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Biodiversity Development Assessment Report for industrial re-development at 158-164 Old Bathurst Rd, Emu Plains (Lot 1 DP588918 and Lot 2 DP588919)

Prepared by:

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Prepared for:

Penrith City Council

Document control

Version	Date	Author	Details
1	03/04/2022	Dr AnneMarie Clements, Dr Anne Baumann, Joelan Sawyer, Tony Rodd, Pauline Dever.	Final issued with development application
2	05/07/2022	Dr AnneMarie Clements, Dr Anne Baumann, Joelan Sawyer, Tony Rodd, Pauline Dever.	Amended in response to Council comments. Letter from Penrith City Council dated 14 June 2022. Reference: DA 22/0318. Contact: Donna Clarke – Consultant Planner.
3	6/10/2022	Dr AnneMarie Clements, Dr Anne Baumann, Joelan Sawyer, Tony Rodd, Pauline Dever.	Responses to subsequent amendments prepared for Council. No major changes to the Biodiversity Assessment Report.

Summary

This BDAR has been revised in response to Attachment A of the Penrith City Council's letter dated 14 June 2022. It addresses the Biodiversity concerns raised with the BDAR submitted dated 8 April 2022 and subsequent amendments prepared for Council (Civil Engineering Plans, dated 27.09.22).

This BDAR has been prepared as a *Streamline assessment module – Planted native vegetation* in accordance with the BAM (DPIE 2020) and the decision making key in Appendix D was applied. Despite the vegetation on the subject land being planted trees, the BAM Calculator was used as a tool to generate the BioNet data for threatened species and confirm the absence of Plant Community Types (PCTs) on the subject land.

Development description

The proposal is an industrial re-development on the approximately 16.3 ha site at 158-164 Old Bathurst Rd, Emu Plains (Lot 1 DP588918 and Lot 2 DP588919) in the Penrith City Local Government Area. The proposal is to upgrade the industrial land to meet the criteria in the Penrith Development Control Plan 2014 for mitigating the urban heat island effect, as well as conserve and enhance habitats for native biota.

The proposal is an industrial warehouse subdivision with land raised to enable it to drain to the existing low points for water treatment and discharge into the surrounding trunk drainage beyond. The existing water treatment ponds in the western corner of the site will be re-engineered to form constructed wetlands for water quality and to provide fauna habitat. The proposal results in the removal of some planted trees.

Prior to agricultural clearing and the Rocla industrial land use, the site on alluvial river terraces associated with the Nepean River, is likely to have supported PCT 835 - Cumberland Riverflat Forest which is mapped nearby by DPIE (2015).

Reason why a BDAR has been prepared

A BDAR is required for the proposed development under the NSW *Biodiversity Conservation Act 2016* as the north-eastern corner of the subject land is mapped on the Biodiversity Values Map. This area is also mapped as *Important Area for Swift Parrot*. The mapped area on the Biodiversity Values Map and the Important Area for Swift Parrot are the same and occur on the subject land and extend onto the recently cleared adjacent land to the east. The north-eastern corner of the subject land consists of garden beds which include planted trees with the winter-flowering *Eucalyptus sideroxylon*.

Plant community types (PCTs), threatened ecological communities (TECs) and EPBC Act listed ecological communities (ECs).

Given the subject land supports planted trees, the decision-making key was applied (Appendix D: *Streamline assessment module – Planted native vegetation* of the Biodiversity Assessment Methodology (BAM) DPIE 2020).

A flora survey was conducted on 30 March 2022 with data recorded in three BAM Plots and six patches. No PCTs could reasonably be assigned to the vegetation onsite. No TECs nor EPBC Act listed ECs occur on the subject land.

Threatened species

No suitable habitat nor any threatened flora species were recorded on the site.

In accordance with Appendix D of the BAM, the suitability of the planted native vegetation for use by threatened species was assessed.

Fauna habitat assessments and surveys were undertaken on the 21st October and 1st and 2nd November 2021 by Martin James and on 1st November 2021 by Deryk Engel. No threatened fauna species were recorded.

Despite the vegetation on the subject land being planted trees, the BAM Calculator was used as a tool to generate the BioNet data (last updated: 24/11/2021 (Version: 50) and potential Threatened Species for the site. This was generated for the likely original vegetation of *PCT 835 Cumberland River Flat Forest*, which is associated with the alluvial river terraces of Emu Plains. Twenty (20) Ecosystem Credit Species and 22 Species Credit Species were generated.

In terms of the subject land:

- The listed Ecosystem Credit Species have the potential to occur *if* the vegetation was PCT 835. The Ecosystem Credit Species include Swift Parrot (Foraging) (*Lathamus discolor*). All of the ecosystem species have the potential to forage or fly over the subject land; and
- the habitats of the Species Credit Species associated with PCT 835 are absent, including Swift Parrot (Breeding), especially as the Swift Parrot breeds in Tasmania, not in NSW.

Impacts

The proposal results in potential loss of foraging habitat due to the removal of some of the planted exotic and native trees. No offsets for impacts are required for the loss of Planted Trees onsite. The area of planted trees in the north east of the subject land mapped as *Important area for Swift Parrot* is proposed to be retained. There are no prescribed or serious and irreversible impacts.

Mitigation measures

Measures to mitigate and manage impacts are identified in accordance with Section 8.4 of the BAM *Measures to mitigate and manage impacts*.

To meet the criteria in the Penrith Development Control Plan 2014 for mitigating the urban heat island effect, as well as to conserve and enhance habitats for native biota, the following are to be designed and implemented in consultation with the ecologist:

- as many as practicable of the existing perimeter trees be retained, including the winter-flowering eucalypts in the north-east corner;
- supplementary planting using local provenance native trees, shrubs and groundcovers to enhance the amenity of the subject land, and to provide habitat for native flora and fauna species. This includes extensive planting of winter flowering local native eucalypts along Old Bathurst Road to enhance the foraging habitat of the Swift Parrot; and
- the re-engineered constructed wetlands, are to be designed to provide shade, moisture and increased diversity of the native habitats.

Final offset requirements

No offsets are required for the loss of Planted Trees onsite from the application of Appendix D in the BAM. Species credits are not required to offset the proposed impacts (see Tables E1, E2). The area of planted trees in the north east of the subject land mapped as *Important area for Swift Parrot* is proposed to be retained.

Table E1 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
Planted trees	None	None	1.4 of 2.47 ha	None
Constructed ponds	None	None	0.72 of 0.93 ha	None

Table E2 Impacts that require an offset – species credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
None	None	None	None

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The proposal

- 1e. Bulk earthworks plan (ACOR, Project No. NSW211637, DWG No. C2.001, Issue B, Sep 2022)
- 1f. Stormwater Management Strategic Plan (ACOR, Project No. NSW211637, DWG No. C7.101, Issue B, Sep 2022)
- 1g-1. Tree Retention Plan (ACOR, Project No. NSW211637, DWG No. C06, dated March 2022)
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Regulatory mapping

- 2a. Site boundary overlaid on the Penrith Local Environmental Plan 2010 - Land Zoning Map.
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Shortened forms

BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
CEEC	critically endangered ecological community
DBH	diameter at breast height over bark
DPIE	Department of Planning Industry and Environment
EC	ecological community listed under the EPBC Act
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EEC	endangered ecological community
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
LLS Act	<i>Local Land Services Act 2013</i> (NSW)
NSW	New South Wales
PCT	plant community type
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 *Biodiversity certification assessment report of the Biodiversity Conservation Act 2016* (BC Act).

Signature: 

Date: 10 October 2022

Dr AnneMarie Clements

BAM Assessor Accreditation no: BAAS17088

This BDAR has been prepared to meet the requirements of BAM 2020.

ii. Details and experience of author/s and contributors

Authors and contributors

Name	Position/ Role	Tasks performed include	Relevant qualifications
Dr AnneMarie Clements BAM Assessor number: 0129 NSW BAM Accreditation: BAAS17088	Ecologist	- report preparation - data checking - supervising survey - checking figures - review of data, - cross checking specimens - cross-checking photo records and data recorded - BAM-C analysis	MSc, PhD Ecology Specialists Certified Environmental Practitioner under the EIANZ: CEnvP Registration Number E200001.
Dr Anne Baumann	Ecologist	- reviewing existing data - report preparation - document review - checking figures - checking data	PhD, BScAg, Cert IV Conservation and Land Management. Dip. Arboriculture
Joelan Sawyer	Ecologist	- report preparation - figure preparation - field survey, include BAM Plots - BAM-C data entry and analysis with AC - targeted threatened flora surveys	BSc
Tony Rodd	Botanist	- field survey, include BAM Plots - detail observations - report preparation	BSc, Specialist botanist with many years of experience

Name	Position/ Role	Tasks performed include	Relevant qualifications
		- data review - double checking mapping	
Pauline Dever	Ecologist	- field survey - data entry	Dip. Conservation and Land Management. Completing BEnv.

iii. Conflict of interest

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature: 

Date: 10 October 2022

Dr AnneMarie Clements

BAM Assessor Accreditation no: BAAS17088

Preamble

This BDAR has been revised in response to Attachment A of Penrith City Council's letter dated 14 June 2022, notably:

It is requested that the information is transferred into the BDAR template that has been prepared and released by the NSW Department of Planning and Environment.

Consequently the BDAR has been prepared in accordance with the recently released Department of Planning and Environment (2022) *Guidance for the Biodiversity Development Assessment Report Template* (dated 7 April 2022).

This BDAR has been prepared as a *Streamline assessment module – Planted native vegetation* in accordance with the BAM (DPIE 2020). It also addresses the Biodiversity issues raised by Council with the previously submitted BDAR dated 8 April 2022, as follows:

Issues raised	Issues addressed
Biodiversity <i>Overall, the information presented in the BDAR has a number of errors, omissions or inconsistencies that need to be resolved for the application to be considered further:</i>	
<i>1. The BDAR does not provide a map of Plant Community Types on the development site as required by Section 5.2 of the BAM. The BDAR contains one map that identifies the vegetation as 'Planted' and 'Constructed dam vegetation.' The consultant has identified some of the vegetation as River-flat Eucalypt Forest – not EEC as per the BAM credit reports. It is unknown if the remaining vegetation has been assigned to a PCT or remains assessed as Planted vegetation.</i>	This BDAR has been prepared as a <i>Streamline assessment module – Planted native vegetation</i> . In Section 5.3 of the BDAR it is concluded that: - Neither the vegetation of Planted trees nor Constructed ponds can reasonably be assigned to a PCT. - The use of Chapters 4 and 5 of the BAM are not required to be applied. (Section 5.2 of the BAM does not apply). A map of the vegetation (Planted trees) is shown on Figures 6a and 7. (There are no PCTs on the site).
<i>2. The BDAR does not provide a sufficient explanation or consideration of alternative vegetation communities that could occur within the development site. In addition, there is no reference to the NSW Scientific determinations to support the decision that the River-flat Eucalypt Forest is not an Endangered ecological community (EEC) in accordance with the NSW Scientific determinations. The previous Flora and Fauna Assessment that was prepared for the site identified the vegetation in the south west portion of the study area as 'Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' and Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.' These two communities were not considered and further explored as part of the BDAR. If it is determined that the area comprises of two different Plant Community Types additional plots may be required</i>	See Section 5.3 of the BDAR Response to Question 1 of the Decision-making key (Appendix D of the BAM) assesses whether the vegetation can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal. In this response, the PCT online tool was used and no PCT could be reasonably fitted to the recorded BAM Plot data. Furthermore, the BAM Calculator was applied as a 'tool' for the likely original vegetation type that would have naturally occurred on the site prior to clearing for agriculture and subsequent industrial landuse. The

