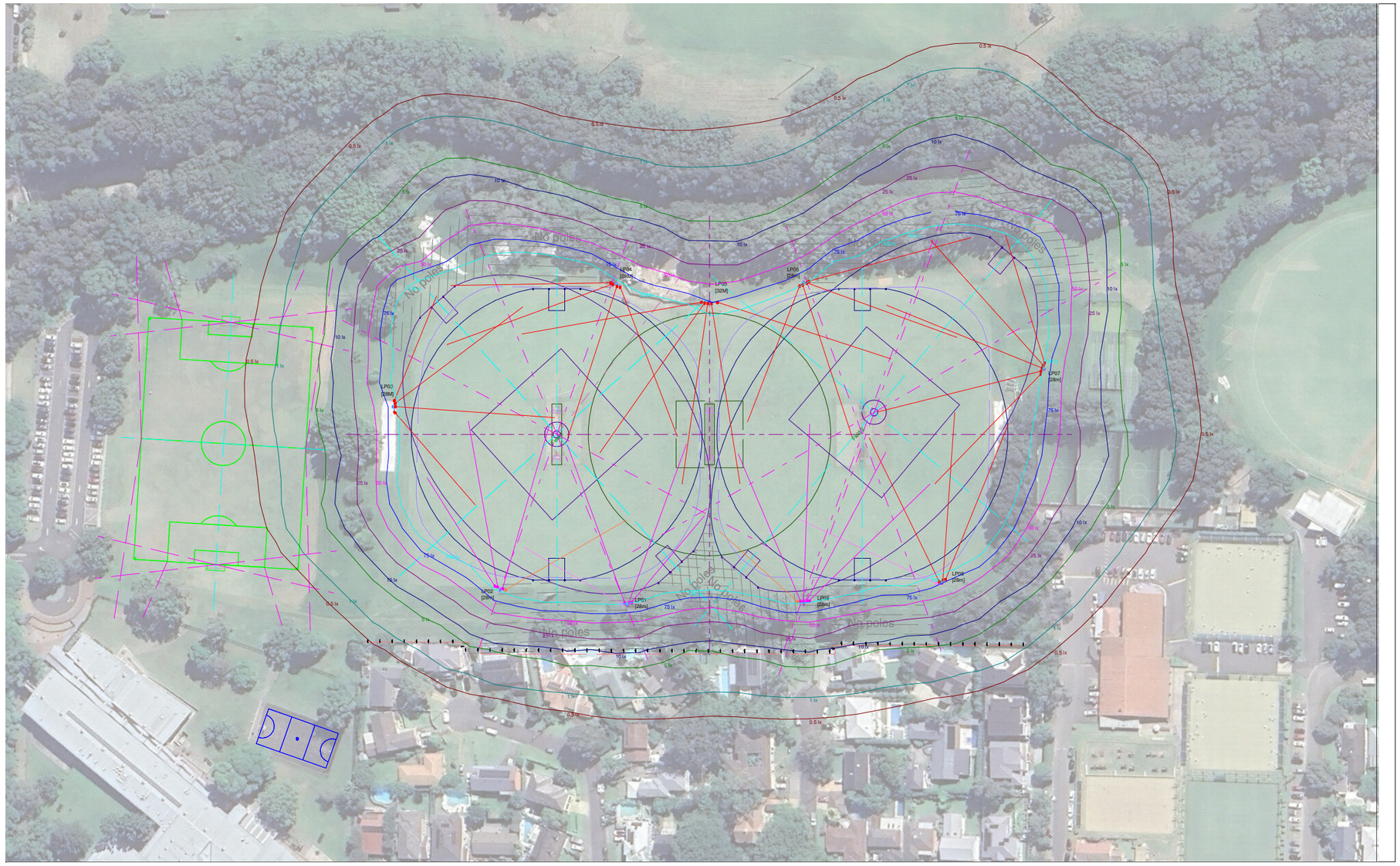
Calculations Tested (5):

Calculation Label	Test Results
OL_01_Cd_Seg1	PASS
OL_01_Cd_Seg2	PASS
OL_01_Cd_Seg3	PASS
OL_01_Cd_Seg4	PASS
OL_01_Cd_Seg5	PASS

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 2.0 %

Calculated UWLR: 0.1 %
Test Results: PASS



Spill Boundaries		
Project: 3 Obtrusive Light		
Scenario: All		
Label	**CalcType**	**Max**
OL_01_Cd_Seg1	Obtrusive - Cd	8352
OL_01_Cd_Seg2	Obtrusive - Cd	9716
OL_01_Cd_Seg3	Obtrusive - Cd	11462
OL_01_Cd_Seg4	Obtrusive - Cd	7484
OL_01_Cd_Seg5	Obtrusive - Cd	8756
OL_01_Ill_Seg1	Obtrusive - Ill	3
OL_01_Ill_Seg2	Obtrusive - Ill	3
OL_01_Ill_Seg3	Obtrusive - Ill	9
OL_01_Ill_Seg4	Obtrusive - Ill	4
OL_01_Ill_Seg5	Obtrusive - Ill	8

UWLR Area Summary	
Project: 6 Upward waste light	
Scenario: All	
Label	**UWLR**
Upward Waste Light Ratio	0.001

Luminaire Schedule			
Scenario: All			
Symbol	**Qty**	**Description**	**LLF**
	25	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W	1.000
	10	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back Shield	1.000
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Left Side Shield	1.000
	2	Sylvania - RAPTOR SR2A1G4-740 CRI70 CCT4000K Asymmetric Narrow 1200W + Back and Right Side Shield	1.000

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PROJECT
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CONTACT
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TITLE
AS/NZS4282:2023 Obtrusive Light Report

DOCUMENT NO.
0255326-01_R1.AGI

REES SPORTS LIGHTING

REVISION
R1

SHEET
A3

DESIGN NOTES: AS/NZS4282 DEFINITIONS AND CALCULATION PARAMETERS

The Obtrusive Light assessment is based on the light limiting parameters and guidelines from Australian Standards AS/NZS4282:2019, "Control of the obtrusive effects of outdoor lighting". To claim compliance, calculations must comply with the light limiting parameters specified by AS/NSZ4282:2023 for Spill Light, luminous Intensity, Threshold Increment and Upward Light Ratio.

The lighting design must determine whether light limiting parameters are to be calculated assuming Pre-Curfew or Curfew conditions. For example, Pre-Curfew conditions may be applicable up to a time slot of 10pm therefore, Curfew conditions will be applicable at a time slot from 10pm to 6am. We note, the actual time frame for Pre-Curfew conditions will be set by the Controlling Regulatory Authority.

Spill Light:

* The calculation plane, being a vertical grid facing the site, is generally determined at the building line of the potentially affected dwelling/s.

* Property building lines are assessed at their assumed locations, as shown on previous page.

* In the case where the building line is greater than 10m from the relevant property boundary, the calculation plane shall be located 10m from the property boundary.

* Spill light has been calculated in a vertical plane, facing the site from a starting height of 1.5m.
  The calculation grid size is 5m(L) x 1m(H), where boundaries are greater than 20m from nearest pole.
  The calculation grid size is 2m(L) x 1m(H), where boundaries are less than 20m from nearest pole.

* Light limiting parameters must not exceed values highlighted in Table 3.2 within AS/NZS4282:2023.

Luminous Intensity:

* The direct view of bright luminaires from normal viewing directions can cause annoyance, distraction, and discomfort. The luminous intensity of a luminaire, in a nominated direction, is an indicator of this effect.

* All new installations require luminaires to be aimed to meet Level 1 Control Limits. Level 1 being the highest form of control afforded to luminaire aiming. Where the reuse of existing infrastructure, or a modified installation, does not permit Level 1 control, Level 2 control is applicable.

* Luminous Intensity has been calculated on the same vertical plane at coincidental points, as per the Spill Light grids noted above. Light limiting parameters must not exceed values highlighed in Table 3.3 within AS/NZS4282:2023.

Threshold Increment:

* The effects on transport system users (e.g., motorists, railway lines) normally involve a reduction in the ability to see caused by disability glare from bright light sources. The relevant indicator for transport system users is Threshold Increment.

* Threshold Increment has been calculated on all surrounding roadways, as shown on previous page, in accordance with Table 3.2 within AS/NZS4282:2023.

Upward Light Ratio (Sky Glow):

* The amount of flux from a luminaire that is emitted above the horizontal, directly into the night sky, calculated as a ratio and expressed as a percentage, is known as the Upward Light Ratio (ULR). Maximum limits as per Table 3.2 within AS/NZS4282:2023.

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Rydalmere NSW 2116 Australia
T 1300 489 780
www.sylvania-schreder.com
ABN 17 604 331 937

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PROJECT
Frank Gray & Mike Pawley Ovals, North Curl Curl NSW.

TITLE
AS/NZS4282:2023 Definitions and Parameters

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SHEET
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CONTACT
Ryan Thompson
rthompson@sylvania-schreder.com

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Appendix 2 Flora and Fauna Assessment

Sportsground Lighting Project at Frank Gray and Mike Pawley Ovals

Flora and fauna assessment

Draft Report

Prepared for Northern Beaches Council

22 January 2026

Biosis offices

New South Wales

Albury
Phone: (02) 6069 9200
Email: albury@biosis.com.au

Gosford
Phone: (02) 9101 8700
Email: gosford@biosis.com.au

Newcastle
Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Western Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Wollongong
Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

Victoria

Ballarat
Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

Melbourne
Phone: (03) 8686 4800
Email: melbourne@biosis.com.au

Wangaratta
Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

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Report to:	Northern Beaches Council
Prepared by:	Jemma Giuliano Rachel Moore Trevor Coombes
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- NSW Department of Primary Industries Fisheries for access to the predicted distribution maps for threatened species and fish communities.

Biosis staff involved in this project were:

- Natasha Zahra (field investigations).
- Rachel Moore and Trevor Coombes (reporting).
- Jenny Beckius (GIS mapping).

Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work.

We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.

Contents

Tables

Figures

Definitions

BC Act	*Biodiversity Conservation Act 2016*
Biosecurity Act	*Biosecurity Act 2015*
BOS	Biodiversity Offsets Scheme
CBD	Central Business District
CM Act	*Coastal Management Act 2016*
Cth DCCEEW	Australian Commonwealth Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
GIS	Geographic Information System
KTP	Key Threatening Process
Impact area	20m buffer around perimeter of ovals including the amenities building in the north and the construction compound in the northeast
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
MNES	Matters of National Environmental Significance
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
PCT	Plant Community Type
SEPP	NSW State Environmental Planning Policy
SIC	Significant Impact Criteria
SIS	Species Impact Statement
Study area	Frank Gray and Mike Palwey Ovals
TEC	Threatened Ecological Community
ToS	Test of Significance
WM Act	*NSW Water Management Act 2000*

Summary

Biosis Pty Ltd was commissioned by Northern Beaches Council to undertake a Flora and Fauna Assessment (FFA) for the proposed sportsground lighting and new shared pathway project at Frank Gray and Mike Pawley Ovals (the Project) located in Curl Curl, New South Wales (NSW). This FFA will support the Review of Environmental Factors (REF), also being prepared by Biosis, which will inform the approval and implementation of the Project by Council as required under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The project works involve the installation of a new sportsground lighting system involving nine lighting poles with concrete footings, steel poles, and Sylvania RAPTOR GEN 4 floodlights mounted at approximately 28–32 metres height. The poles will be located outside the existing cricket field boundaries and provide individually controlled lighting for each oval. Additionally, a new shared pedestrian pathway and associated lighting will be constructed, which will connect the Northern Beaches Secondary School Freshwater Campus carpark on Harbour Rd with the new Frank Gray amenities building.

The study area comprises both the ovals, a small portion in the northern section of Freshwater Campus school grounds and associated carpark, as well as the surrounding vegetation and Greendale Creek, which is located to the north of the ovals. For the purposes of this assessment, Biosis have assumed that nine new poles will require installation as a worst-case scenario, and a 10-metre corridor around the perimeter for the ovals will be required to accommodate trenching, as well as additional area to the north and northeast to incorporate the amenities building and the proposed construction compound (the impact area).

This assessment approach has been undertaken to allow for assessment of both the direct area of impact as well as any additional areas in the broader study area which are likely to be affected by the proposal, either directly or indirectly. Identified constraints will be used to guide detailed design, with an emphasis on avoiding impacts where feasible.

The objective of this FFA is to determine the presence of any threatened ecological communities (TECs) within the study area and, where applicable, assess the impacts of the project on any threatened species, populations and/or ecological communities (entities), or their habitat, listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the NSW *Biodiversity Conservation Act 2016* (BC Act).

Ecology values and impacts

This report is an assessment of the potential impact of the proposed works in accordance with the EP&A Act, EPBC Act and BC Act.

The proposed works will result in the following impacts:

- Exotic turf will be removed for installation of lighting and trenching for power cables.
- Light spill into the 'dark' areas of the riparian corridor of Greendale Creek.
- Contribution to the cumulative artificial light pollution across the Sydney metropolitan area.
- Potential changes in the abundance and diversity of bat species.
- Potential impacts to foraging habitat for threatened microbat species and Grey-headed Flying-fox, which may lead to behavioural adaptions.

- Resource partitioning and shifts in foraging niches.
- Alterations to predator-prey species interactions.

