

BIODIVERSITY ASSESSMENT REPORT

Quakers Hill Water Resource Recovery Facility (WRRF) Advanced Treatment Upgrade



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SYDNEY WATER BIODIVERSITY ASSESSMENT REPORT

Quakers Hill Water Resource Recovery Facility (WRRF) Advanced Treatment Upgrade

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW)
BCA	Biodiversity Constraints Assessment
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CPLS	Cumberland Plain Land Snail
CPW	Cumberland Plain Woodland
DBH	Diameter At Breast Height (over bark)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
HBT	Hollow-bearing Tree
HDD	Horizontal directional drilling
HEVAE	NSW High Ecological Value Aquatic Ecosystems
HTW	High Threat Weed
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS Act	<i>Local Land Services Act 2013</i> (NSW)
MNES	Matters of National Environmental Significance
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
PCT	Plant Community Type
PRW	Purified Recycled Water
RAP	Rapid Assessment Point
RFEF	River-flat Eucalypt Forest
SAT	Spot Assessment Technique
SOFF	Swamp Oak Floodplain Forest
SVTM	State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
WRRF	Wastewater Resource Recovery Facility

EXECUTIVE SUMMARY

A Review of Environmental Factors (REF) is being prepared to assess potential impacts and changes to the environment as a result of the Quakers Hill Water Resource Recovery Facility (WRRF) Advanced Treatment Upgrade and the construction of a new 8-kilometre brine pipeline (the Proposal). The proposed upgrades are required to help meet the increased service demand for wastewater treatment and support the NSW Government's housing policies in the region. The Proposal will also provide high-quality water treatment that will enable a Purified Recycled Water (PRW) scheme to be developed at the Quakers Hill WRRF in the future.

To inform the REF, Arcadis was engaged to prepare this Biodiversity Assessment Report (BAR) to assess the biodiversity impacts associated with the construction and operation of Proposal and considers the potential to have a significant impact on listed threatened entities under the *NSW Biodiversity Conservation Act 2016* (BC Act) and/or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Construction impacts from the Proposal includes the removal of native vegetation and threatened species habitat, as well as adjoining indirect impact to sensitive ecological areas including edge effects, sedimentation and erosion impacts. Operational impacts from the Proposal are mainly related to changes in water discharge to Breakfast Creek at the Quakers Hill WRRF. Operational noise and lighting is unlikely to increase more than what already exists in the locations where the Proposal will be situated.

Biodiversity investigation and findings

Arcadis undertook detailed desktop and field investigations to determine the biodiversity value of the location where the Proposal is to be developed. Investigations included:

- Review of biodiversity databases and existing mapping of biodiversity values
- Ground-truthing vegetation surveys, identification and mapping of Plant Community Types and Threatened Ecological Communities
- Appraisal of habitat suitability to threatened species
- Targeted surveys for threatened species identified as having potential to occur

Detailed surveys found that 2.87 hectares within the Study Area supported native vegetation and a further 12.20 hectares supported mixed native exotic vegetation, exotic grasslands and weedy areas. The remaining area comprised built assets including roads, buildings, cleared areas, miscellaneous facilities and infrastructure.

Native vegetation within the Study Area was further classified into four native Plant Community Type (PCTs) and four Threatened Ecological Communities (TEC). These PCTs and their equivalent TECs has been summarised in the table below.

Plant Community Type	Equivalent Threatened Ecological Community
PCT 3320 - Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically endangered (BC Act)
PCT 3975 - Southern Lower Floodplain Freshwater Wetland	Does not meet the definition of associated TEC
PCT 4023 - Coastal Valleys Riparian Forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Coast Bioregions – Endangered (BC Act)
PCT 4025 - Cumberland Red Gum River-flat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – Endangered (BC Act)
	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – Critically endangered (EPBC Act)

One threatened flora species and seven threatened fauna species listed under the BC Act and/or EPBC Act were detected in the Study Area, including:

- Magenta Lilly Pilly (*Syzygium paniculatum*)
- Cumberland Plain Land Snail (*Meridolum comeovirens*)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Little Bent-winged Bat (*Miniopterus australis*)

Despite not being detected during detailed site investigations, an additional 23 threatened and/or migratory fauna species were considered to have potential to occur based on the habitat features present. No other threatened flora species were considered to have potential to occur.

Aquatic habitat was restricted to Breakfast Creek and Blacktown Creek, both of which have flowing water however were determined to have a poor condition and low habitat value by Jacobs (2025) in the Surface Water Quality and Aquatic Ecology Assessment for the Proposal. Field survey by Arcadis ecologists confirmed the degraded nature of these waterways and the low likelihood of supporting threatened terrestrial species known from the locality.

Patches of PCT 4023 and PCT 4025 occur in areas mapped as having a 'low' or 'moderate' likelihood of ground water dependence on the High Ecological Value Aquatic Ecosystems (HEVAE) Atlas (NSW DCCEEW, 2025d). Although these PCTs have some reliance on groundwater, they are terrestrial riparian forest communities that can tolerate changes to groundwater.

Avoiding and minimising impacts to biodiversity values

In response to the findings from detailed biodiversity investigations, the location of the Proposal was shifted to avoid impacts to areas of higher biodiversity value. Shifting of the Proposal footprint avoided and minimised direct impacts to:

- River-flat eucalypt forest on Coastal floodplains at Harvey Park.
- Cumberland Plain Woodland within the Quakers Hill WRRF.
- Breakfast Creek, Blacktown Creek and riparian native vegetation

Further avoidance is anticipated during the detailed design phase of the project and during construction, where construction methodologies will be adapted to minimise the removal/impact to native vegetation and trees (e.g. prioritise tree trimming over removal).

Residual impacts to native vegetation, threatened ecological communities and threatened species habitat

The residual impact to native vegetation and threatened ecological communities, following updates to the Proposal footprint to avoid and minimise impacts, is summarised in the table below.

Plant Community Type	Equivalent Threatened Ecological Community	Within the Construction footprint (ha)
PCT 3320 - Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically endangered (BC Act)	0.95
PCT 3975 - Southern Lower Floodplain Freshwater Wetland	Does not meet the definition of associated TEC	0.01

Plant Community Type	Equivalent Threatened Ecological Community	Within the Construction footprint (ha)
PCT 4023 - Coastal Valleys Riparian Forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Coast Bioregions – Endangered (BC Act)	0.62
PCT 4025 - Cumberland Red Gum River-flat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – Endangered (BC Act)	0.39
	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – Critically endangered (EPBC Act)	0.13

Impacts to threatened species and threatened species habitat from the Proposal are considered to be low/negligible for most species determined to have a moderate or higher likelihood to occur. Potential for direct impacts to individuals/occupied habitat of a threatened species has been identified for Cumberland Plain Land Snail. Habitat has the potential to support live individuals of Cumberland Plain Land Snail, however targeted searches for this species will be undertaken as part of the pre-clearance survey with any live individuals being relocated outside of the construction footprint. The single Magenta Lilly Pilly located at the International Peace Park will not be impacted and impacts to adjoining areas of potential habitat will be minor (if any). The other threatened species known to occur (the five microbat species and Grey-headed flying-fox), are highly mobile and while there are anticipated direct impacts to foraging resource, impacts are considered minor in nature. Impacts to these threatened species will only occur to areas of potential habitat, not individuals or occupied habitat.

Assessment of the potential impacts to these species from the Proposal was reviewed against the Test of Significance (for BC Act listed species) and/or the Significant Impact Criteria (for EPBC Act). It was determined that impacts from the Proposal are unlikely to have a significant impact upon any listed threatened or migratory species.

Mitigation measures to minimise further impact to biodiversity values

A suite of mitigation measures are recommended to ensure potential impacts to biodiversity associated with the Proposal are minimised. Some of the key measures include:

- Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing.
- Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.
- Adjust methodology (e.g. avoid area, hand excavate, implement exclusion fencing) to protect sensitive areas where possible (such as mature trees, known threatened species, populations or ecological communities).
- Undertaking pre-clearing ecological surveys, which will involve inspecting vegetation for potential fauna prior to clearing or trimming. If fauna is present, or ecological assessment has determined high likelihood of native fauna presence (including hollow bearing trees), engage a licenced ecologist to inspect and relocate fauna before works, if possible.
- Undertake targeted searches for Cumberland Plain Land Snail within 48 hours of vegetation removal for a specific patch of habitat. Any live individuals should be relocated into adjoining areas of habitat, outside of the Proposal footprint.

- Have an ecologist present during removal of habitat features which could not be completely excluded from containing fauna during pre-clearance surveys or has the potential to be re-inhabited since pre-clearing surveys.
- Inclusion of site requirements in the Proposals Construction Environmental Management Plan to minimise biosecurity risks including introduction of novel weeds and pathogens or further spread of these across the Proposal footprint.
- Offset residual impacts to native vegetation and trees in accordance with the Biodiversity Offset Guideline.

Mitigation measures related to impacting aquatic habitats and groundwater including controlling sedimentation, erosion and groundwater drawdown has been included in the Groundwater Impact Assessment (Jacobs, 2025b), Surface Water Quality and Aquatic Ecology Assessment (Jacobs, 2025a), and Geomorphology and Hydrology Assessment (Streamology, 2025).

Offsetting

Residual impacts to biodiversity from the Proposal that could not be avoided will be offset in accordance with the Sydney Water's Biodiversity Offset Guide (Sydney Water, 2024).

The offsets required for a worst-case scenario, which assumes wholesale clearing within the construction footprint, has been summarised in the table below. No threatened species-specific offsetting is identified below, as species offsets have been accounted for in the offsetting of TECs.

Plant Community Type / Threatened Ecological Communities	Area of Impact (ha)	Required area of restoration (ha)
PCT 3320 - Cumberland Shale Plains Woodland AND Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act)	0.95	2.85
PCT 4023 - Coastal Valleys Riparian Forest AND Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act)	0.62	1.86
PCT 4025 - Cumberland Red Gum River-flat Forest AND River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (BC Act) AND River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria (EPBC Act)	0.39	1.17
PCT 3975 - Southern Lower Floodplain Freshwater Wetland	0.01	0.02
Total	1.97	5.90

The final offsetting requirement should be re-calculated for the actual area of native vegetation and habitat removal following construction of the Proposal. This approach provides further incentive for biodiversity values to be avoided during the detailed design stages and during construction.

1 INTRODUCTION

Arcadis has been engaged by Sydney Water to prepare a Biodiversity Assessment Report (BAR) to inform a Review of Environmental Factors (REF) for the Sydney Water Quakers Hill Water Resource Recovery Facility (WRRF) Advanced Treatment Upgrade and the construction of a new 8-kilometre brine pipeline. The proposed upgrades are required to help meet the increased service demand for wastewater treatment and support the NSW Government's housing policies in the region. The proposed upgrades will also provide high quality water treatment that will enable a Purified Recycled Water (PRW) scheme to be developed at the Quakers Hill WRRF in the future.

1.1 Proposal overview

Upgrades to Sydney Water's Quakers Hill WRRF are required by 2028 to:

- Service industry growth and housing policies as current treatment capacity at the plant of 28 Megalitres /day is expected to be exceeded in late 2028
- Meet Environment Protection Licence limits that require reduced nutrient loads to the Hawkesbury - Nepean River (Sackville 2 zone)
- Provide high quality water treatment that enables a future Purified Recycled Water (PRW) scheme and its introduction into Prospect Reservoir.

The key features of the Proposal include:

- Secondary treatment process upgrade from the current 28 Megalitres/day to 48 Megalitres/day
- A new advanced treatment plant, including reverse osmosis, ultrafiltration and stabilisation
- A range of ancillary infrastructure such as new buildings, tanks, pipes, services and chemical storage
- New brine pipeline to transfer the brine generated as a by-product of the reverse osmosis process into the existing wastewater network. The pipeline would:
 - Have flow capacity of up to 12.5 Megalitres/day
 - Be about 8 kilometres long and about 500 millimetres diameter
 - Be installed largely along shared paths, public parkland, and road corridors
 - Be mostly underground and built using open trench and trenchless methods
 - Be connected into Sydney Water's existing Northern Suburbs Ocean Outfall Sewer (NSOOS).

The advanced treatment plant is required to treat the wastewater to meet more stringent nutrient limits. However, it would also produce high quality water that could be further treated to produce PRW.

The proposed works have been depicted in Figure 1-1.

1.2 Location and site information

The Proposal is located within the Blacktown Local Government Area (LGA), between Quakers Hill and Seven Hills, within the suburbs of Quakers Hill, Marayong, Blacktown, Lalor Park and Seven Hills. The Proposal extends across multiple land zonings within an urbanised setting. The areas encompassed by the Proposal comprise developed land, urban parks and playing fields, ornamental gardens, planted and native vegetation.

The location of the Proposal is shown in Figure 1-1.

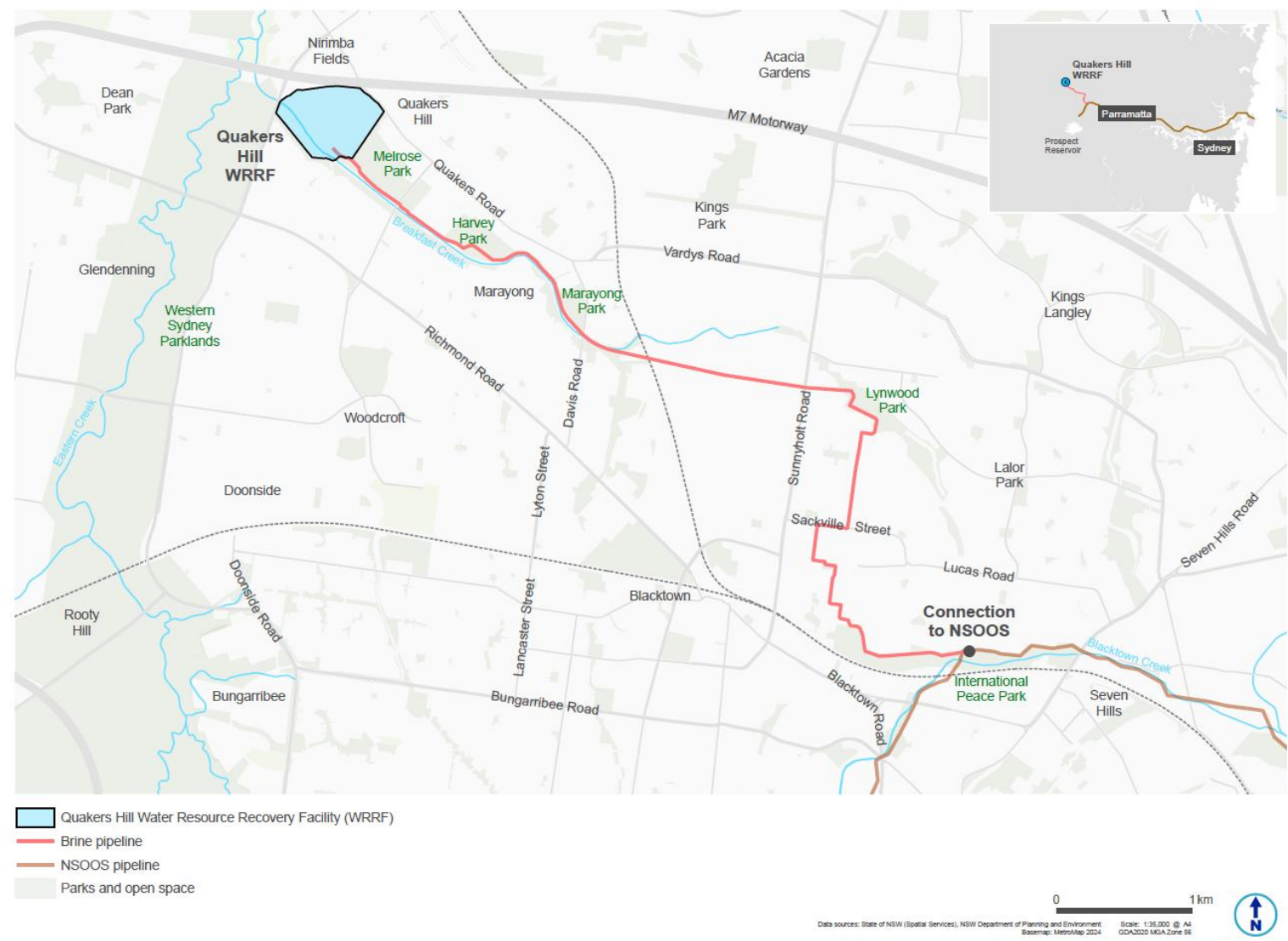


Figure 1-1. Overview of the Proposal in the locality.

1.3 Scope of the report

The scope of this report is to assess the biodiversity impacts associated with the proposed upgrades to Quakers Hill WRRF and construction of an 8-kilometre brine pipeline. This assessment will be used to inform the Review of Environmental Factors (REF) for this Proposal. A Biodiversity Assessment Report is required to inform that REF under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It considers the potential to have a significant impact on listed threatened entities under the *NSW Biodiversity Conservation Act 2016* (BC Act) and/or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The BAR has considered and assessed the project impacts as described in the REF. Residual impacts to biodiversity from the Proposal that cannot be avoided during design will be offset in accordance with *Sydney Water's Biodiversity Offset Guide* (Sydney Water, 2024).

1.4 Study Area and construction footprint

The Study Area has been through two iterations and has been refined based on the Proposal design. A broader Study Area was initially investigated as part of an ecological constraints assessment (Arcadis, 2025) to help inform the location of the Proposal. The final iteration, which is presented in this report, was developed by applying a buffer to the construction footprint (described below). In some locations where the Proposal design intersected native vegetation a wider buffer was adopted. The Study Area encompassed a total extent of 36.62 hectares.

The construction footprint encompasses the site of the Quakers Hill WRRF, and any ancillary areas required for construction. For the linear portions of the Proposal, i.e. the pipeline alignment, the construction footprint has been defined as the area required for all construction activities, excluding where horizontal directional drilling (HDD) is proposed. Due to the depth of drilling, impacts to terrestrial biodiversity on the ground surface are not anticipated. As such, the construction footprint excludes underground areas of HDD. Impacts to terrestrial biodiversity may occur at launch and retrieval pits for HDD and has therefore been included in the Construction Footprint. The extent of the construction footprint for the Proposal is 32.39 hectares.

The Study Area and construction footprint is presented in Figure 1-2. Native vegetation within the Study Area has also been presented in this figure because these locations are the focus of the assessment. Native vegetation was mapped in the Biodiversity Constrain Memorandum (Arcadis, 2025).

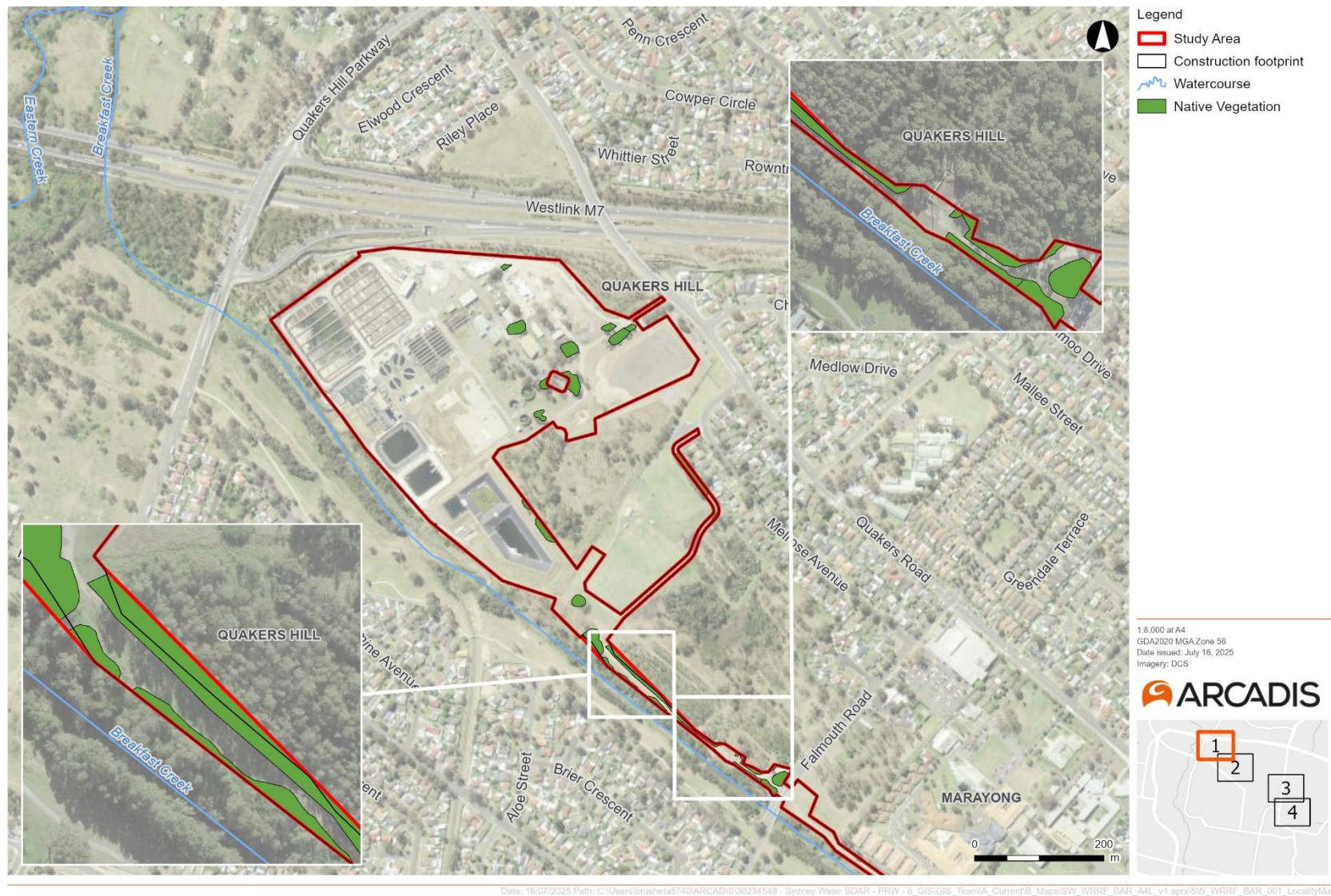


Figure 1-2 Study Area and construction footprint for the Proposal (1 of 4)

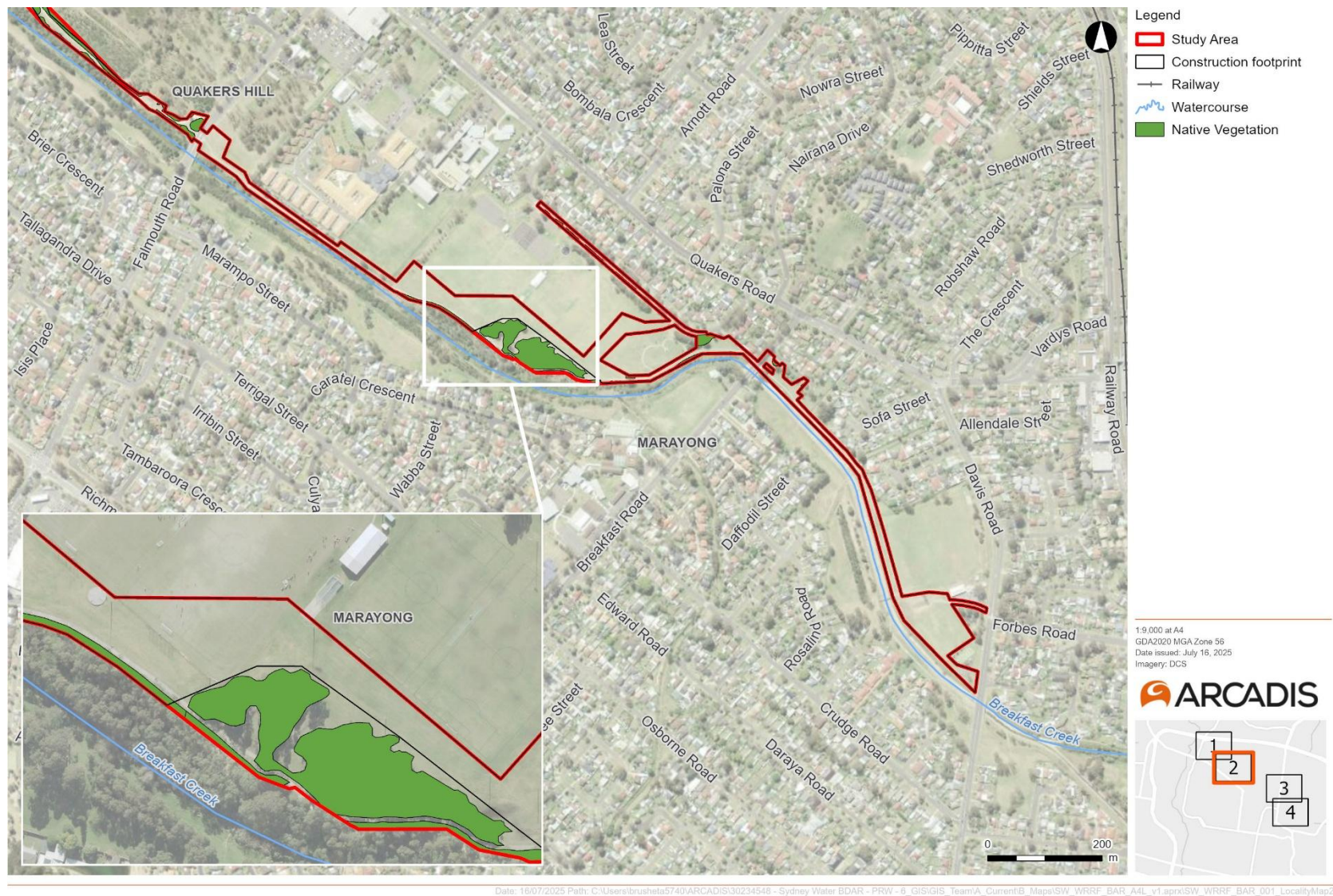


Figure 1-2 Study Area and construction footprint for the Proposal (2 of 4)

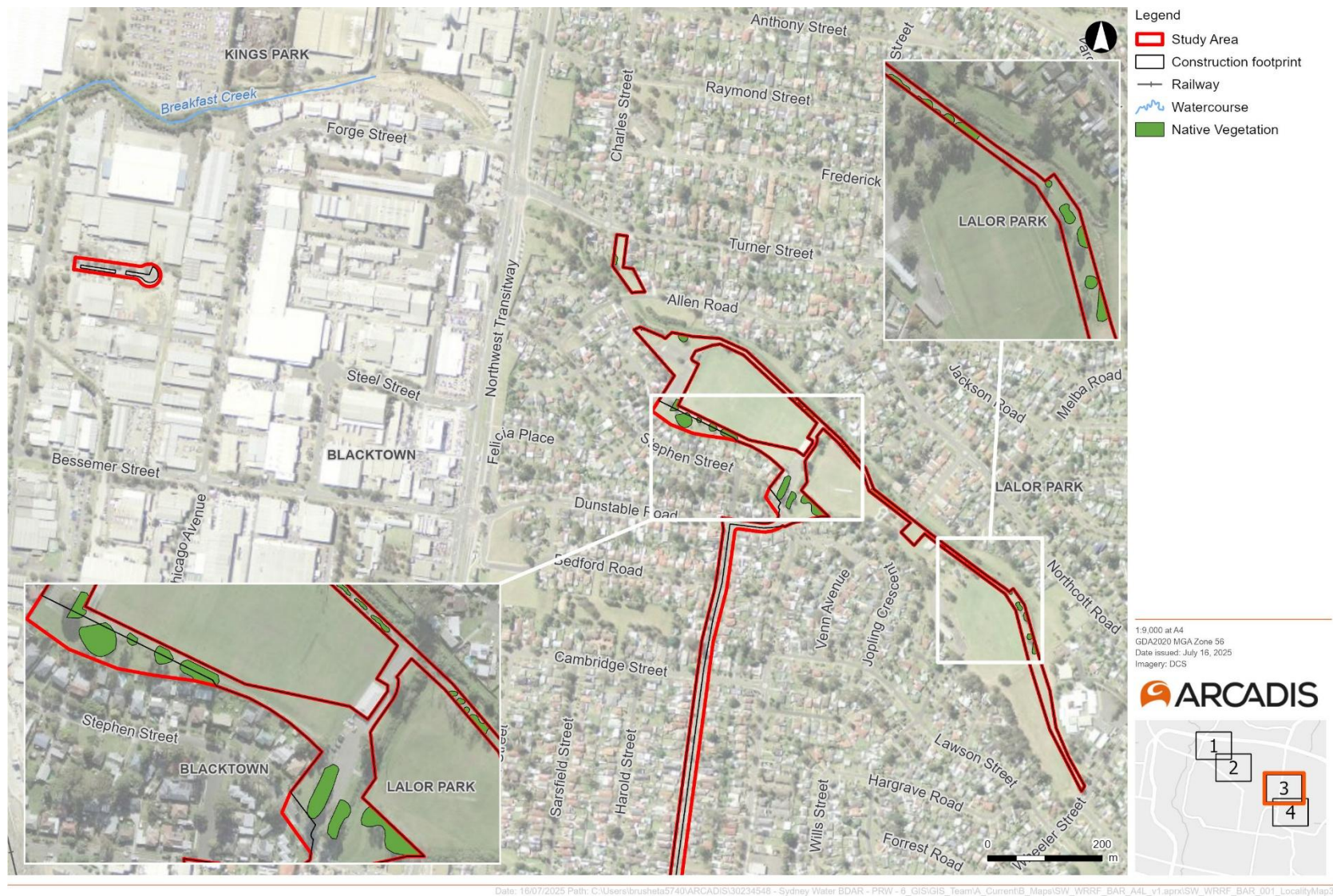


Figure 1-2 Study Area and construction footprint for the Proposal (3 of 4)