Issues raised	Issues addressed
<i>especially if it is determined that Freshwater Wetlands on Coastal Floodplains is present.</i>	vegetation onsite had low VIS scores, further confirming no PCT could be reasonably fitted. Given there are no PCTs on the site, there are no TECs, EECs nor EPBC Act listed ECs on the site.
3. <i>It is unclear whether the Streamlined Module Appendix D: Streamlined assessment module – Planted native vegetation of the BAM 2020 was used for the majority of the site or whether the full BAM was used According to the BAM Credit Summary Report it appears that the Assessment Type included in the BAM calculator was Part 4 Developments (General), however it appears elements of the assessment used the streamlined module such as not proving maps identifying the Plant Community Types and adequately justifying the removal of Species Credit Species such as the Swift Parrot.</i>	This BDAR has been prepared for the entire site as a <i>Streamline assessment module – Planted native vegetation.</i> The widespread extent of planted trees is shown on Figures 6a and 7. There are no areas of native vegetation on this site to be assessed under the general BAM. The BAM Calculator was only used as a tool as it contains BioNet data for the local area.
4. <i>Section 4.1 Ecosystem Credit species does not specifically state which species were retained as Ecosystem Species and what species were excluded from the assessment. It is understood from the BAM predicted Species Report that all Ecosystem species were retained as part of the assessment. This would be better presented in a table format.</i>	In Appendix D <i>Streamline assessment module – Planted native vegetation</i> in the BAM, it states: <i>The assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation.</i>
5. <i>Section 4.2.2 titles Candidate Species for which surveys are to be completed does not adequately address how candidate species were excluded from further assessment. This is dependent on whether the full BAM was applied or only for portions of the site. If the full BAM was used then further consideration and justification is required.</i>	This has been undertaken (See details in Section 4.2.2 of the BDAR). The BAM Calculator tool generated lists of ecosystem species and candidate species for the likely original vegetation type that would have naturally occurred on the site prior to clearing for agriculture and subsequent industrial land use. The ecosystem species have the potential to fly over the site and possibly forage in the planted trees.
6. <i>It appears that Swift Parrot was excluded as a candidate species based on survey undertaken in November (according to the BAM Candidate Species Report). However as per the BioNet Threatened Biodiversity Data Collection Tool (TBDC) it states: Only present in non-breeding season; present in northern NSW for a shorter period than southern NSW. The species is a dual credit</i>	The Swift Parrot (Breeding) is listed as a Candidate species associated with the likely original vegetation, however: - this species does not breed in NSW;

Issues raised	Issues addressed
<i>species, with the species credit component mapped as an important area. These mapped areas do NOT require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts. Important habitat maps (formally Important Mapped Area): Only select species have important habitat maps. These maps identify land that is considered important to support critical life stages of the species and are classed as species credits. Mapping is in accordance with the Guide for mapping threatened species for inclusion in the NSW regulatory framework. Maps may include breeding areas, key areas that migratory species forage/over-winter in, or sites where multiple records have been located over multiple years. Important habitat maps are generally restricted to species that are highly mobile and difficult to reliably detect by survey, and where long-term location data exists. If the subject land is within a mapped area, no survey is required for that species and it is assumed present. The part of the subject land within the important habitat map forms the species polygon used to generate species credits. Where only part of the subject land is mapped as important habitat, the remaining areas are assessed for ecosystem credits. The BDAR has not provided an assessment of Serious and Irreversible Impacts for the Swift Parrot.</i>	- nor does the likely original vegetation occur on the site. The site, post clearing for agriculture and subsequent industrial land use, supports planted trees and no PCTs. The Swift Parrot (Breeding) is not excluded or included in the streamline assessment for planted trees. There is evidence of foraging Swift Parrots in the north east corner of the site, mapped as Important Area for this species (Figure 6c). It is stated in Section D.2 of Appendix D of the BAM that: <i>If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Species credits are not required to offset the proposed impacts.</i> See Section 6.1.2 Project design of the BDAR for mitigation measures including: <i>The proposed additional plantings are directed to restoring winter-flowering eucalypts especially for the winter foraging Swift Parrot.</i>
<i>7. The justification as to how the future integrity score as provided in the fourth table in Section 3.4.2 is not clear. Future integrity score for vegetation that will be impacted as part of the works should be set to 0 and should not have a modified value.</i>	Part of the Constructed Ponds and Planted Trees vegetation are to be retained and some are to be cleared for the proposal. The calculated vegetation integrity scores in Section 5.3 of the BDAR further confirm there are no PCTs onsite.
<i>The above points are to be addressed by the accredited assessor.</i>	
<i>To demonstrate the project has been designed to avoid and minimise impacts to the Swift Parrot the project should be redesigned to retain as many trees as possible which should include the strip of trees along the north east corner and eastern boundary which was mapped and adjacent to an important area for the Swift Parrot.</i>	See Section 6.0
<i>The presentation of the information provided in the BDAR is not clear and is confusing. It is requested that the information is transferred into the BDAR template that has</i>	As requested the revised BDAR is presented using the BDAR template that has been prepared and released

Issues raised	Issues addressed
<i>been prepared and released by the NSW Department of Planning and Environment. This is not a legislative requirement but is strongly encouraged to allow easier understanding of the information that has been prepared and provided for Council to review.</i>	by the NSW Department of Planning and Environment. The Template has not been used to present Figures, Tables and Appendices.
<i>It is recommended to avoid excessive clearing of native vegetation in the south west corner of the site Lot 33 is absorbed into Lot 32 and utilised to enhance the wetland increase the capability.</i>	See Section 6
<i>Although planted the Casuarina sp. trees provide foraging habitat for threatened fauna species including threatened microbat species, Gang-gang Cockatoo and the Glossy Black Cockatoo as well as other non-threatened fauna species such as Yellow-tailed Black Cockatoo and should be retained where possible.</i>	See Section 6. The existing Casuarinas are largely proposed for retention, as shown in Figures 6a and 7.
<i>It is also recommended that the trees around the perimeter are retained, and the subdivision layout and associated earthworks are redesigned to retain these trees which will aid in providing foraging habitat for highly mobile fauna as well as maintaining/ improving existing visual buffer/screenings from adjacent development and view from the railway line.</i>	See Section 6. Details of retention of existing trees shown in Figures 6a and 7.

Stage 1: Biodiversity assessment

1.0 Introduction

Prior to its industrial land use from the 1960s until 2019, as a concrete production, manufacturing and storage operation (Rocla Pipes Pty Ltd), the natural vegetation was cleared and used for productive agricultural cropping on the alluvial river terraces associated with the Nepean River. With the change to industrial land use, the landform and drainage were modified including excavating treatment ponds in the western corner of the site for the purpose of ameliorating alkaline concrete-enriched runoff water. Extensive areas of the soil surface are now covered in crushed concrete and rubble.

Rows of exotic and native trees have been planted mainly on the perimeter of the site as visual plantings surrounding the site and as rows adjacent to the treatment ponds with minor occurrences of local native groundcover species. From the historic aerial photographs, these row plantings are visible:

- by 1975, adjoining Old Bathurst Road;
- by 1984, with growth of planted trees adjoining Old Bathurst Road, minor tree planting onsite and possible tree growth along the drainage line in the south.
- by 1994, with planting along the entire length of the boundary adjoining Old Bathurst Road, along the eastern and part of the southern boundaries and possibly along David Street in the west; Expansion of tree growth areas along the drainage line in the south onsite. A water treatment pond was being constructed with possible start of tree planting associated with the ponds.
- by 2005, with growth of linear planted trees in areas of the water treatment ponds.

1.1 Proposed development

1.1.1 Development overview

The proposal is an industrial subdivision. This development requires consent under Part 4 of the EP&A Act.

1.1.2 Location

The proposed industrial subdivision development is located on the approximately 16.3 ha site at 158-164 Old Bathurst Rd, Emu Plains (Lot 1 DP588918 and Lot 2 DP588919) in the Penrith City Local Government Area (Figures 1a-1 to 1g, 2a).

1.1.3 Proposed development and the subject land

The proposed development includes (Figures 1e, 1f, 1g):

- demolitions of existing buildings onsite, old bituminised driveways and concrete rubble.
- land raised to enable it to drain to the existing low points for treatment and discharge into the surrounding trunk drainage beyond. The existing water treatment ponds in the south west corner of the site will be re-engineered to form constructed wetlands.

The proposed constructed wetlands will have a total treatment area of 1700 m² with sedimentation pools and active macrophyte zones which remove pollutants such as nutrients, heavy metals and sediments. Furthermore, the wetlands will provide habitat for local flora and fauna as well as water balance by evapotranspiration (Figure 1f).

The proposal results in the removal of some of the planted trees and retention of some existing plantings along the Old Bathurst Road frontage (Figure 1g), as well as the

regenerating *Casuarina glauca* trees adjacent to the proposed constructed wetlands. (Note: the *Casuarina glauca* are regenerating from planted trees).

The extent of vegetation on the subject land impacted by the proposal is shown on Figure 7.

Subject land is defined in the BAM as:

land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal.

The subject land is all areas of the site requiring regrading (Figure 1e).

1.1.4 Other documentation

The other documentation submitted with the proposed development that is relevant to biodiversity used in the preparation of this BAR include the following:

Existing reports prepared

ACOR Consultants Pty Ltd (ACOR) (2022) Flood Impact Assessment. Proposed subdivision of 158-164 Old Bathurst Road, Emu Plains. Prepared for Penrith City Council. Dated March 2022.

ACOR Consultants Pty Ltd (2022) Industrial development 158-164 old Bathurst Road, Emu Plains, NSW 2750 civil engineering services - development application. Issue B, Dated September 2022.

Arnold N and Oates J (2022) *Arboricultural Impact Assessment. Emu Plains Industrial Park. 158-164 Bathurst Road, Emu Plain NSW.* Prepared for Penrith City Council. CIVICA Reference number: JNC02821. Dated 2 March 2022.

Arnold N, Oates J and Clark A (2022) *Arboricultural Impact Assessment. Emu Plains Industrial Park. 158-164 Old Bathurst Road, Emu Plains NSW.* Prepared for Penrith City Council. CIVICA Reference number: JNC02821v3. Dated 1 September 2022

Group GSA (2022) Landscape plans. Finalised in April 2022.

JBS&C (2021a) Detailed Site Investigation. 158 to 164 Old Bathurst Road, Emu Plains NSW. Prepared for Penrith City Council. Reference number: 60007/135919 Rev 0. Dated 3 March 2021.

JBS&C (2021b) Remedial Action Plan. 158 to 164 Old Bathurst Road, Emu Plains NSW. Prepared for Penrith City Council. Reference number: 60007/135934 Rev 0. Dated 3 March 2021.

Draft reports (not submitted with the proposed development, emailed from client)

Engle D and Morton J (2021) Draft site assessment: 158-164 Old Bathurst Rd, Emu Plains. Undated.