Plant Community Type (PCT) 4028 Estuarine Swamp Oak Twig-rush Forest and PCT 3969 Estuarine Reedland were recorded within the study area. Although some native vegetation corresponds to the TEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, the condition and floristic composition do not meet the listing criteria for the corresponding Endangered Ecological Community (EEC) under the EPBC Act. A detailed justification is provided in Section 3.1. The proposed works are not expected to impact any native vegetation present and all impacts to vegetation will be restricted to the maintained exotic grasslands within the sports fields.

No threatened flora species listed under the EPBC Act or BC Act were recorded during field surveys. Two threatened fauna species listed under the EPBC and eight threatened species listed under the BC Act were determined to have a moderate to high likelihood of occurrence within the study area including:

- Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (Vulnerable, BC Act)
- Greater Borad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act)
- Grey-headed Flying Fox *Pteropus poliocephalus* (Vulnerable EPBC Act and BC Act)
- Large Bent-winged Bat *Miniopterus orianae orianae* (Vulnerable, BC Act)
- Large-eared Pied Bat *Chalinolobus dwyeri* (Endangered, EPBC Act and BC Act)
- Little Bent-wing Bat *Miniopterus australis* (Vulnerable, BC Act)
- Southern Myotis *Myotis macropus* (Vulnerable, BC Act)
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act)

Test of Significance (ToS) and Species Impact Criteria (SICs) assessments were carried out for these species due to potential impacts on foraging resources as a result of the proposed works. These assessments concluded that the proposal is unlikely to have a significant impact on these EPBC Act and/or BC Act listed fauna species.

Greendale Creek, a Strahler order 1 system, was recorded within the study area. This watercourse and associated riparian vegetation will not be directly impacted by the proposed works for the project.

The proposed location of the site compound is mapped within the 'Coastal Environmental Area' under the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP). However, as the compound does not require surface disturbance, it will not interfere with the objectives of the Resilience and Hazards SEPP.

The proposed works will not result in a significant effect on threatened species, populations or communities listed under the EPBC Act or BC Act as described in Section 4 of this report. As such, consideration of the Biodiversity Offset Scheme (BOS) is not warranted and a Biodiversity Development Assessment Report (BDAR) is not required. A referral to the Commonwealth Minister for the Environment and Water is also not required.

Recommendations

Given that the works will not require the removal of any native vegetation within the study area, the focus of the recommendations is to minimise disturbance to any surrounding native vegetation and fauna habitat which may be negatively impacted by increased levels of artificial light at night.

The recommendations include:

- Lighting modules are to be fitted with shields to minimise light spill and pointed downwards to minimise contribution to sky-glow. It is acknowledged that some lighting may need to remain uncovered/angled skywards to allow for illumination during ball sports in accordance with AS 2560.2:2021 Sports lighting, Part 2: Specific applications (Standards Australia Limited 2021) (all codes). Use of these unshielded lights is to be minimised as much as possible.
- Lighting levels are to be adjusted to match minimum level of illuminance required for the sport and level of competition in play. Lighting should be programmed to meet these various requirements and switched off when not required.
- During the installation of the lighting towers, minimise disturbance to any native vegetation surrounding to the fullest extent practicable.
- A luminosity assessment should be undertaken following installation of the proposed lighting works to ensure consistency with the modelled lighting output and compliance with AS 4282 *Control of the Obtrusive Effects of Outdoor Lighting* (Standards Australia 2019). Assessment should include measures of luminous flux and illuminance under the different lighting setups required for the various types of sports and competition levels to ensure lighting levels do not exceed the minimum requirements.
- Where possible, any trees to be retained should be protected in accordance with Australian Standard AS4970 – 2009 Protection of trees on development sites, during construction, operation and decommissioning of the site compound.
- In the unlikely event that unexpected threatened species are identified during the project, works should cease and an ecologist contacted.
- Two priority weeds within the Northern Beaches Council LGA were identified within the study area. Soil transportation should be minimised within, into or out of the study area to reduce the spread of weeds.
- The northwest section of the study area is located within the Coastal Environmental Area. Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values.

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Northern Beaches Council (Council) to undertake a Flora and Fauna Assessment (FFA) for the proposed upgrade of the existing sportsground lighting and a new shared path connection at Frank Gray and Mike Pawley Ovals (the Project) located in Curl Curl, New South Wales (NSW). This FFA will support the project's Review of Environmental Factors (REF), also being prepared by Biosis, to inform the approval and implementation of the Project by Council as required under Part 5, Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Biosis understands that Council is proposing to install a new sportsground lighting system for the sports fields at Frank Gray and Mike Pawley Ovals. Additionally, a new shared path connection and associated pedestrian lighting are proposed between the Freshwater Campus carpark on Harbour Road to the new amenities building which will be located adjacent to the ovals. The study area comprises Frank Gray Oval and Mike Pawley Oval, the a small portion in the northern section of Freshwater Campus school grounds and associated carpark, as well as the surrounding vegetation and Greendale Creek, which is located to the north of the sports fields. While the project design is yet to be finalised, it is expected to involve the installation of either seven or nine new lighting poles. Each pole will include a concrete footing, steel pole and Sylvania RAPTOR GEN 4 floodlight luminaires mounted at a height of approximately 28–32 metres (with four to five floodlights per pole). The poles will be positioned outside the boundaries of the cricket fields and will provide individually switched lighting for each oval. It is understood that trenching will be required for the installation of the electrical wiring and a construction compound will be established in the northeastern section of the study area as part of the proposed works.

For the purposes of this assessment, Biosis have assumed that nine new poles will require installation as a worst-case scenario, and a 10-metre corridor around the perimeter for the ovals will be required to accommodate trenching, as well as additional area to the north and north east to incorporate the amenities building and the proposed construction compound (the impact area).

The lighting system will use correlated colour temperature and will be designed in accordance with Australian Standards for Sports Lighting to ensure appropriate illumination levels. An assessment of the proposed lighting configuration against *AS/NZS 4282:2023 Australian Standard for Obtrusive Lights Evaluation* has also been undertaken (Standards Australia Limited 2023).

1.2 Scope of assessment

The objectives of this investigation are to:

- Describe the vascular flora (ferns, conifers, and flowering plants), vertebrate fauna (birds, mammals, reptiles, frogs, and fish) and decapod crustacea (e.g., crayfish).
- Map native vegetation and other habitat features.
- Review the implications of relevant biodiversity legislation and policy.
- Identify potential implications of the proposed works and provide recommendations on the proposed lighting design and installation in order to minimise or mitigate impacts to nocturnal fauna.
- Recommend any further assessments of the site that may be required.

1.3 Location of the study area

The study area is located approximately 1.9 kilometres southwest of North Curl Curl and approximately 18 kilometres north of the Sydney Central Business District (CBD) (Figure 1). It encompasses 6.7 hectares of public land and is currently zoned as RE1 Public Recreation under the *Warringah Local Environmental Plan 2011*. The surrounding landscape integrates residential development and recreational spaces with pockets of remnant native vegetation, the riparian corridor of Greendale Creek, and other natural environments including Curl Curl Lagoon.

The study area is within the:

- Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and Pittwater IBRA subregion.
- Port Jackson/Georges River Basin.
- Greater Sydney Local Land Services (LLS) Management Area.
- Northern Beaches Local Government Area (LGA).

biosis
APEM Group

Figure 1 Location of the study area

Matter: 43625, Date: 20 January 2026,
Prepared for: JG, Prepared by: HL., Last edited by: jbeckius
Location: P:\43600s\43625\Mapping\
43625_PawleyOvals_LightingREF
Layout: 43625_F1_Locality

0 200 400 600 800 1,000
Metres
Scale 1:25,000@ A4, GDA2020 MGA Zone 56

N

2 Methods

2.1 Database and literature review

Prior to completing the field investigation, information provided by Council as well as other key information was reviewed, including:

- Australian Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) BioNet Atlas of NSW Wildlife, for items listed under the BC Act.
- The NSW Department of Primary Industries (DPI) Spatial Data Portal for *Fisheries Management Act 1994* (FM Act) listed threatened species, populations and communities
- NSW DPI WeedWise database for priority weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Local Land Services (LLS) area.
- Existing vegetation mapping including the NSW State Vegetation Type Map (SVTM C2.0M2.1).
- Previous site reports including the *Freshwater Senior Campus Sportsground Lighting Flora and Fauna Assessment* (Biosis 2023).

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Biodiversity Conservation Act 2016* (BC Act).
- *Water Management Act 2000* (WM Act).
- *Biosecurity Act 2015* (Biosecurity Act).
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP).
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP).
- *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP).
- *Warringah Development Control Plan 2011* (Warringah DCP).
- *Warringah Local Environment Plan 2011* (Warringah LEP).
- *AS 2560.2:2021Sports lighting, Part 2: Specific applications.*
- *AS/NZS 4282:2023 Australian Standard for Obtrusive Lights Evaluation.*
- *National Light Pollution guidelines for Wildlife* (DCCEEW 2023).

2.2 Field investigation

A field investigation of the study area was undertaken on 21 October 2025 by Natasha Zahra (Botanist). Vegetation within the study area was surveyed using the random meander technique (Cropper 1993) over three person hours.

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is PCT as defined by the Biodiversity Assessment Method (BAM) (DPIE 2020) and has been the standard used across NSW since 2016.

The vegetation types, within the study area, were stratified into PCTs broadly based on previous vegetation mapping, and the vegetation boundaries marked with a hand-held GPS in the field. Appropriate PCTs were selected on the basis of species composition and structure, known geographical distribution, landscape position, underlying geology, soil type, and any other diagnostic features.

A habitat-based assessment was completed to determine the presence of suitable habitat for threatened species previously recorded (NSW DCCEEW 2025a) or predicted to occur (Cth DCCEEW 2025) within 5 kilometres. This list was filtered according to species descriptions, life history, habitat preference and soil preference to determine those species most likely to be present within the study area.

2.2.1 Permits and licences

The FFA was conducted under the terms of Biosis' Scientific Licence issued by NSW DCCEEW under the BC Act (SL100758, expiry date 30 June 2026). Wildlife surveys were conducted under the Secretary's Animal Care & Ethics Committee Approval (TRIM 17.892, expiry date 31 January 2028).

3 Results

The study area is located within North Curl Curl and includes Frank Gray Oval, Mike Pawley Oval, the surrounding vegetation and Greendale Creek which is situated in the northern section of the study area. The surrounding landscape is characterised by a diverse range of land uses including residential development, recreational spaces, and community and industrial facilities, with small, isolated patches of remnant native vegetation scattered throughout. Natural environments such as the Garigal National Park, Manly Reservoir, Middle Bay and North Curl Curl lagoon are located within a 5 kilometre radius of the study area boundary, which support contiguous, intact vegetation which likely provides habitat and connectivity corridors for locally occurring species.

Regional soil landscape mapping indicates that the study area occurs on the Warriewood soil landscape of the Sydney 1:1,000,000 map sheet (Chapman et al. 1989). The Warriewood soils landscape is characterised by gently undulating swales and infilled lagoons on Quaternary sands. As a relatively level landscape, less than 3 % contains slopes, with local relief of less than 10 metres and a slope gradient of less than 5 %. Soils consist of deep (>150 centimetres), well sorted, sandy Humus Podzols and dark, mottled Siliceous Sands, overlying buried Acid Peats. Localised flooding and run-off are common. This soil landscape has been extensively cleared with remnant native vegetation including, Broadleaved Paperbark *Melaleuca quinquenervia*, Coastal Banksia *Banksia integrifolia*, Swamp Oak *Casuarina glauca*, Swamp Mahogany *Eucalyptus robusta*, Coastal Teatree *Leptospermum laevigatum*, Spike Rushes *Eleocharis* spp., and Tall Swamp Sedge *Gahnia sieberiana*.

The study area comprises a combination of native vegetation patches, planted native species and exotic species. Patches of intact native vegetation are primarily located along the riparian corridor of Greendale Creek, while planted native species are mainly scattered along the boundaries of the study area. Exotic vegetation is predominantly associated with the ovals with scattered occurrences throughout the remainder of the study area. Greendale Creek is present in the northern section of the study area (Photo 6).

The vegetation along Greendale Creek has been substantially degraded due to historical land use, however, extensive regeneration and landscaping efforts are prominent throughout the area. Native, locally occurring species such as Swamp Mahogany and Broadleaved Paperbark are present along the creek line with individual trees established throughout the study area as part of the rehabilitation works. Additionally, Reed beds comprised predominantly of Common Reed *Phragmites australis* are also present along the creek, contributing to the bank stabilisation. Several stag trees were also recorded in the northwest corner of the study area, containing cracks and crevices within the bark that may provide potential habitat for threatened microbat species. A culvert is also present within the northern section of the study area facilitating the flow of Greendale Creek (Photo 3).

While the proposed works are not expected to directly impact any native vegetation, it should be noted that native vegetation visually intersects the edge of the impact area (Figure 2), however this is restricted to canopy overhang only. All direct impacts will be confined to the maintained exotic grassland area within the ovals, and no trimming or removal of native flora is expected to occur within the study area.

3.1 Vegetation communities

Prior to the field investigation, Biosis confirmed that various native vegetation communities including two TECs has been mapped in the broader landscape (Tozer 2003, NSW DCCEEW 2025a), including *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (EEC, BC Act)

and the associated *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (EEC, EPBC Act).