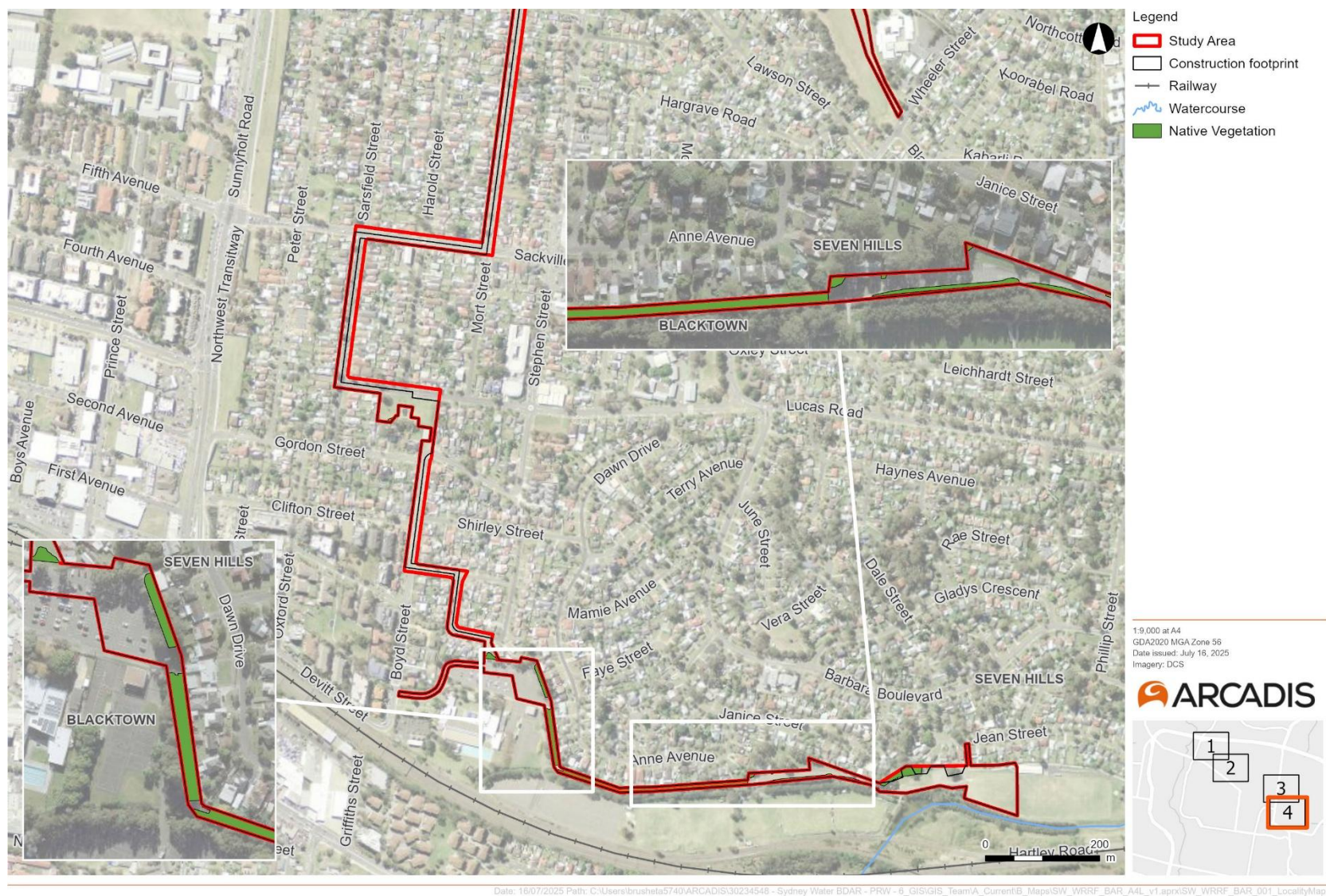


Figure 1-2 Study Area and construction footprint for the Proposal (4 of 4)

2 LEGISLATIVE CONTEXT

The following table provides a summary of the Commonwealth and State biodiversity legislation that is relevant to the Proposal.

Table 2-1 Summary of legislation relevant to the Proposal

Legislation	Relevance to the Proposal
<i>Biodiversity Conservation Act 2016</i>	The purpose of the <i>Biodiversity Conservation Act 2016</i> (BC Act) is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Under the BC Act, proponents of Part 5 activities must apply the test of significance to assess biodiversity impacts. If the activity is likely to have a significant impact or will be carried out in a declared Area of Outstanding Biodiversity Value (AOBV), the proponent must either apply the Biodiversity Offsets Scheme or prepare a Species Impact Statement (SIS). The environmental impact of activities that will not have a significant impact on threatened entities or impact an AOBV will continue to be assessed under Section 5.5 of the <i>Environmental Planning and Assessment Act 1979</i>. As the Proposal is being assessed on behalf of Sydney Water (a public authority) and will not significantly impact a threatened entity or an AOBV, this Biodiversity Assessment Report is adequate to assess potential impacts of the Proposal.
<i>Biosecurity Act 2015</i>	The <i>Biosecurity Act 2015</i> primary objective is to provide a framework for: • the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matters • dealing with biosecurity matters, carriers and potential carriers, and • other activities that involve biosecurity matter, carriers or potential carriers. Division 2 of the <i>Biosecurity Act 2015</i> defines local control authorities for weeds. Schedule 1 of the <i>Biosecurity Act 2015</i> outlines special provisions relating to weeds, including the duty of land occupiers to control and manage weeds. These controls will be considered through identifying weeds and other potential biosecurity risks in the Study Area and addressing duties for management during construction and operation in the Mitigation section of this report.
<i>Cumberland Plain Conservation Plan 2022</i>	The <i>Cumberland Plain Conservation Plan</i> (CPCP) facilitates growth in Western Sydney to 2056 and beyond and delivers important development and biodiversity outcomes. The CPCP was finalised with NSW approvals in place in August 2022 and Commonwealth approvals were granted in March 2024. The Plan has been developed to meet requirements for strategic biodiversity certification under the BC Act and strategic assessment under the EPBC Act. The Study area is located entirely outside of lands applicable to the CPCP. As such, consideration to the CPCP has not been further considered.
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	The Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places as defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a MNES require approval from the Australian Government Minister for the Department of the Environment (the Minister).

Legislation	Relevance to the Proposal
	Impacts to EPBC Act listed entities are considered further in this report. No significant impacts are expected for any EPBC Act listed entities and therefore Referral to the Minister is not required.
<i>Fisheries Management Act 1994</i>	The <i>Fisheries Management Act 1994</i> (FM Act) provides for the identification, conservation and recovery of threatened fish, aquatic invertebrates and marine vegetation listed under Schedules 4, 4A and 5 of the Act. The FM Act also covers the identification and management of Key Threatening Processes (which affect threatened species or could cause other species to become threatened). If a planned development or activity is likely to have any impact on a threatened species listed under the FM Act, an Assessment of Significance as described under Part 7A: Division 12 must be undertaken. If the impacts are likely to be significant, or if critical habitat is affected, a Species Impact Statement must be prepared. Section 199 (Part 7: Division 3) of the FM Act states that consultation with the Minister must be undertaken by a public authority prior to carrying out dredging or reclamation works. Under the FM Act, dredging or reclamation works include the following: • Dredging work – excavation or removal of material from water land • Reclamation work – using any materials to fill in water land or depositing materials for construction of anything on water land (e.g., bridge) or draining of water from water land for the purposes of reclamation. Key Fish Habitat (KFH) should be identified and assessed in accordance with Policy and Guidelines for fish habitat conservation and management (DPI, 2013). Where impacts will occur to aquatic habitat identified as KFH offsets are required in accordance with Section 3.3.3 Rehabilitation and compensation measures of the Policy. The Proposal does not include dredging, or reclamation works in mapped waterways or habitat that have potential to support threatened entities listed under the FM Act. Indirect impacts to Breakfast Creek may occur from the Proposal which will be considered in this report. Breakfast Creek is mapped as KFH within the Study Area.

3 METHODS

A description of the methodology applied for desktop and field surveys has been discussed below.

3.1 Desktop assessment

A review of existing literature and online databases was undertaken in October 2024 to better understand the biodiversity values of the Study Area prior to undertaking field surveys. The online resources and databases reviewed are listed in Table 3-1.

This review involved desktop searches of BioNet for state listed entities, and the Protected Matters Search Tool (PMST) for federal listed entities, which have been recorded or are anticipated to occur within a 10-kilometre radius of the Study Area. The BAM Calculator was also interrogated to determine Candidate and Predicted threatened species which are associated with the vegetation communities (Plant Community Types) present in the Study Area. The species returned by BioNet, PMST and the BAM Calculator were reviewed to determine their likelihood to occur within the Study Area and have been included in Appendix C and Appendix D.

Table 3-1 Online resources and databases investigated to review the biodiversity values in the Study Area

Database	Purpose of the search
BAM-C Calculator (NSW DCCEEW, 2025a)	Used to compile the Candidate and Predicted species list for the PCTs which occur in the Study Area. The results of this BAM-C case was considered as a part of the threatened species Likelihood of Occurrence assessment.
BioNet Atlas of NSW Wildlife, managed by the Department of Planning and Environment NSW (NSW DCCEEW, 2025e)	Used to compile a list of threatened species records listed under the BC Act within 10km of the Study Area
Bureau of Meteorology. Groundwater Dependent Ecosystem Atlas (BOM, 2025b)	Identify locations supporting Groundwater Dependant Ecosystems
DPI Fisheries NSW Spatial Data Portal (DPI, 2024)	Identify any threatened species habitat and areas of Key Fish Habitat in or near the Study Area and define stream characteristics
eSpade v2.2 Spatial data tool, NSW Department of Planning and Environment (DPE, 2025)	Used to identify soil landscapes in the Study Area.
NSW BioNet Vegetation Classification (NSW DCCEEW, 2025b)	Provides information on Plant Community Types (PCTs) and their relationship to a vegetation formation and vegetation class (managed and maintained in the Vegetation Information Systems (VIS) Classification database).
Phytophthora distribution (NSWDCCEEW, 2020)	Used to identify the pathogen Phytophthora, distribution in the site context.
Protected Matters Search Tool managed by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW, 2025)	Used to compile a list of potentially occurring MNES listed under the EPBC Act within 10km of the Study Area
State of New South Wales through Local Land Services (2022). Greater Sydney Regional Strategic Weed Management Plan 2023-2027.	Identification of priority listed exotic weed species.
State Vegetation Type Mapping through The Sharing and Enabling Environmental Data Portal (NSW DCCEEW, 2025c)	Used to determine review existing vegetation mapping of Plant Community Types for the Study Area
Threatened species, populations and ecological communities profile database (TBDC) (DPE, 2024c)	Contains information for all listed threatened species, populations and communities

The likelihood of threatened species to occur within the Study Area was determined by comparing each species' habitat and lifecycle requirements to the habitat present within the Study Area, and the location and number of nearby, recent records of the species. The criteria used to determine the likelihood of occurrence of threatened biodiversity within the Study Area has been outlined in Table 3-2. Threatened species likelihood of occurrence was undertaken and appraised prior to surveys and updated after surveys to reflect ground-truthed habitat suitability, site observations and targeted threatened species surveys. The results of these assessments have been included in Appendix C, Appendix D and Appendix E.

A total of 23 marine species were excluded from assessment as there is no marine habitat located in the Study Area.

Table 3-2 Likelihood of occurrence criteria

Likelihood of occurrence	Criteria - one or more of the following conditions applies for threatened <u>flora</u> species	Criteria - one or more of the following conditions applies for threatened <u>fauna</u> species
Low	- The species has not been recorded previously within 10km of the Study Area. - The species has historically (>20 years ago) been recorded within 10km of the Study Area, and suitable habitat is no longer present. - The Study Area is beyond the current known geographic range of the species. - The species has specific habitat requirements that are not present on the Study Area. - The species is considered extinct.	- The species has not been recorded previously within 10km of the Study Area. - The species has historically (>20 years ago) been recorded within 10km of the Study Area, and suitable habitat is no longer present. - The Study Area site is beyond the current known geographic range. - The species has specific habitat requirements that are not present on the Study Area. - The species is considered extinct.
Moderate	- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area. - The species has historically (>20 years ago) been recorded (no recent records) within 10km of the Study Area and suitable habitat is present on the Study Area. - The species has specific habitat requirements that are present on the Study Area, but in a poor or modified condition.	- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area. - The species has historically (>20 years ago) been recorded (no recent records) within 10km of the Study Area and suitable habitat is present on the Study Area. - The species has recently (<20 years) been recorded within 10km of the Study Area and the Study Area contains marginally suitable habitat for the species. - The species is unlikely to maintain a resident population on the Study Area, however, may occasionally utilise resources within the Study Area.
High	- The species has recently (within the last 20 years) been recorded on the Study Area or nearby. - The species has specific habitat requirements that are present on the Study Area and are in good condition. - A known population of the species is located in similar habitat in proximity to the Study Area.	- The species has recently (within the last 20 years) been recorded on the Study Area or nearby. - The species has specific habitat requirements that are present on the Study Area. - The species is known or likely to maintain resident populations in proximity to the Study Area and could utilise resources within the Study Area.

Likelihood of occurrence	Criteria - one or more of the following conditions applies for threatened <u>flora</u> species	Criteria - one or more of the following conditions applies for threatened <u>fauna</u> species
		The species is known or likely to regularly utilise resources on the Study Area.
Known	The species was recorded in the Study Area during the current survey.	The species was recorded in the Study Area during the current survey.

3.2 Field survey

Ecological surveys were undertaken over 19 days from October 2024 to June 2025 to ground truth biodiversity values identified during desktop assessment and identify threatened biota. Surveys were completed by several Arcadis' ecologists and subcontractor David James. The personnel involved in surveys and their qualifications has been listed in Table 3-3.

Table 3-3 Ecologist involved in undertaking field surveys across the Study Area

Person	Role	Qualification
Nathan Banks	Senior ecologist	B. Zool BAM Accredited Assessor (BAAS 23023)
Kate Mauger	Senior ecologist	B. Sci, M. Env BAM Accredited Assessor (BAAS 25010)
Brendan Fletcher	Senior ecologist	M. Env Man BAM Accredited Assessor (BAAS 25005)
William Terry	Senior ecologist	B. Zoo (Hons), PhD in Zoo/Ani Bio
Taylor Bliss-Henaghan	Ecologist	B. Sci, M. Con Bio
Acacia Jennings	Ecologist	B. Sci (Hons), M. Con Bio
Emma Teusner	Graduate ecologist	B Adv Sci (Hons)
Emily Cleghorn	Graduate ecologist	B Adv Sci
David James	Principal zoologist	B Sc (Hons)

The following activities were undertaken during ecological surveys within the Study Area:

- Ground-truthing existing vegetation mapping (SVTM) (DPE 2024) including identifying and mapping vegetation assemblages to Plant Community Types (PCTs)
- Conducting Rapid Assessment Vegetation Points (RAVP) and Biodiversity Assessment Method (BAM) vegetation plots to confirm PCTs and measure vegetation integrity,
- Identifying and mapping Threatened Ecological Communities (TECs),
- Identifying priority weed species as listed in the Greater Sydney Local Land Services Region
- Undertaking threatened species habitat assessments and recording fauna habitat features including:
 - Hollow-bearing trees
 - Waterbodies
 - Caves, crevices, and culverts
 - Bird nests

- Logs and rock habitat
- Targeted surveys for threatened flora and fauna species with a moderate or high likelihood of occurrence in areas of suitable habitat (see Section 3.2.1 and Section 3.2.2)

Biodiversity data, including vegetation and threatened species habitat mapping were spatially recorded using Field Maps on an iPad. Fauna and flora species recorded during field investigations have been included in Appendix A and Appendix B.

3.2.1 Threatened flora surveys

Targeted threatened flora surveys were undertaken across six days from October 2024 to May 2025. Searching for threatened plant species is more reliable on clear days with little or no wind. Factors that may affect searching time include light levels, bad weather, wet grass, steep slopes and time of day (Moore JL, 2011). Survey dates and relevant weather records have been included in Table 3-4. Weather data has utilised data collected from Horsley Park Weather Station (station: 067119) which is located approximately 10.5 kilometres from the Study Area.

Table 3-4 Dates and weather conditions of targeted flora surveys (BoM, 2025a).

Date	Observers	Temperature		Rain (mm)	Maximum wind gust	
		Min (°C)	Max (°C)		Direction	Speed (km/h)
18/10/2024	N. Banks, K. Mauger, T. Bliss-Henaghan, A. Jennings	14.8	26.1	1.4	SW	48
30/10/2024	N. Banks, A. Jennings	15.7	29.6	0	ESE	28
03/12/2024	N. Banks, T. Bliss-Henaghan	19.5	33.1	0.2	NNW	46
05/02/2025	B. Fletcher, K. Mauger, E. Teusner, A. Jennings	19.7	32.9	0	ESE	33
31/03/2025	N. Banks, T. Bliss-Henaghan	17.5	23.9	5.2	SW	43
15/05/2025	N. Banks, T. Bliss-Henaghan	13.2	19.7	0	SSE	20

Surveys utilised the parallel field traverse method described in the guideline: *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020c). The method involves walking parallel field traverses through areas of suitable habitat at specified spacings depending on the growth form of the target species and the density of habitat being investigated. The recommended field traverse widths for the different plant life forms have been included in Table 3-5 along with considerations for different types of habitats.

Table 3-5. Separation widths for parallel field traverses targeted threatened flora (DPIE, 2020c)

Life form	Maximum distance between parallel field traverse (separation widths (metres))	
	In open vegetation	In dense vegetation
Trees (>6m)	40	20
Medium shrubs (1-6 m)	20	10
Sub-shrubs (<1m)	15	10

Life form	Maximum distance between parallel field traverse (separation widths (metres))	
	In open vegetation	In dense vegetation
Herbs, forbs, grasses, sedges, rushes, climbers and orchids	10	5
Aquatic plants	Search the appropriate parts of the waterbody using a traverse coverage that equates to the relevant growth form.	

Targeted surveys were only conducted for threatened plants with suitable habitat ground-truthed to occur in the Study Area (i.e. determined to have a moderate or higher likelihood to occur, following habitat assessments) (Appendix C). Targeted surveys were undertaken to meet the seasonal survey requirements of target species as identified on the TBDC (NSW DCCEEW, 2025e). These species and their recommended survey window have been included in Table 3-6. Additionally, the field traverses completed within the Study Area have been shown in Figure 3-1.

Flowering of the cryptic threatened flora species *Pimelea spicata* (Spiked Rice-flower) is unpredictable and rain dependant, and in drier times plants can often not visible above ground. (NSW DCCEEW, 2025e). For this reason, prior to undertaking targeted surveys a reference population within 200 metres of the Study Area was visited to confirm that the species was above ground and able to be detected. On all survey events individuals of Spiked Rice-flower were observed at the reference population (Plate 3-1).



Plate 3-1. *Pimelea spicata* (Spiked Rice-flower) observed flowering near the Study Area in January 2025

Table 3-6 Targeted threatened flora species

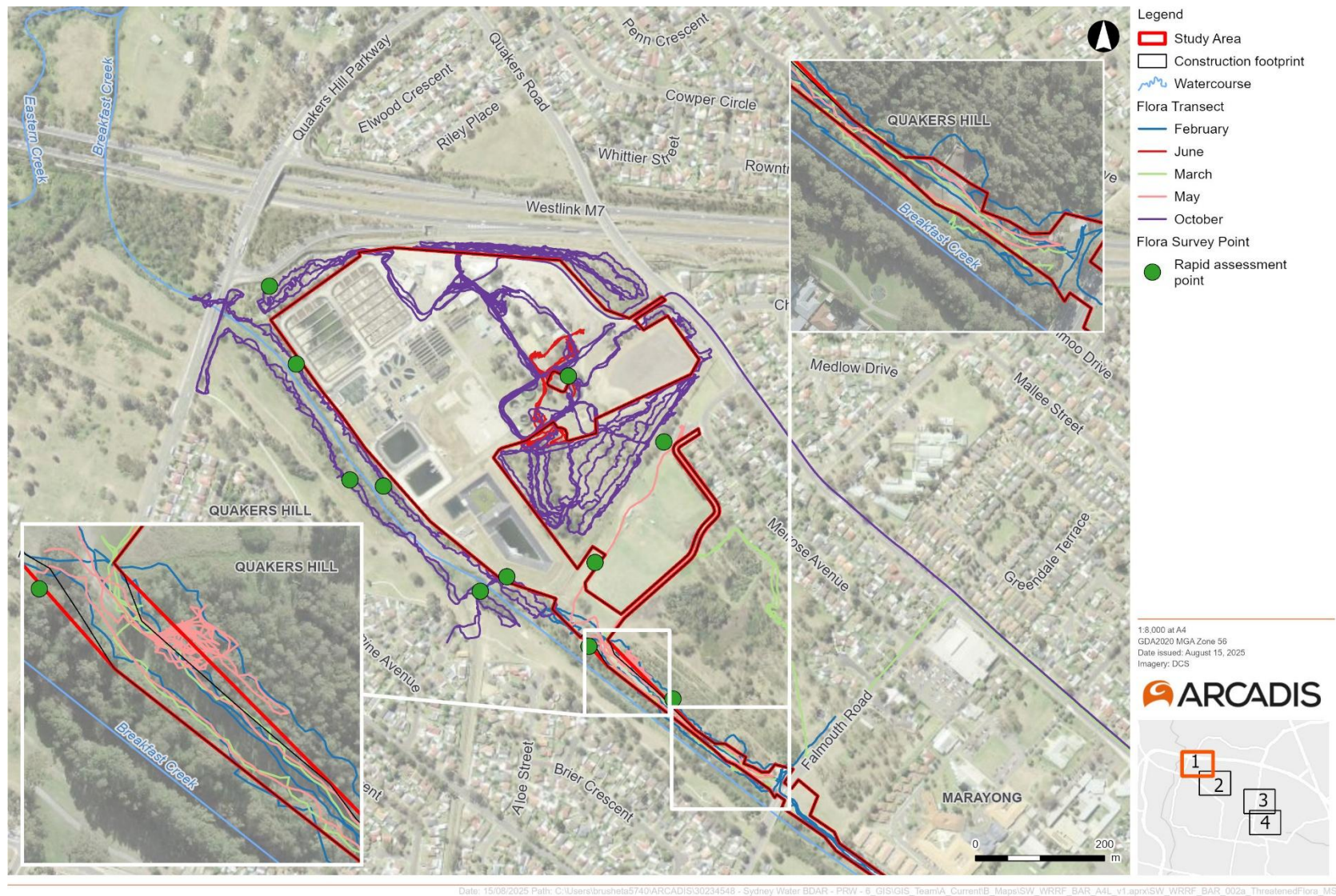
Species	Listing status	Max. field traverse separation width by life form (DPIE, 2020c)	Seasonal requirement (NSW DCCEEW, 2025e)	Survey effort*	PCTs that offer potential habitat to target species
<i>Acacia pubescens</i> Downy Wattle	BC Act: V EPBC Act: V	15m spacing	Year-round	18, 30 October 2024, 5 February, 31 March, 15 May 2025	3320, 4023 and 4025
<i>Grevillea juniperina</i> subsp. <i>juniperina</i> Juniper-leaved Grevillea	BC Act: V EPBC Act: Not listed	15m spacing	Year-round	18, 30 October 2024, 5 February, 31 March, 15 May 2025	3320, 4025

Species	Listing status	Max. field traverse separation width by life form (DPIE, 2020c)	Seasonal requirement (NSW DCCEEW, 2025e)	Survey effort*	PCTs that offer potential habitat to target species
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> Penrith LGAs	BC Act: EP	10m spacings	November-February	5 February 2025	3320, 4023 and 4025
<i>Persoonia hirsuta</i> Hairy Geebung	BC Act: E EPBC Act: E	15m spacing	Year-round	18, 30 October 2024, 5 February, 31 March, 15 May 2025	4025
<i>Pimelea spicata</i> Spiked Rice-flower	BC Act: E EPBC Act: E	10m spacings	Year-round	18, 30 October 2024, 5 February, 31 March, 15 May 2025 **	3320, 4023 and 4025
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	BC Act: E EPBC Act: V	20 m spacing	April - June	15 May 2025	4025

*Targeted surveys in October 2024 were only undertaken within the Quakers Hill WRRF as the Proposal design for the brine pipeline was yet to be finalised.