SIA Ecological & Environmental Planning Pty Ltd (2021) Draft Flora & Fauna Impact Assessment. 158-164 Old Bathurst Rd, Emu Plains. Dated 26 November 2021.

James M (no date) Results of targeted surveys in the constructed water treatment ponds.

1.2 Biodiversity Offsets Scheme entry

A Biodiversity Development Assessment Report (BDAR) under the *Biodiversity Conservation Act 2016* is required, if:

- the proposal triggers the Biodiversity Offsets Scheme (BOS) threshold; or
- the proposal is likely to significantly affect threatened species based on the test of significance in section 7.3 of the NSW *Biodiversity Conservation Act 2016*.

The *Biodiversity Conservation Regulation 2017* sets out threshold levels for when the

Biodiversity Offsets Scheme will be triggered. The threshold has two elements:

- (a) *the clearing of native vegetation of an area declared by clause 7.2 as exceeding the threshold, or*
- (b) *the clearing of native vegetation, or other action prescribed by clause 6.1, on land included on the Biodiversity Values Map published under clause 7.3.*

The north east corner site is mapped on the updated Biodiversity Values Map (Figure 2b-1, 2b-2). The update is related to the north-eastern corner of the site being mapped as Important Area for Swift Parrot. This mapping is based on:

Swift Parrot sightings records from 1990-2020 were extracted from BioNet and Birdlife Australia Atlas...

Areas with sightings of five or more more birds recorded over any two or more years, or single sightings of 40 or more birds, were identified as important for the species.

The mapped area on the Biodiversity Values Map (Figure 2b-2) extends to the east onto the recently cleared land. The north-eastern corner of the site consists of garden beds, which include the planted winter-flowering *Eucalyptus sideroxylon* (sampled in Patch E, location on Figure 1a-2).

The BOS clearing threshold relates to minimum lot size of the land under the LEP. Under the LEP, the minimum lot size mapped on the site is 6000 m² (0.6 ha) fronting Old Bathurst Road and 2000 m² (0.2 ha) on the remainder of the site (Figure 2c). From Clause 7.2 of the *Biodiversity Conservation Regulation 2017*, the trigger for clearing for a minimum lot size of <1 ha is as follows:

Minimum lot size of land	Area above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha

Note: to achieve a 0.25 ha clearing of the existing row-planted trees on the site, assuming a 20 m width of trees, would require a clearing of 125 linear metres of plantings.

As the proposal occurs on an area mapped on the Biodiversity Values Map, the Biodiversity Offsets Scheme is triggered and a BDAR is required.

1.3 Excluded impacts

The site is not on rural land and *Local Land Services Act 2013 (LLS Act)* does not apply.

Under the *Local Land Services Act 2013 (LLS Act)*, Category 1 – exempt land – native vegetation clearing is allowed without approval from Local Land Services.

Under the *LLS Act*, Part 5 applies to the Land Management (native vegetation). It states in Section 60A that:

This Part applies to any area of the State, other than the following—

- a *urban areas of the State to which State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 applies, ...*

State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (now incorporated in the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*) states:

2.3 Land to which Chapter applies

(1) *This Chapter applies to the following areas of the State (the non-rural areas of the State)—*

(a) *land in the following local government areas— ..., City of Penrith, ...*

(b) *land within the following zones under an environmental planning instrument— ... Zone IN1 General Industrial, ...*

Note— Part 5A (Land management (native vegetation)) of the Local Land Services Act 2013 does not apply to non-rural areas to which this Chapter applies.

Therefore as *State Environmental Planning Policy (Biodiversity and Conservation) 2021* applies to land within the City of Penrith and within Zone IN1 General Industrial.

The *LLS Act* does not apply to a site zoned IN1 General Industrial in Penrith LGA.

1.4 Matters of national environmental significance

The Swift Parrot is listed as 'Critically Endangered' under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.

From the Conservation Listing Advice,

(<http://www.environment.gov.au/biodiversity/threatened/species/pubs/744-conservation-advice-05052016.pdf>.) accessed 1 July 2022:

The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter...

In New South Wales, swift parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought (Saunders & Tzaros 2011).

Swift Parrot have been observed foraging in the north east corner of the site and on the adjoining land to the east. The adjoining land to the east has recently been cleared.

If clearing of existing winter-flowering eucalypts in the north east corner of the site was proposed, a referral may be required under the *EPBC Act*. The proposal is to retain the vegetation in this area (see Figure 7).

1.5 Information sources

Literature considered

Bannerman SM and Hazelton PA (1990) *Soil landscape of the Penrith 1:100 000 sheet*. Soil Conservation Service of New South Wales.

Benson D and McDougall L (1998) Ecology of Sydney plant species. Part 6: Dicotyledon family Myrtaceae. *Cunninghamia* 5(4), 808-987.

Department of Planning, Industry and Environment (DPIE) (2020) *Biodiversity Assessment Method*. Dated October 2020.

Department of the Environment, Water, Heritage and the Arts (2010) *Survey guidelines for Australia's threatened frogs. Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*.

Harden GJ (1990-93, 2002) *Flora of New South Wales*. Volumes 1 to 4. University of New South Wales Press, Kensington.

Harden GJ and Murray LJ (2000) Supplement to Flora of New South Wales. Volume 1. University of New South Wales Press, Kensington.

Hazelton P. and Clements A. (2009) Construction of an Environmentally Sustainable Development on a Modified Coastal Sand Mined and Landfill Site – Part 1. Planning and Implementation. *Sustainability*. 2009; 1(2):319-334.

Mitchell PB (2002) *Descriptions for NSW (Mitchell) Landscapes*. Published by Department of Planning, Industry and Environment.

Mowat, E., Meney, B., Peters, K., Timewell, C., Ingwersen, D. & Roderick, M. (2021). 'Saving the Swift Parrot: A Conservation and Management Guide'. BirdLife Australia, Melbourne.

Tozer M (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8(1): 2003, 1-75.

Maps

Central Mapping Authority of New South Wales (1982) 1:25 000 topographic map Springwood 9030-IV-S 2nd Edition.

Online Maps and data include from:

Biodiversity Values Map

Bureau of Meteorology

NearMap aerial photographs

NSW FloraOnline - PlantNET

OEH Website

Penrith City Council's website

Seed Portal – NSW Government

2.0 Methods

The methods discussed relate to the environmental setting. The Biodiversity methods are discussed with the Biodiversity findings.

2.1 Site context methods

2.1.1 Landscape features

Landscape features were assessed using:

- topographic maps, and aerial photographs from the Seed Portal – NSW Government website;
- Nearmap aerial photographs on subscription;
- the Penrith 1 Metre DEM LiDAR dated July 2019 from Spatial Services, ELVIS;
- Geology and soil landscape mapping from the Seed Portal – NSW Government website;
- Geotechnical report prepared for the proposal; and
- Field inspection and photographic record.

2.1.2 Native vegetation cover

The extent and condition of native vegetation cover on the subject land and assessment area were assessed using:

- Priority 5 Mapping Area (P5MA) Vegetation Extent VIS_ID 4172 (DPIE 2015) (Figure 5a);
- current extent of vegetation reviewed from the most recent Nearmap aerial photograph (Figures 1a-1, 1a-2, 1a-3);
- Review of historic aerial photographs (Figures 1-1966 to 1- 2010); and
- onsite survey assessing vegetation and fauna habitat and biodiversity sampling using BAM plots (details in Section 4.2); and
- overall site inspection.

3.0 Site Context

The site is east of the Lapstone Monocline and approximately 1 km east of Emu Heights. It is on the relatively flat river terraces of the Nepean River, centrally located within the river bend (Figure 1b-1, 1d-1).

The landform of the site is predominantly flat with elevations generally ranging from 24 to 25 m AHD. The lowest point is approximately 22 m AHD in the western corner and the highest point is 28m AHD on the raised bund along the western boundary.

There are two nearby historic upper tributaries of Lapstone Creek which flows across the river terraces to the Nepean River. One of these tributaries crossed the north-east corner of the site flowing under Old Bathurst Road, and the other was offsite to the west. These two watercourses now exist as (Figure 1a-1, 1b-1, 1b-2, 1d-1):

- a depression in the north-east corner of the site, flowing WNW across the Emu Plains Correctional Centre land with a pipe under Old Bathurst Road; and
- a piped drainage line under the raised industrial land to the west of the site.

3.1 Climate

Climate affects the survival of existing plantings on the site. Since the 1970s, every decade has been as warm as, or warmer than, the last (CSIRO & Bureau of Meteorology 2010, Cai *et al.* 2009, cited in OEH 2010).

The pattern of rainfall recorded at Orchard Hills meteorological station (Number: 67084, opened 1970, elevation 93 m) located approximately 7 km from Emu Plains since the 1990s shows climatic extremes with extended periods of low rainfall separated by periods of high rainfall.

The extended periods of low rainfall are likely to cause drought-stress in planting and high rainfall saturated soils.

3.2 Flooding

ACOR 2022 conducted an assessment of the potential flood impacts using both the TUFLOW flood model (which was developed for the Lower Nepean River Floodplain Risk Management Study), and the 1% AEP event (Figures 3a, 3b).

The assessment incorporated modeling for the site under existing conditions, as well as for post-development conditions. The assessment concluded pre and post development that:

- the majority of the site is not expected to be inundated during the 1% AEP event for both pre and post development scenarios;
- The existing water treatment ponds and proposed constructed wetlands in the west of the site are predicted to be inundated by floodwaters backing up the culvert under Old Bathurst Road and David Road;
- A small portion of the north-eastern corner of the site is also predicted to be inundated during the 1% AEP event;
- The peak 1% AEP flood level in the vicinity of the development site is predicted to be about 23.9 m AHD;
- Flow velocities at the peak of the 1% AEP event are generally expected to be less than 0.5 m/s in the vicinity of the site.

The proposed development and associated filling would not result in any loss in flood storage volume for the 1% AEP flood.

3.3 Geology and soil landscapes

3.3.1 Geology

The geology of the site is mapped as Quaternary terrace deposits (map unit Q_at) with Alluvial terrace deposits – high-stand facies (Map unit CZ_ath) to the south-west and Rickabys Creek Gravels of Lapstone Monocline (map unit NM_i) further to the west (Figure 4a).

3.3.2 Soil landscape

The soil landscape of the river terraces is mapped as Richmond (map unit ri) with upslope Hawkesbury soil landscape mapped approximately 1.5 km to the west (Figure 4b). The Richmond soil landscapes are described by Bannerman and Hazelton (1990):

Landscape	Quaternary terraces Mainly flat (slopes <1%) Splays and levees provide local relief (<3 m) Tree cover, now almost completely cleared, ...
Soils	Poorly structured orange to red clay loams, clays and sands ...
Limitations	High erosion hazard on terrace edges Minor localised flooding

3.3.3 Geotechnical findings

The landform and the soils on the site have been modified. The soil/substrate was investigated by JBS&G (2021a):

... at 38 locations (S01 to S07, S09 to S11 and S14 to S41) across the site, 22 of which were test-pits advanced using a backhoe (to a maximum depth of 3.6 m below ground surface (bgs)), and the remaining 16 using a large diameter solid flight auger until natural soils were encountered or maximum depth of the auger (to a maximum depth of 2.0 m bgs). Three of the borehole locations were converted to groundwater monitoring wells (to a maximum depth of 9.75 m bgs). Additional grab samples were collected from stockpiled roadbase material by hand at three locations.