A key focus of the field investigation was to assess the vegetation of the study area against the final determinations for the above listed TECs to determine presence or absence.

The vegetation of the study area was found to comprise four vegetation communities:

- PCT 4028Estuarine Swamp Oak Twig-rush Forest (Table 1)
- PCT 3963Estuarine Reedland (Table 2)
- Planted Native Vegetation (Table 3)
- Exotic Vegetation (Table 4)

The structure, floristic composition and condition of these communities are described in the tables below.

Table 1 PCT 4028 Estuarine Swamp Oak Twig-rush Forest within the study area

PCT 4028 Estuarine Swamp Oak Twig-rush Forest	
PCT	4028
Extent within study area	A total of 0.50 ha of PCT 4028 occurs within the study area in low condition, and 0.04 ha present in a thinned condition.
Description	Low condition patches of this community occurred adjacent to Greendale Creek as well as along the eastern boundary of the study area. The canopy is dominated by Swamp Oak *Casuarina glauca* with Broad-leaved Paperbark and Swamp Paperbark also present along Greendale Creek. The understorey contains scattered tree species such as Kurrajong *Brachychiton populneus* and Sandpaper Fig *Ficus fraseri* which are sparsely scattered throughout, accompanied by ground cover species Spiny-headed Matrush *Lomandra longifolia*. This community had a number of exotic species scattered throughout including Large-leaved Privet *Ligustrum lucidum,* Camphor Laurel *Cinnamomum camphora* and Wandering Jew *Tradescantia fluminensis.* A small patch of this PCT in a thinned condition is present along the southern boundary occurring. Swamp Oak and Kurrajong are the dominant species present occurring in a linear formation. Both the midstory and groundcover layers are absent within this condition.
TEC status	**NSW BC Act:** PCT 4028 meets the requirement of the EEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* The landscape position, soil type and dominance of Swamp Oak confirm the listing of this community under the BC Act. **Commonwealth EPBC Act:** PCT 4028 does not meet the criteria for the EEC *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*. Although the patch size meets the criteria for a small, continuous patch, native species comprise less than 50% and transformer species comprise less than 30% of total understorey vegetation cover (DoEE 2018).

PCT 4028 Estuarine Swamp Oak Twig-rush Forest

Photos

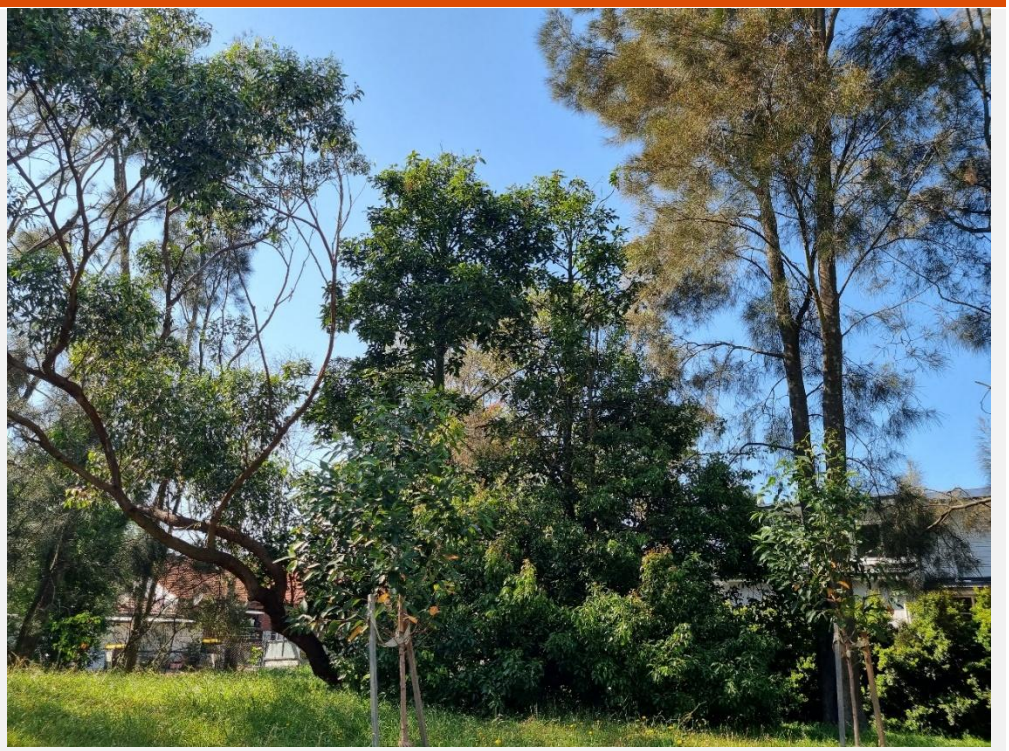


Photo 1 PCT 4028 in a low condition within the study area

Photo 2 PCT 4028 in a thinned condition within the study area

Table 2 PCT 3963 Estuarine Reedland within the study area

PCT 3963 Estuarine Reedland	
PCT	3963
Extent within study area	Approximately 0.35 ha of PCT 3963 was recorded within the study area.
Description	This community occurs in a low condition and is characterised by a tall reedland dominated by Common Reed *Phragmites australis*. Broad Leaved Paperbark is sparsely scattered throughout forming a sparse canopy. The groundcover layer was heavily disturbed which is a typical characteristic of areas adjacent to creek lines and contains a variety of weed species including Morning Glory *Ipomoea indica*, Prarire Grass *Bromus catharticus,* Wandering Trad *Tradescantia fluminensis* and Saw Sedge *Gahnia clarkeri*.
TEC status	**NSW BC Act:** PCT 3963 meets the requirement of the EEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* The landscape position, soil type and dominance of Common Reed confirm the listing of this community under the BC Act. **Commonwealth EPBC Act:** PCT 3963 does not meet the criteria for the EEC *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* as the patch size is less than 0.5 ha (DoEE 2018).
Photo	 **Photo 3 PCT 3963 in a low condition within the study area**

Table 3 Planted Native Vegetation within the study area

Planted Native Vegetation	
PCT	N/A – Planted Native Vegetation does not conform to a PCT.
Extent within study area	Approximately 0.91 ha of Planted Native Vegetation was recorded within the study area.
Description including fauna habitat	This vegetation type is associated with vegetation within the study area that cannot be reasonably assigned to a PCT, but comprises plants native to NSW, as per *the Local Land Services Act 2013* (LLS Act). The native trees and shrubs within the study area are present in open, highly disturbed settings and do not occur in sufficient density, continuity, or diversity to be considered representative of a native vegetation community. Within the study area, Planted Native Vegetation is comprised predominantly of scattered canopy species including Swamp Magony and Grey Gum *Eucalyptus punctata* occurring in isolated patches or linear plantings. The understorey was characterised by various native locally occurring shrubs including Norfolk Island Hibiscus *Lagunaria patersonia,* Sweet Pittosporum *Pittosporum undulatum* and Coffee Bush *Breynia oblongifolia.* The species in this community have likely been planted with some occurring from natural regeneration via seed dispersal from nearby vegetation.
Photo	 **Photo 4 Planted Native Vegetation within the study area**

Table 4 Exotic vegetation within the study area

Exotic Vegetation	
PCT	N/A – Exotic Vegetation does not conform to a PCT.
Extent within study area	Approximately 4.58 ha of Exotic Vegetation was recorded within the study area.
Description	This community is primarily limited to the area within the sports ovals and consists of an open ground layer dominated by common lawn and pasture grass species. The study area appears to be regularly maintained and is dominated by Kikuyu Grass *Cenchrus clandestinus*, with scattered patches of White Clover *Trifolium repens*, Bindyi *Soliva sessilis* and Dandelion *Taraxacum officinale*.
Photo	 **Photo 5 Exotic Vegetation within the study area**

3.2 Aquatic habitats

Aquatic habitat within the study area is limited to Greendale Creek which is a first order Strahler watercourse located in the northern section of the study area (Strahler 1964). This watercourse was stagnant with limited flow at the time of the field investigation and traverses an area of low condition native vegetation mapped as PCT 3963. Greendale Creek flows into the Tasman Sea, the closest major waterbody, located approximately 1.7 kilometres to the east.

A culvert was present facilitating water flow, however the water quality appears to be in a poor condition, with visible orange-discolouration and surface film. This likely results from the degraded nature of the surrounding vegetation and sedimentation accumulation which is characteristic of urban-influenced creek lines. Greendale Creek within the study area is not mapped as Key Fish Habitat on the Fisheries Spatial Data Portal (DPI 2025).. However, sections of the creek downstream of the study area, where is joins with the Curl Curl lagoon are mapped as Key Fish Habitat.

3.3 Threatened species

Background searches identified 36 threatened flora species and 141 threatened fauna species recorded (DPE 2022a) or predicted to occur (Cth DCCEEW 2025) within 5 kilometres of the study area. Those species considered most likely to have habitat within the study area based on the background research are as follows:

Flora

- Netted Bottle Brush *Callistemon linearifolius* (Vulnerable, BC Act).
- Sunshine wattle *Acacia terminalis* subsp. *Eastern Sydney* (Endangered, EPBC and BC Act).
- *Tetratheca glandulosa* (Vulnerable, BC Act).

Fauna

- Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (Vulnerable, BC Act).
- Grey-headed Flying-fox *Pteropus poliocephalus* (Vulnerable, EPBC Act and BC Act).
- Greater Broad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act).
- Large Bent-winged Bat *Miniopterus orianae oceanensis* (Vulnerable, BC Act).
- Large-eared Pied Bat *Chalinolobus dwyeri* (Endangered, EPBC Act & BC Act).
- Little Bent-winged Bat *Miniopterus australis* (Vulnerable, BC Act).
- Powerful Owl *Ninox strenua* (Vulnerable, BC Act).
- South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami* (Vulnerable, EPBC Act & BC Act).
- Southern Myotis *Myotis Macropus* (Vulnerable, BC Act).
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act).

An assessment of habitat values is provided in of the study area is provided in Table 5 for threatened flora species and Table 6 for threatened fauna species. These tables discuss areas of habitat value and potential impact for all species with a medium or greater likelihood of occurrence and determine the need for a Test of Significance (ToS) for species listed under the BC Act, or Significant Impact Criteria (SIC) Assessment for species listed under the EPBC Act.

Table 5 Assessment of habitat for threatened flora species

Vegetation Community	Habitat requirements and likelihood of occurrence
PCT 4028 (Low and Thinned) and PCT 3028 (Low)	This vegetation condition type has a low likelihood of supporting threatened flora species (including Netted Bottle Brush, Sunshine Wattle and *Tetratheca glandulosa*) due to its highly disturbed nature, degraded condition and the influence of the urbanised landscape. The native ground layer is largely absent and has been replaced by several exotic species. There is limited structural diversity and minimal recruitment of native species which collectively reduce the availability of suitable microhabitats and ecological niches required to support threatened flora.
Planted Natives and Exotic vegetation	These vegetation condition types are considered highly unlikely to support threatened flora species (including Netted Bottle Brush, Sunshine Wattle and *Tetratheca glandulosa*). Both are heavily modified, lack natural floristic diversity, and show minimal native understorey development or natural recruitment. The simplified structure, dominance of non-native species and long-term

Vegetation Community	Habitat requirements and likelihood of occurrence
	disturbance have eliminated the key ecological features necessary to support threatened flora.

Based on the size of the study area, the survey effort is considered comprehensive to assess the presence of threatened flora species as outlined in Table 5. Considering the above factors, there is a low likelihood of occurrence for the above listed species.

While the proposed works will not result in the removal of any roosting habitat, indirect impacts associated with increased artificial light pollution are likely to affect a range of nocturnal mammals and birds (Table 6) which occur within the broader locality. Impacts associated with additional artificial lighting at night within the study area and particularly along the riparian corridor of Greendale Creek may reduce the quality of foraging, breeding and roosting resources for a range of threatened fauna within the study area.

Foraging and roosting habitat within the study area is relatively limited due to the urbanised nature of the study area. The riparian corridor along Greendale Creek represents the most significant foraging habitat for threatened fauna within the study area, however the quality of this foraging habitat is quite poor given the level of weed ingress and lack of connectivity. As such, it is unlikely to represent important habitat for locally occurring threatened species. Furthermore, given the context of the current levels of artificial lighting within the broader locality, it could be assumed that any species utilising the study area for foraging would be relatively tolerant to light pollution.

Bush-stone Curlew has been recorded within 5 kilometres of the study area. However, this species is rare in NSW, and habitat within the riparian corridor is not considered suitable due to the dense, closed vegetation and weed ingress. The species prefers open woodland vegetation with shorter grass and woody debris to assist with camouflage. It is highly unlikely this species would occur in this highly urbanised environment without being recorded. Although rare, the Bush-stone Curlew may occur in larger more in-tact native vegetation in the region such as areas around Manly reservoir and Middle Harbour, approximately 2.7km west of the study area.