** Requires three repeat surveys

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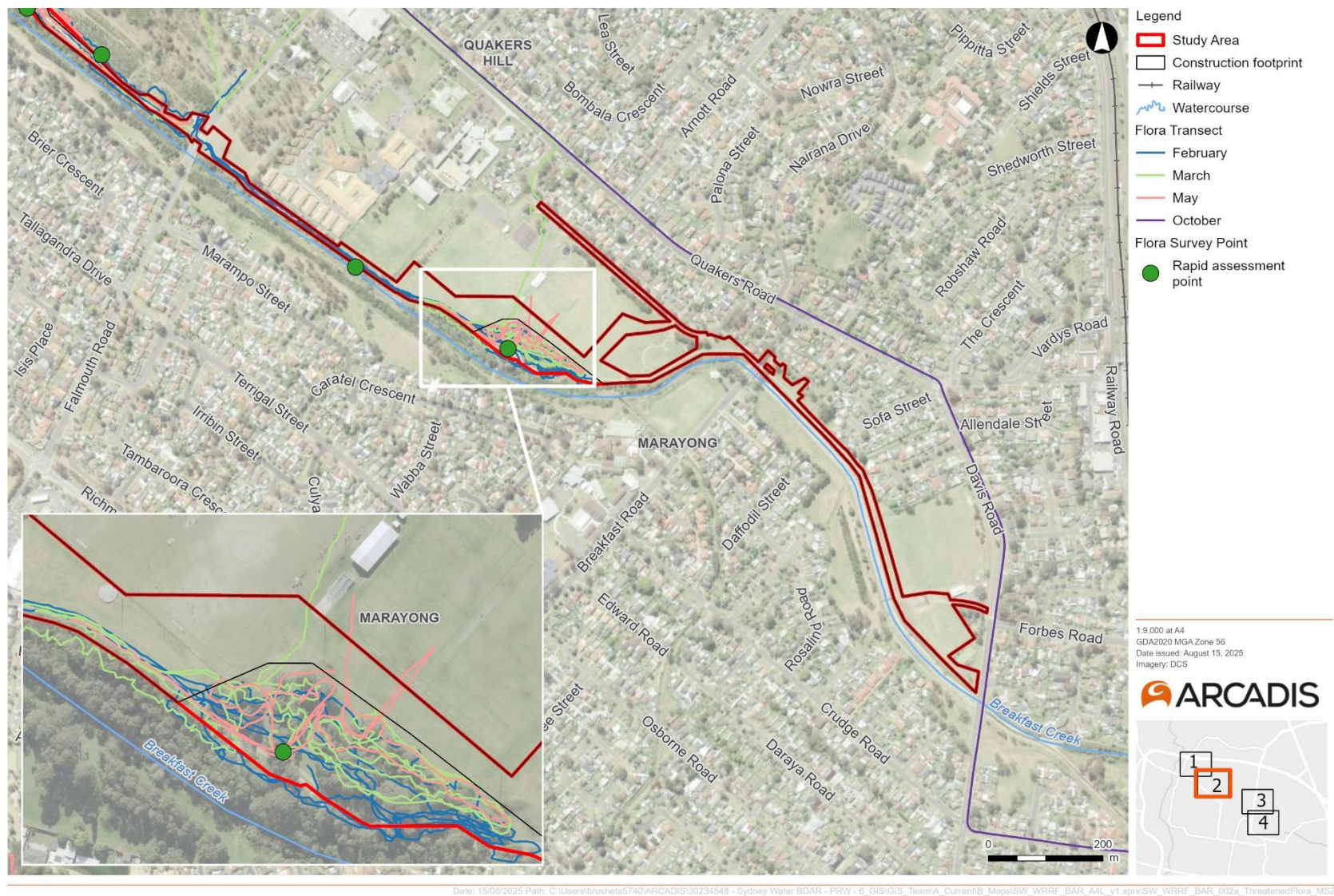


Figure 3-1 Threatened flora survey location and methods (2 of 4)

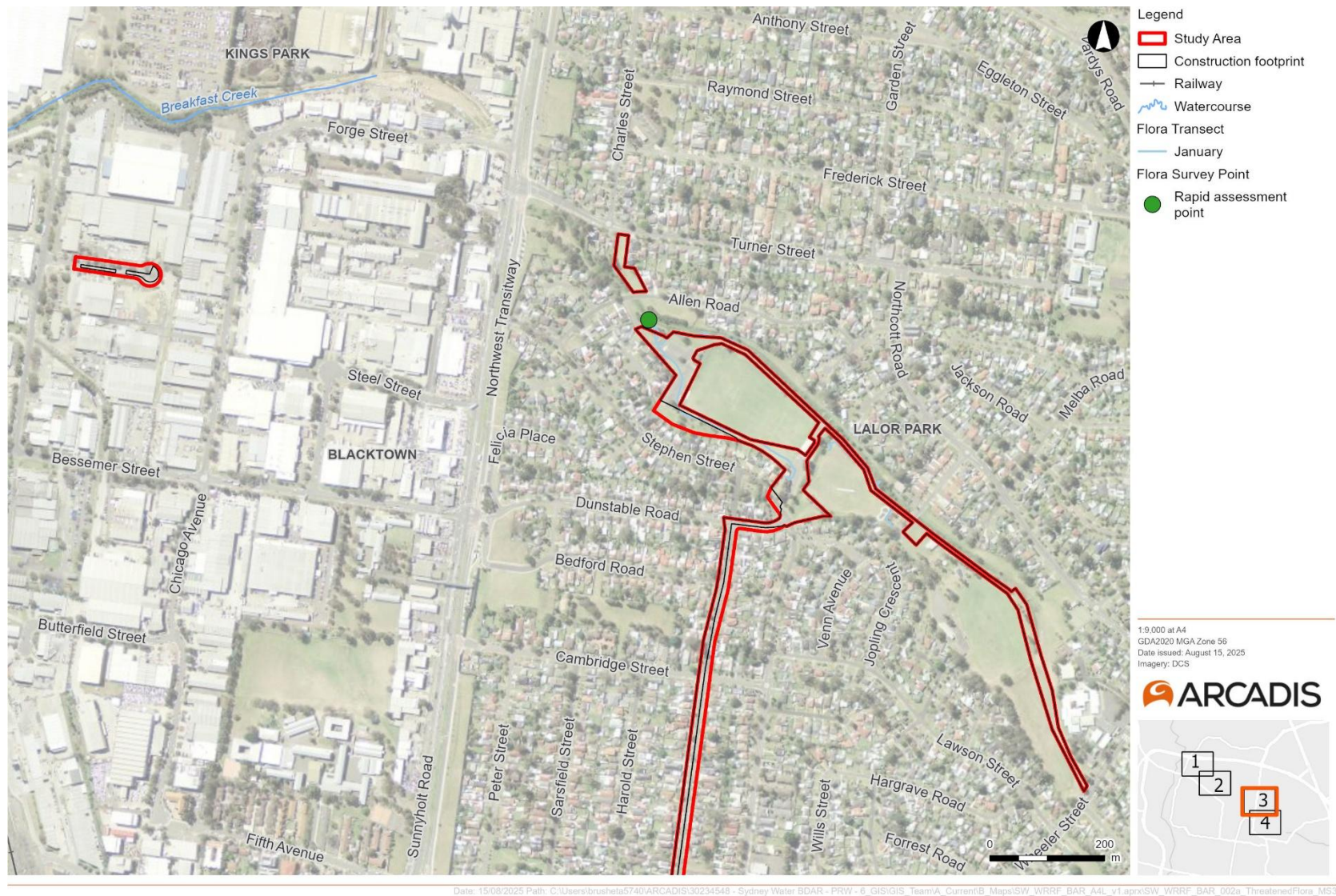


Figure 3-1 Threatened flora survey location and methods (3 of 4)

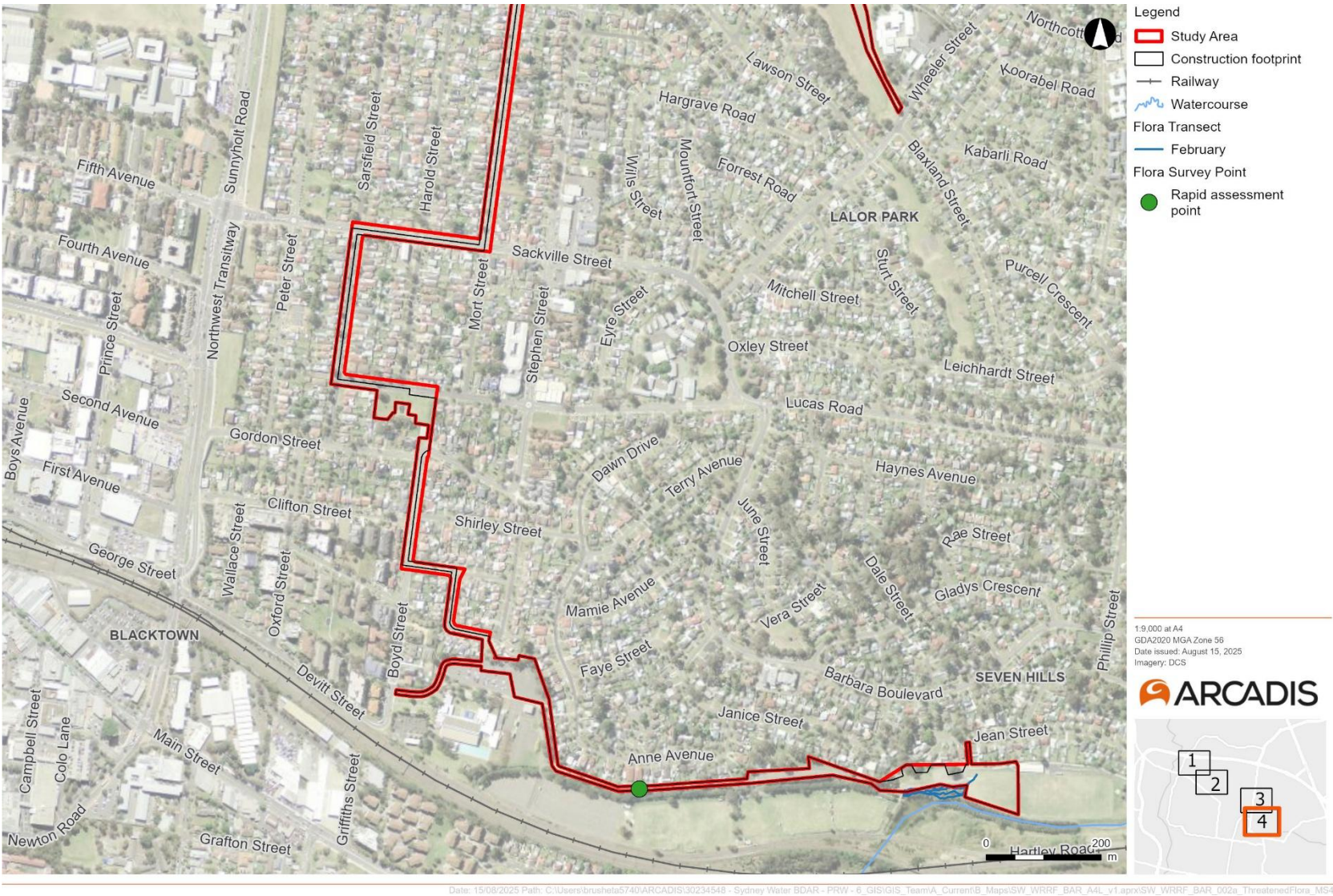


Figure 3-1 Threatened flora survey location and methods (4 of 4)

3.2.2 Threatened fauna surveys

Targeted threatened fauna surveys were undertaken across 15 days from October 2024 to June 2025. Surveys followed the methods outlined in the BAM (DPIE, 2020a) and the following guidelines:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* (DEC, 2004)
- *Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2021b)
- *NSW Survey Guide for Threatened Frogs: a guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE, 2020b)
- *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (DPIE, 2022b)
- *Survey guidelines for Australia's threatened birds: guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (CoA, 2010)
- *Survey guidelines for Australia's threatened mammals: guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (CoA, 2011)
- *The Spot Assessment Technique: A tool for determining localised levels of habitat use by Koalas, Phascolarctos cinereus* (Philips & Callaghan, 2011)

Details of targeted threatened fauna surveys, including survey methods and effort are provided in Table 3-7 below. All fauna survey data was recorded using Field Maps on an iPad, with geographic coordinates, time, date, observer, species observations, and other relevant information such as weather conditions recorded for each survey. Weather data has utilised data collected from Horsley Park Weather Station (station: 067119) which is located approximately 10.5 kilometres from the Study Area.

Table 3-7 Details of threatened fauna surveys including environmental conditions (BoM, 2025a) during threatened species surveys.

Date	Observers	Survey type	Temperature (°C)		Rainfall (mm)	Wind*	
			Min	Max		Direction	Max (km/hr)
18/10/2024	T. Bliss-Henaghan, N. Banks	Diurnal bird survey	14.8	26.1	1.4	SW	48
3/12/2024	T. Bliss-Henaghan, N. Banks	Anabat deployment, diurnal bird surveys	19.5	33.1	0.2	NNW	46
18/12/2024	T. Bliss-Henaghan, N. Banks	Anabat collection, diurnal bird surveys	15.9	23.9	6.0	SSE	44
22/01/2025	T. Bliss-Henaghan, N. Banks	Diurnal bird survey	16.6	38.4	0.4	SSE	31
17/02/2025	T. Bliss-Henaghan, W. Terry	Green and Golden Bell Frog (GGBF) survey, diurnal bird survey,	12.2	24.8	0	SE	30
18/02/2025	W. Terry, A. Jennings	GGBF survey, diurnal bird survey, remote camera deployment, nest box deployment	11.3	28.6	0	E	24
19/02/2025	W. Terry, A. Jennings	GGBF survey, diurnal bird survey, remote	14.7	27.4	0	ESE	37

Date	Observers	Survey type	Temperature (°C)		Rainfall (mm)	Wind*	
			Min	Max		Direction	Max (km/hr)
		camera deployment, nest box deployment					
20/02/2025	W. Terry, E. Teusner	GGBF survey, diurnal bird survey, remote camera deployment	18.4	22.8	0	S	33
20/03/2025	T. Bliss-Henaghan, A. Jennings	GGBF survey, spotlighting, remote camera collection, nest box check	17.5	33.9	0	E	26
24/03/2025	A. Jennings, E. Cleghorn	Nest box check	18.6	25.9	3.0	NNE	19
26/03/2025	T. Bliss-Henaghan, D. James	GGBF survey, spotlighting	18.4	28.3	1.4	NE	24
27/03/2025	N. Banks, A. Jennings	GGBF survey, spotlighting	16.3	26.2	0	E	26
14/04/2025	A. Jennings, E. Teusner	SAT surveys for Koalas, nest box check	13.1	29.0	0	SSE	43
02/06/2025	N. Banks, T. Bliss-Henaghan	Spotlighting	7.2	17.3	0.2	SW	9
05/06/2025	E. Teusner, K. Mauger	SAT surveys for Koalas	7.1	17.2	0	WSW	30

*Max wind speed does not reflect wind at time of survey

Only species which were determined to have a moderate or higher likelihood to occur following habitat assessments were targeted (Appendix D). Where possible, where project timeframes allowed, targeted surveys were undertaken to meet the seasonal survey requirements of target species as identified on the TBDC (NSW DCCEEW, 2025e). These species and their recommended survey window have been included in Table 3-6. Additionally, the locations of surveys completed within the Study Area have been shown in Figure 3-2.

Diurnal bird surveys

Diurnal bird surveys were conducted across the Study Area and involved area searches or walking transects in areas of suitable habitat (determined through habitat assessment surveys) to detect threatened and non-threatened birds. Area searches were conducted whilst undertaking habitat assessments across the Study Area; and were undertaken at a pace of 20 minutes per 2 hectares. Walking transects were conducted within the first three hours following sunrise, or within two hours of sunset and involved slowly traversing the Study Area on foot, recording all species detected through call or visual observation (e.g. through binoculars). All bird species detected by visual observation or call were noted and have been presented in Appendix A. The location of any threatened species detected was also recorded on a ESRI enabled iPad.

Spotlighting

Spotlighting was used to target threatened nocturnal mammals and birds including threatened forest owls and threatened gliders. Spotlighting transects were conducted over four nights between 20 March and the 2 June 2025. Spotlighting was completed by a pair of ecologists, commencing a minimum of 30 minutes after last light. The surveys were conducted on foot using high-powered hand torches, and binoculars. When targeting birds and mammals, a thermal monocular was also used

during some transects to improve detectability of species in vegetation. Spotlighting transects were undertaken at a pace of 2 hours per 500 metres. Locations of threatened species encountered were recorded and transects were streamed using Field Maps on an iPad. Spotlighting survey effort is shown below in Figure 3-2.

Spot Assessment Technique (SAT)

The SAT (Spot Assessment Technique; (Philips & Callaghan, 2011) survey method was used to identify the presence of Koalas within the Study Area. Survey locations were determined utilising the methodology outlined in the Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPIE, 2022b). Suitable habitat for Koala includes associated PCTs (as listed in the species profile in the Threatened Biodiversity Database Collection (TBDC)), and Koala use tree species (as listed for the Central Coast Koala Management Areas in the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (DPIE, 2021a)).

SAT surveys were conducted in accordance with the method prescribed by Steve Phillips and John Callaghan (2011) as summarised below:

- A central tree that meets one or more of the following selection criteria was located:
 - A tree of any species beneath which one or more Koala faecal pellets have been observed, and/or
 - A tree in which a Koala has been observed, and/or
 - A Koala use tree species, being any other tree known or considered to be potentially important for Koala, or of interest for other assessment purposes.
- Selecting an additional 29 trees in proximity to the central tree that have a minimum diameter at breast height of over 100 millimetres.
- An average of 2-minute search for faecal pellets was undertaken carried out beneath each of the 30 identified trees. This involved an inspection of the undisturbed ground surface within 100 centimetres around the base of each tree, followed by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.

A total of seven SAT surveys were undertaken within the Study Area. SAT survey effort is shown below in Figure 3-2.

Aural-visual frog surveys

Aquatic habitat assessments were conducted throughout the Study Area to identify watercourses or other habitat features suitable for threatened amphibians. Potential habitat was identified for Green and Golden Bell Frogs (*Litoria aurea*) (GGBF), through the presence of emergent aquatic vegetation and slow moving or still water (CoA, 2009). Four locations were determined to contain potential habitat of GGBF:

- Breakfast Creek between Quakers Hill WRRF and Falmouth Road (Site 1),
- Breakfast Creek as it flows past Harvey Park (Site 2),
- A patch of emergent vegetation surrounding a water body at Cavanagh Reserve (Site 3), and
- A man-made water channel along the Boyd Street Reserve or International Peace Park (Site 4).

Green and Golden Bell Frog detectability is tied with their breeding season, as they are most commonly detected from their loud breeding call. This breeding window is from December – March with best detectability after rainfall. Survey effort involved call-playback surveys which includes playing the frogs call for 2-minute intervals followed by a two-minute listening period and spotlighting as well as active searches along the edges of the waterbodies and within vegetation fringing the waterbody. Spotlighting survey effort and call play backs locations are shown in Figure 3-2. Call Play backs were conducted across seven dates with four repeats at each site between February and March 2025 in line with the *Survey Guide for Threatened Frogs* (DPIE, 2020b).

Remote cameras

Four remote motion-sensing infra-red cameras were deployed within the Study Area, targeting arboreal mammals. Remote camera traps were deployed in areas of native vegetation identified as containing habitat for the target species specifically Squirrel Gliders (*Petaurus norfolcensis*) and Eastern Pygmy Possum (*Cercartetus nanus*) as well as Koala (*Phascolarctos cinereus*). Remote cameras were installed on trees, focusing on a bait canister positioned on an adjacent tree. Bait balls made of peanut butter, oats, and honey were placed into the bait containers to lure target species (Plate 3-2). Locations of remote camera deployment are shown in Figure 3-2.



Plate 3-2 Example of remote camera deployment in the Study Area

Nest boxes

Four nest boxes targeting Eastern Pygmy-possum were deployed in areas of suitable habitat in and near the Study Area (Figure 3-2). Pygmy-possum boxes were installed at breast height, on mature trees in areas with a dense shrub layer where possible (Plate 3-3). Nest boxes were deployed on February 18 and 20. Nest boxes were checked for signs of occupation on the three occasions (March 20 and 24 as well as on May 14), two of which were within their October-March survey window.



Plate 3-3 Examples of Pygmy-possum nest box deployment throughout the Study Area

Microbat surveys and roosting habitat assessments

During preliminary habitat assessments, potential microbat roosting habitat was identified for further survey. A passive ultrasonic call detector (Anabat) was deployed just outside the Study Area,

adjacent to the Quakers Hill WRRF (Figure 3-2). This deployment used an 'Anabat Chorus' (Titley Pty Ltd) and was deployed within suitable habitat (Plate 3-4); to target threatened microchiropteran (microbat) species, including Large-eared Pied Bat (*Chalinolobus dwyeri*), Southern Myotis (*Myotis macropus*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Little Bent-winged Bat (*Miniopterus australis*). This device was deployed from 3 December until 18 December 2024, for 15 trap nights.



Plate 3-4 Anabat deployment.

Snail surveys

Surveys for Cumberland Plain Land Snail (*Meridolum carneovirens*) consisted of diurnal and nocturnal searches in accordance with the TBDC (DPE, 2025b). Diurnal searches consisted of meandering transects across suitable habitat to locate empty shells and were done in conjunction with Koala SAT surveys. Leaf litter at the base of large Eucalypts was also searched for shells while searching for Koala scats. Nocturnal surveys were conducted when the top soil and leaf litter were moist, in warm weather following rain, similarly to diurnal surveys this consisted of meandering transects across suitable habitat, spotlighting along the ground for live individuals and for glistening reflections from snail residue trails. Weather conditions leading up to and during snail surveys can be viewed below Table 3-8. Survey days have been bolded. Locations of snail surveys are shown in Figure 3-2.

Table 3-8 Weather conditions leading up to and during snail surveys (Horsley Park Weather Station (station: 067119))

Date	Observers	Temperature (°C)		Rainfall (mm)	Wind	
		Min	Max		Direction	Max (km/hr)
18/03/2025	-	13.0	25.1	0	SE	26
19/03/2025	-	15.5	30.1	0	ENE	28
20/03/2025	T. Bliss-Henaghan, A. Jennings	17.5	33.9	0	E	26
24/03/2025	-	18.6	25.9	3.0	NNE	19
25/03/2025	-	19.0	26.8	0	E	30
26/03/2025	T. Bliss-Henaghan, D. James	18.4	28.3	1.4	NE	24
27/03/2025	N. Banks, A Jennings	16.3	26.2	0	E	26
12/04/2025	-	17.5	26.7	0	E	26
13/04/2025	-	14.5	27.3	0.2	NNE	22
14/04/2025	A. Jennings, E. Teusner	13.1	29.0	0	SSE	43
30/05/2025	-	14.4	18.7	8.4	SSW	41

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Date	Observers	Temperature (°C)		Rainfall (mm)	Wind	
		Min	Max		Direction	Max (km/hr)
01/06/2025	-	5.9	19.7	0	NE	20
02/06/2025	N. Banks, T. Bliss-Henaghan	7.2	17.3	0.2	SW	9
03/06/2025	-	8.3	19.1	0	S	28
04/06/2025	-	8.8	14.8	0	SSW	46
05/06/2025	E. Teusner, K. Mauger	7.1	17.2	0	WSW	30

Table 3-9 Targeted threatened fauna species

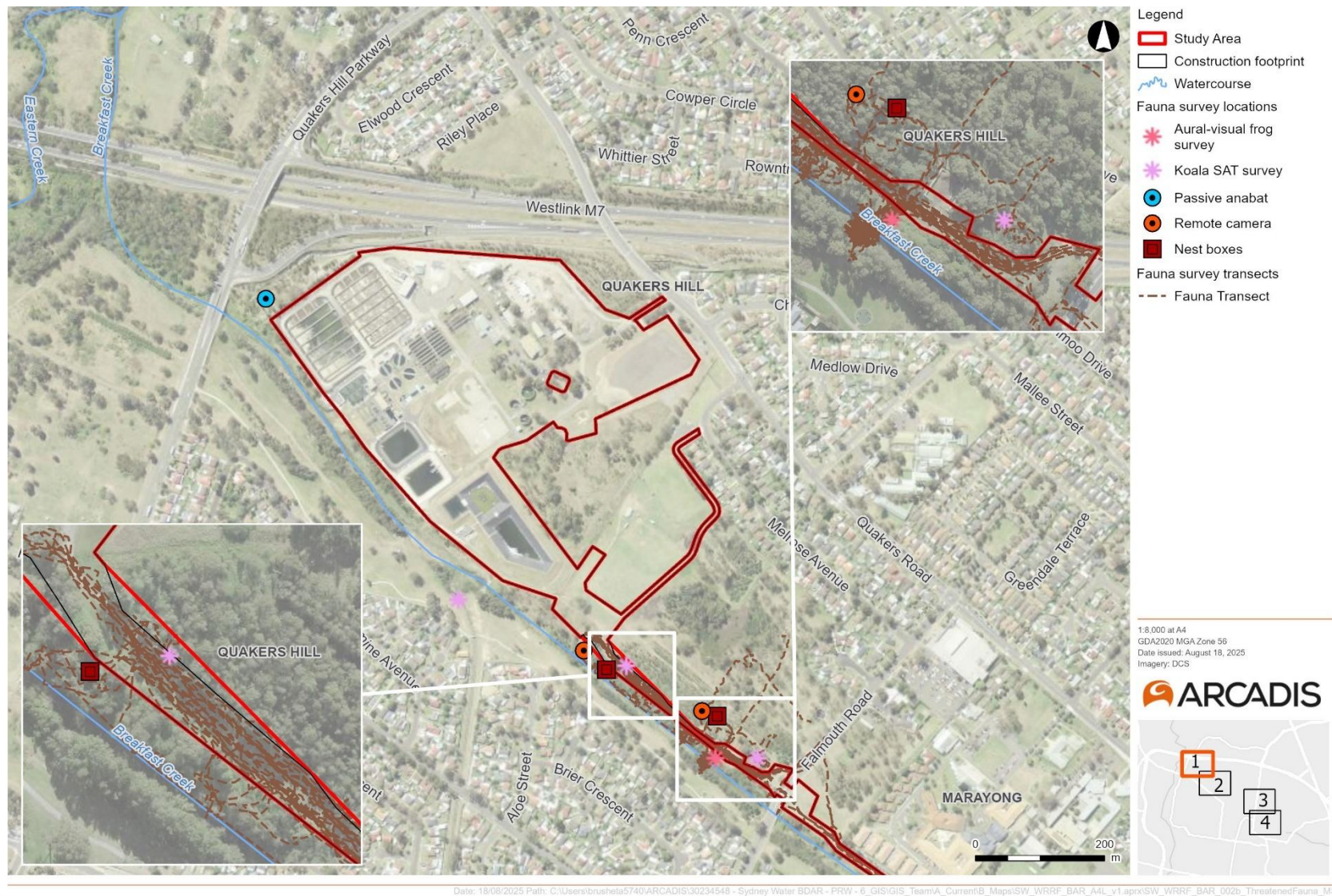
Species	Listing status	Recommended survey method as per the BAM or other guidelines	Seasonal requirement (NSW DCCEEW, 2025e)	Surveys undertaken as part of the detailed site investigation	PCTs that offer potential habitat to target species
<i>Anthochaera phrygia</i> Regent Honeyeater	BC Act: CE EPBC Act: CE	Assumed present for all areas mapped on Important Habitat Mapping (NSW DCCEEW, 2025a) Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Study Area not mapped on IHM Diurnal bird surveys	3320, 4023, 4025
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys	3320, 3975, 4023, 4025
<i>Botaurus poiciloptilus</i> Australasian Bittern	BC Act: E EPBC Act: E	Surveying in breeding season is best as species relatively cryptic but call when breeding but water must be present	Year-round	Diurnal bird surveys	3975, 4023, 4025
<i>Burhinus grallarius</i> Bush Stone-curlew	BC Act: E EPBC Act: Not listed	Call playback / spotlighting surveys (DEC, 2004)	Year-round	Spotlighting Diurnal bird survey	3320, 3975, 4023, 4025
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	BC Act: E EPBC Act: E	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	October – January	Diurnal bird surveys Breeding habitat searches	3320, 3975, 4023, 4025
<i>Calyptorhynchus lathami lathami</i> South-eastern Glossy Black-Cockatoo	BC Act: V EPBC Act: V	Detection by sightings, calls and/or indirect evidence (e.g. foraging signs, moulted feathers). (NSW DCCEEW, 2025e) Avoid wet and windy weather (DEC, 2004).	April – August		3320, 4023, 4025

Species	Listing status	Recommended survey method as per the BAM or other guidelines	Seasonal requirement (NSW DCCEEW, 2025e)	Surveys undertaken as part of the detailed site investigation	PCTs that offer potential habitat to target species
<i>Cercartetus nanus</i> Eastern Pygmy-possum	BC Act: V EPBC Act: Not listed	No species-specific guidelines. Spotlighting repeated at least twice per transect (DEC, 2004). Nest boxes: Deployed for at least three months Invalid source specified.Invalid source specified.	October – March	Nest boxes Remote cameras Spotlighting	3320, 4023, 4025
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	BC Act: E EPBC Act: E	Ultrasonic call detectors deployed in areas of suitable habitat.	November - January	Ultrasonic call recorders (Anabats)	3320, 4023, 4025
<i>Chthonicola sagittata</i> Speckled Warbler	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys	3320, 4023, 4025
<i>Circus assimilis</i> Spotted Harrier	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys Breeding habitat searches	3320, 3975, 4023, 4025
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	BC Act: V EPBC Act: V	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys Breeding habitat searches (hollow bearing trees)	3320, 4023, 4025
<i>Daphoenositta chrysoptera</i> Varied Sittella	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys	3320, 3975, 4023, 4025
<i>Falco subniger</i> Black Falcon	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys	3320, 3975, 4023, 4025

Species	Listing status	Recommended survey method as per the BAM or other guidelines	Seasonal requirement (NSW DCCEEW, 2025e)	Surveys undertaken as part of the detailed site investigation	PCTs that offer potential habitat to target species
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	BC Act: V EPBC Act: Not listed	Ultrasonic call detectors deployed in areas of suitable habitat.	None stated	Ultrasonic call recorders (Anabats)	3320, 4025
<i>Glossopsitta pusilla</i> Little Lorikeet	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	None stated	Diurnal bird surveys	3320, 4023, 4025
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	July – December	Diurnal bird surveys Breeding habitat searches	3320, 3975, 4023, 4025
<i>Hieraaetus morphnoides</i> Little Eagle	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	August - October	Diurnal bird surveys Breeding habitat searches	3320, 3975, 4023, 4025
<i>Hirundapus caudacutus</i> White-throated Needletail	BC Act: V EPBC Act: V	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	N/A	Diurnal bird surveys	3320, 3975, 4023, 4025
<i>Lathamus discolor</i> Swift Parrot	BC Act: E EPBC Act: CE	No survey required – assumed present for all areas mapped on Important Habitat Mapping (NSW DCCEEW, 2025a)	N/A	Diurnal bird surveys	3320, 3975, 4023, 4025
<i>Litoria aurea</i> Green and Golden Bell Frog	BC Act: E EPBC Act: V	Aural-visual surveys: Four repeat transects totalling a minimum of 480 minutes of survey per 500 m of habitat. (DPIE, 2020b)	November – March	Aural-visual nocturnal surveys	3320, 3975, 4023, 4025
<i>Lophoictinia isura</i> Square-tailed Kite	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	September - January	Diurnal bird surveys Breeding habitat searches	3320, 3975, 4023, 4025

Species	Listing status	Recommended survey method as per the BAM or other guidelines	Seasonal requirement (NSW DCCEEW, 2025e)	Surveys undertaken as part of the detailed site investigation	PCTs that offer potential habitat to target species
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	BC Act: E EPBC Act: Not listed	Diurnal and nocturnal meandering transects in all areas of suitable habitat (NSW DCCEEW, 2025e)	Year-round	Diurnal searches Nocturnal transects	3320, 4025
<i>Micronomus norfolkensis</i> Eastern Coastal Free-tailed Bat	BC Act: V EPBC Act: Not listed	Ultrasonic call detectors deployed in areas of suitable habitat (DPIE, 2021b)	N/A	Ultrasonic call recorders (Anabats)	3320, 3975, 4023, 4025
<i>Miniopterus australis</i> Little Bent-winged Bat	BC Act: V EPBC Act: Not listed		December - February		3320, 3975, 4023, 4025
<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat	BC Act: V EPBC Act: Not listed				3320, 3975, 4023, 4025
<i>Myotis macropus</i> Southern Myotis	BC Act: V EPBC Act: Not listed				3320, 3975, 4023, 4025
<i>Ninox connivens</i> Barking Owl	BC Act: V EPBC Act: Not listed	Call playback and spotlighting surveys repeated for 6 nights. Required effort is one site every 1500 metres, up to 10 sites per 1000 hectares of habitat (NSW DCCEEW, 2025e)	Year-round	Spotlighting Breeding habitat searches	3320, 3975, 4023, 4025
<i>Ninox strenua</i> Powerful Owl	BC Act: V EPBC Act: Not listed	Call playback and spotlighting surveys repeated for 6 nights. Required effort is one site every 1500 metres, up to 10 sites per 1000 hectares of habitat (NSW DCCEEW, 2025e)	Year-round	Spotlighting Breeding habitat searches	3320, 4023, 4025
<i>Neophema pulchella</i> Turquoise Parrot	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	N/A	Diurnal bird surveys,	3320, 3975, 4023, 4025