It was found that:

A wide range of fill types were encountered across the site: roadbase/gravel, sandy gravel, clayey gravelly sand, clayey sand and gravelly clay/clayey gravel. The fill types are described following:

- Roadbase fill types ... encountered from the ground surface to an average depth of 0.4 m bgs and maximum depth of 1.0 m bgs;*
- Gravel fill types ... encountered from an average depth of 0.1 m bgs to 0.4 m bgs and maximum depth of 0.8 m bgs;*
- Sand fill types ... with inclusions of sandstone gravels, concrete, scrap metal and steel reinforcement bars. ... encountered from an average depth of 0.1 m bgs to 0.4 m bgs and maximum depth of 0.8 m bgs; and*
- Clay fill types ... encountered from an average depth of 0.3 m bgs to 0.7 m bgs and maximum depth of 3.2 m bgs.*

A wide range of natural soil were observed across the site including clay, silty clay, sandy clay, sand, clayey sand and gravelly sand. ... described following:

- Natural clay types ... typically encountered from an average depth of 0.8 m bgs to 1.5 m bgs and a maximum depth of 3.6 m bgs; and*

- *Natural sand types ... typically encountered from an average depth 4.8 m bgs to 6.4 m bgs and a maximum depth of 9.75 m bgs.*

JBS&G (2021b) prepared a Remedial Action Plan. The previous investigations had concluded that:

... significant contamination had not been detected at the site. It was also concluded that no further investigations were considered necessary prior to divestment of the site on the basis that the site continues to be used for commercial/industrial land use. The only exception to this was the area of forklift maintenance ...

A Detailed Site Investigation further characterised potential contamination issues at the site to support the DA documentation in relation to proposed redevelopment. It was found:

Laboratory analysis of soil, groundwater and soil vapour samples for a range of COPCs generally did not identify potential risks to future receptors on the site based on a commercial/industrial landuse scenario with the following exceptions, which will require remediation/management;

- *TRH C 10 -C 16 , TRH C 16 -C 34 and F2 (C 10 -C 16 less Naphthalene) concentrations exceeding ecological and management limits were identified at three locations including the forklift maintenance area, west of the 'wet-cast building', adjacent the substation between the 'dry-cast building' and southern 'small pipe production building' ...*
- *Asbestos as a bonded ACM fragment was identified at one location within a distinct fill profile used to construct a ramp in the central portion of the site...*
- *Heavy metal and TRH concentrations in groundwater were generally consistent with regional and site-wide concentrations reported in the current and historic investigations. Groundwater contaminant concentrations are considered relatively low and are not considered to represent a risk to the surrounding environment given the ecological setting.*

3.4 Land use

The site has been occupied for approximately 60 years by a concrete production, manufacturing and storage operation (Rocla Pipes Pty Ltd) (JBS&G 2021a). Previous to this, the site was cleared agricultural land.

From the historic aerial photographs, the following have been observed (Appendix F of JBS&G 2021a, Figures 1-1966, 1-1975, 1-1984, 1-2010):

Offsite and nearby

- the railway line, raised above the natural landform, was constructed prior to 1943;
- historically, the local drainage:
 - flowed across the NE of the site and then WNW to the north of Old Bathurst Road, and
 - flowed across the SW of the cleared farming land of the site and then NW across farming land;
- soil extraction commenced by 1965 offsite to the NE;
- residential housing commenced to the SW of the site by 1975;
- by 1984, filling land offsite to the south for industrial subdivision; and
- by 2005, filling land offsite to the west for industrial subdivision.

On the site

- it was cleared cropping land with agricultural use on the surrounding land;
- by 1965, industrial land use had occurred in the east of the site, with commencement of filling onsite;
- by 1975, there was expansion of industrial landuse and tree planting adjoining Old

Bathurst Road;

- by 1984, further expansion of industrial landuse, growth of planted trees adjoining Old Bathurst Road, minor tree planting onsite and possible tree growth along the drainage line in south.
- By 1994, further expansion of industrial landuse and planting along the entire length of the boundary adjoining Old Bathurst Road, along eastern and part of the southern boundary and possibly along David Street in the west. Expansion of tree growth area along the drainage line in the south onsite. Water treatment pond was being constructed with possible start of tree planting associated with the ponds.
- By 2005, growth of linear planted trees in areas of the water treatment ponds.

The current land uses surrounding the former industrial plant are as follows:

- North of Old Bathurst Road. A number of properties used for livestock grazing land and the Emu Plains Correctional Centre;
- East – The site is bounded by recently cleared land. A commercial precinct is present further east, including the Amber Laurel Correctional Centre and several automotive repair/maintenance garage premises;
- South – The raised Blue Mountains train line, with residential further to the south; and
- West – adjoins David Road and the property identified as 32 David Road. The area west of the site is a raised commercial/industrial precinct.

3.5 Percent native vegetation cover in the assessment area

The extent of native vegetation cover is calculated within the assessment area (which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land) using the Nearmap aerial photographs (Figures 1a-2, 1a-3).

	Area	Before the proposal		After the proposal	
		Approximate area of canopy vegetation	% canopy vegetation cover	Approximate area of canopy vegetation	% canopy vegetation cover
On the site	16.3 ha	3.4 ha	21% (Class >10-30%)	2.25 ha	13.8% (Class >10-30%)
Within 1.5 km buffer	961 ha	96.1 ha	10% (Class 0-10%)	94.95 ha	9.9% (Class 0-10%)

3.6 Summary of landscape features

The landscape features are summarised as follows:

Landscape features	For the proposal
Percent native vegetation cover in the assessment area	Before the proposal (Figure 1a-3) Onsite, cover class >10-30% Within 1.5 km buffer, cover class 0-10% After the proposal (Figures 1g, 7a) Onsite, cover class >10-30% Within 1.5 km buffer, cover class 0-10%
IBRA bioregion and subregions	The site is in the Cumberland subregion of the Sydney Basin Bioregion (Figure 1c-1).
Rivers and streams	There are modified creeklines or drainage lines

Landscape features	For the proposal
	within the site. Tributaries of Lapstone Creek occur north of Old Bathurst Road (Figure 1b-1).
Wetlands within, adjacent to and downstream of the site	There are constructed water treatment ponds in the west of the site (Figure 1a-1).
Connectivity of different areas of habitat	No connectivity to adjoining bushland (Figure 1a-1).
Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features	Karst, caves, crevices, cliffs are not features of the cleared river terraces.
Areas of outstanding biodiversity value occurring on the subject land and assessment area	There are no areas of outstanding Biodiversity Value occurring on the subject land.
Any additional landscape features identified in any SEARs for the proposal	No Secretary's Environmental Assessment Requirements (SEARs) have been issued for the proposal.
NSW (Mitchell) landscape on which the subject land occurs	Hawkesbury - Nepean Channels and Floodplain (Figure 1c-2).

4.0 Biodiversity

4.1 Existing vegetation mapping

Department of Planning Industry and Environment (DPIE) (2015) – The nearest mapped native vegetation, Cumberland River Flat Forest (map unit 33), is approximately 1 km to the east and north on the river terraces close to the Nepean River, with Coastal Sandstone Ridgetop Woodland (map unit 131) and Hinterland Sandstone Gully Forest (map unit 142) on the higher land more than 1 km to the west (Figure 5a).

Tozer (2003) provides more detailed mapping, including vegetation with canopy cover <10%. Alluvial Woodland (map unit 11) and Riparian Forest (map unit 12) are mapped with canopy cover >10% on the river terraces close to the Nepean River (Figure 5b).

There are no mapped areas of native vegetation on the site. The nearest to the site is Alluvial Woodland with canopy cover <10% (map unit 11) along the tributary approximately 200 m west of the site and a patch approximately 150 m to the north-east (Figure 5b).

Alluvial Woodland is described as (Tozer 2003, pages 31, 32):

Alluvial Woodland is most often dominated by Eucalyptus amplifolia and E. tereticornis with Angophora floribunda occurring less frequently. Map Unit 11 often includes a stratum of small trees, frequently including Acacia parramattensis subsp. parramattensis, and less frequently Casuarina glauca, Angophora floribunda and Melaleuca linariifolia. A shrub stratum is usually evident, but is often sparse and invariably dominated by Bursaria spinosa. Map Unit 11 often has a dense ground cover dominated by grasses such as Oplismenus aemulus, Microlaena stipoides var. stipoides, Entolasia marginata and Echinopogon ovatus. Herb species are also common, including Solanum prinophyllum, Pratia purpurascens and Commelina cyanea.

[Alluvial Woodland] Map Unit 11 typically occurs in close proximity to minor watercourses draining soils derived from Wianamatta Shale. It is the most common community found on soils of recent alluvial deposition. Map Unit 11 is also found on the floodplains of the major watercourse, the Hawkesbury–Nepean River, but grades into Map Unit 12 on the terraces immediately adjacent to the river.

4.2 Onsite surveys

4.2.1 Arborist reports

The arborists assessed trees/groups of trees in December 2021 on the site (Figure 6a, details in Appendix 1a). Two arborist reports have been prepared (Arnold and Oats dated 2 March 2022 and Arnold *et al.* 1 September 2022).

Arnold and Oats (2022) assessed the impacts of the previous application, and Arnold *et al.* (2022) of the current application. For the current application, there is no longer access from Old Bathurst Road and consequently less impact on the existing trees (Figures 1g-1, 1g-2).

Most of the trees are located on the raised constructed perimeter bunds, as well as elevated sections of the water treatment pond in the west of the site. The trees were mostly classified to have a medium or low retention value, probably due to their locations. Only 15% of the trees had a High retention value, with 55% having a Medium retention value and 30% have a Low retention value.

4.2.2 Vegetation and fauna habitat, and fauna surveys

Martin James of SIA Ecological & Environmental Planning Pty Ltd assessed the biodiversity value of the site. The vegetation and fauna habitat were inspected on 21 October, 2 November 2021.

A total of 90 flora species were recorded:

- 36 tree species;
- 8 shrub and bramble species (all exotic, except *Acacia parramattensis*);
- 46 groundcover, climber and mistletoe (all exotic, except *Chloris truncata*, the cosmopolitan grass *Cynodon dactylon*, *Einaridia trigonos*;
- 4 aquatic species (all native).