Table 6 Assessment of habitat for threatened fauna species

Habitat feature	Threatened fauna association	Likelihood of occurrence or impact
Feed trees	Swamp Mahogony, Broad-leaved Paperbark and other flowering perennial species recorded in the study area may provide nectar resources suitable for a range of arboreal and flying fauna (such as Grey-headed Flying-fox whilst in flower). The Swamp Oak trees within the study area provide foraging resources for the South-eastern Glossy Black-Cockatoo.	• Grey Headed Flying Fox - moderate likelihood of occurrence. The closest record of this species was 245 m from the study area, and the nearest camp is located in Balgowlah, which is approximately 3 km away. Given the presence of foraging resources and proximity of a nearby breeding camp, this species has a moderate likelihood of occurrence. • Glossy Black-Cockatoo - low likelihood of occurrence. Although *Casuarina* species were recorded within the study area, which represent foraging habitat for this species, the closest record is over 2 km from the study area boundary. In addition, as this species does not forage at night, there is a low likelihood that this species would be utilising the study area during times where lighting impacts are expected to occur. As such there is a low likelihood that this

Habitat feature	Threatened fauna association	Likelihood of occurrence or impact
		species is utilising the area and no foraging habitat will be directly impacted, further assessment is not required.
Hollow-bearing trees	No hollow bearing trees were recorded in the study area, therefore potential breeding habitat is not present for the Powerful Owl or the South-eastern Glossy Black-Cockatoo. However, these species may forage or disperse through or within the study area. Multiple stags are located in the north west section of the study area which contain cracks and crevices suitable for roosting microbats such as Eastern Coastal Free-tailed Bat and Southern Myotis.	• Powerful Owl – low likelihood of occurrence. Due to the absence of large hollows to provide potential roosting habitat for the Powerful Owl, there is a low likelihood of occurrence of this species within the study area. • Southern Myotis – high likelihood of occurrence. The closest record of this species is approximately 2 km away. Given there is suitable roosting and foraging habitat within the study area, the likelihood of occurrence of this species utilising the study area is high. • Eastern Coastal Free-tailed Bat – moderate likelihood of occurrence. The closest record of this species is approximately 3 km away. Given there is suitable roosting and foraging habitat within the study area, the likelihood of occurrence of this species utilising the study area is moderate.
Rocky outcrops	No rocky outcrops were recorded in the study area.	NA
Waterways (creek, river or dam)	The study area contains Greendale Creek, which is a Strahler order 1 stream. Waterways have the potential to provide foraging habitat for threatened microbats including Large-bent Winged Bat, Large-eared Pied Bat, Little Bent-winged Bat, Greater Broad-nosed Bat and Southern Myotis.	• Microbats: Large Bent-winged Bat, Large-eared Pied Bat, Greater Broad-nosed Bat, Little Bent-winged Bat & Southern Myotis – high likelihood of occurrence. Given the presence of Greendale Creek, as well as suitable foraging and roosting opportunities within the study area, there is a high likelihood of occurrence of these species.
Caves and shelters	One culvert exists within the study area, over Greendale Creek. Culverts have the potential to provide roosting habitat for microbat species.	• Microbats: Large Bent-winged Bat, Large-eared Pied Bat, Little Bent-winged Bat, Greater Broad-nosed Bat, Yellow-bellied Sheathtail-bat & Southern Myotis – high likelihood of occurrence. Given that the study area is located within 2 km of a cliff line, as well as the presence of suitable roosting habitat in the form of the culvert and foraging resources within the study area, there is a high likelihood of occurrence of these species.
Human-made structures	One human-made structure exists within the study area.	• Microbats: Eastern Coastal Free-tailed Bat, Large Bent-winged Bat, Large-eared Pied Bat, Little Bent-winged Bat, Greater Broad-nosed Bat, Yellow-bellied Sheathtail-bat & Southern Myotis – low likelihood of occurrence. One human-made structure exists within the northern section of the study area. The periphery of this building was inspected for

Habitat feature	Threatened fauna association	Likelihood of occurrence or impact
		signs of microbat usage and it was considered there was a low likelihood that microbats would be utilising this building for roosting.

Based on the size of the study area, the survey effort is considered comprehensive to assess habitat presence for the species outlined in Table 6. Eight threatened species were considered to have a moderate or higher likelihood of occurring within the study area, triggering a requirement for further assessment. NSW ToS and Commonwealth SIC assessments have been prepared in Appendix 2 (Tests of Significant) and Appendix 3 (Significant Impact Criteria assessments) within this report. These assessments determined that a significant impact will not occur for any of these species.

3.3.1 Priority weeds

Two priority weeds for Greater Sydney region, which includes the Northern Beaches LGA, have been recorded in the study area, and are listed in Table 7 along with their associated Biosecurity Duty in accordance with the Biosecurity Act.

The Biosecurity Act provides for the identification, classification and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled or eradicated in the region.

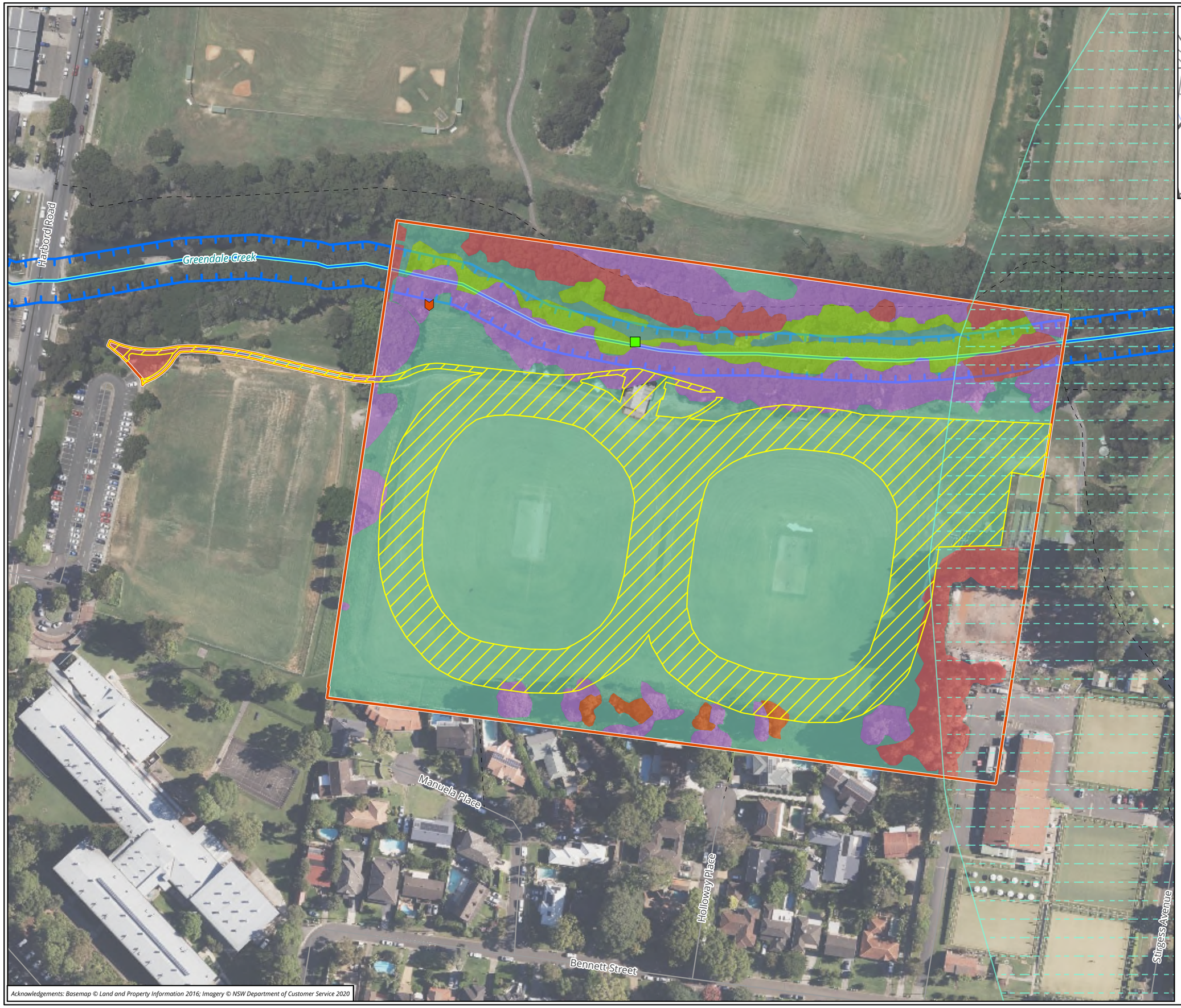
The General Biosecurity Duty as outlined in the Biosecurity Act states:

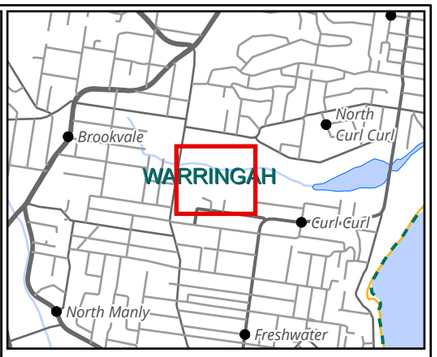
> *All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*

Table 7 Priority weeds within the study area

Scientific name	Common name	Relevant biosecurity duty
Anredera cordifolia	Madeira Vine	General Biosecurity Duty
Cestrum parqui	Green Cestrum	General Biosecurity Duty

To prevent biosecurity impacts from occurring as a result of the presence of the above listed priority weeds within the study area, all practical steps should be taken to control and eradicated the weeds from the study area as per the relevant biosecurity duties outlined above, or prior to or during any future vegetation removal.





Legend

- Study area
- Impact area
- Stag tree
- Culvert
- Greendale Creek - Strahler Order 1
- Greendale Creek - 10m buffer
- Coastal Environment Area - SEPP (Resilience and Hazards) 2021

Vegetation communities

- 3963 - Estuarine Reedland (Low)
- 4028 - Estuarine Swamp Oak Twig-rush Forest (Low)
- 4028 - Estuarine Swamp Oak Twig-rush Forest (Thinned)
- Exotic grassland
- Planted natives
- Urban Native/Exotic

Figure 2 Ecological features of the study area

0 20 40 60

Metres

Scale: 1:1,600 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 43625, Date: 20 January 2026
Prepared by HL, Prepared for JG, Last edited by: jbeckius
Location: P:\43600s\43625\Mapping\43625_PawleyOvals_LightingREF.aprx
Layout: 43625_F2_EcoFeatures

4 Assessment against key legislation

4.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act. Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to the Commonwealth Minister for the Environment and Water for assessment.

Two threatened species listed under the EPBC Act were recorded or assessed to have a medium or greater potential to occur within the study area, Grey-headed Flying Fox and Large-eared Pied Bat. Assessments against the Significant Impact Criteria (CoA 2013) have been prepared for threatened entities that are deemed likely to be subject to negative impacts (Appendix 3) and concluded that a significant impact is not likely to result from the proposed works.

Mitigation measures for the project including directing lights to prevent spill and limiting operation to before 9:30 pm, will be implemented to reduce potential negative impacts on fauna utilising the area. Directing light to minimise spill ensures that illumination to nearby vegetation and watercourses where fauna are most active is limited. Additionally, limiting the operation of lights reduces the exposure of wildlife to artificial lighting during the night when species are most active, helping to maintain natural behaviours and habitat use. Given the limited and indirect nature of potential impacts, the works are not expected to significantly affect the Grey-headed Flying-fox or Large-eared Pied Bat. The project will not result in population decline, habitat loss, or disruption to breeding or recovery.

On the basis of criteria outlined in Commonwealth of Australia (2013) it is considered unlikely that a significant impact on a Matter of NES would result from the project. A referral of the proposed action to the Australian Government Minister for the Environment and Water is not required.

4.2 *Biodiversity Conservation Act 2016*

Test of Significance

One TEC, *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (EEC, BC Act) was identified within the study area. As the project does not involve any direct impacts to native vegetation and all works will be restricted to areas of exotic vegetation, further assessment in the form of a ToS for impacts to the TEC is not required.

No threatened flora listed under the BC Act were detected within the study area. Potential habitat for eight threatened fauna species was identified, with these species considered to have a medium or greater likelihood of occurrence within the study area (including Grey-headed Flying-fox and seven species of threatened microbats). ToS were completed to assess the significance of impacts to each of these species (see Table 8). These assessments determined that the project will not significantly impact these species, as no habitat will be removed and potential impacts are limited to indirect light spill. Mitigation measures will further reduce these impacts.

Table 8 Summary of Tests of Significance

Scientific name	Common name	1	2	3	4	5	6	7	Significant effect?
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	No	No	No	No	No	No	No	No
Miniopterus orianae, oceanensis	Large Bent-winged Bat	No	No	No	No	No	No	No	No
Chalinolobus dwyeri	Large-eared Pied Bat	No	No	No	No	No	No	No	No
Miniopterus australis	Little Bent-winged Bat	No	No	No	No	No	No	No	No
Myotis macropus	Southern Myotis	No	No	No	No	No	No	No	No
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	No	No	No	No	No	No	No	No
Scoteanax rueppellii	Greater Broad-nosed Bat	No	No	No	No	No	No	No	No
Pteropus poliocephalus	Grey Headed Flying-fox	No	No	No	No	No	No	No	No

Biodiversity Offsets Scheme

The proposed will not result in a significant effect on threatened species, populations or communities listed under the BC Act, and therefore, the BOS is not triggered and a BDAR or Species Impact Statement (SIS) is not required.