Species	Listing status	Recommended survey method as per the BAM or other guidelines	Seasonal requirement (NSW DCCEEW, 2025e)	Surveys undertaken as part of the detailed site investigation	PCTs that offer potential habitat to target species
<i>Pandion cristatus</i> Eastern Osprey	BC Act: V EPBC Act: Not listed	Diurnal area searches which may comprise transects or 20 min point surveys in areas of suitable habitat. (CoA, 2010)	April – November	Diurnal bird surveys Breeding habitat searches	3320, 3975, 4023, 4025
<i>Petaurus norfolcensis</i> Squirrel Glider	BC Act: V EPBC Act: Not listed	Spotlighting: Two 200 metre transects per 5-hectare site. Survey effort split between two separate nights where possible (CoA, 2011). Avoid wet and windy weather (DEC, 2004).	Year-round	Spotlighting Remote cameras	3320, 4023, 4025
<i>Phascolarctos cinereus</i> Koala	BC Act: E EPBC Act: E	Spot Assessment Technique: 150 m spacing for sites ≤50 ha. Spotlighting: For suitable habitat ≥5 ha, two 200 m transects are required for every 5 ha of habitat. Repeat transects twice at a pace of 100 m per 10 minutes.	Year-round	SAT surveys Spotlighting Remote cameras	3320, 4023, 4025
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	BC Act: V EPBC Act: V	Search for camps or roosting habitat. (NSW DCCEEW, 2025e)	N/A	N/A	3320, 3975, 4023, 4025
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	BC Act: V EPBC Act: Not listed	Ultrasonic call detectors deployed in areas of suitable habitat.	N/A	Ultrasonic call recorders (Anabats)	3320, 4025
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	BC Act: V EPBC Act: Not listed				3320, 4023, 4025
<i>Tyto novaehollandiae</i> Masked Owl	BC Act: V EPBC Act: Not listed	Call playback and spotlighting surveys repeated for 6 nights. Required effort is one site every 1500 metres, up to 10 sites per 1000 hectares of habitat (NSW DCCEEW, 2025e)	Year-round	Spotlighting Breeding habitat searches	3320, 3975, 4023, 4025



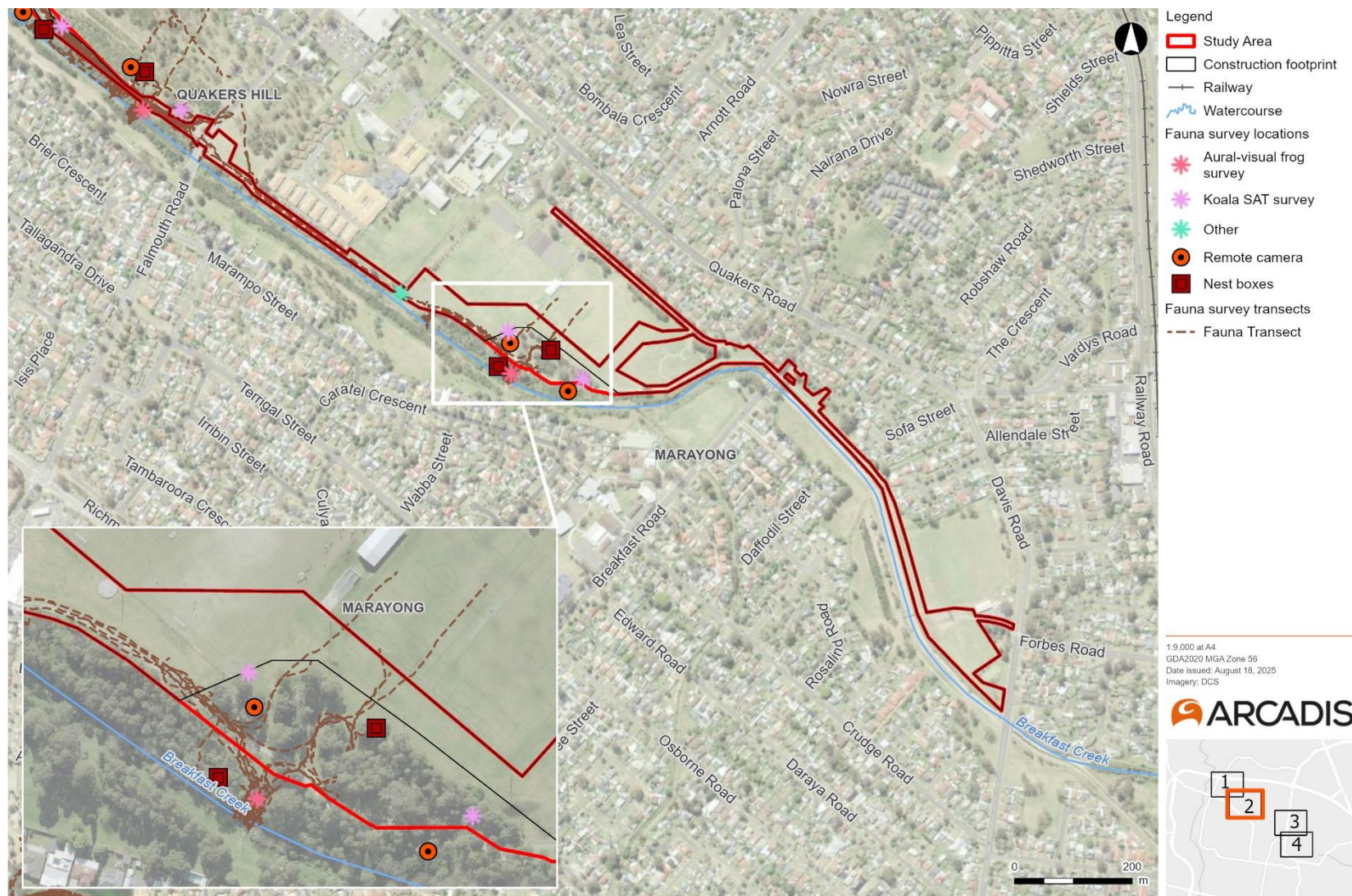


Figure 3-2 Threatened fauna survey locations and methods (2 of 4).



Figure 3-2 Threatened fauna survey locations and methods (3 of 4).

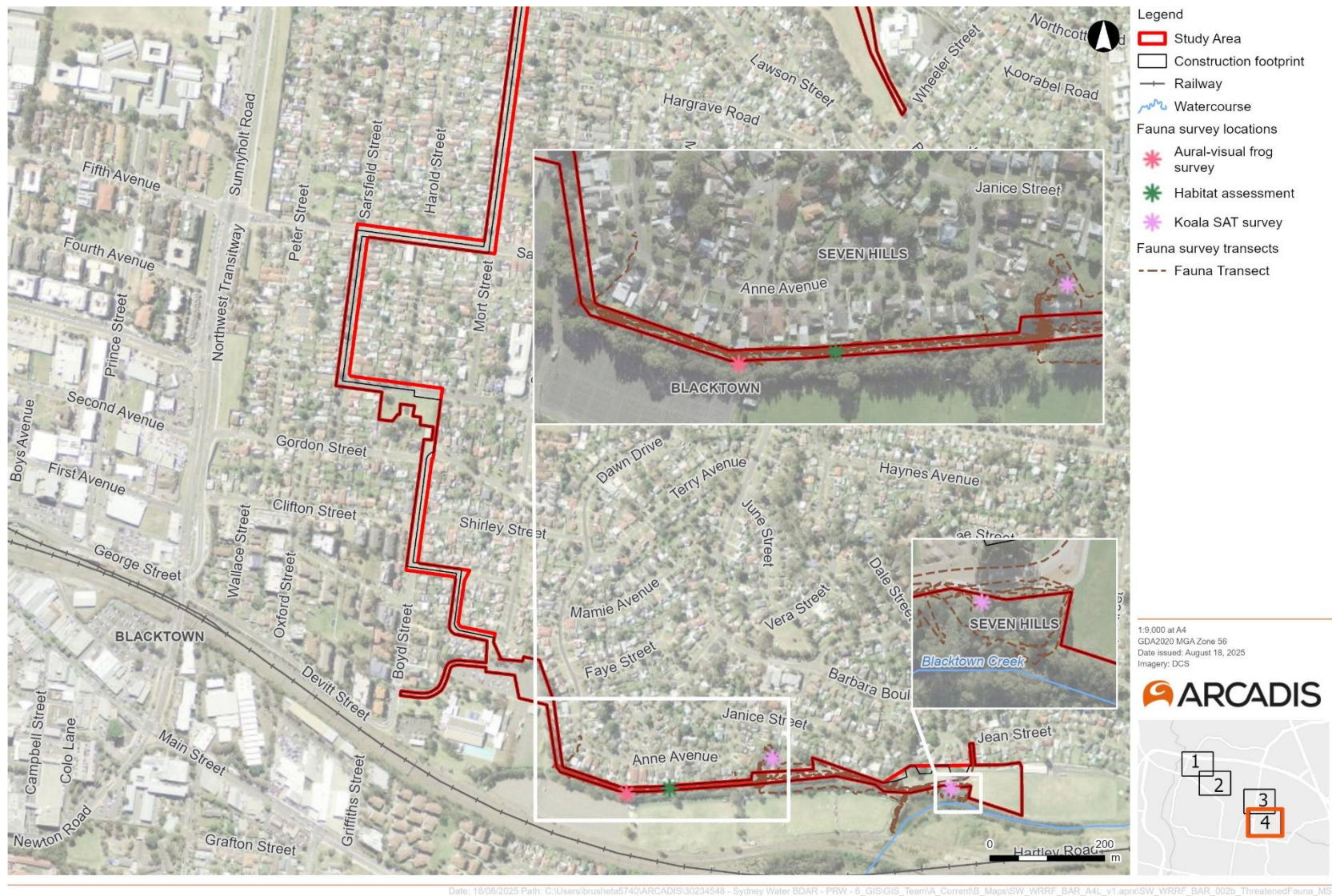


Figure 3-2 Threatened fauna survey locations and methods (4 of 4).

3.2.3 Survey limitations

Field survey and survey effort was conducted to meet relevant survey guidelines, including the Biodiversity Assessment Method for threatened species considered to have a moderate or higher likelihood to occur after field survey and habitat assessment.

The profile for each threatened species within the TBDC lists the suitable months to survey the species according to when they are most detectable. As some species are only present or apparent at certain times of the year (e.g. migratory birds), species recorded in the Study Area should be treated as an indication of species presence at the time of the survey, not a fully comprehensive list. Further, some species require specific conditions for optimum detection such as peak activity periods for fauna correlating with weather conditions. Surveys were conducted aligned with weather condition guidelines as much as feasible.

The conclusions of this report are based upon available data and field surveys and are therefore indicative of the environmental condition of the Study Area at the time of the survey. It should be recognised that conditions, including the presence of threatened species, could change with time. To address this limitation, a precautionary approach has been used which aimed to identify the presence and suitability of the habitat for threatened species (Appendix C; Appendix D; Appendix E).

4 RESULTS

The results of desktop assessment and field investigations for the Study Area are presented in this chapter.

4.1 Landscape features

4.1.1 IBRA Bioregion

The Study Area is located within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and within the Cumberland IBRA subregion (Figure 4-1).

4.1.2 Soil landscape

The Study Area is located in the Blacktown Residual (9030bt) and South Creek Alluvial (9030sc) soil landscapes, adjacent to Luddenham (9030lu) (Figure 4-1).

Blacktown Residual (9030bt) soil landscapes are characterised by gently undulating rises on Wianamatta. The soils are shallow to moderately deep (>100 cm) hard setting mottled texture contrast soils, Red and Brown Podzolic Soils on crests grading to Yellow Podzolic Soils on lower slopes and in drainage lines. This soil landscape is limited by localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.

South Creek Alluvial (9030sc) soils are in a floodplain landscape with valley flats and drainage depressions of the channels on the Cumberland Plain. These are usually flat with incised channels; mainly cleared. The soils are often very deep layered sediments over bedrock or relict soils. Where pedogenesis has occurred Structured Plastic Clays or Structured Loams in and immediately adjacent to drainage lines; Red and Yellow Podzolic Soils are most common terraces with small areas of Structured Grey Clays, leached clays and Yellow Solodic Soils. This soil landscape is prone to seasonal waterlogging, localised permanently high-water tables, localised water erosion hazard, localised surface movement potential.

Luddenham (9030lu) Soil landscapes are characterised by undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone.

4.1.3 NSW landscape regions (Mitchell Landscapes)

NSW landscape regions, known informally as Mitchell Landscapes, were developed for conservation planning and reserve establishment purposes to provide consistent statewide ecological units finer than bioregions and subregions. Each Mitchell Landscape describes the topography, soils, and vegetation typical of the landscape (Figure 4-1). The Study Area is located across the Cumberland Plain Mitchell Landscapes (DPIE, 2016b) and adjacent to Hawkesbury and Nepean Channels and Floodplains at Quakers Hill.

The Cumberland Plain Mitchell Landscape, which covers the entirety of the Study Area is characterised by low rolling hills and valleys in a rain shadow area between the Blue Mountains and the coast on horizontal Triassic shales and lithic sandstones forming a down-warped block on the coastal side of the Lapstone monocline. Intruded by a small number of volcanic vents and partly covered by Tertiary River gravels and sands (Hawkesbury-Nepean Terrace Gravels landscape). Woodlands and open forest of grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*), narrow-leaved ironbark (*Eucalyptus crebra*), thin-leaved stringybark (*Eucalyptus eugenioides*), cabbage gum (*Eucalyptus amplifolia*) and broad-leaved apple (*Angophora subvelutina*) are typical in this landscape region and are largely consistent with what was identified within the Study Area.

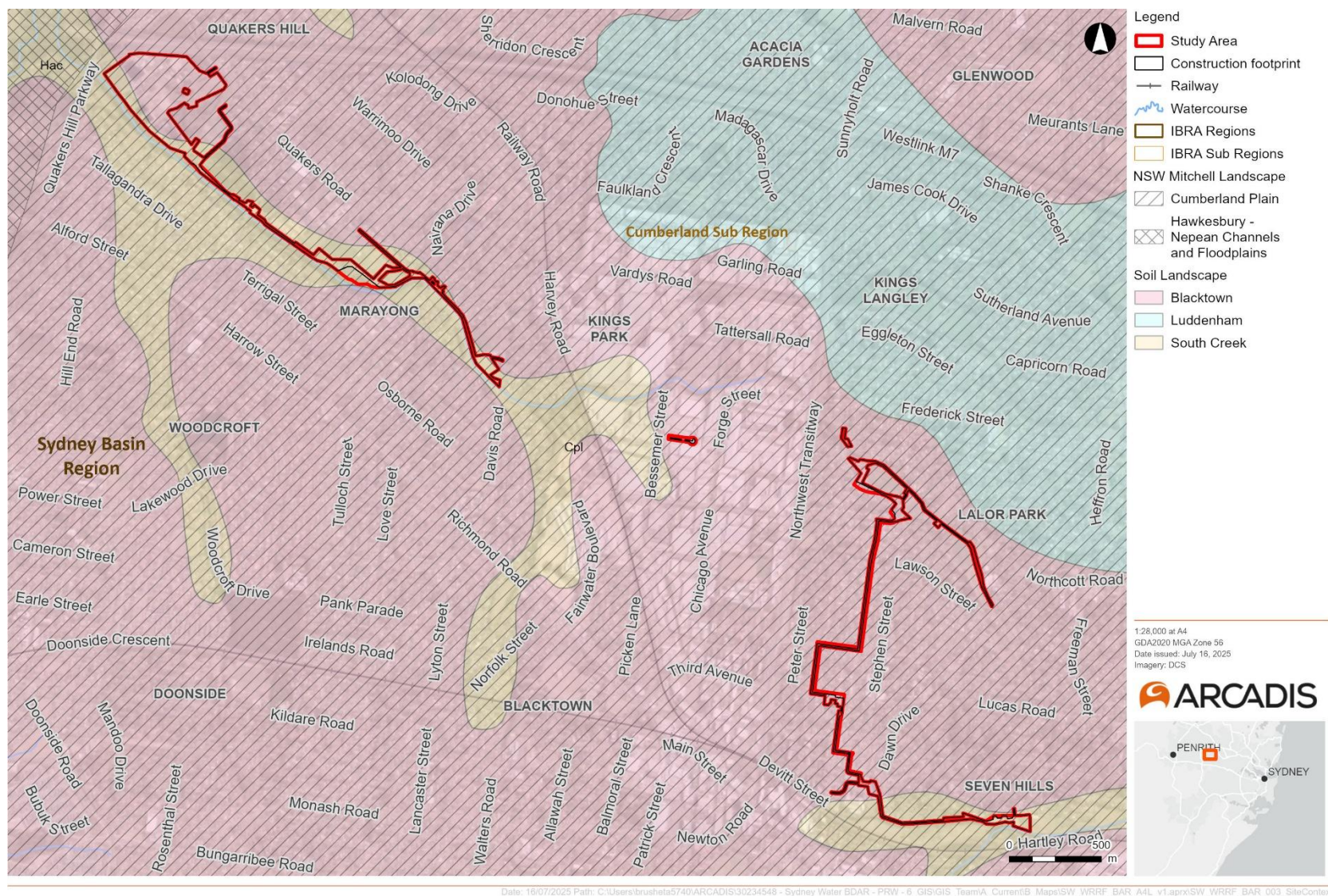


Figure 4-1 Site Context, including IBRA region and subregion, Mitchell Landscape and Soil Landscape across the Study Area and construction footprint

4.2 Vegetation types

4.2.1 State Vegetation Type Mapping (DPE 2022)

Two Plant Community Types have been mapped by the NSW State Vegetation Type Map (SVTM) (NSW DCCEEW, 2025c) as occurring within the Study Area – *PCT 3320: Cumberland Shale Plains Woodland* and *PCT 4025: Cumberland Red Gum River-flat Forest*. These PCTs and their associated Threatened Ecological Communities are shown in Table 4-1.

Table 4-1 Vegetation communities mapped in the Study Area from the SVTM (DPE 2024) and associated Threatened Ecological Communities (NSW DCCEEW, 2025b)

PCT ID	PCT name	Associated Threatened Ecological Communities	
		<i>Biodiversity Conservation Act, 2016</i>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
3320	Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically endangered	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest – Critically endangered
4025	Cumberland Red Gum River-flat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – Endangered	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – Critically endangered

4.2.2 Ground-truthed vegetation types

Following ground-truthing surveys a total of 2.87 hectares within the Study Area was identified to support native vegetation which conforms to four distinct PCTs. These PCTs, their associated TECs and area within the Study Area is summarised in Table 4-2, with their extents illustrated in Figure 4-2.

Two additional PCTs, PCT 4023 and PCT 3975, were ground-truthed to occur within the Study Area, despite not being mapped on the SVTM. PCT 4023 occupies low points in the landscape, including creek lines and has a similar floristic composition to PCT 4025 which has been mapped on the SVTM. PCT 4025 commonly grades into PCT 4023 towards drainage line, as the canopy changes to *Casuarina glauca* (Swamp Oak) dominated, from *Eucalypt* dominated. PCT 3975 has been assigned as a best-fit PCT, despite the vegetation likely resulting from the presence of a man-made drainage line and not remnant vegetation.

Table 4-2 Plant Community Types identified within the Study Area

PCT ID	PCT name	Area within the Study Area	Associated Threatened Ecological Communities*	
			<i>Biodiversity Conservation Act, 2016</i>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
3320	Cumberland Shale Plains Woodland	1.08 ha	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC

PCT ID	PCT name	Area within the Study Area	Associated Threatened Ecological Communities*	
			Biodiversity Conservation Act, 2016	Environment Protection and Biodiversity Conservation Act 1999
3975	Southern Lower Floodplain Freshwater Wetland	0.01 ha	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC	n/a
4023	Coastal Valleys Riparian Forest	0.62 ha	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Coast Bioregions EEC	Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland EEC
4025	Cumberland Red Gum River-flat Forest	1.16 ha	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria CEEC

*Plant Community Type association with a Threatened Ecological Community (TEC) does not mean that a PCT is equivalent to that TEC. Additional comparison between the descriptions of the TEC and whether condition thresholds are met (for EPBC listed TECs), as described in the listing advice is required to determine whether a patch of vegetation is equivalent to its associated TEC.

Descriptions of the PCTs present within the Study Area are provided in the following sections. Excerpts from the BioNet Vegetation Classification profile are presented for each of the PCTs identified within the Study Area to provide a baseline for a 'typical' occurrence of the PCT. Following the BioNet profile, descriptions are provided of the PCT as observed within the Study Area. Descriptions of the planted native vegetation and exotic vegetation observed within the Study Area are also provided in Section 4.4.

The remaining area within the Study Area supports vegetation that does not conform to a described PCT and built assets including roads, buildings, cleared areas, miscellaneous facilities and infrastructure. Non-PCT vegetation has been further categorised into the following: mixed exotic and native vegetation, exotic grassland and weeds. A description of these non-PCT vegetation types has been included in Section 4.4.

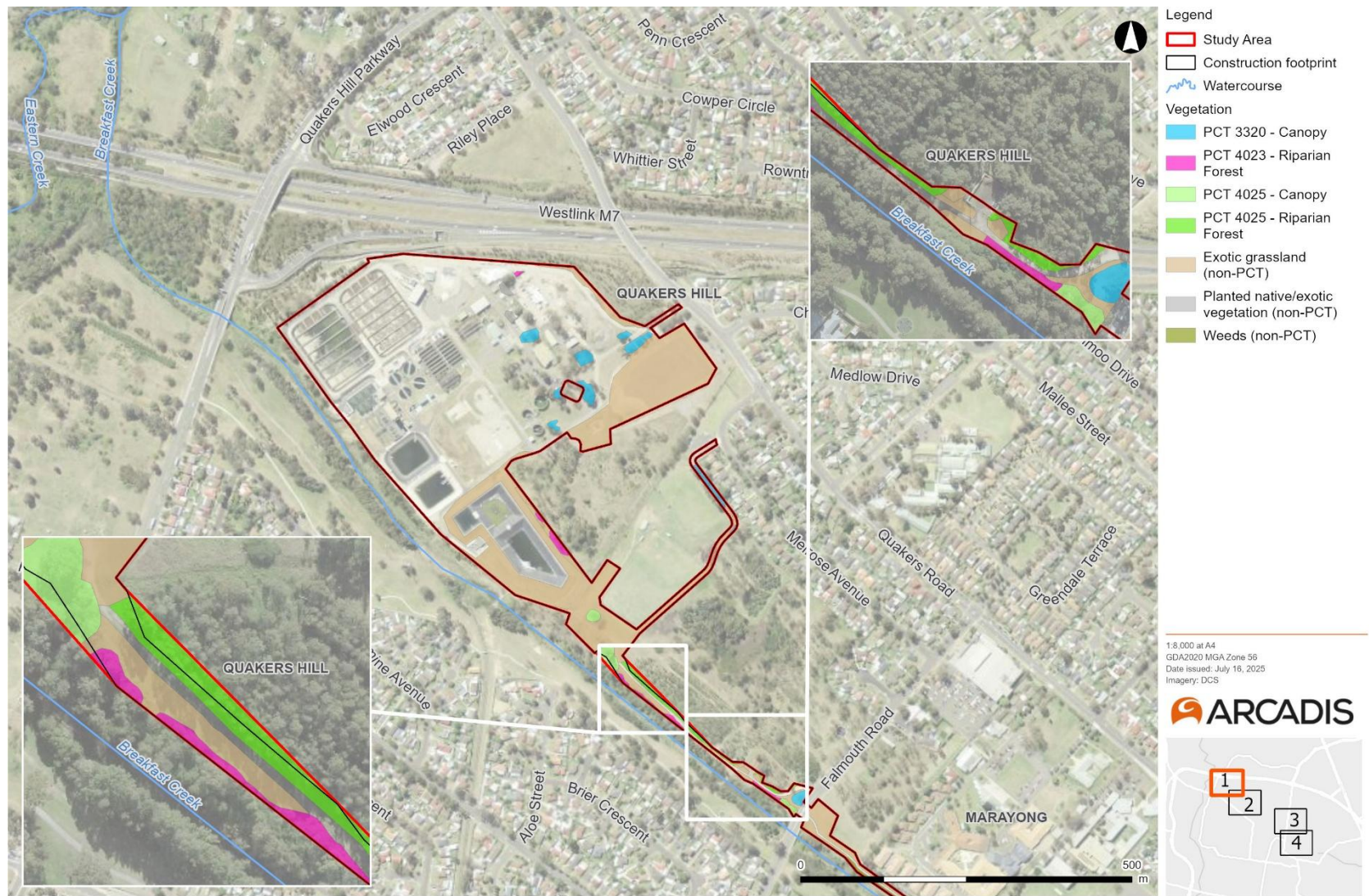


Figure 4-2 Ground-truthed vegetation and Plant Community Types (PCT) within the Study Area and construction footprint (1 of 4)