Deryk Engel and Joey Morton undertook a fauna survey on behalf of SIA on 1 November 2021. It was found that (stick nests and tree hollows recorded on Figure 6b):

- The property provides limited habitat for native fauna since the vast majority of the site comprises hardstand and buildings. The areas of vegetation on the property comprise native trees with varying amounts of understorey and groundcover weeds. Along the western boundary a layer of small native trees (White Cedar) occurs beside the larger native trees, in addition to the many weeds. Although most trees on the property are mature, none are particularly old, and only two trees contain tree hollows.
- Two hollow-bearing trees were recorded with hollow-diameter 5-10 mm on a 15 m tall live tree, and 10-15 mm in dead tree.
- Two large stick nests were observed in trees. Observations of the nests made over a period of 10 minutes (with the aid of binoculars) did not indicate that they were occupied. The nests have the characteristics of those made by the Australian Raven (*Corvus coronoides*) seen in numbers on that part of the property, or a small raptor (such as the Pacific Baza (*Aviceda subcristata*) that was observed flying over the property.
- The vegetation that exists around the perimeter of the property, the isolated trees in the north-eastern area and the wetland area in the western corner of the property provides habitat mainly for invertebrates, frogs, small lizards and snakes, birds, ground-dwelling and arboreal mammals, microbats and fruit bats. The species would most likely be the relatively small number of native species commonly encountered in the residential/ industrial areas of Western Sydney, as well as introduced species. The buildings are not considered likely to provide habitat for microbats.
- During the fauna survey one (1) native mammal, twenty-four (24) native birds, three (3) native reptiles and three (3) native amphibians were recorded. Six (6) introduced species of fauna were recorded.
- Tadpoles were observed in the large waterbody, but not in the smaller one. The introduced Mosquito Fish (*Gambusia holbrooki*), that preys on native tadpoles, was not observed in either waterbody.
- Through considered and targeted during the fauna survey:
 - No living or discarded shells characteristic of the Cumberland Plain Land Snail were observed on the property;
 - No hollow-utilising threatened birds were observed occupying, or investigating, either of the hollow-bearing trees recorded;
 - No cave-dependent microbats were observed or indicated and the structure of the buildings present within the subject site were not considered suitable for use by this group of animals;
 - No threatened raptors were recorded nesting within, or traversing (foraging) over the subject site; and

- No habitat for threatened woodland species was located within the subject site.

Martin James undertook a four night targeted survey in the water treatment ponds in the south-west of the site on 1 to 4 December 2021 from 7:45pm to 9:00pm. It was found that:

At Basin No1 (the large basin) four species of frog were calling every night. They were the Stripped Marsh Frog (Limnodynastes peronii), Peron's Tree Frog (Litoria peronii), Tyler's Tree Frog (Litoria tyleri) and Eastern Dwarf Tree Frog (Litoria fallax).

At Basin No 2 (the small basin) two species were heard every night. They were Peron's Tree Frog and Tyler's Tree Frog. Additionally, the Robust Bleating Tree Frog (Litoria dentata) was heard calling there on one night.

The Robust Bleating Tree Frog was also heard calling on one night from the gutter and downpipe of the amenities building.

The Common Eastern Froglet (Crinia signifera) and Striped Marsh Frog were heard calling from a stormwater pit (?) alongside the south-western property boundary behind the warehouse.

All six species of frog are common native species.

A Stick Nest of the Australian Raven that is occupied was located beside the front entrance of the warehouse in the tall Sydney Blue Gum (Eucalyptus saligna) there.

4.2.3 Biodiversity survey using BAM techniques

As the site is highly modified and vegetation restricted to row planted trees, the location of the BAM Plots was limited by the size of the planting patches. In areas, where a BAM Plot would have sampled mainly bitumen driveways or concrete-rubble covered soil, species present in patches were recorded.

A total of 105 species (28 native, 13 non-local native and 64 exotic) were recorded in three BAM plots and six patches on 30 March 2022 by Tony Rodd, Joelan Sawyer and Pauline Dever (sampling locations shown on Figures 1a-2, 6a, data in Tables 1, 2 and photographs in Appendix 2). From species composition, the vegetation was dominated by exotic species.

	Located	Number of species recorded			
		Total	Native	Exotic	Non-local native
BAM Plots					
1	Constructed ponds (Plot - 20 m x 50 m)	29	9	19	1
2	Western boundary (Plot – 10m x 100 m)	27	3	23	1
3	Northern boundary (Plot – 10m x 100 m)	41	9	28	4
Patches					
A	Previous recorded stick nest near warehouse	9	1	6	2
B	Planting in north-east	17	5	11	1
C	Planting in north-east	17	7	7	3
D	South-western corner adjoining railway line	21	0	18	3
E	North-eastern corner in area mapped as Important Area for Swift Parrot (Figure 6c)	26	7	14	5

	Located	Number of species recorded			
		Total	Native	Exotic	Non-local native
F	North-western corner	23	6	16	1
Total		105	28	64	13

4.2.3.1 Sampling methods

The vegetation was sampled using the BAM techniques for the three BAM Plots (details in DPIE 2020).

In addition to the BAM techniques:

- to calculate the percentage covers of species present in the 0.04 ha floristic quadrat of the BAM plots, the covers recorded in four 10 m x 10 m contiguous subquadrats were averaged;
- To describe vegetation structure and to calculate percentage of particular tree species in the sampled vegetation, the number of individuals and maximum height for species > 2 m tall were recorded in the four 10 m x 10 m contiguous subquadrats;
- Supplementary data were recorded of species present in six planted patches.

All sampling locations were photographed with additional general photographs also taken (Appendix 2). GPS coordinates were recorded at regular intervals along the transects using a hand-held Garmin *GPS map 78* at the time of survey (GPS coordinates in Appendix 3). The GPS coordinates, in conjunction with ground features, were used to plot the sampling locations.

Nomenclature is consistent with Harden (1990-1993, 2002), Harden and Murray (2000) and subsequent taxonomic changes as published in *Telopea*, the Sydney Royal Botanic Gardens' journal of systematic botany, and in other Australian taxonomic literature. The Royal Botanic Gardens' PlantNET website (plantnet.rbgsyd.nsw.gov.au) incorporating Flora Online is the major source for updated taxonomy.

4.2.3.2 Observations

The site was once productive cleared farming land. The vegetation on the site consists predominantly of canopy vegetation and consists of planted trees associated with the approximately 60 years of the former concrete pipe and precast industrial operation. From historic aerial photographs, the plantings occurred prior to 1984, 1994 and the construction of the water treatment ponds, prior to 2005 aerial photograph.

On the adjoining former cleared farmland to the east, some natural recolonisation was occurring but this land has since been recently cleared (Figure 1a-2).

BAM Plot 1 sampled the existing irregular landform of the existing constructed treatment pond in the north. The western section of the floristic quadrat was on higher land with *Casuarina glauca* recorded in one 10 m x 10 m subquadrats as three healthy planted trees up to 25 m and natural regeneration with an additional approximately 1 m tall individual. The total cover by *C. glauca* was 15% in this subquadrat. In this same subquadrat, there was a planted 16 m tall *Eucalyptus robusta* with a 15% cover, as well as weedy growth of *Ligustrum sinense* up to 5 m tall with a 2% cover and *Celtis sinensis* 6 m tall with a 10% cover. In the adjoining 10 m x 10 m subquadrat, there was weedy growth of a 16 m tall *Cinnamomum camphora* and 2 m high *Celtis sinensis*. The remaining two subquadrats had no species > 2 m in height.

The understorey was dominated by exotic pasture grass *Cenchrus clandestinus* (Kikuyu Grass) with cover of 20-30% in each of the subquadrat. In one of the subquadrats, exotic

pasture grass *Paspalum urvillei* had a cover of 25%, and the exotic forbs *Sida rhombifolia* a cover of 10% and *Bidens pilosa* with a cover of 5%.

The native understorey species recorded in Plot 1 were wetland species *Juncus usitatus* with a <1% cover, *Persicaria decipiens* with a cover of 2%, *Schoenoplectus mucronatus* with a 0.1% cover, *Typha domingensis* with a cover 3% and sparse cover by the early colonising native herb species *Alternanthera denticulata* and *Dichondra repens* and the cosmopolitan grass *Cynodon dactylon* as well as *Centella asiatica* with a 0.1% cover.

BAM Plot 2 sampled the plantings along the south-western boundary near the constructed water treatment ponds. The soils in this area were covered in concrete rubble and the surface is relatively flat. The plantings were *Eucalyptus camaldulensis* 18 m tall with a cover between 15-30% in each of the subquadrats. All 17 of these trees were in poor health. The other species colonising this area were weedy growth of *Cinnamomum camphora* up to 9 m tall with cover ranging from 5-80% in the subquadrats, *Celtis australis* up to 8 m tall with a cover of 3-20%. The exotic *Schinus molle* 8 m tall with a cover of 10% had colonised one of the subquadrat.

No hollow bearing trees were detected.

The understorey was dominated by exotic weeds *Tagetes minuta*, *Bidens pilosa* and the exotic pasture grass *Cenchrus clandestinus* with covers up to 10%.

The native species recorded in the floristic quadrat of Plot 2 were the ground cover *Einadia trigonos* with 2% cover, *Convolvulus erubescens* with 0.1% cover and the cosmopolitan weed *Solanum americanum* with less than 1% cover.

BAM Plot 3 sampled the planted trees adjoining Old Bathurst Road also growing in concrete rubble. The plantings were healthy *Corymbia maculata* up to 23 m tall with 35% cover for all subquadrats, *Casuarina cunninghamiana* up to 23 m tall with 25% cover and two *Eucalyptus nicholii* with <1% cover. The remaining trees colonising this area were weedy species *Ligustrum lucidum*, *Ligustrum sinense*, *Celtis australis*, *Celtis sinensis*, *Morus alba* and *Schinus molle* ranging from 2-5m tall with up to 5% cover.

The understorey is dominated by exotic weeds *Bidens pilosa*, *Ehrharta erecta*, *Digitaria sanguinalis*, *Eragrostis curvula* and the vine *Araujia sericifera*.

The native species recorded were the grass *Entolasia stricta*, *Microlaena stipoides*. Other species included *Carex inversa*, *Chloris truncata*, *Cyperus gracilis*, *Glycine tabacina*, *Oxalis perennans*, *Wahlenbergia* sp. and the cosmopolitan grass *Cynodon dactylon*.

Patch A sampled vegetation surrounding the tall planted non-local native white barked *E. grandis* with non-local native *Lophostemon confertus* in front of the shed.

All of the understorey species were exotic, except the native grass *Chloris truncata*.

Patch B sampled the vegetation in the garden bed with planted non-local native trees *Eucalyptus microcorys* (Tallowwood). The surrounding understorey was predominately exotic species, including *Bidens pilosa*, *Chloris virgata*, *Eragrostis curvula* and *Tagetes minuta*.

The native species recorded were restricted to the grass *Chloris truncata*, *Eragrostis tenellula*, the cosmopolitan grass *Cynodon dactylon* as well as *Portulaca oleracea* (Pigweed) which grows as a weed in disturbed areas and is common on cultivated land and the cosmopolitan weed *Solanum americanum*.

Patch C sampled the vegetation in the garden bed with planted non-local native trees *Corymbia maculata*, *Eucalyptus cladocalyx* and *E. sideroxylon* as well as native shrub *Callistemon salignus*.

The understorey consisted of mix of native and exotic species. The native component included the grass *Bothriochloa macra*, *Chloris truncata*, *Sporobolus creber*, the cosmopolitan grass *Cynodon dactylon*, forbs *Glycine tabacina*, *Cyperus gracilis*.

Patch D was dense strip of plantings and weedy exotic trees and shrubs along the south-western boundary adjoining the railway line.

The planted trees were non-local native *Casuarina cunninghamiana*, *Eucalyptus robusta*, *Eucalyptus grandis*. The naturally colonised weedy trees and/or possibly planted were *Morus alba*, *Celtis australis*, *Celtis sinensis*, *Cotoneaster pannosus*, *Ligustrum lucidum*, *Ligustrum sinense*, *Phoenix canariensis*, *Sapium sebiferum*.