4.3 State Environmental Planning Policies

4.3.1 Biodiversity and Conservation SEPP 2021

Chapter 2: Vegetation in non-rural areas

This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of NSW and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation by ensuring that the BOS will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that do not require development consent.

This chapter applies to land zoned RE1 Public Recreation in the Northern Beaches LGA as defined in Clause 2.3. Consent is required for clearance of vegetation within land zones and LGAs to which this chapters applies however, as the project does not involve any direct impacts (trimming or removal) to native vegetation present within the study area, no further consideration is required.

Chapter 3: Koala Habitat Protection 2020

This chapter applies in the NSW core rural zones of RU1, RU2 and RU3, except within the Greater Sydney and Central Coast areas.

As the proposal occurs on land zoned RE1 Public Recreation under the Northern Beaches LEP Warringah LEP, this chapter does not apply.

Chapter 4: Koala Habitat Protection 2021

Chapter 4 Koala Habitat Protection aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

While the Northern Beaches Council LGA, is listed under Schedule 2 of SEPP, meaning the LGA is subject to the requirements laid out in this chapter, the current assessment is being undertaken under Part 5 of the EP&A Act, and thus consideration of this chapter is not required.

4.3.2 Resilience and Hazards SEPP 2021

Chapter 2: Coastal Management

The Resilience and Hazards SEPP aim to promote a co-ordinated approach to land use planning in the coastal zone of NSW in a manner consistent with the objects of the *Coastal Management Act 2016* (CM Act).

The study area is located on land partially mapped as 'Coastal Environment Area' by the Resilience and Hazards SEPP. Under the provisions of Chapter 2 (Coastal Management) of the SEPP, land mapped as "coastal environment area" is subject to specific development controls.

Matters for consideration are:

- The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment. Refer to sections 3 and 5 of this FFA.
- Coastal environmental values and natural coastal processes. The study area is located inland and not immediately influenced by coastal processes. The works occur within an existing disturbed area and will not affect coastal environmental values or natural coastal processes such as shoreline movement, tidal activity, or sediment transport.
- The water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1 (of the Resilience and Hazards SEPP). This consideration is not relevant to this REF as the project are does not form part of the marine estate.
- Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms. Refer to sections 3 and 5 of this FFA.
- Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability. This consideration is not relevant to this REF as the project is not located within the aforementioned areas.
- Aboriginal cultural heritage, practices and places. Refer to section 7.4 of the REF.
- The use of the surf zone. This consideration is not relevant to this REF as the project is not located within or has no impact on the surf zone.

The northeastern section of the study area is mapped as 'Coastal Environment Area' under the Resilience and Hazards SEPP. However, this area will only be used as a compound area and will not involve surface disturbance. Therefore, the proposed works are unlikely to significantly impact on any coastal environment areas as outlined above.

4.4 Water Management Act 2000

The WM Act provides for the sustainable and integrated management of waterfront land. Waterfront land is defined within the WM Act as the bed of any river, lake or estuary and any land within 40 metres of the riverbanks, lake shore or estuary mean high water mark. The WM Act is supported by a series of interpretation guidelines which provide design considerations and overarching management measures for works on waterfront land. These considerations and management measures should be considered when planning and undertaking the proposed works. To which the following guidelines are relevant:

- *Guidelines for watercourse crossings on waterfront land* (DPE 2022b).
- *Guidelines for outlet structures on waterfront land* (DPE 2022c).
- *Guidelines for laying pipes and cables in watercourses on waterfront land* (DPE 2022d).
- *Guidelines for instream works on waterfront land* (DPE 2022e).

One watercourse was identified within the study area, known as Greendale Creek. Under the WM Act an approval is required to undertake controlled activities on waterfront land. However, as Council is a public authority, Council does not need to obtain a controlled activity approval from the Natural Resources Access Regulator for any controlled activities that it carries out in, on or under waterfront land. While Council is exempt from the controlled activity approval process, the design considerations and management measures detailed in the relevant WM Act guidelines should be considered.

4.5 Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through an Assessment of Significance process.

The proposal will not involve any direct impacts to Greendale Creek or the associated riparian habitat and will not result in temporary or permanent blockages to fish passage, and therefore a permit is not required in accordance with section 219 of the FM Act. Further to this, formal notification to Fisheries NSW in accordance with Section 199 of the FM Act is also not required.

4.6 Local planning instruments

Local Environmental Plans (LEP) are legal documents that guide planning decisions and controls land use within a specific local government area in Australia, and Development Control Plans (DCP) are planning and design guidelines to support the planning controls of the LEP for each LGA. The study area falls under the Warringah LEP 2011 and the Warringah DCP 2011.

Warringah LEP

The study area is zoned RE1 – Public Recreation under the Warringah LEP. The objectives of this zone are:

- *To enable land to be used for public open space or recreational purposes.*
- *To provide a range of recreational settings and activities and compatible land uses.*
- *To protect and enhance the natural environment for recreational purposes.*
- *To protect, manage and restore public land that is of ecological, scientific, cultural or aesthetic value.*
- *To prevent development that could destroy, damage or otherwise have an adverse effect on those values*.

The proposed lighting installation will enable the land to be used by the public for recreational purposes for an extended period beyond daylight hours and therefore aligns with the objectives of its current zoning. With appropriate mitigation measures to protect the natural environment, the proposed lighting installation will address all objectives outlined by the LEP for public recreation.

Warringah DCP

E2 Prescribed Vegetation

The objectives of this clause are:

- To preserve and enhance the area's amenity, whilst protecting human life and property.
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction.
- To provide habitat for local wildlife, generate shade for residents and provide psychological & social benefits.
- To protect and promote the recovery of threatened species, populations and endangered ecological communities.
- To protect and enhance the habitat of plants, animals and vegetation communities with high conservation significance.
- To retain and enhance native vegetation communities and the ecological functions of wildlife corridors.
- To reconstruct habitat in non-vegetated areas of wildlife corridors that will sustain the ecological functions of a wildlife corridor and that, as far as possible, represents the combination of plant species and vegetation structure of the original 1750 community.
- Promote the retention of native vegetation in parcels of a size, condition and configuration which will as far as possible enable plant and animal communities to survive in the long-term.

The requirements under the clause identify that development is to be situated and designed to minimise the impact on prescribed vegetation, including remnant canopy trees, understorey vegetation, and ground cover species. As no clearing of vegetation is set to occur, the proposed works will not interfere with the objectives of clause E2 of the Warringah DCP.

E4 Wildlife Corridors

The objectives of this clause are:

- To preserve and enhance the area's amenity, whilst protecting human life and property.
- To improve air quality, prevent soil erosion; assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction.
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits.
- To retain and enhance native vegetation and the ecological functions of wildlife corridors.
- To reconstruct habitat in non-vegetated areas of wildlife corridors that will sustain the ecological function of a wildlife corridor and that, as far as possible, represents the combination of plant species and vegetation structure of the original 1750 community.

The requirements under the clause identify that for the modification of native vegetation where the area of land supporting the vegetation to be modified is greater than 50 m^2 or the land supporting the vegetation to be modified forms part of an allotment where vegetation has been modified in the last five years, the applicant must provide a Flora and Fauna Assessment with mitigation measures to fulfil the requirements of the clause. As the proposed works do not involve removal of native vegetation, they will not interfere with this aspect of the clause. Light pollution caused by the development has the potential to reduce natural habitat and the ecological functions of the riparian corridor of Greendale Creek, however, as the study area occurs in a highly urbanised area with significant light pollution already present, impacts are not significant.

E5 Native Vegetation

The objectives of this clause are:

- To preserve and enhance the area's amenity, whilst protecting human life and property.
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction.
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits.
- Promote the retention of native vegetation in parcels of a size, condition and configuration, which will as far as possible enable local plant and animal communities to survive in the long term.
- To maintain the amount, local occurrence and diversity of native vegetation in the area.

As the proposed works will not involve the modification of any native vegetation, with appropriate mitigation measures to protect the native vegetation surrounding the study area, the proposed works will fulfill the objectives outlined by clause E5 of the Warringah DCP.

5 Impact Assessment

This report is an assessment of the potential impacts of light spill resulting from the installation of new sportsground lighting and the construction of a pedestrian pathway on ecological values within Frank Gray and Mike Pawley Ovals. in accordance with the EP&A Act, BC Act and the EPBC Act. The proposed works will result in the following impacts:

- Exotic turf will be removed for installation of lighting and trenching for power cables.
- Light spill into the 'dark' areas of the riparian corridor of Greendale Creek.
- Contribution to the cumulative artificial light pollution across the Sydney metropolitan area.
- Potential changes in the abundance and diversity of bat species.
- Potential impacts to foraging habitat for threatened microbat species and Grey-headed Flying Fox, which may lead to behavioural adaptions.
- Resource partitioning and shifts in foraging niches.
- Alterations to predator-prey species interactions.

PCT 4028 Estuarine Swamp Oak Twig-rush Forest and PCT 3969 Estuarine Reedland were recorded within the study area, however the proposed works will not directly impact any native vegetation and all impacts to vegetation will be restricted to the maintained exotic vegetation within the playing fields. The proposed pathway connecting the carpark to the new amenities building is not expected to result in impacts to native vegetation, as the alignment will follow an existing informal dirt path across the park land.

No threatened flora species listed under the EPBC Act or BC Act were recorded during field surveys. Two threatened fauna species listed under the EPBC and eight threatened species listed under the BC Act were determined to have a moderate to high likelihood of occurrence within the study area including:

- Eastern Coastal Free-tailed Bat (Vulnerable, BC Act)
- Greater Borad-nosed Bat (Vulnerable, BC Act)
- Grey-headed Flying Fox (Vulnerable EPBC Act and BC Act)
- Large Bent-winged Bat (Vulnerable, BC Act)
- Large-eared Pied Bat (Endangered, EPBC Act and BC Act)
- Little Bent-wing Bat (Vulnerable, BC Act)
- Southern Myotis (Vulnerable, BC Act)
- Yellow-bellied Sheathtail-bat (Vulnerable, BC Act)

ToS and SIC assessments were carried out for these species which concluded that the proposal is unlikely to have a significant impact on any EPBC Act or BC Act listed fauna species. Further assessment in form of a BDAR, SIS or EPBC Referral is not required.

Greendale Creek was recorded within the study area. This watercourse and associated riparian vegetation will not be impacted by the proposed works for the project.

The proposed location of the site compound is mapped within the 'Coastal Environmental Area' under the Resilience and Hazards SEPP. However, no surface disturbance will be involved and therefore, the compound will not interfere with the Resilience and Hazards SEPP.

6 Recommendations

Given that the works will not require the removal of any native vegetation within the study area, the focus of the recommendations is to minimise disturbance to any surrounding native vegetation and fauna habitat which may be negatively impacted by increased levels of artificial light at night.

The recommendations include:

- Lighting modules are to be fitted with shields to minimise light spill and pointed downwards to minimise contribution to sky-glow. It is acknowledged that some lighting may need to remain uncovered/angled skywards to allow for illumination during ball sports in accordance with AS 2560.2:2021 Sports lighting, Part 2: Specific applications (Standards Australia Limited 2021) (all codes). Use of these unshielded lights is to be minimised as much as possible.
- Lighting levels are to be adjusted to match minimum level of illuminance required for the sport and level of competition in play. Lighting should be programmed to meet these various requirements and switched off when not required.
- During the installation of the lighting towers, minimise disturbance to any native vegetation surrounding to the fullest extent practicable.
- A luminosity assessment should be undertaken following installation of the proposed lighting works to ensure consistency with the modelled lighting output and compliance with AS 4282 *Control of the Obtrusive Effects of Outdoor Lighting* (Standards Australia 2019). Assessment should include measures of luminous flux and illuminance under the different lighting setups required for the various types of sports and competition levels to ensure lighting levels do not exceed the minimum requirements.
- Where possible, any trees to be retained should be protected in accordance with Australian Standard AS4970 – 2009 Protection of trees on development sites, during construction, operation and decommissioning of the site compound.
- The proposed pathway should be constructed strictly within the footprint of the existing informal dirt path to avoid impacts and disturbance to surrounding native vegetation.
- In the unlikely event that unexpected threatened species are identified during the project, works should cease and an ecologist contacted.
- Two priority weeds within the Northern Beaches Council LGA were identified within the study area. Soil transportation should be minimised within, into or out of the study area to reduce the spread of weeds.
- The northwest section of the study area is located within the Coastal Environmental Area. Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values.

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Appendices

Appendix 1 Photos

Photo 6 Greendale Creek

Photo 7 Stag trees located within the northwest corner

Photo 8 Culvert within the study area

Appendix 2 Tests of Significance

The following section provides for Tests of Significance as outlined in Section 7.3 of the BC Act for all species listed as a medium likelihood or greater likelihood to occur within the study area.

Grey-headed Flying-fox *Pteropus poliocephalus*

Grey-headed Flying-fox, listed Vulnerable under the BC Act, is a highly mobile flying mammal capable of covering large distances as part of dispersal and foraging movements. The species occurs across the east coast, generally within 200 kilometres of the coast, north from Rockhampton in Queensland to Adelaide in South Australia. The Grey-headed Flying-fox is considered a single population throughout its range and is known to forage over large distances, occurring throughout many major urban areas and cities. Population movements trend with the distribution of plants with similar flowering and fruiting times, supporting regular annual cycles of migration (Eby & Law 2008). Population dispersal is often associated with flowering Myrtaceae species dependant on seasonality.