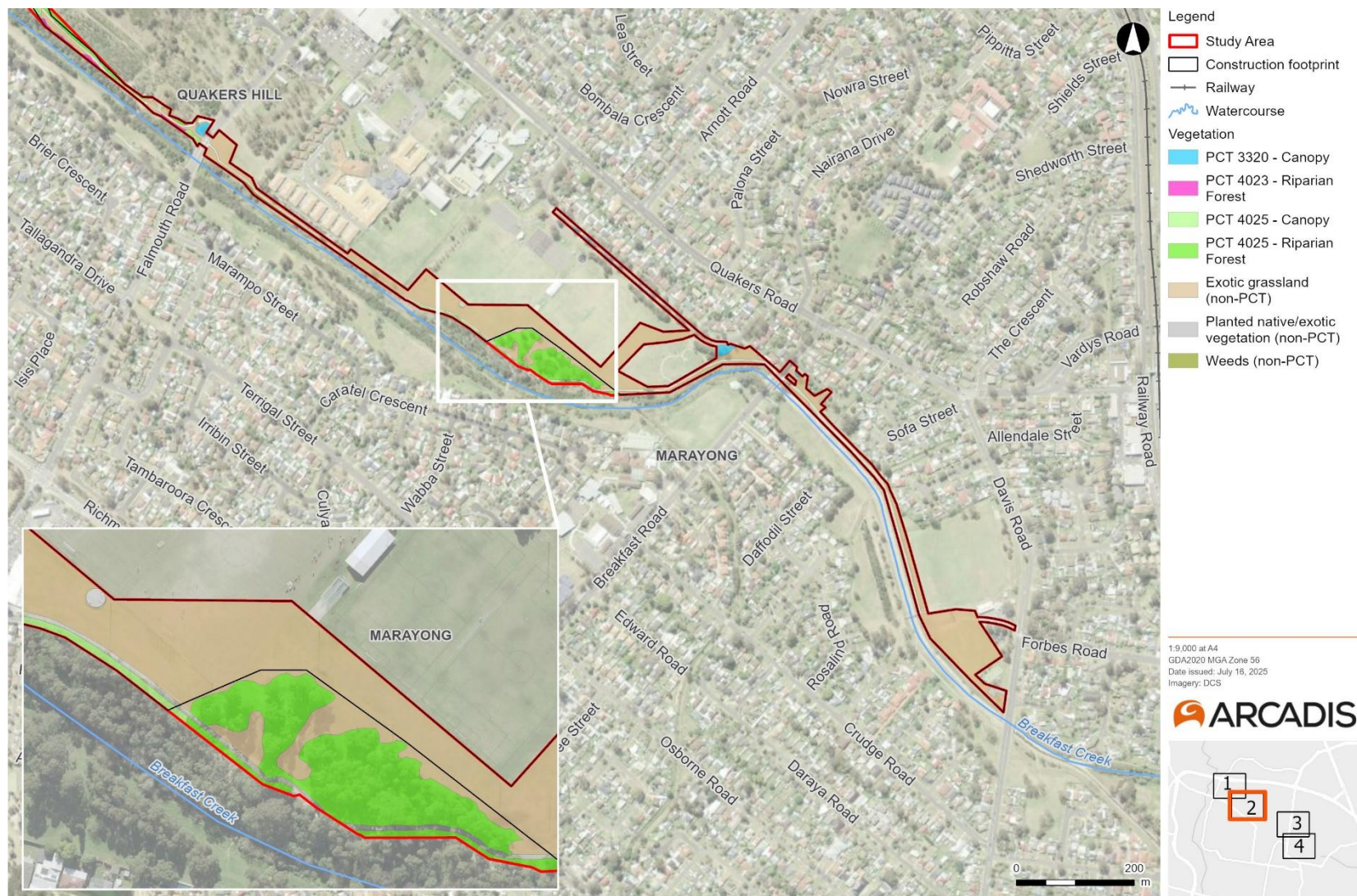
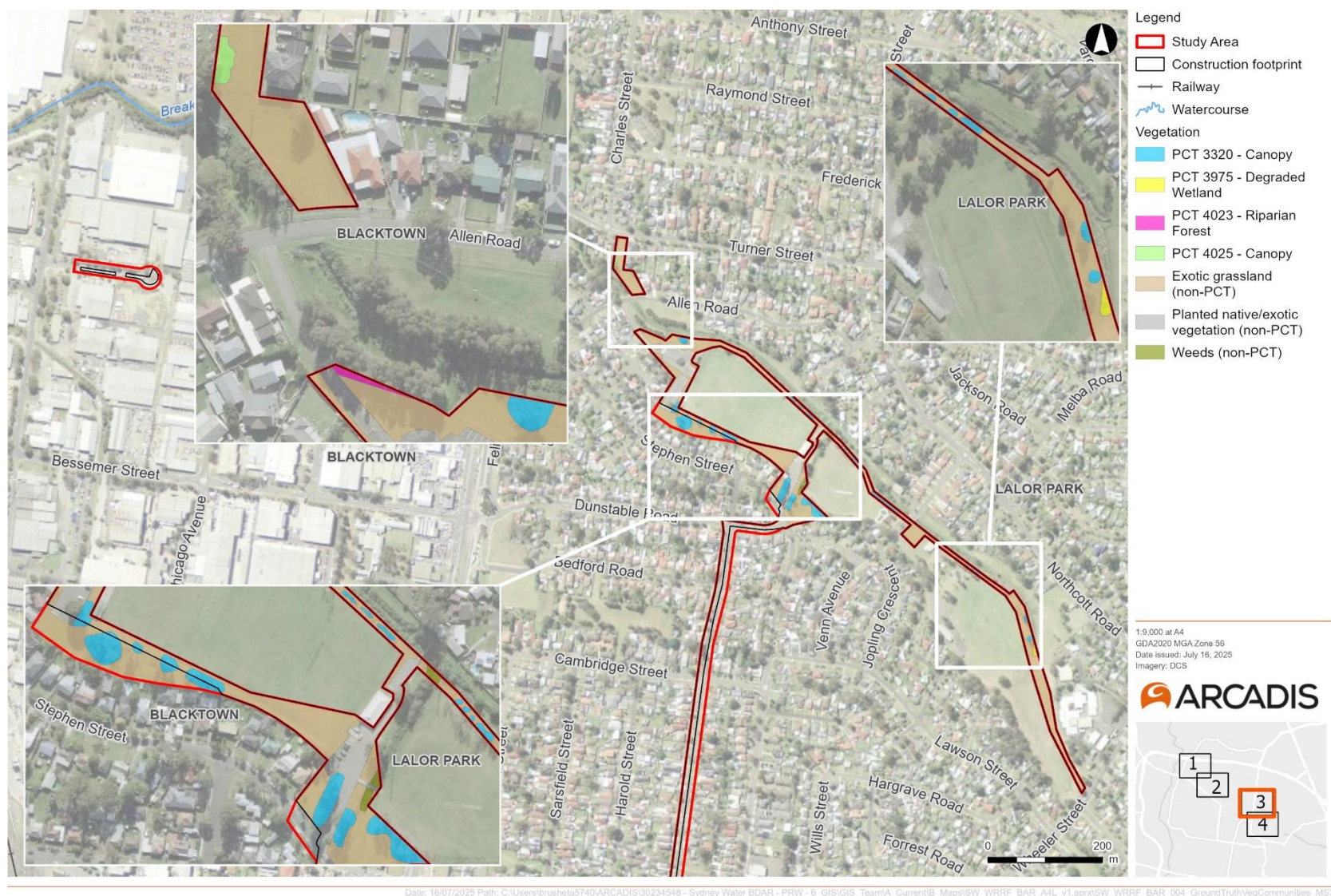


Figure 4-2 Ground-truthed vegetation and Plant Community Types (PCT) within the Study Area and construction footprint (2 of 4)



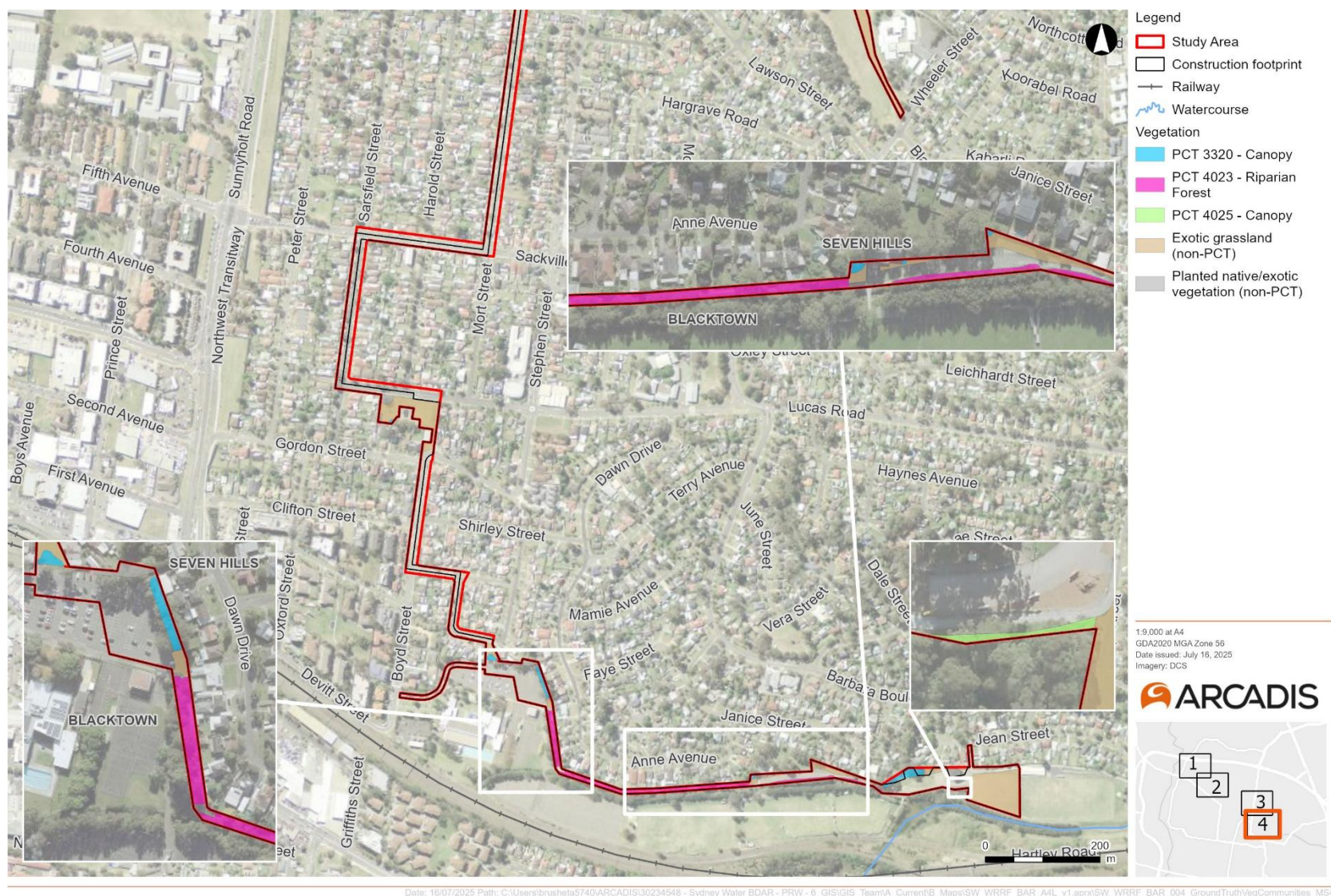


Figure 4-2 Ground-truthed vegetation and Plant Community Types (PCT) within the Study Area and construction footprint (4 of 4)

4.2.3 PCT 3320 – Cumberland Shale Plains Woodland

BioNet profile for PCT 3320

The BioNet profile data for PCT 3320 can be viewed below in Table 4-3.

Table 4-3 Attribute information for PCT 3320 in the Study Area

Attribute	PCT 3320 in the Study Area
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
PCT name	Cumberland Shale Plains Woodland
PCT ID	3320
Conservation status	BC Act: Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC) EPBC Act: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CEEC)
Estimate of percent cleared	93.03 %
Vegetation description	A tall sclerophyll open forest or woodland with a sparse mid-stratum of soft-leaved shrubs and small trees with a grassy ground cover on the undulating Wianamatta Group shale plains of western Sydney. The canopy very frequently includes <i>Eucalyptus tereticornis</i> and <i>Eucalyptus moluccana</i> , with ironbarks (<i>Eucalyptus crebra</i> and <i>Eucalyptus fibrosa</i>) occasionally present and sometimes prominent in localised areas. The sparse shrub to small tree layer very frequently includes <i>Bursaria spinosa</i> and one or more species of <i>Acacia</i> , of which <i>Acacia parramattensis</i> , <i>Acacia decurrens</i> and <i>Acacia falcata</i> are the most frequent and abundant. Presence of these <i>Acacia</i> species helps to distinguish this PCT from the related PCT 3319 on rises of the southern Cumberland Plain which typically includes <i>Acacia implexa</i> . The mid-dense ground layer typically includes grasses, forbs, twiners and hardy small ferns. <i>Microlaena stipoides</i> is almost always present and <i>Themeda triandra</i> , <i>Dichondra repens</i> , <i>Brunoniella australis</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Desmodium varians</i> , <i>Aristida vagans</i> and <i>Glycine tabacina</i> are very frequent. This is the most widespread PCT on the Cumberland Plain, occupying much of the plain between Bankstown and the Hawkesbury and Nepean rivers. It typically occurs in a warm, moist climate below 120 metres above sea level (asl) however can occur up to 200 metres asl on the undulating terrain between Douglas Park and Campbelltown to the east of the Nepean River. A northern outlier occurs near Maroota on a small remnant on a narrow shale ridge. While widespread on the main part of the plain, this PCT primarily occurs in small, often disturbed patches within a rural or urban matrix. In the hilly country to the west of the Nepean River, this PCT is replaced by PCT 3319. On thinner shales above sandstone around the periphery of the Cumberland Plain, it grades into PCT 3321. Ironbarks are very frequent and <i>Eucalyptus punctata</i> is common in the canopy of PCT 3321, and <i>Eucalyptus moluccana</i> and <i>Eucalyptus tereticornis</i> are both rare.
Extent in Study Area (ha)	1.08
Species relied upon for PCT identification	<i>Eucalyptus moluccana</i> (Grey Box), <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Eucalyptus amplifolia</i> (Cabbage Gum), <i>Melaleuca linariifolia</i> (Flax-leaved paperbark), <i>Microlaena stipoides</i> (Weeping Grass), <i>Themeda triandra</i>

Attribute	PCT 3320 in the Study Area
	(Kangaroo grass), <i>Carex inversa</i> (Knob sedge), <i>Dichondra repens</i> (Kidney Weed), <i>Oxalis perennans</i> and <i>Einadia nutans</i> (Climbing Saltbush).

Justification of PCT selection

A total of 1.08 hectares of PCT 3320 occurs in the Study Area spread across Quakers Hill WRRF, with small patches at Melrose Park adjacent to Falmouth Road, at Benalla Crescent, adjacent to Lynwood Park and at the International Peace Park (Figure 4-2). Within the Study Area this PCT occurs in a degraded state, characterised by canopy trees and an absence of native understorey vegetation (Plate 4-1).



Plate 4-1 PCT 3320 within the Study Area

PCT 3320 is mapped as occurring in the Study Area on the SVTM and was selected as the best-fit due to having a geographic distribution, landscape position and species assemblage which is consistent with that described in Table 4-3. Patches of this assemblage occupy an undulating landscape which ranges in elevation from 120 to 200 above sea level (asl) and is predominately mapped as the Blacktown soil landscape (DPE, 2025), which has a composition of Wianamatta Group shales. This landscape characteristics are consistent with that described for PCT 3320. Further the vegetation assemblage has a floristic composition which is consistent with the description of PCT 3320 with a canopy co-dominated by *Eucalyptus moluccana* and *Eucalyptus tereticornis*.

Alignment with BC Act listed TECs

PCT 3320 is associated with the Critically Endangered Ecological Community (CEEC) Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW) as listed under the BC Act.

Assemblages of PCT 3320 within the Study Area has been compared against the diagnostic characteristics of CPW, as described in the Scientific Committee Final determination. CPW is a typically an 'open grassy woodland an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small tree'. However, the community also includes 'derived' native grasslands which result from removal of the woody strata from the woodlands and forests' (NSW Scientific Committee, 2009).

When comparing the patches of PCT 3220 in the Study Area to the description of CPW, it was determined all assemblages are equivalent to the CEEC (NSW Scientific Committee, 2009) due to the presence of the key diagnostic tree species Grey Box and Forest Red Gum. Therefore, the total area of CPW in the Study Area equates to 1.08 hectares (Figure 4-3).

Alignment with EPBC Act listed TECs

PCT 3320 is associated with the Critically Endangered Ecological Community (CEEC) Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPSWSGTF) as listed under the EPBC Act. Assemblages of PCT 3320 within the Study Area has been compared against the diagnostic characteristics and condition thresholds to be considered as the CPSWSGTF CEEC, as described in the Commonwealth Listing Advice (DEWHA, 2009).

Assemblages of PCT 3320 within the Study Area were not found to meet the minimum condition thresholds for the CEEC *Condition thresholds*, of the conservation advice (DEWHA, 2009). Although the size of some patches of PCT 3320 within the Study Area met the threshold for inclusion (>0.5 ha), the absence or completely exotic understorey precluded patches from identification as the nationally listed community. To be considered a Matter of National Environmental Significance (MNES) a minimum of 50 per cent of understorey vegetation is required to be native. Or if the patch size is >5 hectares or contiguous with native remnant vegetation, only >30 per cent understorey is required to be native to reach the threshold. The vegetation within the Study Area does not meet either of these thresholds and is therefore not considered the EPBC listed CPSWSGTF.

4.2.4 PCT 3975 – Southern Lower Floodplain Freshwater Wetland

BioNet profile for PCT 3975

The BioNet profile data for PCT 3975 can be viewed below in Table 4-4.

Table 4-4 Attribute information for PCT 3975 in the Study Area

Attribute	PCT 3975 in the Study Area
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Freshwater Lagoons
PCT name	Southern Lower Floodplain Freshwater Wetland
PCT ID	3975
Conservation status	BC Act: Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)
Estimate of percent cleared	92.99%
Vegetation description	A tall to very tall freshwater sedgeland or forbland occurring in depressions on Quaternary alluvial deposits (primarily backswamps with organic-rich mud, silt or clay soils) on coastal floodplains of the Central Coast and South Coast botanical divisions. Almost all known locations occur at elevations of below 10 metres asl, however this PCT can occur at higher elevations in lagoons that have prolonged inundation, such as Ellalong Lagoon south-west of Cessnock which is just over 100 metres asl. This PCT describes non-woody freshwater wetlands on Quaternary alluvium south from the Hunter valley that are not dominated by <i>Phragmites australis</i> or <i>Eleocharis equisetina</i> and are either on low coastal floodplains or at the edges of more elevated lagoons that have prolonged inundation. Within these environmental and floristic parameters this PCT can encompass a range of sedgeland and aquatic forb assemblages. On presently available information the aquatic forb <i>Persicaria decipiens</i> is very frequently present with very sparse cover. The grasses <i>Cynodon dactylon</i> and <i>Paspalum distichum</i> and the reed <i>Typha orientalis</i> commonly occur with sparse cover, while the sedge <i>Eleocharis sphacelata</i> is occasionally present however where it does occur tends to have mid-dense cover. A diversity of other sedges, rushes

Attribute	PCT 3975 in the Study Area
	and aquatic forbs are occasionally or rarely recorded, such as <i>Persicaria hydropiper</i> , <i>Cyanogeton microtuberosa</i> , <i>Ludwigia peploides</i> subsp. <i>montevidensis</i> , <i>Alternanthera denticulata</i> and species of <i>Juncus</i> . Rarely, a very sparse emergent tree layer is present, which may include <i>Casuarina glauca</i> , melaleucas or, very rarely, overhanging Eucalypts. Some sedges such as <i>Machaerina articulata</i> , <i>Fimbristylis velata</i> , <i>Eleocharis acuta</i> and <i>Bolboschoenus</i> species dominate individual sites, reflecting the floristic diversity of this PCT. This community often occurs in disturbed environments and may potentially include derived states. The assessment of new non-woody freshwater wetland plots against this PCT should primarily consider environmental domain.
Extent in Study Area (ha)	0.01
Species relied upon for PCT identification	Species identified during site investigation relied upon for PCT identification include <i>Persicaria decipiens</i> (Slender knotweed) and <i>Typha orientalis</i> (Bullrush).

Justification of PCT selection

A total of 0.01 hectares of PCT 3975 occurs in the Study Area. This PCT is present in one small patch in Lalor Park at Cavanagh Reserve (Figure 4-2) and is within a drainage channel in the Study Area. The strength of this PCT association with the vegetation present is weak, however due to the presence of native species, a best-fit PCT was assigned.

This patch of PCT 3975 within the Study Area is unlikely to be indicative of remnant wetlands, rather has likely established following changes to the landscape which has occurred as a result of land development in the region. The patch of PCT 3975 within the Study Area is small and isolated degraded native emergent vegetation, which comprises only a few native species and a high composition of exotic plant species. PCT 3975 occurs in a single condition within the Study Area; described as PCT 3975 (Degraded wetland). A typical example of this vegetation type in the Study Area is shown in Plate 4-2.

This condition state is characterised as mixed native/exotic aquatic and emergent vegetation in highly modified drainage channels or water infrastructure which has *Typha orientalis* (Bullrush) as the dominant native species with sparse occurrences of *Persicaria decipiens* (Slender knotweed). The assemblage contains a high diversity and composition of exotic species.



Plate 4-2 PCT 3975 (Degraded wetland) within the Study Area

Alignment with BC Act listed TECs

PCT 3975 is associated with the Endangered Ecological Community (EEC) *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (FWCF) as listed under the BC Act.

The assemblage of PCT 3975 within the Study Area was compared against the diagnostic characteristics of FWCF, as described in the Scientific Committee Final determination. FWCF generally occupies low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes; habitats where flooding is periodic and standing fresh water persists for at least part of the year in most years. The composition and structure of the vegetation is also influenced by grazing history, changes to hydrology and soil salinity, catchment runoff and disturbance, and may have a substantial component of exotic grasses and forbs. Artificial wetlands created on previously dry land specifically for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community, although they may provide habitat for threatened species.

Based on the above, PCT 3975 within the Study Area is not considered to qualify for listing as the EEC due to being established in a manmade stormwater channel.

Alignment with EPBC Act listed TECs

PCT 3975 is not associated with a federally listed Threatened Ecological Community.

4.2.5 PCT 4023 - Coastal Valleys Riparian Forest

BioNet profile for PCT 4023

The BioNet profile data for PCT 4023 can be viewed below in Table 4-5.

Table 4-5 Attribute information for PCT 4023 in the Study Area

Attribute	PCT 4023 in the Study Area
Vegetation formation	Forested Wetland
Vegetation class	Coastal Floodplains Wetland
PCT name	Coastal Valleys Riparian Forest
PCT ID	4023
Conservation status	BC Act: Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Coast Bioregions (EEC) EPBC Act: Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland (EEC)
Estimate of percent cleared	78.22%
Vegetation description	A tall <i>Casuarina</i> open forest with a dense grassy ground layer that is found adjacent to streams or on river flats, primarily in the South Creek catchment of the Cumberland Plain to the west of Sydney and from Ellalong to north of Rothbury in the central Hunter valley. The canopy is one of the distinguishing features of this PCT, very frequently including a high cover of relatively young <i>Casuarina glauca</i> amongst a mix of old and young eucalypts, commonly red gums (<i>Eucalyptus amplifolia</i> and <i>Eucalyptus tereticornis</i>) or occasionally <i>Eucalyptus moluccana</i> . The only common species in the sparse shrub layer is <i>Bursaria spinosa</i> . There is a dense ground cover, typical of river flat forests, that is typically comprised of grasses, forbs, twiners and

Attribute	PCT 4023 in the Study Area
	ferns. A high cover of <i>Microlaena stipoides</i> is almost always present, with more scattered <i>Brunoniella australis</i> and <i>Dichondra repens</i> being very frequent. Common ground covers include <i>Solanum prinophyllum</i> , <i>Glycine tabacina</i> , <i>Cheilanthes sieberi subsp. sieberi</i> , <i>Oplismenus aemulus</i> and <i>Lobelia purpurascens</i> . It is possible that this PCT represents a successional state in a community that is re-establishing following clearing. In addition, the dominance of the salt tolerant <i>Casuarina glauca</i> may indicate saline conditions. This PCT typically occurs at elevations below 70 metres asl in a hot, dry climate. On broader floodplains of the Cumberland Plain, it grades into PCT 4025, which rarely includes <i>Casuarina glauca</i> however nevertheless has considerable floristic overlap with this PCT. Near the edge of the floodplain, it adjoins the grassy forests of either the Cumberland Plain (PCT 3320) or the Hunter valley (PCT 3315). Again, <i>Casuarina glauca</i> is rare in these PCTs.
Extent in Study Area (ha)	0.62
Species relied upon for PCT identification	<i>Casuarina glauca</i> (Swamp Oak)

Justification of PCT selection

A total of 0.62 hectares of PCT 4023 occurs in the Study Area. This PCT is predominantly present in along the banks of Breakfast Creek and along a narrow man-made tributary of Blacktown Creek at the International Peace Park (Figure 4-2). Some individuals and isolated patches of *Casuarina glauca* (Swamp Oak) have also been identified as the PCT.

PCT 4023 is mapped as occurring in the locality on the SVTM. PCT 4023 was selected as the best-fit due to having a geographic distribution, landscape position and species assemblage which is consistent with that described in Table 4-5. Patches of this assemblage occupy low points in the landscape, including manmade drainage lines and creek lines at elevations below 70m asl. Further the vegetation assemblage has a floristic composition which is consistent with the description of PCT 4023 with a canopy dominated by *Casuarina glauca* (Swamp Oak) with infrequent occurrence of *Eucalyptus amplifolia* (Cabbage Gum). The understorey is generally absent or heavily degraded with a high composition of weeds, however where native species are present, they are consistent with those known from the community including *Dichondra repens*, *Microlaena stipoides*, *Oplismenus aemulus* and *Lobelia purpurascens*.

Patches of PCT 4023 within the Study Area have naturally regenerated following historical land clearing or have been planted. No remnant stands of PCT 4023 are present. Along Breakfast Creek historical images indicate that patches of PCT 4023 have naturally regenerated over time (Plate 4-3). All assemblages of PCT 4023 share a similar floristic structure and composition in the Study Area, comprising a canopy of *Casuarina glauca* (Swamp Oak) with an exotic or bare understorey.



Plate 4-3. Historic photograph of a section of Breakfast Creek running along the south of Melrose Park in Blacktown from 2005 (left) and 2013 (right)

PCT 4023 occurs in a single condition within the Study Area; described as PCT 4023 (Riparian Forest). A typical example of this vegetation type in the Study Area is shown in Plate 4-4.

This condition state is characterised by a canopy of *Casuarina glauca* (Swamp Oak) and variable understorey ranging from bare ground to dominated by weeds. It has been determined that the presence or absence of weeds in the understorey does not reflect a change in condition states, as both conditions support the same composition and cover of native species.



Plate 4-4 PCT 4023 (Riparian Forest) within the Study Area

Alignment with BC Act listed TECs

PCT 4023 is associated with the Endangered Ecological Community (EEC) *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (SOFF) as listed under the BC Act.

Assemblages of PCT 4023 within the Study Area were compared against the diagnostic characteristics of SOFF, as described in the Scientific Committee Final determination. SOFF has a

tree canopy dominated by *Casuarina glauca* (Swamp Oak) with a relatively low abundance of *Eucalypt* species; and a prominent groundcover of forbs and graminoids. It generally occupies low-lying parts of floodplains, alluvial flats, drainage lines, lake margins and fringes of estuaries; habitats where flooding is periodic and soils show some influence of saline ground water (NSW Scientific Committee, 2011b).

When comparing the patches of PCT 4023 in the Study Area to the description of SOFF, it was determined that all patches are equivalent to the EEC (NSW Scientific Committee, 2011b).

Alignment with EPBC Act listed TECs

PCT 4023 is associated with the Endangered Ecological Community (EEC) *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (CSOFF) as listed under the EPBC Act. Assemblages of PCT 4023 within the Study Area were compared against the key diagnostic features and condition thresholds to be listed as the CSOFF EEC, as described in the Commonwealth Conservation Advice (DoEE, 2018).

Assemblages of PCT 4023 within the Study Area were not found to meet the minimum condition thresholds for the EEC as stepped out in *Table 1. Condition thresholds, classes and categories for patches of Coastal Swamp Oak* of the conservation advice (DoEE, 2018). Although the size of some patches of PCT 4023 within the Study Area met the threshold for inclusion, the absence or completely exotic understorey precluded patches from identification as the nationally listed community. A minimum of 20 per cent of understorey vegetation is required to be native to be considered as a Matter of National Environmental Significance (MNES).

4.2.6 PCT 4025 – Cumberland Red Gum River-flat Forest

BioNet profile for PCT 4025

The BioNet profile data for PCT 4025 can be viewed below in Table 4-6.

Table 4-6 Attribute information for PCT 4025 in the Study Area

Attribute	PCT 4025 in the Study Area
Vegetation formation	Forested Wetland
Vegetation class	Coastal Floodplains Wetland
PCT name	Cumberland Red Gum River-flat Forest
PCT ID	4025
Conservation status	BC Act: River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC) EPBC Act: River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (CEEC)
Estimate of percent cleared	88.84%
Vegetation description (NSW DCCEEW, 2025b)	A tall to extremely tall sclerophyll open forest with a mid-stratum of soft-leaved shrubs and small trees and dense, grassy ground layer situated on the alluvial flats alongside streams that drain the Cumberland Plain or more rarely the broad alluvial flats of the Hawkesbury and Nepean River systems to the west of Sydney. The canopy almost always includes red gums (<i>Eucalyptus tereticornis</i> , <i>Eucalyptus amplifolia</i>), occasionally associated with an apple (<i>Angophora floribunda</i> , <i>Angophora subvelutina</i>), which may be locally prominent. A sparse mid-stratum almost always includes <i>Bursaria spinosa</i> and one or more <i>Acacia</i> species, of which <i>Acacia parramattensis</i> is

Attribute	PCT 4025 in the Study Area
	the most frequent and abundant. The ground layer is typically characterised by a dense cover of grasses along with soft-leaved forbs and ferns. A high cover of <i>Microlaena stipoides</i> is almost always present with more scattered <i>Dichondra repens</i> , <i>Oplismenus aemulus</i> and <i>Solanum prinophyllum</i> being very frequent. The largest remaining areas are situated along the smaller streams and, while widespread, this PCT primarily occurs in small, often disturbed patches and is threatened by ongoing weed invasion following flood events. It typically occurs in a warm, moist climate at low elevation with a mean of 60 metres asl, however may occur up to 320 metres in southern parts of the Cumberland Plain. Where saline soils occur on the floodplain, this PCT grades into PCT 4023 which includes <i>Casuarina glauca</i> in its canopy. Where the floodplain narrows in valleys with sandstone escarpments upslope, it grades into PCT 4058 which includes a wider range of shrubs and scramblers including <i>Sigesbeckia orientalis subsp. orientalis</i> , <i>Breynia oblongifolia</i> and <i>Rubus parvifolius</i> . As elevation or distance from the margin of the floodplain increases, this PCT grades into grassy woodlands of the Cumberland Plain (PCT 3320) in which <i>Eucalyptus moluccana</i> is common.
Extent in Study Area (ha)	1.16
Species relied upon for PCT identification	Species identified during site investigation relied upon for PCT identification include <i>Eucalyptus amplifolia</i> (Cabbage gum), <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Casuarina glauca</i> (Swamp Oak) and <i>Dichondra repens</i> (Kidney Weed).

Justification of PCT selection

A total of 1.16 hectares of PCT 4025 occurs in the Study Area, across two condition states, 4025 Riparian Forest (higher quality) and 4025 Canopy (lower quality). This PCT is predominately present along the banks of Breakfast Creek, with a large patch at Harvey Park. Some isolated patches of *Eucalyptus amplifolia* (Cabbage Gum) have also been identified as the PCT (Figure 4-2).