The understorey consisted of exotic weeds, *Asparagus officinalis*, *Bidens pilosa*, *Chloris virgata*, *Cyperus eragrostis*, *Euphorbia hyssopifolia*, *Hydrocotyle bonariensis*, *Melinis repens*, *Rubus anglocandicans*, *Setaria parviflora* and *Verbena bonariensis*.

No local native species were recorded in this patch.

Patch E is located in north-eastern corner adjoining the recently cleared land offsite to the east. This is in the area recently mapped as Important Area for Swift Parrot (Figure 6c).

The planted trees in these garden strips were non-local native *Corymbia maculata*, *Eucalyptus microcorys*, *Eucalyptus sideroxylon*, *Lophostemon confertus*, *Melaleuca bracteata* and exotic *Jacaranda mimosifolia*, *Platanus x acerifolia*, *Ulmus parvifolia*. The naturally colonised weedy trees and/or possibly planted in this patch were *Morus alba*, *Ligustrum lucidum*, *Ligustrum sinense*.

The native small tree *Acacia implexa* may have been planted, but it might have germinated from the soil seed bank. The other native tree species was *Callistemon salignus*.

The understorey was mix of native and exotic species with native component being *Cayratia clematidea*, *Chloris truncata*, *Cyperus gracilis*, *Glycine tabacina*, *Microlaena stipoides*.

Patch F sampled the vegetation on the corner of Old Bathurst Road and David Road. The trees in this patch were native species *Casuarina glauca*, non-local native *Melia azedarach* and exotic *Jacaranda mimosifolia*.

The naturally colonised weedy trees recorded were *Ligustrum lucidum*, *Ligustrum sinense*, *Morus alba*.

The understorey was predominantly exotic weed including *Araujia sericifera*, *Asparagus asparagoides*, *Eragrostis curvula*, and the exotic pasture grass *Cenchrus clandestinus* and cover grass *Chloris gayana*. The native component were *Cayratia clematidea*, *Glycine tabacina*, *Microlaena stipoides*, and the cosmopolitan *Solanum americanum* and the fern *Pellaea falcata*.

4.3 Threatened flora

4.3.1 Review of existing information

From the BioNet data search (using the online BAM Calculator for PCT 835), the likely threatened species to occur in the natural vegetation on the river terrace deposits in Emu Plains were the following:

Threatened species	Common	Description and habitat from PlantNET
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Shrub 3-4 m high Grows in dry sclerophyll forest on the coast and adjacent ranges, chiefly from Georges R. to the Hawkesbury R.
<i>Cynanchum elegans</i>	White-flowered wax plant	Climber or twiner with stems becoming

Threatened species	Common	Description and habitat from PlantNET
		corky, cream to fawn. recorded from rainforest gullies scrub and scree slopes;
<i>Eucalyptus benthamii</i>	Camden White Gum	Tree to 40 m high; bark smooth, white, shedding in short ribbons or flakes. in wet forest on sandy alluvial soils along valley floors;
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in ... Penrith LGA.	Twining stems to 4 m high. Grows in woodland and scrub.
<i>Persicaria elatior</i>	Tall Knotweed	Erect herb to 90 cm high, stalked glandular hairs present on most parts, occasionally sessile glands present too. In damp places, usually on the margin of standing water.
<i>Persoonia hirsuta</i>	Hairy Geebung	Erect shrub to 4 m high, sparsely hairy; prickles absent. Grows in disturbed or open areas of coastal ranges and tablelands
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	Rhizome long-creeping, slender; sterile fronds bright green, filiform, to 8 cm long, in groups of 2 or 3 along the rhizome; sparsely hairy with pale brown hairs, glabrescent. Widespread but not common in seasonally dry depressions and margins of marshes; may grow submerged.
<i>Pomaderris brunnea</i>	Brown Pomaderris	Shrub 2–3 m high, stems with long spreading brownish simple hairs above a short whitish tomentum. In open forest, confined to the Colo R. and upper Nepean R.
<i>Wahlenbergia multicaulis</i> - endangered population	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield – not including Penrith	Perennial tufted herb, 10–75 cm high, branching below the inflorescence, glabrous or sometimes sparsely hirsute. Grows in forest, woodland and grassland, chiefly in coastal and tablelands districts

4.3.2 Flora habitat constraints assessment

All areas with vegetation present were searched by a team of an experienced botanist and ecologists, including the constructed water treatment ponds in the west of the subject land.

The habitats of the threatened flora species were absent, except possibly *Persicaria elatior* and *Pilularia novae-hollandiae* which are associated with damp soils.

4.3.3 Field surveys

Field surveys and habitat assessments on the site were undertaken by:

- The ecologist Martin James of SIA on 21 October and 1, 2 November 2021;
- The botanist Tony Rodd and ecologists Joelan Sawyer and Pauline Dever on 30 March 2022.

4.3.4 Findings for threatened flora

Despite extensive search of this former industrial site, no suitable habitat was found to be present, nor any of the threatened species were found to be present on the site.

4.4 Threatened fauna

4.4.1 Review of existing information

The existing fauna information was reviewed by Martin James of SIA Ecological & Environmental Planning Pty Ltd, with:

Background information was collated from relevant sources and databases including, but not limited to, Department of Primary Industry and Environment (DPIE) BioNet Atlas of NSW Wildlife database, DPIE vegetation mapping, NSW Government Six Viewer website, Google Maps, etc.

From assessment of potential habitat on the site, the area of potential threatened fauna habitat, the former water treatment ponds, was further investigated. It had been noted that tadpoles were observed in the large waterbody.

4.4.2 Habitat constraints assessment

It is stated in the draft by Martin James of SIA that:

Site assessments were undertaken on the 21st October and 1st and 2nd November 2021 by Martin James (BSc(hons) Geographical Ecology; Principal Ecologist/ BAM Accredited Assessor). The site assessed, fauna habitat described, any opportunistic sightings of fauna documented, and any significant flora or fauna features described. A brief examination of the vegetation in the adjoining and surrounding areas was undertaken to establish the local context for vegetation and fauna habitat on the site. Digital photographs were taken for later reference and for inclusion in this report.

The results of the site assessments were analysed with reference to relevant information sources and databases including, but not limited to, the NSW Flora Online PlantNET database, NSW Threatened Species Profiles, NSW Scientific Committee Determinations, Commonwealth Listing Advices, and Threatened Species Assessment of Significance Guidelines (DECC, 2007).

In addition to the above, a fauna survey was undertaken on 1st November 2021 by Deryk Engel (B.Env.Sci.(Hons): Senior Ecologist) and Joey Morton (B.Env.Bio. Ecologist). The methods employed to target those fauna species listed under the BC Act and/ or EPBC Act that could occur on the subject site included:

- Dedicated bird surveys;
- Ground debris searches targeting the Cumberland Plain Land Snail (*Meridolum corneovirens*), this being the only invertebrate considered due to its conservation status;
- The identification of any indirect evidence such as tracks, scats, scratchings and diggings that would suggest the presence of a particular fauna species.

4.4.3 Field surveys

The field survey methods used and species targeted.

Dedicated bird surveys

To determine the birds present, a 20-minute dedicated survey was conducted by both researchers. The survey involved each researcher employing the point count method (DEC 2004). During this survey, any birds heard calling or observed were recorded. In addition, any evidence to suggest the presence of a bird (e.g. white wash, preened feathers, nest site) was recorded.

The site selected for the dedicated bird survey was one where suitable habitat was present (i.e. a wetland and/or stands of vegetation). In this instance the GPS coordinates of the site where the dedicated bird survey was undertaken is Easting (E) 283637; Northing (N) 6263871. Whilst traversing the subject site and conducting the other fauna survey methods employed, any birds observed or heard calling were also recorded.

Cumberland Plain Land Snail investigation and dedicated ground debris searches

Searches for the Cumberland Plain Land Snail involved lifting and looking underneath rocks, logs and both natural and artificial (urban refuse) ground debris. In addition, leaf litter accumulations at the base of trees, was raked. These investigations lasted for a minimum period of 20 person minutes.

During the course of the survey any areas of similar habitat, including instances of artificial ground debris (e.g. urban refuse) and exfoliated bark, were also searched for reptiles and frogs.

Habitat tree survey

The locations of identified hollow-bearing trees was recorded using a Garmin™ hand-held Global Positioning Unit (GPS).

4.5.4 Findings for threatened fauna

It was found that (stick nests and tree hollows recorded shown on Figure 6b):

- The property provides limited habitat for native fauna since the vast majority of the site comprises hardstand and buildings. The areas of vegetation on the property comprise native trees with varying amounts of understorey and groundcover weeds. Along the western boundary a layer of small native trees (White Cedar) occurs beside the larger native trees, in addition to the many weeds. Although most trees on the property are mature, none are particularly old, and only two trees contain tree hollows.
- Two hollow-bearing trees were recorded with hollow-diameter 5-10 mm on a 15 m tall live tree, and 10-15 mm in dead tree.
- Two large stick nests were observed in trees. Observations of the nests made over a period of 10 minutes (with the aid of binoculars) did not indicate that they were occupied. The nests have the characteristics of those made by the Australian Raven (*Corvus coronoides*) seen in numbers on that part of the property, or a small raptor (such as the Pacific Baza (*Aviceda subcristata*) that was observed flying over the property).
- The vegetation that exists around the perimeter of the property, the isolated trees in the north-eastern area and the wetland area in the western corner of the property provides habitat mainly for invertebrates, frogs, small lizards and snakes, birds, ground-dwelling and arboreal mammals, microbats and fruit bats. The species would most likely be the relatively small number of native species commonly encountered in the residential/ industrial areas of Western Sydney, as well as introduced species.

- The buildings are not considered likely to provide habitat for microbats.
- During the fauna survey one (1) native mammal, twenty-four (24) native birds, three (3) native reptiles and three (3) native amphibians were recorded. Six (6) introduced species of fauna were recorded.
- Tadpoles were observed in the large waterbody, but not in the smaller one. The introduced Mosquito Fish (*Gambusia holbrooki*), that preys on native tadpoles, was not observed in either waterbody.

Though considered and targeted during the fauna survey:

- No living or discarded shells characteristic of the Cumberland Plain Land Snail were observed on the property;
- No hollow-utilising threatened birds were observed occupying, or investigating, either of the hollow-bearing trees recorded;
- No cave-dependent microbats were observed or indicated and the structure of the buildings present within the subject site were not considered suitable for use by this group of animals;
- No threatened raptors were recorded nesting within, or traversing (foraging) over the subject site; and
- No habitat for threatened woodland species was located within the subject site.

Frog survey - a four night targeted survey in the water treatment ponds in the west of the site was undertaken on 1 to 4 December 2021 from 7:45pm to 9:00pm by Martin James. It was found that:

At Basin No1 (the large basin) four species of frog were calling every night. They were the Stripped Marsh Frog (Limnodynastes peronii), Peron's Tree Frog (Litoria peronii), Tyler's Tree Frog (Litoria tyleri) and Eastern Dwarf Tree Frog (Litoria fallax).