The species feeds on a variety of preferred Eucalypt and non-Eucalypt species depending on a number of factors including location, vegetation type, and vegetation condition. The vegetation along Greendale Creek, adjacent to the study area provides potential foraging resources for the Grey-headed Flying-fox.

Grey-headed Flying-fox is well known to occur in and utilise urban spaces, and their distribution coincides with the concentration of urban development of the east coast of Australia. The species is relatively tolerant of noise and light disturbance (Ecosure 2021) with camps often occurring in urban parks, riparian corridors and remnant patches of vegetation. However, management of Grey-headed Flying-fox camps is sometimes undertaken and can involve the use of noise and lighting to encourage the bats to move camp locations. Land clearing and disturbance of camps are threats to the species.

Grey-headed Flying-fox in the study area

No Grey-headed Flying Fox camps are present adjacent to the study area, and no individuals were recorded during the field investigation (although no targeted surveys were undertaken). However, there are records of the species within the Greendale Creek riparian corridor, adjacent to the northern edge of the study area (NSW DCCEEW 2025a).

The proposed works will not involve removal of any foraging habitat to the species, however, light spill from the proposed sport field lights may impact the suitability of foraging habitat during operation. Due to the potential for impacts to occur upon this species, an assessment in accordance with Section 7.3 of the BC Act has been undertaken below.

Table 9 ToS assessment for Grey-headed Flying-fox

Test of Significance for Grey-headed Flying-fox
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
The proposed works involve the installation of up to nine lights around the perimeter of the two ovals within the study area, which will be utilised until 9:30pm on days where sporting activities occur, or bookings have been made. The habitat with the potential to be impacted by the proposed works is limited to the area immediately adjacent to the ovals, within 300 m of the light poles.

Test of Significance for Grey-headed Flying-fox
Although the proposed works will not involve the removal of any potential foraging habitat for this species, light spill associated with the new lighting has the potential to impact foraging behaviours of several nocturnal species, including the Grey-headed Flying-fox. There is potential for light and noise to impact the suitability of foraging habitat by inducing avoidance of the habitat by individuals. The species may avoid the airspace over the well-lit areas during dispersal and foraging movements, potentially increasing energy expenditure. Increased energy expenditure by individuals can lead to impacts to long-term health and breeding success. Given this species tolerance of urban environments, it is unlikely that additional lighting would result in any significant impact to its ability to forage in vegetation within and adjacent to the study area, particularly given the highly urbanised surrounding landscape. In addition, larger areas of contiguous vegetation outside of the study area that likely support higher quality foraging resources will remain unaffected by the proposed works. Thick canopy cover within the Greendale Creek riparian corridor will likely provide a level of dampening, which will further reduce the potential impacts to foraging habitat in the riparian corridor. Mitigation measures will also be implemented to reduce overall impacts, including automatic timing for lights to be turned off (at 9:30pm) and angling of the lights downward to provide maximum use with minimal light spill to the surrounding vegetation and vertical airspace will reduce the potential for impacts to adjacent foraging areas and overhead flight trajectories for the species. In addition, even if individuals avoid utilising the vegetation of the riparian corridor while the lighting is being used, the short lighting timeframe means that these foraging resources would become available again following the lights automatic shutdown at 9:30pm. Given the small area to be impacted, the highly urbanised setting of the landscape, and the short operational time frame for the lighting, it is unlikely that the level of impact would be sufficient that a local population of the species would be placed at risk of extinction.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: 1. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* 2. *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*
Not applicable.
In relation to the habitat of a threatened species or ecological community: 1. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and* 2. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and* 3. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*
No habitat will be removed by the proposed works, however, the area adjacent to the ovals which represents potential foraging habitat for the Grey-headed Flying-fox will be indirectly impacted by increased light spill. The habitat with the potential to be impacted is limited to the area immediately adjacent to the ovals, within 300 m of the light poles. It is highly unlikely that an area of habitat would become fragmented or isolated from other areas of habitat as no native vegetation will be removed as part of the proposed works. Impacts will be restricted to increased light spill in the vegetation adjacent to the impact area, however, lighting will not be continuously used throughout the dark hours. Although the species may avoid use of the adjacent vegetation due to increased noise and light spill during sporting events, the use of the oval is proposed to end by 9:15pm, with all associated lighting to be turned off by 9:30pm. This would allow any avoided habitat to be utilised from 9:30pm to dawn, while the species is active foraging and moving around the landscape. The habitat adjacent to the study area may provide important foraging resources for individuals at the locality level, on occasion, when species are flowering. The area of vegetation is small, occurring along a narrow linear riparian corridor within a highly urbanised environment. While resources within the urban environment may be important to the local individuals, it is not likely to be significant to the long-term survival of the species. In addition, larger areas of contiguous

Test of Significance for Grey-headed Flying-fox
vegetation occur outside of the study area that likely support higher quality habitat, which will remain unaffected by the proposed works. Even if individuals avoid utilising the vegetation of the riparian corridor while the lighting is being used, these foraging resources will become available following the lights automatic shutdown at 9:30pm prior to active foraging. Therefore, it is unlikely that the vegetation within the study area represents significant habitat for the species, such that the increased lighting and any associated avoidance of habitat for 2-3 hours is unlikely to decrease the chances of long-term survival in the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed development will not impact on any declared area of outstanding biodiversity value.
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works are not part of a Key Threatening Process (KTP), or likely to increase a KTP. Impacts from light spill are not listed as a KTP, however loss of habitat could occur due to indirect impacts as the species may exhibit avoidance of the area. These indirect impacts would only occur while the lighting is in use, and the proposed use of the ovals will be limited to 9:30pm. The potential for light spill and increased noise to impact the use of the adjacent vegetation is unlikely to cause habitat loss or result in a significant impact to the local Grey-headed Flying-fox population, as no camps will be disturbed, no foraging habitat will be removed and the species will be able to utilise the existing foraging resources after lighting is switched off.
Conclusion
In consideration of the above five factors, the proposed activity is not likely to significantly impact Grey-headed Flying-fox within the study area or wider locality, as: • No foraging or roosting habitat will be removed, and impacts are limited to indirect light and noise spill within a small area of edge-affected vegetation. • Light pollution is not expected to significantly increase in areas of potential roosting along the main channel of Greendale Creek due to thick remnant vegetation and the implementation of mitigation measures. • The proposed works are unlikely to result in fragmentation of habitat for Grey-headed Flying-fox. • The proposed works is not considered likely to adversely affect the lifecycle of these species. • The proposed works does not significantly contribute to the KTPs for these species. Therefore, entry into the BOS or preparation of a SIS or BDAR is not required.

Threatened microbat species

Threatened microbat species with potential habitat within the study area which have been recorded in the locality (5-kilometre radius) include:

- Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (Vulnerable, BC Act).
- Greater Broad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act).
- Large Bent-winged Bat *Miniopterus orianae oceanensis* (Vulnerable, BC Act).
- Large-eared Pied Bat *Chalinolobus dwyeri* (Endangered, EPBC Act and BC Act).
- Little Bent-winged Bat *Miniopterus australis* (Vulnerable, BC Act).
- Southern Myotis *Myotis Macropus* (Vulnerable, BC Act).
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act).

Foraging habitat within study area

The study area occurs adjacent to vegetation along the riparian corridor of Greendale Creek which flows to Curl Curl Lagoon and out to the ocean. No vegetation removal is required as part of the works, however the riparian corridor provides potential foraging habitat for a range of threatened microbats known to occur in the wider locality. While no direct impact is expected to occur to remnant vegetation, indirect impacts from anthropogenic light pollution has the potential to reduce the overall quality of available habitat.

Roosting habitat within study area

The study area and surrounding locality contain a range of potential roosting habitat for threatened microbats that may be affected by impacts associated with anthropogenic light pollution. Potential roots include:

- Stag trees: Seven stag trees occur within the northwestern corner of the study area. These may provide roosting opportunity but currently experience a level of noise and light spill from existing structures and sport fields (Photo 7).
- Artificial roosting structures: The culvert located in the northern section of the study area along Greendale Creek may provide potential roosting habitat for threatened microbats (Photo 8).

Microbats' species which utilise hollows for roosting include Eastern Coastal Free-tail Bat, Greater Broad-nosed Bat, Southern Myotis, and Yellow-bellied Sheathtail-Bat, (NSW DCCEEW 2025b, NSW DCCEEW 2025c, NSW DCCEEW 2025d). Microbats that utilise artificial roosting structures (bridges, culverts and buildings) include Greater Broad-nosed Bat, Large Bent-winged Bat, Little Bent-winged Bat, Southern Myotis, and Yellow-bellied Sheathtail-Bat (NSW DCCEEW 2025b, NSW DCCEEW 2025d, NSW DCCEEW 2025c, NSW DCCEEW 2025e, NSW DCCEEW 2025f).

Overall potential roosting habitat within the study area is considered to be degraded due to urban and industrial development within the locality. This extensive development has resulted in light pollution from street lighting and security lighting around buildings. While overall roosting habitat is considered degraded, roosting habitat provided by the culvert and the stag trees along Greendale Creek is considered to have potential of being active due to the number of historical records of Large Bent-winged Bats (603 records within 5 kilometres) and Little Bent-winged Bats (111 records within 5 kilometres) within close proximity to the locality.

Impacts of light and noise

Based on the morphological and behavioural characteristics of Large Bent-winged Bat, Little Bent-winged Bat and Yellow-bellied Sheathtail-bat, it is assumed that these species are likely to utilise artificial lighting for foraging purposes. The species are fast flyers that can be observed foraging above the canopy or low through grassy fields. Due to their agile and fast flight, they can intersect positive phototaxis prey in open areas (i.e., prey that moves towards the light such as beetles and flies) (Churchill 2008). The research undertaken by Haddock et al. (2019), further endorsed this positive response of Large Bent-winged Bat to LED streetlights.

Recent global studies have reported a negative association between bat activity and increased light pollution, specifically relating to the genus of Myotis. International research relevant to the Myotis genus have shown that this taxon has developed a behavioural adaption to avoid anthropogenic light Black et al. (1994), McGuire & Fenton (2010), (McGuire & Fenton 2010) and (Patriarca & Debernardi 2010). This behavioural adaption has been inherited to reduce the risk of predation and avoid potential adverse impacts on sensorial capabilities (Patriarca & Debernardi 2010). In America, *Myotis lucifugus* showed a drastic worsening in its ability to avoid large obstacles under artificial lighting conditions (McGuire & Fenton 2010). Furthermore, impaired

flight response under artificial lighting conditions theoretically, would make the species more susceptible to predation and less effective during foraging efforts.

In broader terms, the research suggests that the impacts of artificial lighting on bats is highly dependent on taxonomical and morphological traits (i.e., physical characteristics and foraging guilds). Faster flying bats with longer wingspans (i.e. Freetail bats and Bent-winged bats) would potentially utilise artificial lighting for foraging, whereas slower flyers with short-broader wings (i.e. Southern Myotis and Greater Broad-nosed Bat) that utilise cluttered and edge environments, tend to avoid artificial lighting (Rowse, Harris, & Jones 2016), Haddock et al. (2019). Artificial light spill is listed as a threat for Eastern Coastal Free-tailed Bat (NSW DCCEEW 2025g). The potential impacts resulting from anthropogenic light pollution include:

- Increased resource partitioning (creating new foraging niches (Rowse, Harris, & Jones 2016)).
- Behavioural adaptions (Haddock et al. (2019).
- Reduced sensorial capabilities (McGuire & Fenton 2010).
- Long-term impacts to physiology (McGuire & Fenton 2010).
- Shifts in prey composition and an increase in phototaxis positive prey (Rowse, Harris, & Jones 2016)).
- Shifts in microbat species composition (Rowse, Harris, & Jones 2016)).
- Potential reduction in nightly foraging activity (Patriarca & Debernardi 2010).
- Reduced predator avoidance (McGuire & Fenton 2010).
- Modification of regular flightpath (Patriarca & Debernardi 2010).
- Increased stress, which may lead to reduce population size or mortality (Rowse, Harris, & Jones 2016)).
- Changes in trophic interactions (Rowse, Harris, & Jones 2016)).

Threatened microbats within the study area

The study area is comprised of the existing sporting ovals, as well as a portion of Greendale Creek and the associated riparian vegetation. The study area is proposed to have sport field lighting installed, to be turned on during approved bookings or use of the fields for sport and recreation. The lighting will be in use for up to six nights a week (not used on Sundays), and proposed use is to occur up until 9:15pm with lighting automatically turning off at 9:30pm. The vegetation adjacent to the study area is part of a small patch, which is poorly connected through the wider locality through street trees dispersed among residential dwellings. Larger patches of vegetation occur to the west of the study area (approximately 2.7 kilometres), with significant barriers to dispersal (the urban areas of Brookvale) occurring between the study area and these larger patches.

No individuals were recorded during the field investigation (although no targeted surveys were undertaken). However, there are several records of each of these species within 5 kilometres of the study area (NSW DCCEEW 2025a). The proposed works will not involve the removal of habitat for these species, however, light spill from the proposed works may impact the suitability of foraging and roosting habitat during operation.

Given the presence of potential roosting habitat within the study area, and that remnant urban vegetation is important for providing foraging habitat for microbat species, a test for determining whether the proposed works are likely to significantly affect these species in accordance with Section 7.3 of the BC Act has been undertaken below.