PCT 4025 is mapped as occurring in the Study Area on the SVTM. PCT 4025 was selected as the best-fit to classify vegetation within the Study Area due to having a geographic distribution, landscape position and species assemblage which is consistent with that described in Table 4-6. Patches of this assemblage occupy low points in the landscape, including manmade drainage lines and creek lines at a mean elevation of 60m asl. Further the vegetation assemblage has a floristic composition which is consistent with the description of PCT 4025 with a canopy dominated by *Eucalyptus amplifolia* (Cabbage Gum) with scattered occurrence of *Angophora floribunda* (Rough Barked Apple), *Angophora subvelutina* (Broad-leaved Apple) and *Eucalyptus tereticornis* (Forest Red Gum). The tree *Casuarina glauca* (Swamp Oak) becomes apparent as the community transitions into PCT 4023. On broader floodplains of the Cumberland Plain, PCT 4025 grades into PCT 4023, generally where soil salinity increase (NSW DCCEEW, 2025b). A native understorey is largely absent in the Study Area however is well developed in remnant patches including a suite of native grasses, forbs and twiners including *Dichondra repens*, *Microlaena stipoides*, *Oplismenus aemulus* and *Solanum prinophyllum*.

Patches of PCT 4025 within the Study Area include remnant assemblages and planted trees in areas which have subject to historical land clearing.



Plate 4-5 PCT 4025 within the Study Area at Harvey Park (left) and the Peace Park (right)

Alignment with BC Act listed TECs

PCT 4025 is associated with the Endangered Ecological Community (EEC) *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (RFEF) as listed under the BC Act.

Assemblages of PCT 4025 within the Study Area have been compared against the diagnostic characteristics of RFEF, as described in the Scientific Committee Final determination. RFEF generally occupies central parts of floodplains and raised levees; habitats where flooding is periodic, and soils are rich in silt. The assemblage naturally occurs as tall open forests or woodlands, however in areas of historical clearing (i.e. urban areas) may have been reduced to scattered trees of species *Eucalyptus tereticornis* (Forest red gum), *Eucalyptus amplifolia* (cabbage gum), *Angophora floribunda* (Rough-barked Apple) and *Angophora subvelutina* (Broad-leaved apple). The EEC may have a mixed eucalypt canopy or may be dominated by a single species of eucalypt, and has relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca* species (NSW Scientific Committee, 2011a).

When comparing the patches of PCT 4025 in the Study Area to the description of RFEF, it was determined that all patches are equivalent to the EEC (NSW Scientific Committee, 2011a).

Alignment with EPBC Act listed TECs

PCT 4025 is associated with the Critically Endangered Ecological Community (CEEC) *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (RFEFCF) as listed under the EPBC Act. Assemblages of PCT 4025 within the Study Area were compared against the key diagnostic features and condition thresholds to be listed as the RFEFCF CEEC, as described in the Commonwealth Conservation Advice (DAWE, 2020).

Some patches of PCT 4025 within the Study Area did not meet the minimum condition thresholds for the CEEC as stepped out in *Table 1. Condition thresholds, classes and categories for patches of Coastal Swamp Oak* of the conservation advice. Although the size of some patches of PCT 4025 within the Study Area met the threshold for inclusion, the absence or completely exotic understorey precluded patches from identification as the nationally listed community. A minimum of 30 per cent of understorey vegetation is required to be native and must contain a minimum of 4 native species per 400 square metres to be considered a Matter of National Environmental Significance (MNES) (DAWE, 2020).

It was determined that assemblages of PCT 4025 adjacent to Harvey Park along Breakfast Creek are equivalent to the RFEFCF CEEC. The total area of RFEFCF within the Study Area is approximately 0.88 hectares. The extent of RFEFCF within the Study Area is shown in Figure 4-3. These patches qualify for listing as the CEEC under the following condition thresholds:

- Class C2 (Large or continuous patch in moderate condition) – Breakfast Creek adjacent to Harvey Park

A summary of these condition classes is included in Table 4-7.

Table 4-7. Condition thresholds Class A1 and C1 as described in Table 4 of the RFEFCF Conservation Advice (DAWE, 2020)

Patch size AND Biotic thresholds	Large patch Patch size ≥ 2 ha	Small contiguous patch Patch size ≥ 0.5 ha within a ≥ 5 ha area of native vegetation
Moderate condition $\geq 30\%$ of its total perennial understorey vegetation cover is comprised of native species <u>AND</u> Ground cover richness ≥ 4 native species per sample plot2	CLASS C2 Large or contiguous patch in moderate condition	

4.3 Threatened Ecological Communities

There are three BC Act TECs and one EPBC Act TECs within the Study Area. Justifications for PCT assemblages which are equivalent to the state and federally listed TECs is included in Sections 4.2.3 - 4.2.6. TECs and their extent in the Study Area Land are listed in Table 4-8 and have been illustrated in Figure 4-3.

Table 4-8 PCT and their equivalent TECs within the Study Area, including total extent

PCT	Equivalent TEC	Extent within the Study Area (ha)
PCT 3320	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically endangered (BC Act)	1.08
	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest – Critically endangered (EPBC Act)	Does not meet the criteria for inclusion as the EPBC listed TEC
PCT 4023	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Coast Bioregions – Endangered (BC Act)	0.62
	Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland – Endangered (EPBC Act)	Does not meet the criteria for inclusion as the EPBC listed TEC
PCT 4025	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – Endangered (BC Act)	1.16
	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – Critically endangered (EPBC Act)	0.88

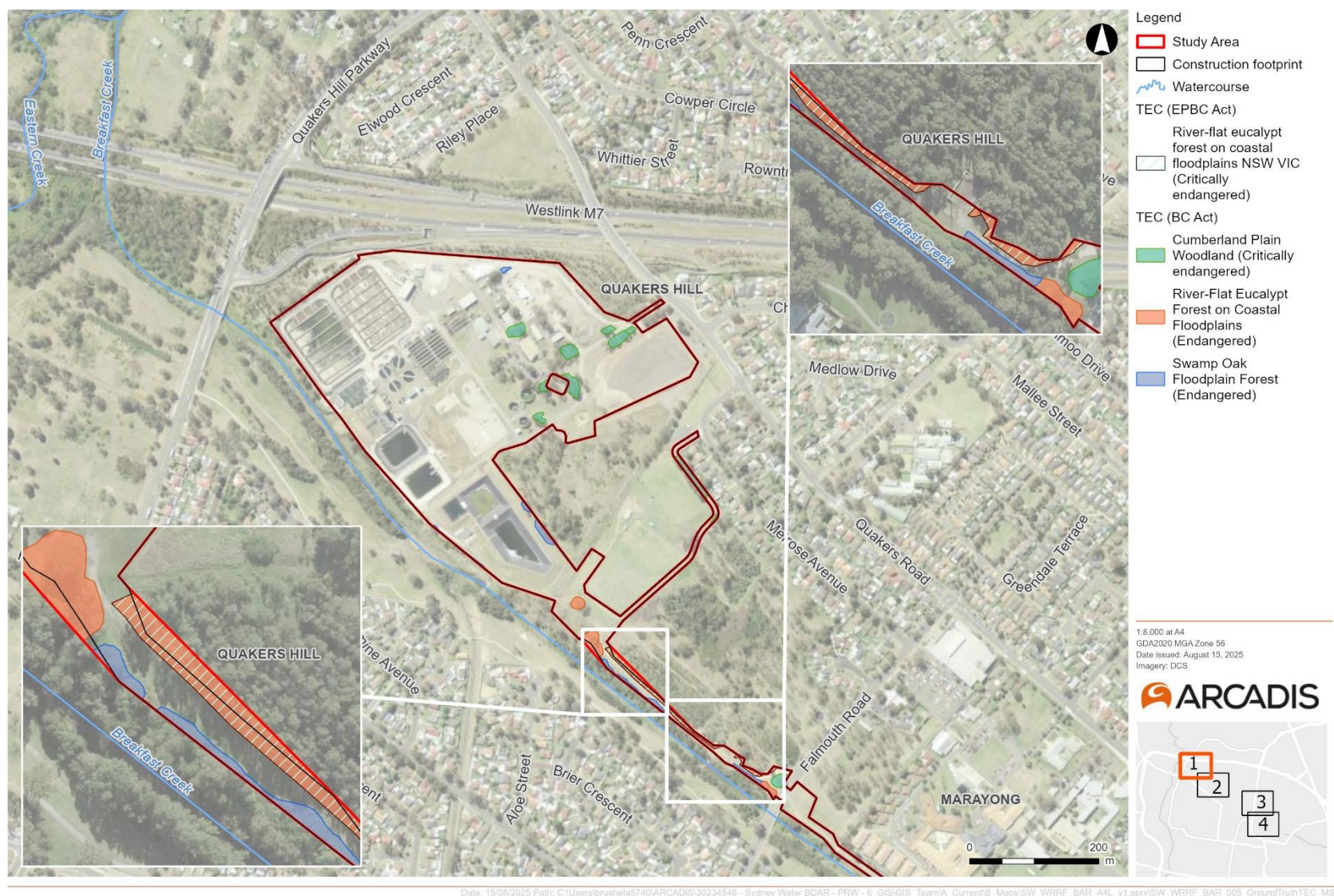


Figure 4-3 Ground-truthed Threatened Ecological Communities (TEC) within the Study Area and construction footprint (1 of 4).

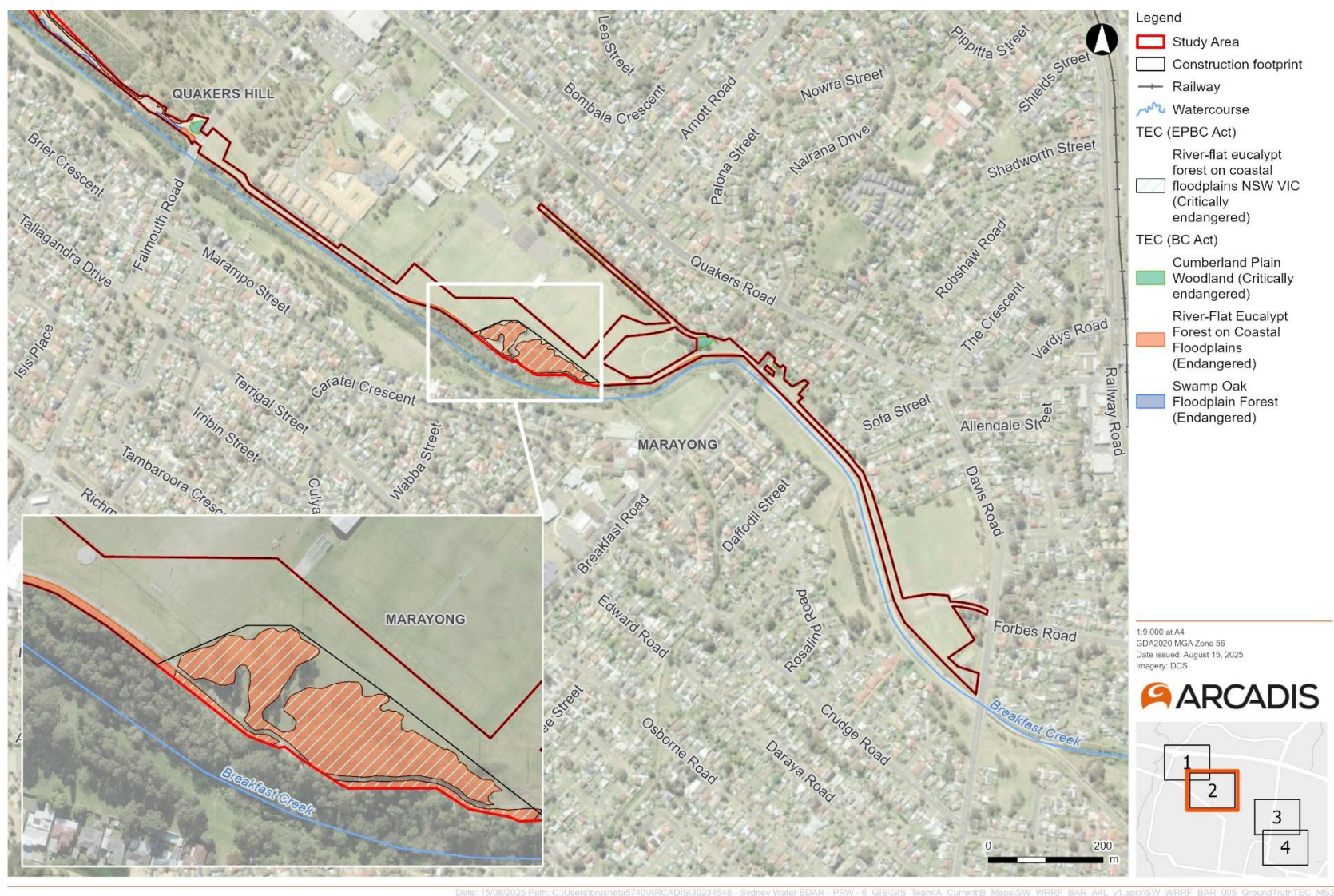


Figure 4-3 Ground-truthed Threatened Ecological Communities (TEC) within the Study Area and construction footprint (2 of 4).

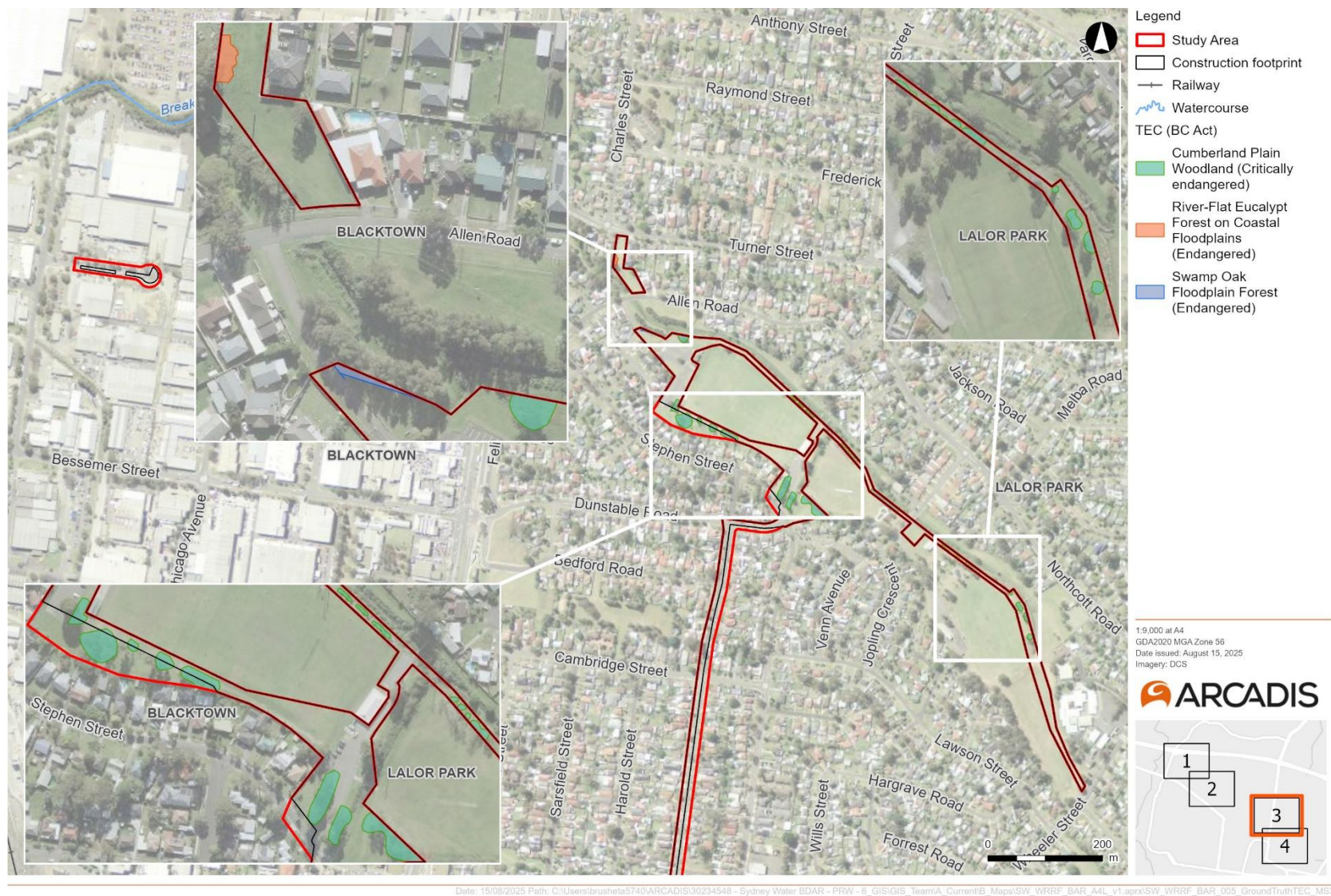


Figure 4-3 Ground-truthed Threatened Ecological Communities (TEC) within the Study Area and construction footprint (3 of 4).

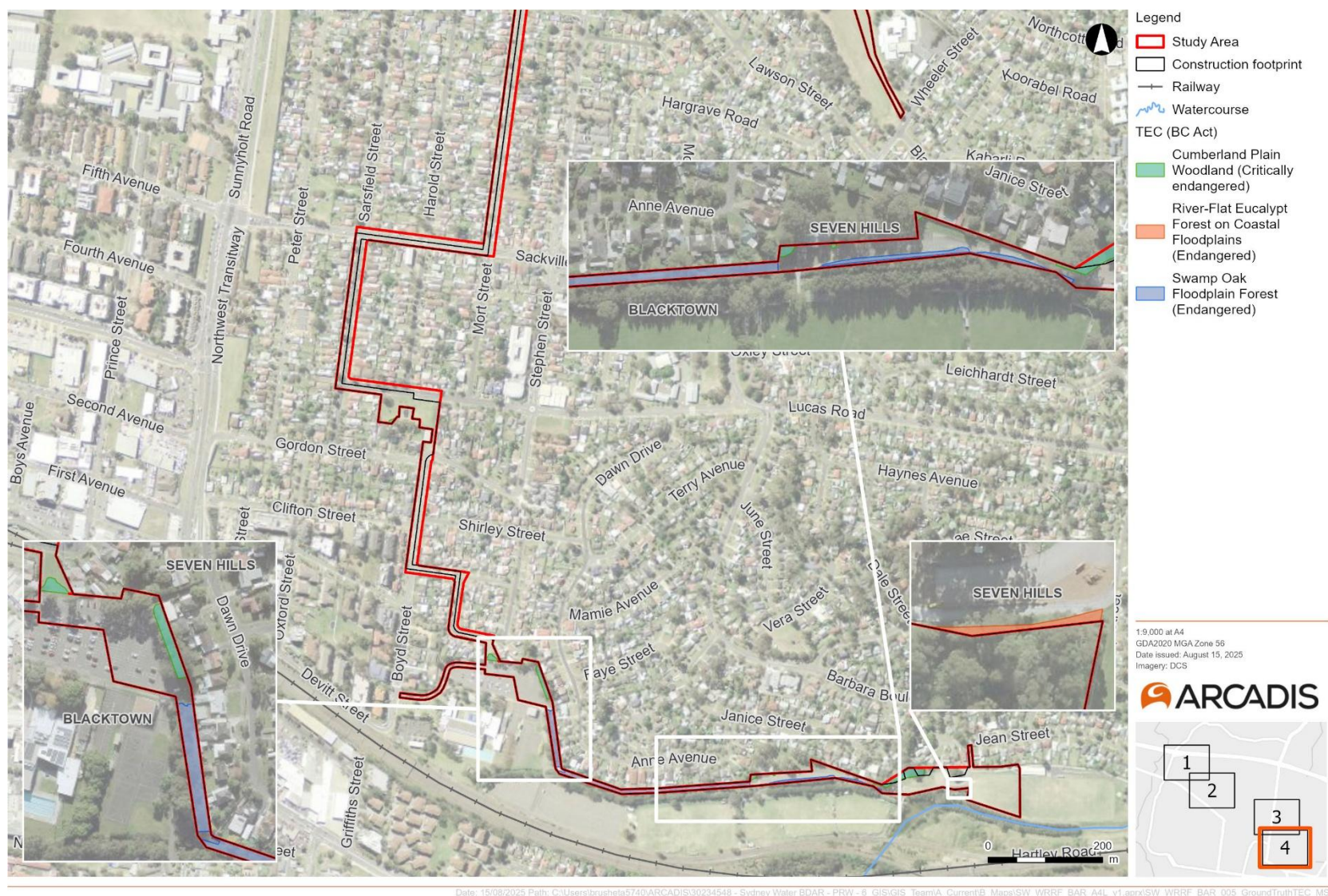


Figure 4-3 Ground-truthed Threatened Ecological Communities (TEC) within the Study Area and construction footprint (4 of 4)

4.4 Non-PCT vegetation types

Mixed exotic and native vegetation, Exotic grassland and Weeds do not conform to any PCTs listed on the BioNet Vegetation Classification Database. The total extent of these vegetation types is 12.20 hectares within the Study Area. A breakdown of these vegetation types and their area within the Study Area is provided in Table 4-9.

Table 4-9 Description of vegetation types within the Study Area that do not conform to a PCT.

Non-PCT vegetation type	Description	Area (ha)
Mixed native and exotic vegetation	The mixed native and exotic vegetation consist of street trees and garden vegetation distributed throughout the Study Area. These species are typically selected for their appearance such as native <i>Erythrina spp.</i> , <i>Lophostemon confertus</i> (Brush Box) as well as exotic species such as <i>Jacaranda mimosifolia</i> (Jacaranda) and <i>Phoenix canariensis</i> (Canary Island Date Palm).	0.35
Exotic grasslands	Exotic grasslands are the most abundant vegetation community within the Study Area, considering the alignment has been concentrated through parks dominated by exotic grass. These areas are not considered priority habitat for flora or fauna as these lawns are highly trafficked and likely to be regularly mowed. Exotic grasslands commonly comprise the following species: <i>Avena fatua</i> (Wild Oats) <i>Briza minor</i> (Shivery Grass) <i>Bromus catharticus</i> (Prairie Grass) <i>Chloris gayana</i> (Rhodes Grass) <i>Echinochloa crus-galli</i> (Barnyard Grass) <i>Ehrharta erecta</i> (Panic grass) <i>Eragrostis curvula</i> (African Lovegrass) <i>Pennisetum clandestinum</i> (Kikuyu Grass) <i>Trifolium arvense</i> (Haresfoot Clover)	11.74
Weeds	Weeds form part of all the vegetation communities within the Study Area however occur in purely exotic patches concentrated on the edges of parks, particularly bordering Cavanagh reserve. Common weed species within the Study Area include the following: <i>Araujia sericiflora</i> (Moth Vine) <i>Asparagus aethiopicus</i> (Asparagus Fern) <i>Asparagus asparagoides</i> (Bridal Creeper) <i>Bidens pilosa</i> (Cobbler's Pegs) <i>Cardiospermum grandiflorum</i> (Balloon Vine) <i>Centaureum erythraea</i> (Common Centaury) <i>Cestrum parqui</i> (Green Cestrum) <i>Chrysanthemoides monilifera subsp. rotundata</i> (Bitou Bush) <i>Cirsium vulgare</i> (Spear Thistle) <i>Cyclospermum leptophyllum</i> (Slender Celery) <i>Cyperus eragrostis</i> (Umbrella Sedge) <i>Euphorbia peplus</i> <i>Foeniculum vulgare</i> (Fennel) <i>Hypochoeris radicata</i> (Catsear) <i>Ligustrum lucidum</i> (Large-leaved Privet)	0.11

Non-PCT vegetation type	Description	Area (ha)
	<i>Lysimachia arvensis</i> (Scarlet Pimpernel) <i>Modiola caroliniana</i> (Red-flowered Mallow) <i>Paspalum dilatatum</i> (Paspalum) <i>Passiflora suberosa</i> (Cork Passionfruit) <i>Plantago lanceolata</i> (Lamb's Tongues) <i>Richardia stellaris</i> <i>Senecio madagascariensis</i> (Fireweed) <i>Senna pendula</i> <i>Setaria gracilis</i> <i>Sida rhombifolia</i> (Paddy's Lucerne) <i>Solanum nigrum</i> (Black-berry Nightshade) <i>Verbena bonariensis</i> (Purpletop) <i>Vulpia bromoides</i> (Squirrel Tail Fesque)	

4.5 Priority weeds and pathogens

Of the 39 exotic species recorded in the Study Area, five are listed as state priority weeds under the Greater Sydney Regional Strategic Weed Management Plan 2023-2027. These weeds are listed in Table 4-10 with their associated biosecurity duty.

Table 4-10 Priority weeds present in the Study Area

Scientific name	Common name	WeedWise Photo	Biosecurity duty
<i>Asparagus aethiopicus</i>	Asparagus Fern		CONTAINMENT AND/OR ASSET PROTECTION: Mandatory Measure prohibits sale within or import into NSW
<i>Asparagus asparagoides</i>	Bridal Creeper		ASSET PROTECTION: Mandatory Measure prohibits sale within or import into NSW
<i>Cestrum parqui</i>	Green Cestrum		BIOSECURITY ZONE: Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou bush		

Scientific name	Common name	WeedWise Photo	Biosecurity duty
			suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone
<i>Senecio madagascariensis</i>	Fireweed		CONTAINMENT AND/OR ASSET PROTECTION: Mandatory Measure prohibits sale within or import into NSW

Phytophthora cinnamomi (Phytophthora) is a soil borne pathogen that infects the roots of native and introduced plants and is associated with damage and death to native plants. It may be dispersed over large distances in flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. A review of Phytophthora distribution map (NSW DCCEEW, 2020) did not identify the site as being likely to contain phytophthora. The nearest record of phytophthora is approximately 7 kilometres north-east of the site. During site inspection ecologists did not observe any noticeable signs of dieback which may indicate that phytophthora is present in the Study Area.

4.6 Threatened species

The results of desktop and field investigations for threatened species within the Study Area is discussed below.

4.6.1 Threatened flora

Database searches identified 64 threatened flora species which have been recorded or are predicted to occur within a 10-kilometre radius of the Study Area (Appendix C). Of these, 55 species were returned from BioNet and PMST searches and 26 were identified as Candidate species in the BAM Calculator.

This included 52 species that were listed under the BC Act and 37 species listed under the EPBC Act. A total of six species were considered to have a moderate or higher likelihood of occurrence in the Study Area following desktop and site investigations which included habitat assessments. These species included: *Acacia pubescens* (Downy Wattle), *Syzygium paniculatum* (Magenta Lilly Pilly), *Grevillea juniperina subsp. juniperina* (Juniper-leaved Grevillea), *Persoonia hirsuta* (Hairy Geebung), *Pimelea spicata* (Spiked Rice-flower) and an endangered population of *Marsdenia viridiflora subsp. viridiflora*.

Most of these species were ruled out from occurring within the Study Area following targeted flora surveys as no individuals were found. This has been reflected in column 'Likelihood of Occurrence – After Survey' in Appendix C.

A single individual of Magenta Lilly Pilly was identified at the International Peace Park just outside the Study Area (~1 meter) (Figure 4-4). Magenta Lilly Pilly is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. This medium sized rainforest tree is not a cryptic species and therefore other individuals are not considered to be present within the Study Area as they were not detected during targeted surveys. However, it is possible for the species to exist as seed in the seedbank, particularly in the patch of PCT 4025 where the individual was found that extends into the Study Area.



Plate 4-6 *Syzygium paniculatum* (Magenta Lilly Pilly) identified at the International Peace Park just outside the Study Area.

Following targeted surveys only one threatened flora species, Magenta Lilly Pilly, was considered as having a moderate or higher likelihood to occur in the Study Area.

4.6.2 Threatened fauna

Database searches identified 85 threatened fauna species which have been recorded or are predicted to occur within a 10-kilometre radius of the Study Area (Appendix C). Of these, 77 species were returned from BioNet and PMST searches and 56 were identified as Candidate/Predicted species in the BAM Calculator. This included 73 species that were listed under the BC Act and 48 species listed under the EPBC Act.

Seven threatened fauna species were confirmed to occur within the Study Area during targeted surveys, including:

- Cumberland Plain Land Snail (*Meridolum comeovirens*)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Little Bent-winged Bat (*Miniopterus australis*)

The locations where these threatened species have been recorded has been included in Figure 4-4.

Based on habitat quality and features present an additional 23 threatened fauna species were also considered to have a moderate or higher likelihood to occur following desktop assessment and detailed field surveys (Appendix C).

A summary of the findings from targeted fauna surveys are included below based on the survey technique:

Spotlighting: One threatened species listed as Vulnerable under both the BC and EPBC Act, the Grey-headed flying-fox (*Pteropus poliocephalus*) was detected during spotlighting (Figure 4-4). This was in addition to unlisted native species including Sugar glider (*Petaurus breviceps*), Tawny frogmouth (*Podargus strigoides*) and Ringtail possum (*Pseudocheirus peregrinus*); as well as common pest species such as, house cats (*Felis catus*), and black rats (*Rattus rattus*).