At Basin No 2 (the small basin) two species were heard every night. They were Peron's Tree Frog and Tyler's Tree Frog. Additionally, the Robust Bleating Tree Frog (Litoria dentata) was heard calling there on one night.

The Robust Bleating Tree Frog was also heard calling on one night from the gutter and downpipe of the amenities building.

The Common Eastern Froglet (Crinia signifera) and Striped Marsh Frog were heard calling from a stormwater pit (?) alongside the south-western property boundary behind the warehouse.

All six species of frog are common native species.

A Stick Nest of the Australian Raven that is occupied was located beside the front entrance of the warehouse in the tall Sydney Blue Gum (Eucalyptus saligna) there.

A survey effort of a minimum of four night survey under ideal conditions is required for *Litoria aurea* (Green and Golden Bell Frog) under the Commonwealth survey guidelines for this species (www.agriculture.gov.au/sites/default/files/documents/survey-guidelines-frogs.pdf, accessed 1 July 2022).

4.6 Weather conditions

Weather conditions were presented for the fauna survey on 1 November 2021.

Date	Start	End time	Weather			
			Cloud cover	Temp	Wind	Rain
1 Nov 21	9:00	10:40	100%	16oC	Still	0 mm

Weather data were not presented in the Draft report by Martin James. Using rainfall recorded from Penrith meteorological station (Number: 67113) located approximately 3.5 km from Emu Plains (bom online data, accessed 1 July 2022).

Table A Environmental conditions during threatened species surveys

Survey undertaken	Date	Time	Temperature (min. & max.)	Wind (light, mod...)	Rainfall (mm)	Other conditions relevant to the species
Target species <i>Litoria aurea</i> (Green and Golden Bell Frog)	1/12/21	19:45-21:00	19.1°C to 27.7°C and at 3pm 26.9°C	E at 6 km/hr at 3pm	0	In Nov 2021, monthly total of 208.8 mm
	2/12/21	19:45-21:00			0	
	3/12/21	19:45-21:00			0	
	4/12/21	19:45-21:00			3	
Note: A four night targeted survey in the water treatment ponds was undertaken following rain.						
BAM Plot and patch survey	30/03/22	10:00-16:30	18.1°C to 23.1°C	SW 15km/hr at 9am S at 26 km/hr at 3pm	1 mm	Total in March 55.8 mm, Feb 212.4.

4.7 Limitations

There were no obvious limitations during the surveys undertaken. Rain had fallen prior to the surveys. The site was not flooded.

5.0 Native vegetation and threatened ecological communities

5.1 Native vegetation extent and changes to the mapped extent

Changes in vegetation cover occur over time (see Figures 1a-1, a-2, 1-1966 to 1-2010).

The extent of vegetation cover does not always match that mapped in the past. For example, the area offsite on the adjoining land to the east of the subject land, mapped on the Biodiversity Values Map and Important Area for the Swift Parrot has been recently cleared.

5.2 Areas that are not native vegetation

The extent of area of the subject land not supporting canopy vegetation is illustrated by the recent and historical aerial photographs, biodiversity survey results and photographs of the site (Figures 1a-1, a-2, 1-1966 to 1-2010, data in Tables 1, 2, photographs in Appendix 2). The planted trees were a combination of native, non-local native and exotic species. None were remnant.

5.3 Plant community types

Vegetation within the subject land consists of planted trees and constructed treatment ponds built for the purpose of ameliorating alkaline concrete-enriched runoff water from former industrial use.

The areas with vegetation present have been assigned to two Vegetation Zones:

1. Planted trees; and
2. Constructed ponds (with planted trees).

The decision-making key in Appendix D: *Streamline assessment module – Planted native vegetation* (BAM, page 75 - 78) provides a framework for the assessment of planted native vegetation. The key was applied as follows:

D.1 Decision-making key

1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?

i. Yes The planted native vegetation must be allocated to the best-fit PCT and the BAM must be applied.

ii. No Go to 2.

Question 1 requires responses to two parts.

1. whether the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation?

The possible remnant component on the site consists of a small number of scattered groundcover species growing amongst exotic weed growth under planted trees (see sampling locations on Figure 1a-2, data in Table 1, photographs in Appendix 2), with:

in Vegetation Zone 1 – Planted Trees (sampled BAM Plots 2, 3, Patches A to F)

The native component was sparse with covers of 0.1 to 3%, except for the cosmopolitan grass *Cynodon dactylon* with 15% cover. The exotic weed cover in the understorey was high with *Bidens pilosa* up to 35% cover and *Ehrharta erecta* up to 30% cover. The planted trees were a mix of exotic and Australian native species,

with none being remnant.

in Vegetation Zone 2 – Constructed Ponds (sampled in BAM Plot 1)

Dense exotic weed growth including 16 m tall *Cinnamomum camphora* (15% cover) and 2 m high *Celtis sinensis* (3% cover) with one naturally regenerating 1 m tall individual of *Casuarina glauca* from the planted *C. glauca*. Understorey was dominated by exotic pasture grasses *Cenchrus clandestinus* (25% cover) and *Paspalum urvillei* (10% cover). There was a low cover by native species (0.1 to 3% cover).

In conclusion to part 1 of Question 1, both Vegetation Zones are dominated by exotic species with a canopy of planted trees – Neither were a mosaic of planted and remnant native vegetation.

2. Can the planted native vegetation be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?

Using the BAM Plot data, the best fit PCTs using the online PCT tool (filtered for “Cumberland” IBRA subregion and “*Casuarina glauca*”) were:

PCT 1232 Coastal freshwater swamp forest, and

PCT 1800 Cumberland Swamp Oak riparian forest.

The other PCT considered was *PCT 835 Cumberland River Flat Forest* (the likely PCT present prior to clearing for agriculture and subsequent industrial land use).

Species matched for these three communities with the data collected in Plot 1 were very low.

For Plot 1:

Species matches	PCT 1232	PCT 1800	PCT 835
<i>Alternanthera denticulata</i>	1	0	0
<i>Casuarina glauca</i>	1	1	0
<i>Centella asiatica</i>	1	0	0
<i>Cynodon dactylon</i>	1	0	0
<i>Dichondra repens</i>	0	1	1
<i>Microlaena stipoides</i>	0	1	1
Total	4	3	2

For Plot 2 (located in the south of the site) there were no species matches with any PCTs known to occur in the Cumberland IBRA subregion.

For Plot 3 (adjoining Old Bathurst Road, in the north) the number of species matched with PCT 1232, 1800 and 835 was one groundcover species only.

Species matches	PCT 1232	PCT 1800	PCT 835
<i>Cynodon dactylon</i>	1		
<i>Microlaena stipoides</i>		1	1
Total	1	1	1

There were no native canopy species recorded in Plot 3 to match with a PCT.

For all PCTs in the Cumberland IBRA subregion, the highest number of species matches for Plot 3 was:

- 4 species for PCT 850 *Cumberland shale hills woodland* and for PCT 806 *Derived grasslands on shale hills of the Cumberland Plain*; and
- 3 species for PCT 1847 *Sydney Foreshores shale forest* and PCT 830 *Cumberland moist shale woodland*.

Species matches	PCT 850	PCT 806	PCT 835	PCT 1847	PCT 830
<i>Carex inversa</i>	1	1			
<i>Cyperus gracilis</i>	1	1			1
<i>Cynodon dactylon</i>	1	1			
<i>Entolasia stricta</i>				1	
<i>Microlaena stipoides</i>	1	1	1	1	1
<i>Oxalis perennans</i>	1	1		1	1
Total	4	4	1	3	3

The only canopy species recorded in Plot 3 was *Corymbia maculata* (planted) which does not form part of any PCTs listed to occur in the Cumberland IBRA subregion.

The lack of PCTs on the site was further confirmed by the low Vegetation Integrity Scores (VIS) obtained using the BAM plot data (input data in Appendix 3) for the likely original PCT 835 *Cumberland River Flat Forest*, namely:

	Composition	Structure	Function	Vegetation integrity score
Constructed ponds				
BAM Plot 1	32.2	4.3	13.8	12.4
Planted Trees				
BAM Plot 2, 3	15.7	3.1	57.6	14.1

The function score of 57.6 for the Planted Trees implies that there may be fauna habitat, despite there being only a small number of tree hollows recorded in the fauna survey.

The calculated scores of both Vegetation Zones were too low for an offset to be considered. Note: the BAM (section 9.2.1, page 44) it states that:

The assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

a. ≥ 15 , where the PCT is representative of an EEC or a CEEC

b. ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community

c. ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.

In conclusion to part 2 of Question 1, neither the vegetation of Planted trees nor Constructed ponds can reasonably be assigned to a PCT. Hence the response to Question 1 of the key is:

‘ii. No Go to 2.’.

2. Is the planted native vegetation:

a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and

b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?

i. Yes The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.

ii. No Go to 3.

The answer is 'ii. No Go to 3.'

3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:

a. a species recovery project

b. Saving our Species project

c. other types of government funded restoration project

d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat

e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)

f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or

g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?

i. Yes The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.

ii. No Go to 4.

The answer is 'ii. No Go to 4.'

4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?

i. Yes Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. No Go to 5.

The answer is 'i. Yes Go to D.2...(the use of Chapters 4 and 5 of the BAM are not required to be applied)'

5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?

i. Yes Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. No Go to 6.

Similarly, the answer is 'i. Yes Go to D.2...(the use of Chapters 4 and 5 of the BAM are not required to be applied)'

6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?

i. Yes Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. No There may be other types of occurrences of planted native vegetation that do not easily fit into the decision-making key above. Assessors should contact the BAM Support mailbox at bam.support@environment.nsw.gov.au for further advice on using the BAM to assess other types of occurrences of planted native vegetation.

Question 6 is not applicable.

Given that there are “Yes” responses to Decision-making key Questions 4 and 5, Section D.2 Assessment of planted native vegetation for threatened species habitat is applied. As stated in the key, the use of Chapters 4 and 5 of the BAM are not required to be applied.

Section D.2 states that:

The assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation.

This has been undertaken. The site does not support habitat for threatened flora nor fauna species, except in the north east corner where foraging Swift Parrots have been recorded in the planted trees.

If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Species credits are not required to offset the proposed impacts.

Yes, there is evidence of foraging Swift Parrots in the north east corner of the site - Section 8.4 of the BAM to mitigate and manage impacts on these species is applied.

Species credits are not required to offset the proposed impacts.

The steps taken to assess threatened species habitat and all reasonable measures proposed to be taken to mitigate or minimise impacts must be set out in the BDAR or BCAR.

There may be unforeseen types of planted native vegetation that do not easily fit into the decision-making key above. In those circumstances contact the BAM Support mailbox at bam.support@environment.nsw.gov.au for further advice.

No additional comment.

Hence, no PCTs occur on the subject land.

Table B PCTs identified within the subject land

PCT ID	PCT name	Subject land area (ha)
None	None	None
Total area		

5.4 Alignment with TECs

None. No PCTs occur on the subject land and hence no alignment with TECs.

5.5 Alignment with EPBC Act listed ECs

None. No PCTs occur on the subject land and hence no alignment with EPBC Act listed ECs.

5.6 Threatened ecological communities

No TECs nor EPBC Act listed ECs are identified within the subject land (see application of decision making key from Appendix D of the BAM above).