Table 10 ToS assessment for Microbat species

Test of Significance for Microbats
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Impacts likely to have an adverse effect on the life cycle of threatened microbats include direct mortality, loss or disturbance of roosting sites, clearing of and adjacent to foraging areas (i.e. decreased numbers of insects), application of pesticides in or adjacent to foraging areas, reduction in stream quality affecting food resources and predation by feral animals. The proposed works within the Frank Gray and Mike Pawley Ovals may affect the suitability of potential foraging and roosting habitat for threatened microbats for a period of dark hours from sunset to 9:30pm. Indirect impacts resulting from uncontrolled light spill may provoke avoidance behaviour in these species and/or disorientation during flight. As such, indirect impacts associated with light spill from the project may negatively affect foraging habitat along the riparian corridor of Greendale Creek and potential roosting habitat within the stag tree and at the culvert within Greendale Creek. However, the vegetation adjacent to the study area is not well connected to larger patches within the locality due to residential and urban development. The small patch of potential foraging and roosting habitat is not likely to constitute a significant portion of a home range of any microbats in the locality, due to the small size of the patch and its location within the highly developed landscape. The dense riparian vegetation is considered likely to inhibit much of the light spill within the riparian corridor and impacts are likely to be limited to the southern bank, adjoining the sport ovals. While the works will not result in the removal of any roosting habitat, increased levels of light within the locality is has potential to negatively impact roosting habitat for hollow dependent microbats. Although hollows were not recorded in the study area, multiple stags containing cracks and crevices were recorded in the northwestern corner, which may provide roosting habitat. Artificial light sources may impact emergence timing and foraging duration, due to natural lighting cues being disrupted. Additional light pollution levels at the potential roosting habitat is not expected to significantly increase as dense remnant vegetation will limit light filtration into areas utilised for roosting. Mitigation measures including directing the lights towards the ground and limiting light use to 9:30 pm each night, will further minimise the risk of impacts. Additionally, as microbats utilise several roosts throughout their home range, it is unlikely that any adverse effects associated with the works would significantly reduce the availability of resources within the broader locality. Open-space foragers such as Little Bent-wing Bat, Large Bent-winged Bat and Yellow-bellied Sheathtail-Bat have morphological traits which may provide the opportunity to benefit from increased artificial lighting. These faster-flying species (long wingspans) would potentially utilise artificial lighting for foraging in open spaces, targeting positive phototaxis prey (i.e. prey that is attracted to light). The research undertaken by Haddock et al. (2019), further endorsed this positive response of Bent-wing-bats to LED streetlights. For species such as the Southern Myotis, Eastern Coastal Free-tailed Bat and Greater Broad-nosed Bat which are more susceptible to light related foraging disruption, impacts to the riparian corridor along Greendale Creek are expected to be minimal, as lights will be turned off at 9:30 pm, and typical foraging behaviour can resume after this period. Taking these factors into consideration, it is unlikely that the installation of the proposed lighting, appropriately mitigated, would have an adverse effect on threatened microbats such that a viable local population of any of the above listed species would be placed at risk of extinction.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: 4. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* 5. *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*
Not applicable, not an ecological community.
In relation to the habitat of a threatened species or ecological community: 6. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

Test of Significance for Microbats
7. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and* 8. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*
No habitat will be removed by the proposed development; however, habitat adjacent to the ovals may be indirectly impacted by lighting for the sporting field between sunset and 9:30pm. The effects of light spill are likely to occur around the edges of remnant vegetation along Greendale Creek and may extend (to a lesser extent) across the creek and into vegetation on the opposite bank. It is highly unlikely that an area of habitat would become fragmented or isolated from other areas of habitat as no native vegetation will be removed as part of the proposed works. Impacts will be restricted to increased light spill in the vegetation adjacent to the impact area, however, lighting will not be continuously used throughout the dark hours. Although the species may avoid use of the adjacent vegetation due to increased noise and light spill during sporting events, the use of the oval is proposed to end by 9:15pm, with all associated lighting to be turned off by 9:30pm. This would allow any avoided habitat to be utilised from 9:30pm to dawn, while the species is active foraging and moving around the landscape. The habitat potentially affected by light spill may provide connectivity for threatened microbat species moving through the locality. The area of riparian vegetation directly adjacent to the ovals with the highest potential for impacts from light spill is approximately 300m long, and the width of the riparian corridor is approximately 67m wide. Light spill may affect the outer edge of the riparian vegetation; however, it is not considered likely to impact significantly on the inner riparian vegetation and channel of Greendale Creek due to the density of vegetation within the riparian corridor providing a barrier to light spill. Given the The vegetation surrounding the study area is not well connected to the wider locality due to residential development to the north and south and the urban centre of Brookvale to the west. The main area of connectivity occurs to the south of the study area, where the terminal end of the riparian vegetation occurs approximately 1.3 km to the east where Greendale Creek (and Curl Curl Lagoon) meets the ocean. Although flying species may be able to navigate the urban environment, the lack of continuous vegetation/canopy cover would limit movements between the remnant patch adjacent to the study area, and larger patches associated with Middle Harbour and Manly Reservoir further to the west. Potential roosting habitat, located to the north of the study area from the culvert and stag trees along Greendale Creek, is not expected to be negatively impacted by the proposed works as the density of the tree canopy along the riparian corridor will minimise additional light spill into this area. The stag located at the edge of the riparian corridor, to the north-west of the study area also currently experiences a level of disturbance due to the position in relation to existing sport fields and developed areas. While some edge-space foraging habitat may be indirectly affected by the proposed lighting installation due to light spill, impacts to edge-space foraging habitat will be minimal. The works are not expected to significantly degrade flight paths along the riparian corridors, which are largely protected by dense canopy cover. The potential use of the habitat by threatened microbats may be modified during operational hours of the sport field, however, it is not likely that the small area of fragmented vegetation, which will be impacted over a short timeframe each night would be significant such that the long-term survival of the species is at risk.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed activity does not occur on or adjacent to an area of outstanding biodiversity.
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The project will not result in, or increase the impact of any KTPs. Loss of hollow-bearing trees is listed as KTP; however, no hollow-bearing trees, roosting habitat or foraging habitat will be removed by the proposed works. A number of threats are listed for the microbats considered in this assessment, including: • Disturbance of colonies, especially in nursery or hibernating caves • Loss of high productivity foraging habitat • Loss of hollow-bearing trees, clearing and fragmentation of forest and woodland habitat • Disturbance to roosting and summer breeding sites

Test of Significance for Microbats

- Foraging habitats cleared for residential and agricultural developments including clearing within rural subdivisions.

Light spill is not listed as a KTP; however, artificial light sources spilling onto foraging and/or roosting habitat is listed as a threat to Eastern Coastal Free-tailed Bat and is relevant for the project regarding threatened microbats occurring in the locality.

Artificial light spill may reduce quality of potential roosting and foraging habitat within the riparian corridor. Multiple stags providing potential roosting was recorded in the north-west of the study area, as well as one culvert located along Greendale Creek. The suitability of these potential roost structures may be reduced by artificial light spill. The light spill may also impact these potential roost structures by inducing a later emergence and therefore reduced foraging opportunities for individuals utilising potential roosting habitat. The suitability of foraging habitat may be reduced during times the lighting is turned on, for microbats more likely to be sensitive to artificial light spill, such as the Eastern Coastal Free-tailed Bat, Greater Broad-nosed Bat and Southern Myotis. It is likely that habitat to be affected currently experiences a degree of indirect impacts from artificial lighting from the adjacent residential areas, school buildings and existing sport fields.

The proposed new lighting for the ovals will be turned off at 9:30pm, returning the potential foraging habitat to pre-development levels of disturbance for the remainder of the night.

Given the small area of impact, short timeframe (each day of use) of impact, limited roosting habitat and discontinuous nature of the potential habitat within and adjacent to the study area, it is unlikely that the proposed development and operation will increase the impact of a KTP such as loss of high productivity foraging habitat.

Conclusion

In consideration of the above five factors, the proposed activity is not likely to significantly impact Southern Myotis, Eastern Coastal Free-tailed Bat, Little Bent-wing-bat, Large Bent-winged Bat, Greater Broad-nosed Bat, Large-eared Pied Bat and Yellow-bellied Sheathtail-Bat within the study area or wider locality, as:

- No foraging or roosting habitat will be removed, and impacts are limited to indirect light and noise spill within a small area of edge-affected vegetation.
- Light pollution is not expected to significantly increase in areas of potential roosting or along the main channel of Greendale Creek due to thick remnant vegetation and the implementation of mitigation measures.
- The proposed works are unlikely to significantly impact potential foraging habitat for threatened microbat species with mitigation measures in place, as the timing of light use will be limited, light spill will be limited to an area within 300 m, and some species may utilise artificial lighting during foraging. Other habitat features within the surrounding locality, provide larger areas of foraging habitat for Threatened microbats.
- The proposed activity is not considered likely to adversely affect the lifecycle of these species.
- The proposed activity does not significantly contribute to the KTPs for these species.

Application of the BOS or preparation of a SIS or BDAR is therefore not required.

Appendix 3 Significant Impact Criteria assessments

An assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (CoA 2013) has been undertaken below.

Grey-headed Flying-fox *Pteropus poliocephalus*

Table 11 SIC assessment for Grey-headed Flying-fox

SIC assessment for vulnerable species
Lead to a long-term decrease in the size of an important population of a species.
The proposal is unlikely to lead to a long-term decrease in the size of an important Grey-headed Flying-fox population as the proposed works will not result in any direct impacts to foraging or breeding resources for Grey-headed Flying-fox. The impacts associated with the proposed works will be indirect only, including increased light spill and noise pollution, which may affect the suitability of potential foraging and roosting habitat for threatened microbats for a period of dark hours from sunset to 9:30pm. Indirect impacts resulting from uncontrolled light spill may provoke avoidance behaviour, which may negatively affect foraging habitat along the riparian corridor of Greendale Creek. However, the small patch of potential foraging habitat is not likely to constitute a significant portion of the range of this species, due to the small size and its location within the highly developed landscape. The species prefers large, consolidated vegetation communities that produce significant foraging resources. In addition, the dense riparian vegetation is considered likely to inhibit much of the light spill within the riparian corridor and impacts are likely to be limited to the southern bank, adjoining the sport ovals. Given the scale of the impact, and amount of low-quality foraging habitat to be indirectly impacted, it is unlikely that the proposed works will lead to a long-term decrease in the size of an important Grey-headed Flying-fox population.
Reduce the area of occupancy of an important population.
The species is highly mobile and relatively widespread, preferring large, consolidated vegetation communities that produce significant foraging resources. In addition, roosting and breeding camps are well documented and conspicuous. As no roosting or breeding habitat was recorded during field investigation, no breeding camps are known to occur within the study area and the small size of the potential foraging habitat within the study area, it is highly unlikely that this species would be utilising the study area for anything more than occasional foraging. Although the proposed works may result in some avoidance behaviour during light operation (sunset to 9:30pm) and reduce the quality of habitat during this time, the foraging resources will become available during active foraging hours for the Grey-headed Flying-fox. The species will continue to forage in riparian habitat to north of the study area, and the development will not represent a barrier to the movement or area of occupancy of individuals. As such, the overall area of occupancy of the species is likely to remain unchanged.
Fragment an existing important population into two or more populations.
The national population of the Grey-headed Flying-fox is considered a single population as it is a highly mobile species. Given the scale of impacts, that no native vegetation will be removed as part of the proposed works and the indirect impacts will only occur between sunset and 9:30pm, it is highly unlikely that the proposed works would fragment the existing population. Although the species may avoid use of the vegetation due to increased noise and light spill during sporting events, the species may utilise this habitat 9:30pm to dawn, while the species is active foraging and moving around the landscape. The study area already occurs in a fragmented landscape surrounded by urban development, and larger intact vegetation patches occur to the west of the study area associated with Manly reservoir and Middle Harbour. No camps have previously been recorded within the study area, and no roosting flying-foxes were present during field investigation.