SAT surveys: No evidence of Koala (*Phascolarctos cinereus*) presence (from scats or scratching) was detected from the seven SAT surveys conducted throughout the Study Area.

Frog Surveys: During frog surveys conducted using call playback and spotlighting methods (Figure 3-2), no threatened frogs were detected. However, several common native species were observed and/or heard, including Common Eastern Froglet (*Crinia signifera*), Striped Marsh Frog (*Limnodynastes peronii*), Eastern Sedge Frog (*Litoria fallax*), Eastern Long-necked Turtle (*Chelodina longicollis*), Short-finned Eel (*Anguilla australis*), and pest species Eastern Mosquitofish (*Gambusia holbrooki*). As Eastern Mosquitofish are a predatory fish and an identified threat to GGBF the likelihood of these waterways being occupied by threatened amphibians, which are susceptible to predation, is considered low.

Remote cameras: No native fauna were detected across the fauna camera traps deployed (Figure 3-2). One exotic species the Black rat (*Rattus rattus*) was detected across two cameras at Breakfast Creek near the Quakers Hill WRRF and at Harvey Park respectively.

Nest boxes: Nest boxes were checked for signs of occupation on the three occasions, on March 20 and 24 as well as on May 14 (Figure 3-2). During all three checks no fauna or signs of occupation were detected.

Microbat surveys and roosting habitat assessments: From analysis of ultrasonic calls detected on the Anabat (Figure 3-2), the following species listed as Vulnerable under the BC Act were confirmed present:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*),
- Little Bent-winged Bat (*Miniopterus australis*),
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*),
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*).

As well as the following species which are not recognised under the BC or EPBC Act; Gould's Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*Chalinolobus morio*), Lesser long-eared bat (*Nyctophilus geoffroyi* / *N. gouldii*), Eastern broad-nosed bats (*Scotorepens orion*) and Eastern Free-Tailed Bat (*Ozimops ridei*).

The following species are possibly present - calls like those of the species were recorded but could not be positively identified, these include the Southern myotis (*Myotis macropus*) which is listed as Vulnerable under the BC Act, as well as unlisted Large Forest Bat (*Vespadelus darlingtoni*), Eastern Forest Bat (*Vespadelus pumilus*), Eastern Cave Bat (*Vespadelus troughtoni*) and Little Forest Bat (*Vespadelus vulturnus*). These species are precautionarily presumed present for the purpose of this Biodiversity Assessment.

Snail surveys: Cumberland Plain Land Snail (*Meridolum corneovirens*), shells were detected during surveys. Two of which are located outside of the Study Area outside of the Quakers Hill WRRF. The other two shells identified at Harvey Park and adjacent to Breakfast Creek are within the Study Area (Figure 4-4). No live individuals were detected.

Cumberland Plain Land Snail

Cumberland Plain Land Snail (CPLS) thrives in undisturbed, moist leaf litter and soil under native eucalypt forests. This snail relies on dense ground cover and fallen logs, essential for shelter and food, and is sensitive to habitat disturbance and fragmentation. CPLS are associated with both PCT 3320 and PCT 4025, however considering their habitat requirements of woody debris and logs for refuge habitat, PCT 3320 Canopy and 4025 Canopy, has been excluded from identified suitable habitat within the Study Area. As such, only PCT 4025 Riparian Forest is considered suitable based on the absence of native understorey identified in the other vegetation zones.

Grey-headed Flying-Fox

Grey-headed Flying-foxes (GHFF) are associated with all the native PCTs within the Study Area (PCTs: 3320, 3975, 4023, 4025) as well as planted native vegetation. They roost in large trees, forming camps near water sources like rivers or wetlands. A review of the National Flying-fox monitoring viewer identified a Grey-headed Flying-fox camp approximately 7.2 kilometres from the Study Area at Prospect Reservoir, at Wetherill Park (Camp ID 490). However, this camp has not had individuals recorded in latest surveys in 2022, with the most recent survey confirming presence in 2020. Approximately 200 individuals were recorded during that census. There are two additional camps recorded within 10 kilometres of the construction footprint; Ropes Creek (Camp ID 626) which has up to 3000 individuals recorded in 2022, Paramatta Park 1 (Camp ID 134) which had approximately 8770 individuals recorded in 2022. GHFF prefer environments with abundant flowering and fruiting plants, vital for their diet of nectar, pollen, such as myrtaceous trees and shrubs. A GHFF was observed flying over the Study Area along Breakfast Creek (Figure 4-4), which is likely to support foraging habitat for this Endangered species.

Threatened Microbats

The threatened microbats detected on the Ultrasonic call detectors include the Eastern False Pipistrelle, Greater Broad-nosed Bat, Little and Large Bent-winged Bats and the Eastern Coastal Free-tailed Bat, with potential recordings of the Southern Myotis. These species are all insectivorous, foraging on small flying insects including moths and beetles. Eastern False Pipistrelle, Greater Broad-nosed Bat, Eastern Coastal Free-tailed Bat, and Southern Myotis all roosts in tree hollows within mature eucalypt forests and woodlands, requiring large home ranges, foraging above the canopy. The Southern Myotis is water dependent, trawling their feet over the surface of the water for small crustaceans and macroinvertebrates. Little Bent-winged Bat and Large Bent-winged Bat require caves, tunnels, or culverts for communal roosting. They forage widely in open woodland and riparian zones. All of these species are associated with PCTs 3320, 3975, 4023 and 4025, except for the Eastern False Pipistrelle who is not associated with PCT 4023, or 3975 and the Greater Broad-nosed bat which is not associated with PCT 3975.

Habitat features

Hollow-bearing trees are a limiting habitat resource, important for nesting and roosting. Six hollow-bearing trees were identified during field surveys (Figure 4-4). These could support hollow dependent microbats, woodland birds, arboreal marsupials or owls. Two hollow bearing trees were identified at Quakers Hill WRRF, one live tree with three hollows and a bee hive and a stag with six hollows with observed red rumped parrot occupation. A single large hollow-bearing tree was observed at Harvey Park within the patch of PCT 4025. At the International Peace Park, the remaining three hollow-bearing trees were observed all bearing no signs of occupancy, one of which contained a large hollow. All hollows were identified above eye-level and were not possible to inspect during the field surveys.

Man-made structures such as culverts, can serve as habitats for threatened fauna, offering refuge and connectivity in fragmented landscapes by providing shelter and facilitating safe passage.

The proximity of native vegetation to suburban and industrial development also reduces the quality of habitat for threatened species due to ongoing disturbance and edge effects. PCT 4025 Riparian Forest provides the highest quality habitat for threatened species in the Study Area with structural complexity including an intact shrub and ground layer. The remainder of the PCTs in the Study Area occur in degraded states or with degraded to absent understories. As such PCT 3320, 3975 and 4023 would not provide habitat for most threatened species in the vicinity.

In PCT 4025 Canopy and 3320 Canopy, although the understorey is degraded the trees are in good condition and offer potential habitat to locally occurring fauna species. These woodlands support a mixture of eucalypt species which may be intermittently used by threatened woodland birds when flowering to forage. Myrtaceous trees and shrubs within the Study Area could also provide foraging habitat for some nectivorous birds and threatened species such as Grey-headed Flying Fox, which may forage in this vegetation on occasion.

Exotic grasslands and weed dominated vegetation are not considered priority habitat for the threatened fauna likely to occur on site.

4.7 Migratory species

Database searches identified 17 species listed as Migratory as being recorded or predicted to occur within a 10-kilometre radius of the Study Area (Appendix C). Of these, 17 species were returned from BioNet and PMST searches and three were identified as Candidate/Predicted species in the BAM Calculator. This included 6 species that were listed under the BC Act and 17 species listed under the EPBC Act.

No migratory species were observed within the Study Area during field surveys.

Based on habitat quality and features present, two migratory species are considered to have a moderate or higher likelihood to occur following desktop assessment and field surveys (Appendix D). These have been listed in Table 4-11 with a description of their potential habitat within the Study Area.

Table 4-11 Migratory species habitat identified within the Study Area

Species	Listing status	Identified Habitat
Eastern Osprey <i>Pandion cristatus</i>	BC Act: V EPBC Act: Not listed	Eastern Osprey is typically found near large bodies where it can hunt for fish. The presence of suitable roosting, including tall trees, or foraging habitat has been identified within the Study Area in mapped PCTs:3320, 3975, 4023, 4025.
White-throated Needletail <i>Hirundapus caudacutus</i>	BC Act: V EPBC Act: V	Known for its aerial foraging habits, they prefer habitats with abundant insect populations, including open woodlands, forests, and grasslands, with identified suitable habitat present in the Study Area in PCTs:3320, 3975, 4023, 4025.



Figure 4-4 Threatened species habitat features and presence (1 of 4)

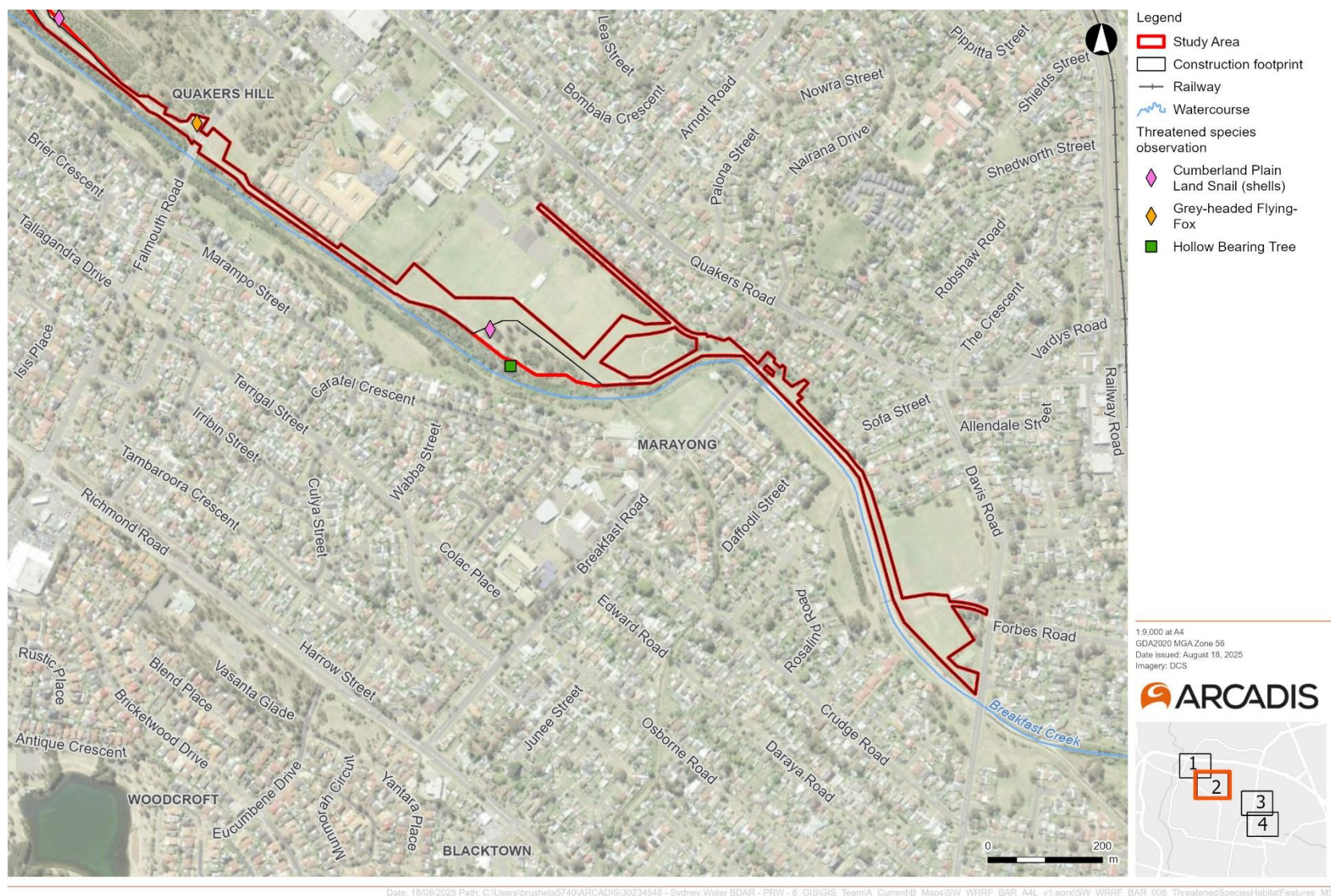
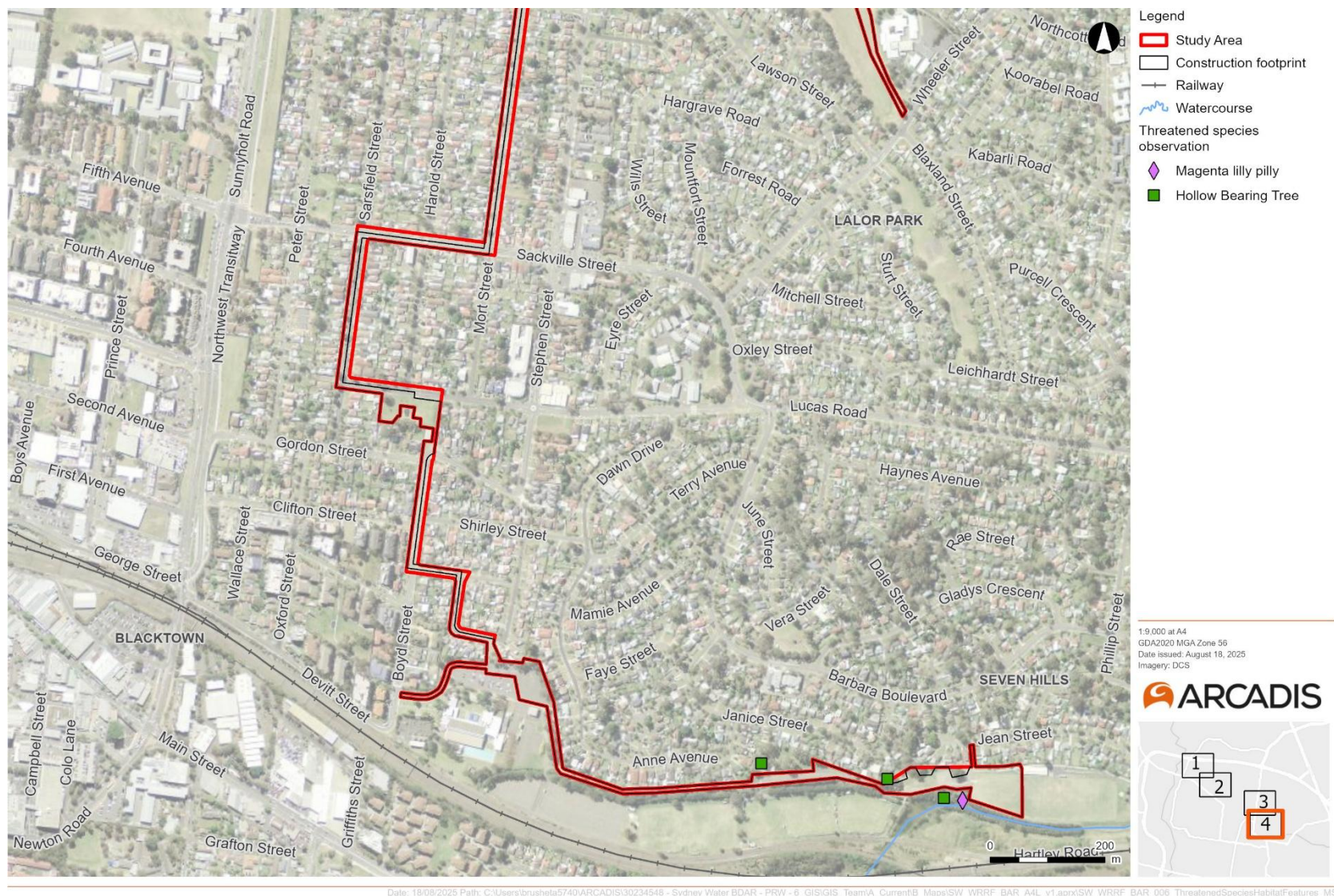


Figure 4-4 Threatened species habitat features and presence (2 of 4)



Figure 4-4 Threatened species habitat features and presence (3 of 4)



4.8 Aquatic environments

There is aquatic habitat present in the Study Area along Breakfast Creek and Blacktown Creek. Both these creeks have flowing water however were determined to be in poor condition. Additionally, the freshwater fish community status for Breakfast Creek is fair and Blacktown Creek is uncategorised, with no mapped freshwater fish threatened species in accordance with Fisheries Spatial Data Portal (DPI, 2024). As such, waterways within the Study Area were considered to have a low likelihood to support aquatic threatened species.

As part of this assessment, the Fisheries Spatial Data Portal for Key Fish Habitat (KFH) mapping was assessed. Breakfast Creek is mapped as KFH under Sydney Metro and the Hawkesbury-Nepean regions (DPI, 2024) based on the Strahler rating (Jacobs, 2025a). The waterway class for Breakfast Creek is ranked as Class 3- Minimal fish habitat due to the multiple barriers to fish passage in the form of the two unculverted road crossings (Jacobs, 2025a). With the results of the Aquatic Ecology Assessment completed by Jacobs (2025a), it was concluded that Breakfast Creek does not constitute a Sensitive Receiving Environment, despite official designation as a KFH. Blacktown Creek is not classified as KFH within the Study Area.

The Groundwater Dependent Ecosystem (GDE) High Ecological Value Aquatic Ecosystems (HEVAE) Atlas was reviewed to determine the occurrence of groundwater dependent ecosystems within and surrounding the Study Area. The HEVAE framework considers four key criteria, 1. Naturalness, 2. Diversity, 3. Distinctiveness and 4. Vital Habitat. This HEVAE mapping was considered in conjunction with PCT mapping and PCTs identified as having a high likelihood of groundwaters dependence. Areas within the Study Area, specifically where the Study Area runs along Breakfast Creek have a medium – low score on the HEVAE framework (Figure 4-6), and these locations support native riparian vegetation characteristic of PCT 4023 and 4025 (Figure 4-2).

Aquatic habitat assessments were conducted throughout the Study Area to describe watercourses, and other aquatic habitat features and appraise the condition and quality of habitat for threatened frog species and other water dependent species such as microbat species, Southern Myotis. The biotic and abiotic characteristics of Breakfast Creek was observed to offer suboptimal habitat to terrestrial threatened species due to being dominated by invasive aquatic species and having a general absence of emergent aquatic vegetation.

Breakfast Creek is a naturally ephemeral and stormwater-dependent watercourse. Its section upstream of the Quakers Hill WRRF discharge point frequently dries or experiences low flows (Jacobs, 2025a). Breakfast Creek's ecosystem is impacted by frequent bank undercutting, silt accumulation, and pollution (Jacobs, 2025a). The section downstream of the Quakers Hill WRRF shows slightly better habitat features, but overall, the creek faces significant disturbances. Blacktown Creek is a highly modified urban stream, comprised of large sections of concrete channels and was observed to have poor water quality due to high nutrient concentrations. The water quality of Blacktown Creek does not meet the recommended guidelines for protection of aquatic ecosystems (Jacobs, 2025a). Both waterways exhibit signs of human impact, with invasive species and disturbed habitats being common issues.

Breakfast Creek flows north-west, into Eastern Creek, a fourth order stream according to the Strahler ranking system. Eastern Creek was assessed as part of the Jacobs (2025a) Aquatic Assessment, as the water quality of Eastern Creek is influenced by treated wastewater discharged from Quakers Hill WRRF into the creek as part of Sydney's water management system. Sensitive receiving environments have a high conservation value that are particularly sensitive to pollution or degradation of water quality (Jacobs, 2025a). Eastern Creek has been classified as a sensitive receiver, as part of the Jacobs (2025a) assessment.



Plate 4-7 Aquatic environments across the Study Area. Breakfast Creek downstream (right) upstream (left)

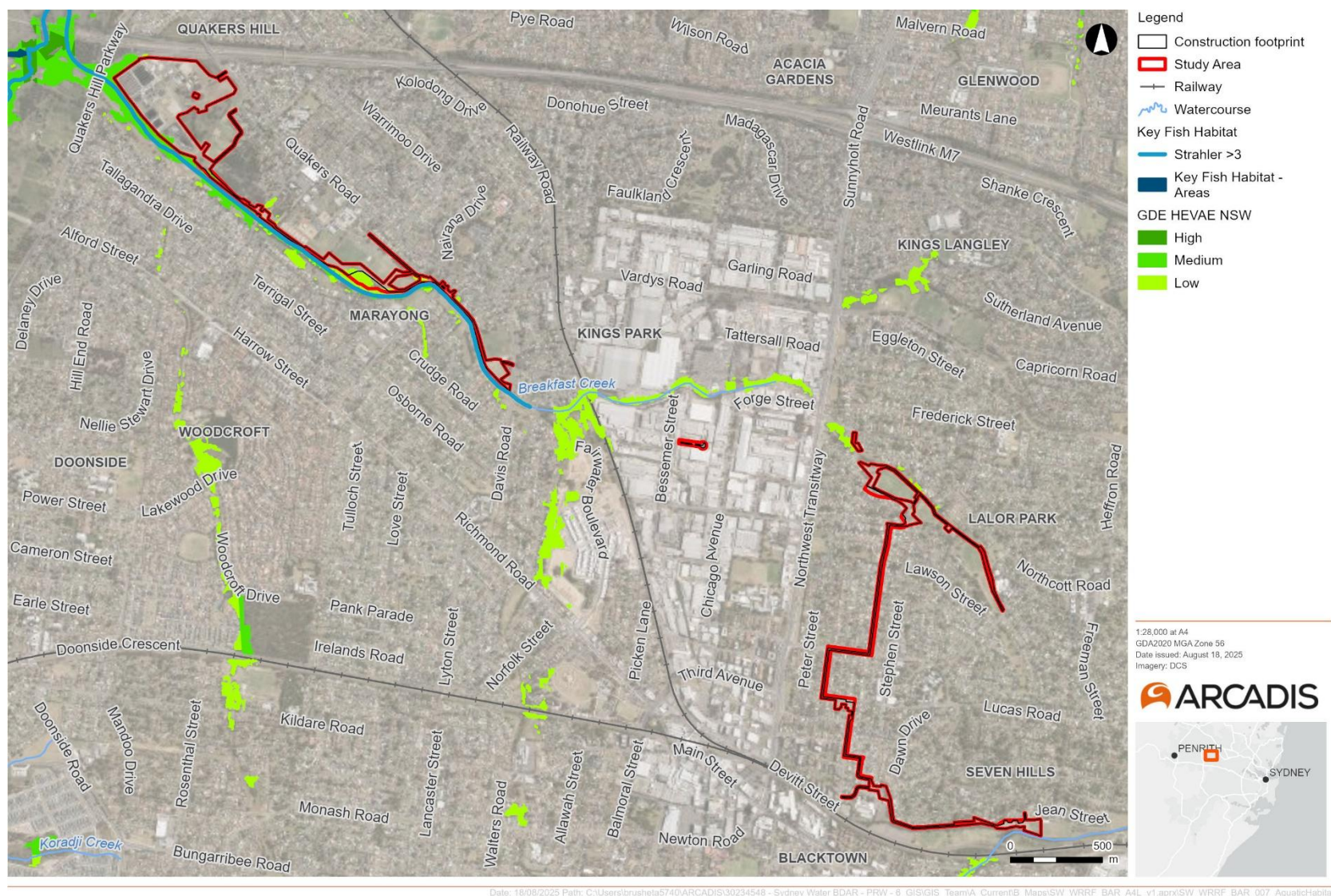


Figure 4-5. Aquatic habitats feature within the Study Area including Groundwater Dependent Ecosystem High Ecological Value Aquatic Ecosystems (HEVAE) and Key Fish Habitat (Overview)

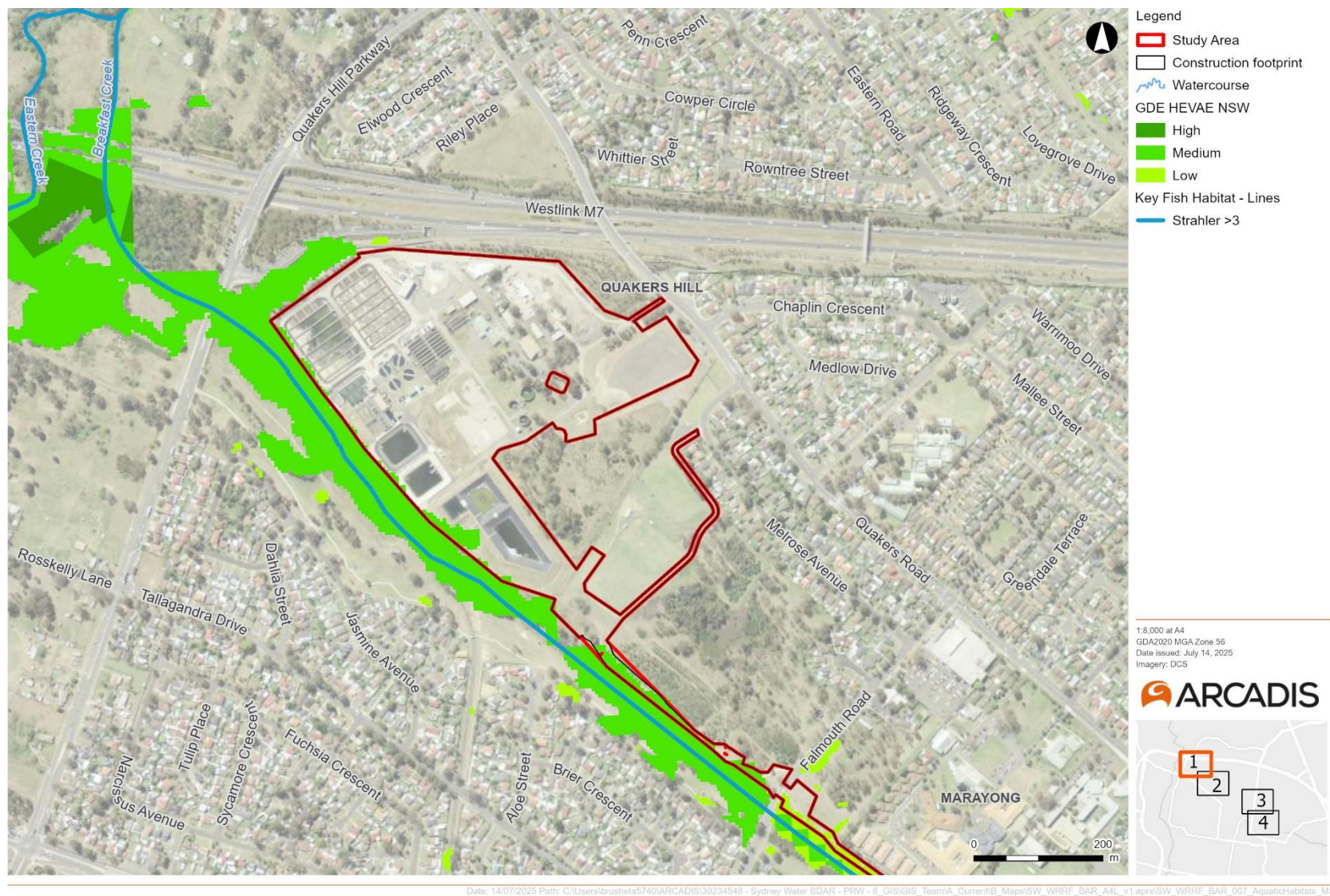


Figure 4-6 Aquatic habitats feature within the Study Area including Groundwater Dependent Ecosystem High Ecological Value Aquatic Ecosystems (HEVAE) and Key Fish Habitat (1 of 4)