Table C TECs within the subject land

TEC name	Profile ID (from TBDC)	BC Act status	EPBC Act status	Associated vegetation zones within the subject land	Area within subject land (ha)
None					

5.7 Vegetation zones

From assessment of the subject land, the vegetation on site was assigned into two Vegetation zones. Neither of the two mapped Vegetation Zones identified can be reasonably matched to any PCT, TEC nor EC. These two Vegetation Zones are a consequence of the former industrial use of the site (see historical aerial photographs Figures 1-1966 to 2010)

Vegetation Zone	Area (ha)
Constructed ponds (with planted trees)	0.93 ha
Planted trees	2.47 ha

As part of planning, both of the Vegetation Zones have been assessed in terms of their asset values for the industrial re-development of the former Rocla industrial site (Figure 7), with:

Vegetation Zone	Area (ha)	Management Zone	Area (ha)
Constructed ponds (with planted trees)	0.93 ha	Cleared	0.72 ha
		Retained	0.21 ha
Planted trees	2.47 ha	Cleared	1.4 ha
		Retained	1.07 ha

5.8 For the BDAR assessment of planted trees

Neither of the follow apply to the subject land:

- Chapter 4 - Assessing native vegetation, threatened ecological communities and vegetation, nor
- Chapter 5 - Assessing the habitat suitability for threatened species.

No Species credits are required to offset the proposed impacts.

Stage 2: Mitigate and manage impacts on biodiversity values

6.0 Mitigate and manage impacts

It is stated in Section D.2 of Appendix D of the BAM that:

If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species.

There is a mapped Important Area for Swift Parrot in the north east corner of the site and extending onto the adjoining land to the east (Figure 6c). The mapped area offsite to the east included native regrowth vegetation which has been recently cleared (Figure 1a-2).

The Swift Parrot is listed as Endangered under the *BC Act* and Critically Endangered under the *EPBC Act*. It breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW it mostly occurs on the coast and south west slopes.

6.1 Mitigate and manage direct and indirect impacts

6.1.1 Project location and design

The proposal has been located to retain as many of the current biodiversity assets on the site, as practicable. The current biodiversity assets associated with the existing industrial site have generally low conservation value and are restricted to two Vegetation Zones:

1. Planted trees; and
2. Constructed ponds (with planted trees).

In order to mitigate and manage direct and indirect impacts on the habitat provided by planted trees, the following are part of the project design:

Utilising existing assets:

The proposal is designed as ecologically sustainable development with existing biodiversity related assets carefully assessed (see example of asset assessment and re-use in Hazelton and Clements 2009). The subdivision is designed to utilise / re-use /re-purpose the current biodiversity assets on the site (Figures 1e, 1f, 1g, 7). The potential assets include:

- existing planted exotic and native trees (life expectancy assessed by the arborist as well as *Which Trees Where* future climate suitabilities). Despite the low conservation value of these trees, the healthier trees provide shade and cooling in western Sydney;
- existing surface cover of crushed concrete and rubble considered for use as fill under the industrial building and roads; and
- existing treatment ponds for re-engineering as constructed wetlands surrounded by planted trees.

Meeting the criteria in Chapter 14 of the Penrith Development Control Plan 2014

Retention of existing planted trees where practicable:

Development controls related to mitigating the urban heat island effect are outlined in Chapter 14 of the Penrith Development Control Plan 2014. The landscape plan

proposes to retain as many as practicable of the existing trees onsite to maintain the existing amenity on the site. Despite the existing trees onsite being planted, they provide shade and the treatment ponds provide a moist environment and potential habitat.

Trees in urban areas play an important role in cooling our cities. These Green Spaces regulate the temperature fluctuations during extreme heat waves and the moist vegetation of wetlands further cools the environment.

Retention value of existing trees:

From the arborist's assessment, of the 28 species to be retained, most of these species were assessed by the arborist as having good health but only 15% of the trees had a High retention value.

Of 28 species to be retained, 11 are classified as "suitable species" in the year 2070 from *Which Plant Where* database (Appendix 1b).

Supplementary planting using local provenance species:

To conserve and enhance habitats for native biota, local provenance native trees, shrubs and groundcovers are to be re-established, especially as the mapped area of important habitat for the Swift Parrot has been recently cleared from the adjoining land to the east.

The proposed additional plantings are directed to restoring winter-flowering eucalypts especially for the winter foraging Swift Parrot.

Species selection:

Species selection should reflect the local native vegetation naturally occurring on the alluvial soils of Emu Plains, and include species such as:

- Larger Trees – *Eucalyptus amplifolia*, *E. baueriana*, *E. parramattensis*, *E. tereticornis*;
- Smaller trees – *Acacia binervia*, *A. decurrens*, *A. floribunda*, *A. implexa*, *A. parramattensis*, *Callistemon salignus*, *Casuarina glauca* in wetter areas, *Angophora floribunda*, *A. subvelutina*, *Melaleuca decora*, *M. linariifolia*; and
- Shrubs – *Acacia elongata*, *Bursaria spinosa*, *Callistemon linearis*, *Eremophila debilis*, *Grevillea juniperina* subsp. *juniperina*, *Indigofera australis*, *Leptospermum polygalifolium*, *Melaleuca diosmatifolia*, *M. nodosa*, *M. thymifolia*, *Myoporum montanum*, *Sannantha (Babingtonia) pluriflora*.

In addition to local provenance plants, winter-flowering local native eucalypts such as *Eucalyptus moluccana* and *Eucalyptus sideroxylon* should be planted along Old Bathurst Road to provide habitat for the Swift Parrot.

The expected flowering times of the local native eucalypts are given in Benson and McDougall (1998). The landscape species selection will require further consideration in consultation with a restoration ecologist and urban designer.

Soil preparation:

As discussed above, the concrete-rich material covering the soil surface should be removed where practicable. Planting into this material should be avoided.

The soil, after the concrete removal, is to be prepared prior to planting in consultation with a restoration ecologist. It is important that during this process the roots of the existing trees are not damaged.

Re-engineered constructed wetlands:

In the existing water treatment ponds associated with the former industrial use, six native frog species were recorded: Common Eastern Froglet (*Crinia signifera*), Eastern Dwarf Tree Frog (*Litoria fallax*), Stripped Marsh Frog (*Limnodynastes peronii*), Peron's Tree Frog (*Litoria peronii*), Tyler's Tree Frog (*Litoria tyleri*) and Robust Bleating Tree Frog (*Litoria dentata*). These frogs are common species, but it is important to encourage and maintain their presence in the proposed re-engineered constructed wetlands (Figures 1e, 1f).

There are two separate wetland systems proposed to manage water from the proposed catchments onsite. Each wetland has three stages with the initial stage removing gross pollutants, stage 2 being an active macrophyte zone to further reduce pollutant load and a third stage to further provide habitat for local flora and fauna, especially frogs and the fishing bat, Southern Myotis.

These wetlands are designed to be overhung by retained trees as well as by supplementary planting of local native trees to provide shade and increase diversity of the native habitats. In addition, the wetlands are to be planted with local native reeds and sedges and shrubs to provide diverse, biologically active fauna habitats and reduce the risk of pest species including mosquitoes.

Specific design criteria for maximising native fauna habitat need to be further considered by a restoration ecologist in conjunction with fauna specialists and design engineers. Features worthy of consideration include rock riffles between ponds within the wetlands and areas of open water suitable for water landing by Southern Myotis.

During planning and construction:

Tree Protection Zones are to be maintained for retained native canopy trees. Measures are to be incorporated for tree protection as outlined in the Arborist Report (Arnold and Oates 2022).

During the tree removals phase, a fauna spotter-catcher is to be present onsite to relocate any native fauna encountered from the construction zone.

Post construction of roads and wetlands associated with the subdivision:

The supplementary planting of local provenance species is to occur in prepared soils.

Newly planted trees are to be monitored for survival in their establishment phase by the ecologist.

In terms of mitigating heat island effects, the success of the proposal is to be monitored (details in reports by Associate Professor Sebastian Pfautsch of the University of Western Sydney such as 'The Impact of Surface Cover and Tree Canopy on Air Temperature in Western Sydney', Report and, 'Benchmarking Tree Canopy in Sydney's Hot Schools', Report).

Post establishment of the additional planted winter-flowering eucalypts along Old Bathurst Road and on the site, the BirdLife Australia records of Swift Parrots are to be monitored (details in Mowat *et al.* 2021).

The project owned by the Council should be seen as a landmark development for the conservation of habitat for the Swift Parrot and to encourage other nearby landowners to provide additional habitat for Swift Parrot.

6.2 Mitigate prescribed impacts

In the Chapter 6 - *Identifying prescribed additional biodiversity impacts* of the BAM (page 7), it states that:

1. *Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the BOS, as per clause 6.1 of the BC Regulation. Such prescribed impacts (including direct and indirect impacts) are impacts:*

(a) on the habitat of threatened entities including:

Habitat	On the site
i. <i>karst, caves, crevices, cliffs, rocks and other geological features of significance, or</i>	None of these habitats occur on the site or nearby
ii. <i>human-made structures, or</i>	Existing buildings assessed with: - The Robust Bleating Tree Frog heard calling in December 2021 from the gutter and downpipe of the amenities building. - the structure of the buildings present within the subject site were not considered suitable for use by this group of animals.
iii <i>non-native vegetation</i>	The swift parrot feeds on winter-flowering eucalypts.

<i>(b) on areas connecting threatened species habitat, such as movement corridors</i>	Swift Parrot Important Habitat is mapped in the north-east corner of the site extending onto the adjoining land to the east which has been recently cleared. The vegetation in the north east is to be retained
<i>(c) that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)</i>	No threatened species have been recorded in the existing constructed treatment ponds.
<i>(d) on threatened and protected animals from turbine strikes from a wind farm</i>	The proposal is not a wind farm.
<i>(e) on threatened species or fauna that are part of a TEC from vehicle strikes.</i>	No TECs on the site.

None of the above items, for which prescribed additional biodiversity impacts may occur, are present on the subject land.

Table D summarises the measures to mitigate impacts.

Table D Mitigation measures for impacts

Action	Outcome	Timing	Responsibility
Utilising existing assets	Ecologically sustainable development	During planning, construction phase.	Project team.
Retain as many as practicable of existing trees (Figure 7).	Provide shade and cooling in western Sydney.	Throughout the life of the project	Project team.
Supplementary planting with local provenance species selected to reflect the naturally occurring local native vegetation of the alluvial soils of Emu Plains.	Enhanced habitat for native fauna including the Swift Parrot. To compensate for the habitat loss from the offsite clearing to the east.	Post construction	Project team.
Re-engineer the existing constructed ponds in consultation with the ecologist (Figure 1f).	Provide ongoing habitat for frogs recorded on the site. Enhance habitat values for a wider range of native species. Provide shade and cooling in western Sydney.	During planning, construction phase and life of the project.	Engineer and ecologist, and project team.
Use of trained wildlife spotter during any tree clearance	To mitigate impacts during possible displacement of resident native fauna.	During construction phase	Fauna ecologist / wildlife spotter.
Maintain Tree Protection Zones for trees in accordance with recommendations in arborist report.	Enhanced habitat for native fauna including the Swift Parrot.	During planning, and throughout the life of the project	Project Arborist / Ecologist.