SIC assessment for vulnerable species
Given the highly mobile nature of the species (known to travel up to 50 km whilst foraging) and that impacts to foraging habitat will be indirect only and occur during a short timeframe, the proposed works are unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species.
Habitat critical to the survival of the Grey-headed Flying-fox includes important breeding and foraging resources. Breeding occurs within camps which are generally utilised over successive years. No camps occur adjacent to the study area. It is considered unlikely that the limited riparian vegetation within the study area would constitute habitat critical to the survival of the Grey-headed Flying-fox for the following reasons: • No camps will be impacted by the proposed works. • No native vegetation representing foraging habitat for Grey-headed Flying-fox will be removed by the proposed works. Vegetation adjacent to the study area is considered unlikely to be selected as a roosting site in the future as the vegetation patch is relatively small and partially fragmented, with existing levels of disturbance due to recreational activities. Limiting foraging resources may constitute habitat critical for the survival of Grey-headed Flying-fox and may include areas with highly productive winter flowering tree species. Although Grey-headed Flying-fox has been recorded in the riparian corridor, it is unlikely that the proposed works would significantly disrupt foraging in this area given the lighting will cease after 9:30pm. As such, it is unlikely the proposed works would adversely affect foraging habitat for GHFF such that it would adversely affect the survival of the species.
Disrupt the breeding cycle of a population.
The proposed works will result in indirect impacts of increased lighting and noise spill on a small area of potential foraging habitat between sunset and 9:30pm; however, it will not result in impacts to Grey-headed Flying-fox that will substantially interfere with the species' ability to reproduce successfully. No breeding camps were recorded during field investigations or are known to occur within the study area, with the closest camp located at Balgowlah approximately 3 km away. Grey-headed Flying-fox will continue to breed in camps in the broader landscape and will have unhindered access to adjacent foraging resources when lights are turned out (after 9:30pm). They may also continue to forage in larger patches of native vegetation outside of the study area associated with Manly Reservoir and Curl Curl Lagoon, which likely provide highly quality resources for this species. As such, it is unlikely that the proposed works would lead to the disruption of the breeding cycle of any local Grey-headed Flying-fox population or the species as a whole.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The proposed works will only result in indirect impacts to a small area representing marginal foraging habitat for the Grey-headed Flying-fox. The proposed light installation will not impact any existing camps, either directly or indirectly, and is unlikely to impact any nearby camps, as the vegetation in the study area is unlikely to produce sufficient foraging resources to support a large number of Flying-foxes. The study area is surrounded by higher-quality resources within larger patches of intact native vegetation, and therefore, indirect impacts will only occur to a very small proportion of resources available in the broader landscape. Further, the increased light spill and noise pollution are expected to only be present when the ovals are in use during night hours, with use of the fields limited to 9:15pm and automatic shut off of lighting to occur at 9:30pm. The increased lighting within potential foraging habitat is unlikely to result in any additional fragmentation or isolation, and given the highly urbanised landscape, it is unlikely to significantly modify or decrease the quality of habitat. While the project may reduce suitability of habitat temporarily during use of the fields, the level of disturbance is not likely to result in the decline of the species at a national scale. Given there are no existing records of a camp within the vegetation, and that the vegetation forms a small, fragmented patch currently exposed to indirect light and noise impacts from surrounding residential and recreation use, it is unlikely the proposed action would decrease the suitability of the habitat to the point that the species would not be

SIC assessment for vulnerable species
able to utilise the area for foraging.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
Several exotic plants and feral animals are known to occur or considered likely to be well established in the study area and have the potential to negatively impact Grey-headed Flying-fox, including foxes and dogs. However, it is unlikely that the project would result in the establishment of new species. The proposed action is unlikely to exacerbate the current level of invasive species threat operating within the study area.
Introduce disease that may cause the species to decline.
The project is unlikely to result in the introduction of a disease that could reduce the reproductive output of Grey-headed Flying-fox in or near the project area.
Interfere substantially with the recovery of the species.
Actions considered likely to substantially interfere with the recovery of the Grey-headed Flying-fox, as determined by key threats to the species (DEW 2021), are as follows: • Habitat loss and fragmentation including important foraging species such as Forest Red Gum. • Winter Foraging resources are limited to a narrow coastal strip in QLD and northern NSW. • Spring foraging resources are considered critical to the survival of the species. • Exploitation – shooting of Grey-Headed Flying-foxes to protect fruit crops involves death of the individual and indirect death as a result of shooting of pregnant and lactating females. • Competition and hybridisation – indirect competition by Black Flying-fox which has had a range expansion in the past. • Pollutants, electrocution and pathogens. A disproportionately higher number of lactating females are killed by electrocution on power lines. The project will not fragment habitat for the Grey-headed Flying-fox and will not significantly contribute to the loss of habitat as all impacts will be indirect only, and these impacts are only expected to occur during a limited time period (sunset to 9:30pm). The project is therefore unlikely to substantially interfere with the recovery of the Grey-headed Flying-fox.
Conclusion
In consideration of the above significant impact criteria, and the nature of the indirect impact, the proposed activity is not likely to significantly impact Grey-headed Flying-fox within the study area or wider locality as it will not: • Lead to a long-term decrease in the size of a population. • Reduce the area of occupancy of the species. • Fragment an existing population into two or more populations. • Adversely affect habitat critical to the survival of a species. • Disrupt the breeding cycle of a population. • Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. • Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat. • Introduce disease that may cause the species to decline. • Interfere with the recovery of the species. A Commonwealth referral is not recommended for impacts to these species.

Large-eared Pied Bat *Chalinolobus dwyeri*

The Large-eared Pied Bat is listed as Endangered under the BC Act and the EPBC Act. The Large-eared Pied Bat is a medium-sized insectivorous bat measuring a total length of approximately 100 millimetres and weighing 7–12 grams (Hoye and Dwyer 1995). Records of the species exist from Shoalwater Bay, north of Rockhampton, Queensland, through to the vicinity of Ulladulla, NSW in the south (Hoye 2005). Despite the large range, it has been suggested that the species is far more restricted within the species' range than previously thought (DECC 2007). The species' current distribution is poorly known however, much of the known distribution is within NSW. Available records suggest that the largest concentrations of populations appear to be in the sandstone escarpments of the Sydney basin and the north-west slopes (Coolah Tops, Mt Kaputar, Warrumbungle National Park and Pilliga Nature Reserve. Although the species is widely distributed, it is uncommon and patchy within this area (DERM 2011).

The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging (TSSC 2012). Almost all records have been found within several kilometres of cliff lines or rocky terrain (Hoye 2005). Roosting has also been observed in disused mine shafts, caves, overhangs and disused Fairy Martin *Hirundo ariel* nests (Hoye and Dwyer 1995).

Only four maternity roosts have been discovered in NSW, with two of these since abandoned due to flood and disturbance by macropods (Pennay 2008). The structure of maternity roosts appears to be very specific (arch caves with dome roofs). Caves need to be high and deep enough to allow juvenile bats to learn to fly safely inside and have indentations in the roof. Roosting bats cluster in these indentations, presumably to allow the capture of heat. These physical characteristics are very uncommon in the landscape and their scarcity presumably poses an important limiting factor in the distribution of the Large-eared pied bat (Pennay 2008).

Large-eared Pied Bat within the study area

Within 5 kilometres of the study area (the locality), 96 records of the Large-eared Pied Bat have been recorded, with the closest record occurring approximately 2.7 kilometres away (NSW DCCEEW 2025a). Records in the locality align with the presence of more suitable habitat for this species to the west of the study area, including areas containing rocky cliff lines with larger patches of more in-tact native vegetation surrounding Middle Harbour, and in a larger patch of more in-tact native vegetation around Manly reservoir.

The proposed works will not result in the removal of any potential foraging habitat or roosting habitat for this species, however, light spill from the proposed sport field lights may impact the suitability of habitat during operation (between sunset and 9:30pm). Therefore, an assessment against the Significant Impact Criteria has been undertaken below.

Table 12 SIC assessment for Large-eared Pied Bat

SIC assessment for critically endangered or endangered species
Lead to a long-term decrease in the size of a population.
Information about the size, distribution and interactions of Large-eared Pied Bat populations is largely unknown. In addition, no populations have been defined as 'important populations' for the species. The largest concentration of records for this species appears to be in the sandstone escarpments of the Sydney basin, and northwest slopes of NSW. The riparian vegetation along Greendale Creek provides potential foraging habitat for Large-eared Pied Bat, which the stags and the culvert may provide potential roosting opportunities. Records of the species in the locality primarily occur

SIC assessment for critically endangered or endangered species
around Middle Harbour to the west, where more suitable foraging roosting habitat likely occurs, in the form of intact vegetation in proximity to rocky outcrops, cliffs and overhangs. No vegetation removal will be undertaken as part of the development and light spill is unlikely to be substantial at the location of the culvert due to dense vegetation acting as a screen to filter excessive light. As the proposed works will not result in fragmentation, no foraging or roosting habitat will be removed, and light spill is unlikely to penetrate substantially that it would impact potential roosting in the culvert over Greendale Creek, it is unlikely the project would result in a decrease in the size of the population of this species.
Reduce the area of occupancy of the species.
Although some marginal breeding and foraging habitat was recorded in the study area, higher quality resources are likely present in the broader landscape, including the intact vegetation and associated in rocky outcrops, cliffs and overhangs at Manly Reservoir. No vegetation removal will be undertaken as part of the development and light spill is unlikely to be substantial at the location of the culvert due to dense vegetation acting as a screen to filter excessive light. The use of lighting until 9:30pm may limit the suitability of foraging habitat outside of operational use times, however given that lighting will be turned off for the majority of the night during active foraging hours, it is unlikely to reduce the area of occupancy for local individuals or the species as a whole.
Fragment an existing population into two or more populations.
Records of the species occur approximately 2.7 km west of the study area, within larger more in-tact vegetation associated with Manly reservoir and Middle Harbour. These areas also contain more suitable roosting habitat in the form of rocky outcrops, overhangs and cliffs. The installation and use of lighting until 9:30pm may limit the suitability of foraging habitat outside of operational use times, however given that lighting will be turned off for the majority of the night it is unlikely to disrupt flight patterns such that the local population would be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species.
Habitat critical to the survival of the species is defined as (DERM 2011): • Maternity roosts. • Sandstone cliffs and fertile wooded valley habitat within close proximity of each other. It is very unlikely that the riparian corridor in the study area supports a maternity roost for this species. Maternity roost sites require highly specific conditions and the study area is not adjacent to any cliffs. Light spill will not impact on any rocky outcrops, cliffs, overhangs or disused mine shafts that may be used by the species. One stag occurs in the north-west of the study area and it is possible this could provide roosting habitat for this species. However, higher quality habitat occurs to the west in the area of Middle Harbour and Manly Reservoir and associated sandstone cliffs and outcropping is more likely to support important habitat for this species. This is reflected by the presence of the local records primarily occurring in these areas, with the closest record to the study area occurring at Manly Reservoir. The project is therefore considered unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population.
While reduction in foraging habitat could disrupt breeding success and therefore the breeding cycle of a population, it is unlikely that the indirect impacts associated with the proposed works would reduce resources to the point that the breeding cycle of the population would be disrupted, given the highly urbanised landscape and fragmented nature of the vegetation. Further, suitable roosting habitat for the species is predominantly in cliff lines and caves, and no such structures occur within or adjacent to the study area. More suitable habitat in larger remnant patches occurs approximately 2.7 km west of the study area along the shores of Middle Harbour and around Manly Reservoir. Thus, it is unlikely that the proposed works would disrupt the breeding cycle of an important population.

SIC assessment for critically endangered or endangered species
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The proposed works will likely result in light spill and possibly increased noise from the sporting field, primarily on the edge of an approximately 300m long band of riparian vegetation. The works will not result in removal of vegetation or roosting structures for the species. Mitigation measures including pointing lights appropriately downwards and limiting lighting to times when the sports field is in use will further reduce the potential for indirect impacts of light and noise. Even if individuals avoid utilising the vegetation of the riparian corridor while the lighting is being used, the short lighting timeframe means that these foraging resources would become available again following the lights automatic shutdown at 9:30pm. Therefore, it is considered unlikely that the indirect impacts to foraging habitat in the riparian corridor over a short period (sunset to 9:30pm) would modify or decrease the availability of habitat to the extent that the species would be likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
The proposed development will include the installation of lighting for sports fields and will not require vegetation removal. As no existing native vegetation will be removed to increase edge effects or create newly opened space within existing vegetation, it is unlikely that the proposed works will increase the number of feral animals operating in the study area. As such, the proposed development will not result in invasive species becoming established.
Introduce disease that may cause the species to decline.
The proposed development will include the installation of lighting for sports fields and will not require vegetation removal. The proposed development will not result in the introduction of a disease that may cause species' decline.
Interfere with the recovery of the species.
The following recovery objectives have been specified within the National recovery plan for the Large-eared Pied Bat: • Identify priority roost and maternity sites for protection. • Implement conservation and management strategies for priority sites. • Educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat. • Research the large-eared pied bat to augment biological and ecological data to enable conservation management. • Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat. One of the recovery actions stated under these objectives is the protection of known roosts and associated foraging habitats and management of threats. If Large-eared Pied Bat was found to be utilising the riparian corridor as either roosting or breeding habitat (within the culvert or stag tree), disturbance to these structures may interfere with this recovery action. However, it is highly unlikely that these structures are being utilised as a maternity roost for this species. Further, these structures will not be removed by the proposed development and indirect impacts to the culvert are unlikely to be significant due to the shielding of light spill by riparian vegetation. Impacts to the stag which provides potential roosting opportunity are unlikely to be greatly exacerbated given the location within the highly urbanised landscape. Records of the species in the locality occur primarily to the west of the study area, in larger more in-tact patches of vegetation associated with Manly Reservoir and Middle Harbour, which provides sandstone outcrops and cliff lines more suited to use for roosting by this species.
Conclusion.

SIC assessment for critically endangered or endangered species

In consideration of the above significant impact criteria, and the nature of the indirect impact, the proposed activity is not likely to significantly impact Grey-headed Flying-fox within the study area or wider locality as it will not:

- Lead to a long-term decrease in the size of a population.
- Reduce the area of occupancy of the species.
- Fragment an existing population into two or more populations.
- Adversely affect habitat critical to the survival of a species.
- Disrupt the breeding cycle of a population.
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
- Introduce disease that may cause the species to decline.
- Interfere with the recovery of the species.

Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on the Large-eared Pied Bat and a referral is not required.


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