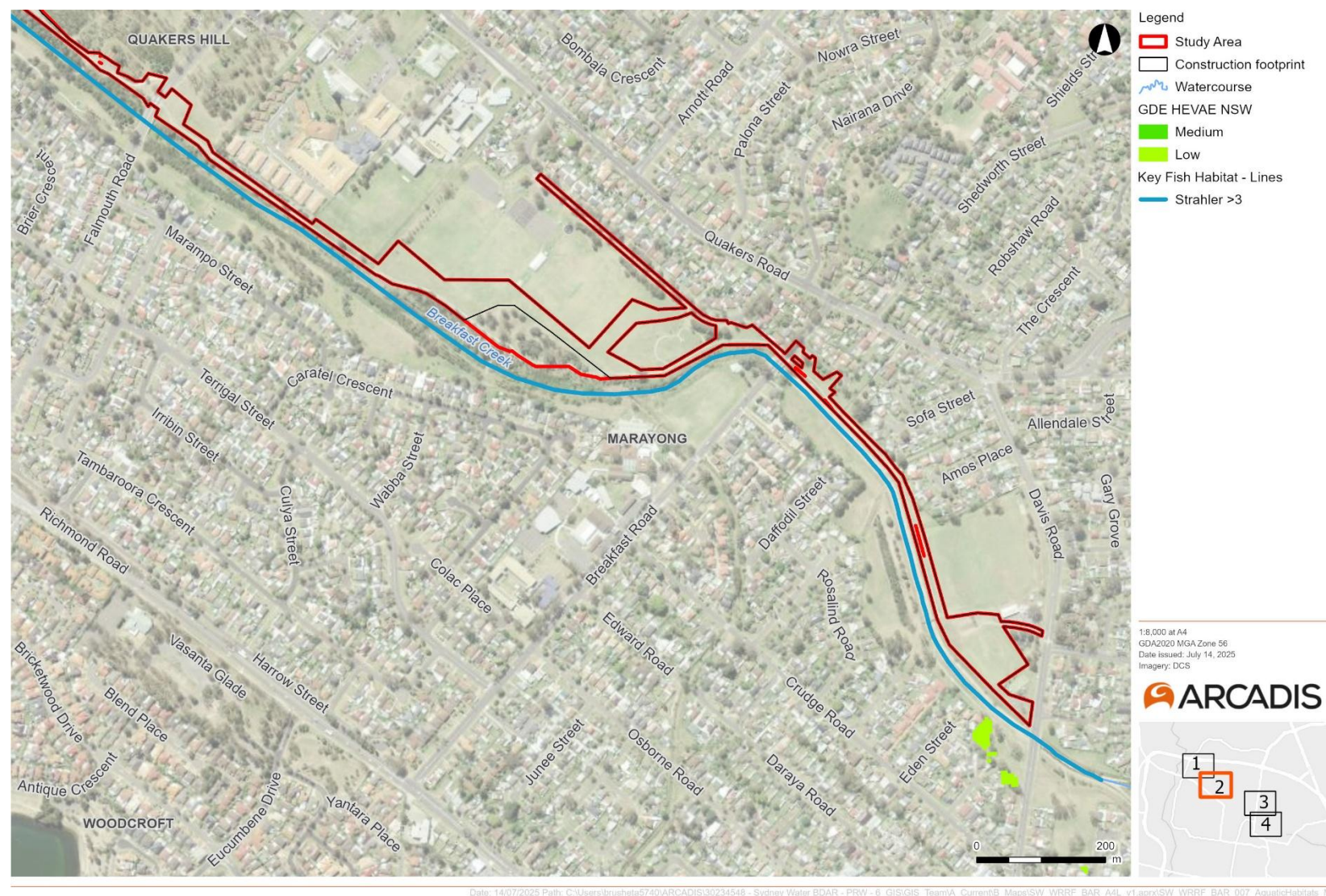


Figure 4-5 Aquatic habitats feature within the Study Area including Groundwater Dependent Ecosystem High Ecological Value Aquatic Ecosystems (HEVAE) and Key Fish Habitat (2 of 4)

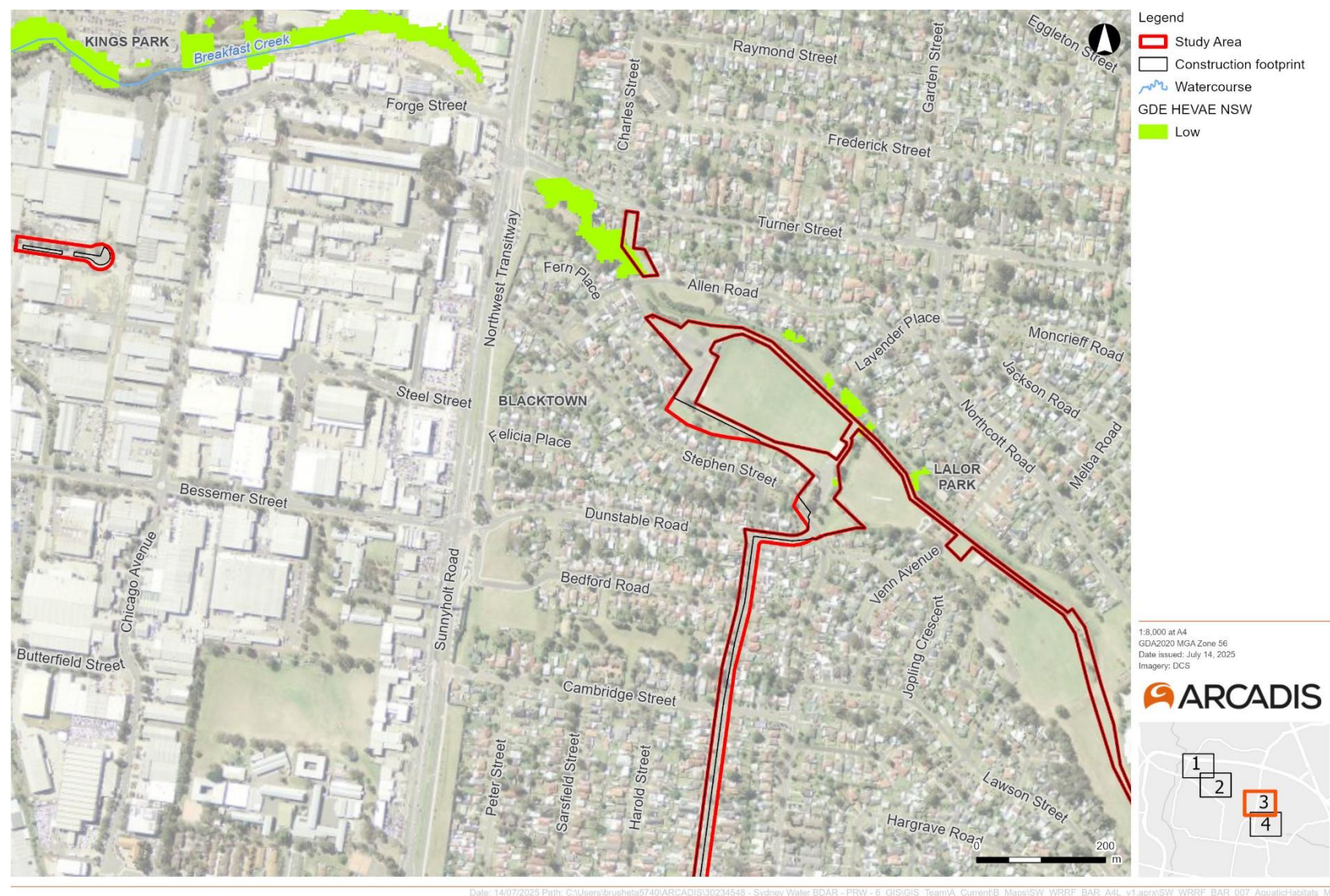


Figure 4-5 Aquatic habitats feature within the Study Area including Groundwater Dependent Ecosystem High Ecological Value Aquatic Ecosystems (HEVAE) and Key Fish Habitat (3 of 4)

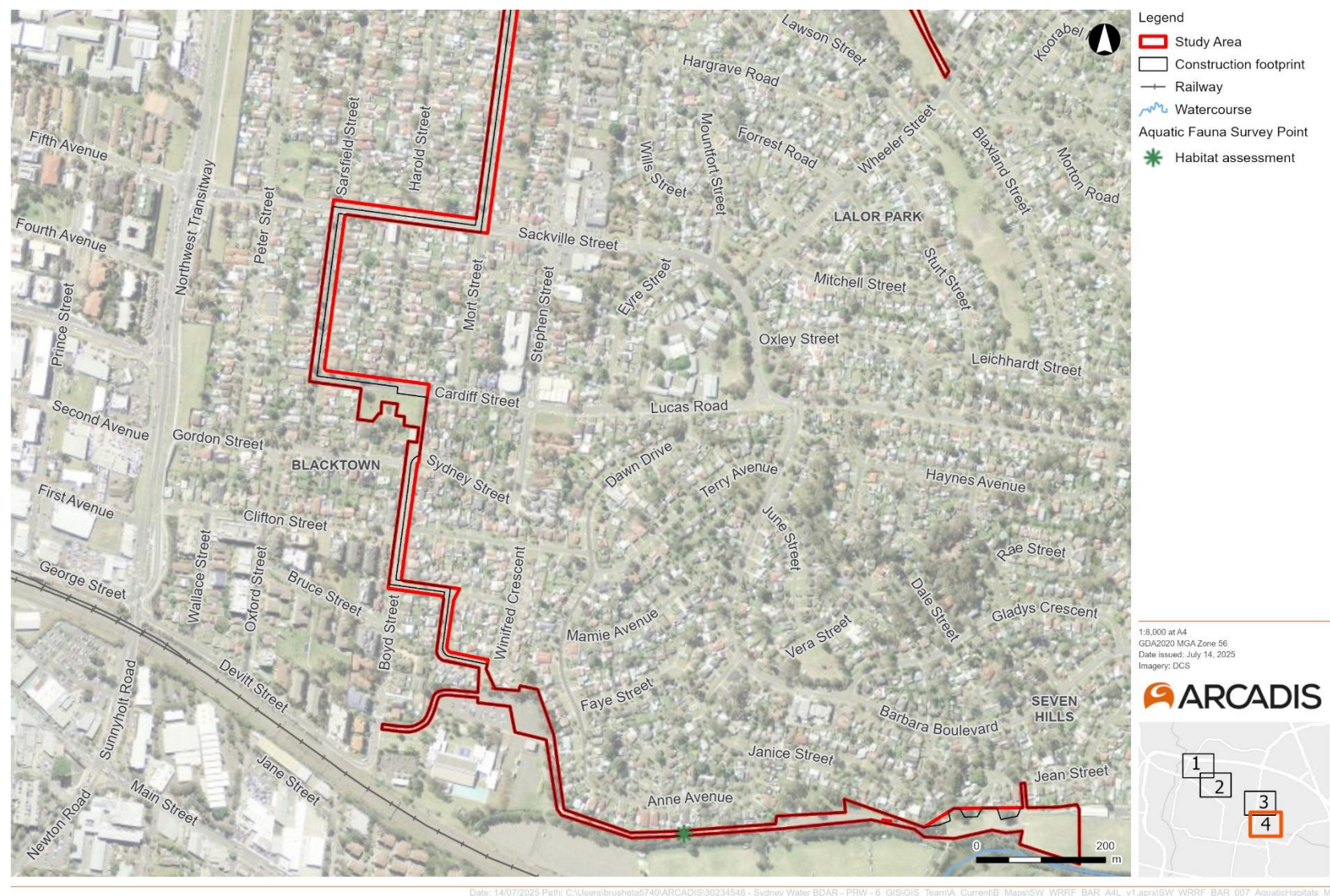


Figure 4-5 Aquatic habitats feature within the Study Area including Groundwater Dependent Ecosystem High Ecological Value Aquatic Ecosystems (HEVAE) and Key Fish Habitat (4 of 4)

5 AVOID AND MINIMISING IMPACTS

To avoid and minimise impacts to biodiversity from the Proposal, Sydney Water engaged Arcadis to undertake a preliminary investigation of a broader Study Area to identify and map biodiversity constraints (Arcadis, 2025). Based on the preliminary constraints mapping, Sydney Water designed the Proposal to largely avoid impacts to high biodiversity values, including threatened ecological communities and threatened species habitat.

In response to constraint mapping, the construction footprint was shifted from intersecting native vegetation to being situated within exotic grasslands at Harvey Park, Lynwood Park and Cavanagh Reserve. At Harvey Park, shifting of the Proposal alignment meant avoiding a patch of PCT 4025 which is equivalent to the state and federally listed CEEC and EEC *River-flat Eucalypt Forest* (RFEF). The location of the original alignment is shown in Figure 5-1 (2 of 4), which shows how the location of the alignment has changed to avoid this threatened community. Approximately 84 percent of RFEF occurrence in the Study Area was able to be avoided.

Avoidance of high-quality native vegetation was also achieved within the Quakers Hill WRRF as patches of PCT 3320 which are equivalent to the CEEC *Cumberland Plain Woodland* have been completely avoided with construction concentrated in areas of already developed land Figure 5-1 (1 of 4).

Furthermore, by avoiding all six hollow-bearing trees identified within the Study Area the Proposal prevents impacts to hollow dependent fauna such as hollow nesting birds, arboreal fauna and microbats.

Key Fish Habitat and Groundwater Dependent Ecosystems have been considered in the design phase with the construction footprint sited along a shared access path and away from Breakfast Creek and Blacktown Creek. This avoids direct impacts to aquatic habitats and minimises the risk of indirect impacts from construction of the Proposal to waterways and fauna dependent on aquatic habitats.

Where the Proposal pipeline alignment could not be shifted to avoid sensitive biodiversity values horizontal direction drilling (HDD) has been adopted as the construction methodology to avoid/minimise impacts to terrestrial biodiversity on the ground surface. HDD was adopted instead of open trenching at the Breakfast Creek crossing upstream of Davis Road.

The current assessment assumes that all vegetation within the construction footprint will be removed to facilitate development of the Proposal, however it is anticipated that native vegetation and habitat removal can be further reduced during detailed design and during construction. As the Proposal progresses, where possible, native vegetation/trees will be avoided or trimming of vegetation will be prioritised rather the removal of whole plants/trees. This will be achieved by adjusting the construction methodology and the width of the construction footprint in sensitive areas (eg avoid having laydown areas and access tracks adjacent to open trenches where native vegetation is present on both sides of the construction footprint; reducing the impact area to the minimum width possible to minimise encroachment into native vegetation and habitat).

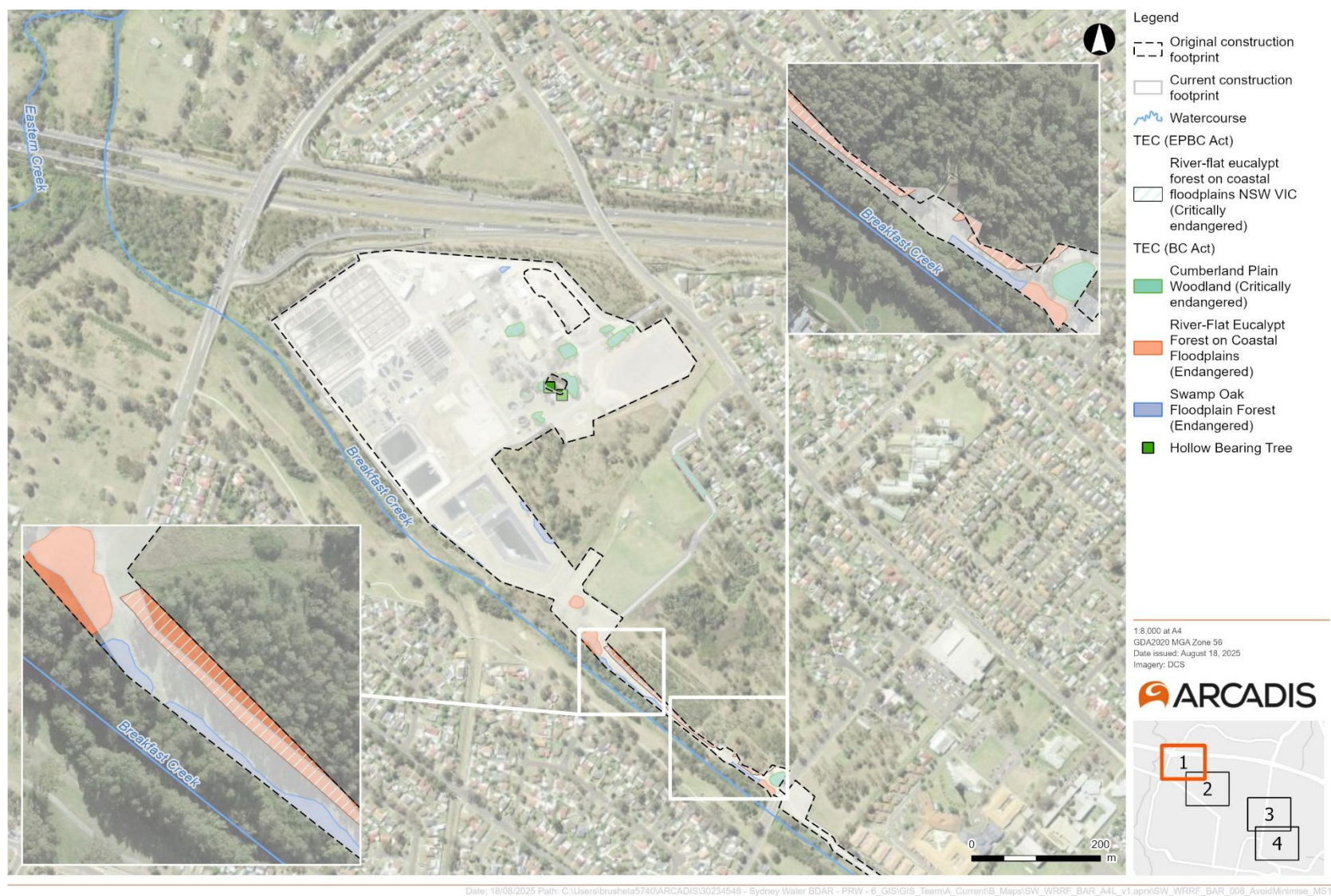


Figure 5-1 Development of the Proposal design to avoid impacts to native vegetation (1 of 4)

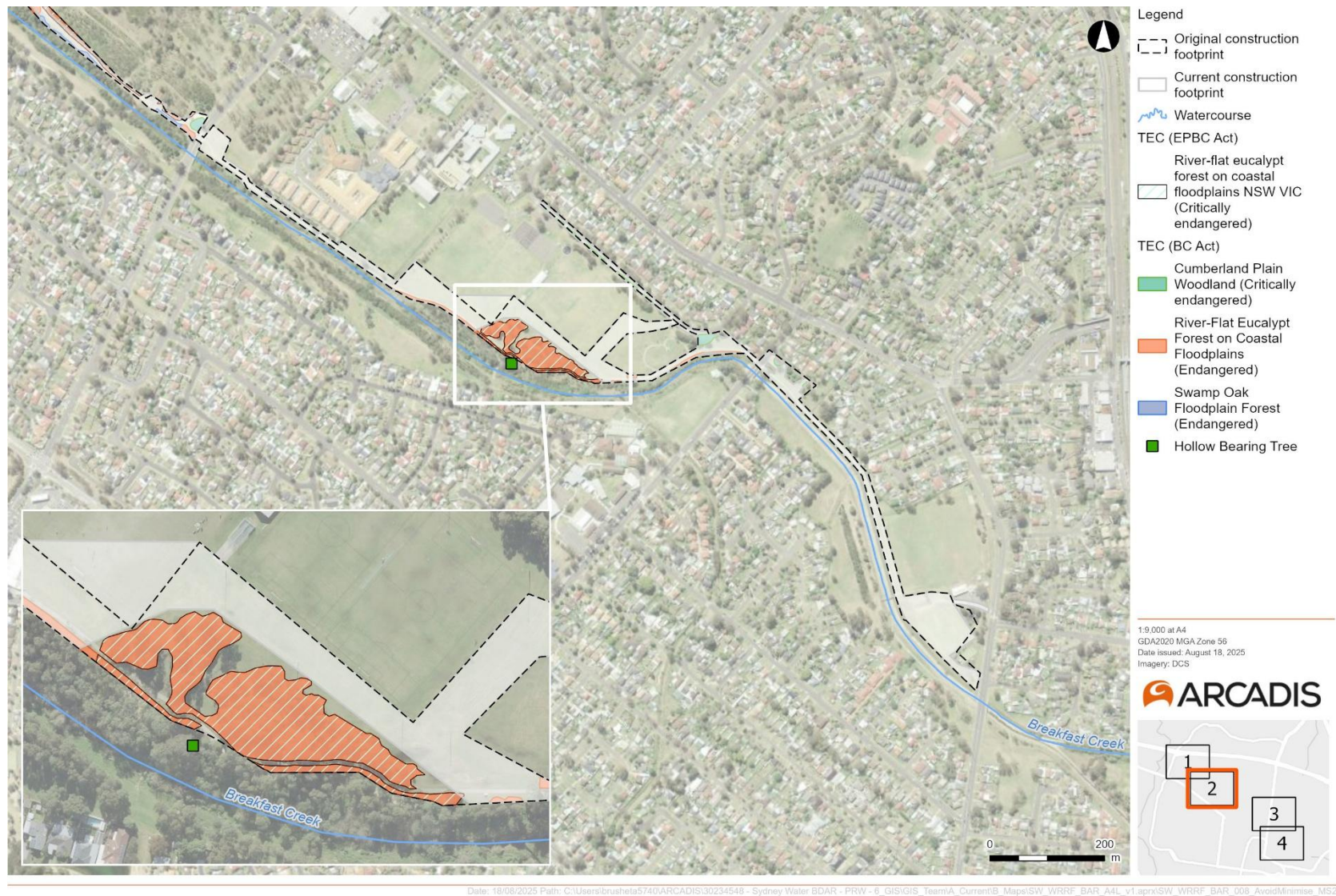


Figure 5-1 Development of the Proposal design to avoid impacts to native vegetation (2 of 4)



Figure 5-1 Development of the Proposal design to avoid impacts to native vegetation (3 of 4)

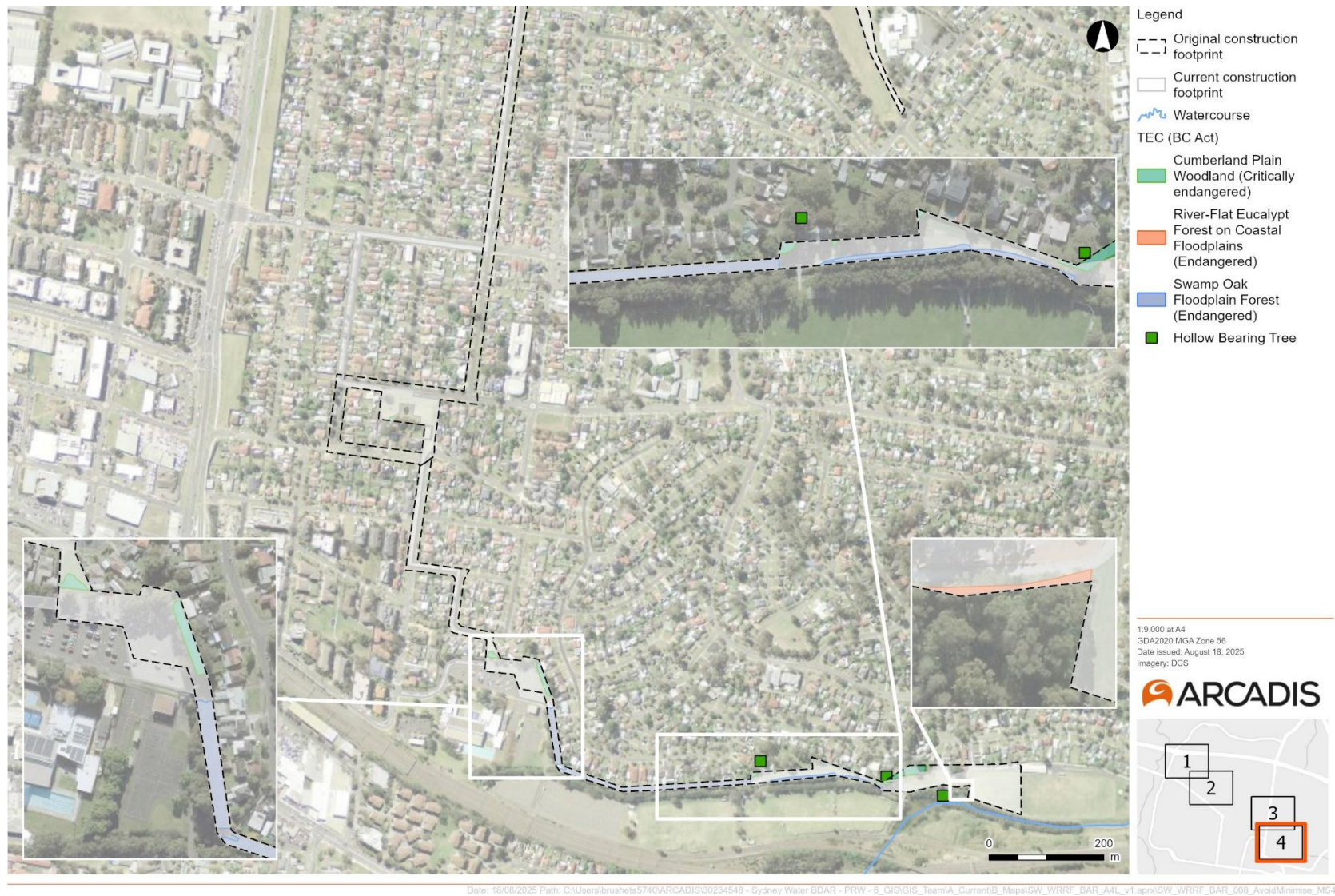


Figure 5-1 Development of the Proposal design to avoid impacts to native vegetation (4 of 4)

6 IMPACT ASSESSMENT

Impacts associated with the Proposal may impact biodiversity values during both the construction and operational phases. This impact assessment focuses on the direct and indirect impacts, specifically from clearing vegetation for pipeline trenches and the Advanced Treatment Upgrade. Additionally, excavation may disrupt root zones, accelerate erosion, and cause sedimentation along identified creeks. Clearing may result in edge effects, spread pathogens and weeds and construction could also cause noise, vibration and lighting which may indirectly disturb fauna.

Operational impacts include ongoing discharge of treated water into Breakfast Creek (before the PRW Treatment Plant becomes operational). The operational phase has risks associated with ongoing noise, lighting, fencing, odour emissions, chemical dosing, brine storage, and potential leaks, which could introduce pollutants into surrounding environments.

6.1 Direct impacts on native vegetation and habitat

For the purpose of this impact assessment it is assumed that all native vegetation within the construction footprint will be removed by the Proposal. Therefore, this assessment is considered to present a worst-case scenario, and it is likely that impacts can be minimised on-site. Opportunities to minimise biodiversity impacts may include avoiding scattered trees; prioritising trees trimming rather than complete removal; reducing the width of the construction footprint where native vegetation is present on both sides of the corridor.

6.1.1 Plant Community Types

A total of 13.57 hectares of vegetation, including native, planted and exotic vegetation and weeds, could be removed by this Proposal. Of the vegetation to be removed, 1.97 hectares is native and constitutes a PCT and, in some instances, a TEC. A summary of impacts to vegetation to facilitate the Proposal is listed in Table-6-1. Impacts to PCTs within the construction footprint can be viewed in Figure 6-1.

Table-6-1 Impacts on vegetation from the Proposal

Plant Community Type	Condition description summary (Detailed description provided in section 4.2)	Within the Study Area (ha)	Within the Construction footprint (ha)
PCT 3320 Cumberland Shale Plains Woodland	Planted, regrowth and remnant trees which are diagnostics of PCT 3320. Largely exotic understorey supporting weeds and exotic grasslands.	1.08	0.95
PCT 3975 Southern Lower Floodplain Freshwater Wetland	Degraded wetland vegetation that is mainly comprised of two native species and a high composition of weeds.	0.01	0.01
PCT 4023 Coastal Valleys Riparian Forest	Degraded patches of riparian forest dominated by Swamp Oak with an absent or completely exotic understorey.	0.62	0.62
PCT 4025 Cumberland Red Gum River-flat Forest	Planted or remnant patches of riparian forest which have a fully structured assemblage including native trees, shrubs and groundcovers.	1.16	0.39
Total native vegetation		2.87	1.97
Mixed exotic and native vegetation	-	0.35	0.22

Plant Community Type	Condition description summary (Detailed description provided in section 4.2)	Within the Study Area (ha)	Within the Construction footprint (ha)
Exotic grassland	-	11.74	11.27
Weeds	-	0.11	0.11
Total vegetation		15.07	13.57

6.1.2 Threatened Ecological Communities

PCTs 3320, 4023 and 4025 were determined to be equivalent with threatened ecological communities listed under the BC Act and/or EPBC Act. The area of vegetation to be removed that is associated with these TECs is quantified below in Table 6-2. Impacts to TECs within the construction footprint can be viewed in Figure 6-2.

Table 6-2 Impacts to threatened ecological communities

PCT	Equivalent TEC	Within the Study Area (ha)	Within the Construction footprint (ha)
PCT 3320 Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically endangered (BC Act)	1.08	0.95
PCT 3975 Southern Lower Floodplain Freshwater Wetland	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Coast Bioregions – Endangered (BC Act)	0.62	0.62
PCT 4023 Coastal Valleys Riparian Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – Endangered (BC Act)	1.16	0.39
	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – Critically endangered (EPBC Act)	0.88	0.13

Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act - Critically endangered)

A total of 1.08 hectares of Cumberland Plain Woodland (CPW) occurs within the Study Area with 0.95 hectares occurring in the construction footprint (Figure 6-2). CPW within the construction footprint is degraded and is not a fully structured assemblage, rather it comprises groupings or scattered occurrences of characteristic tree species *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum) with a predominantly exotic understorey. Of the 0.95 hectares of CPW which may be impacted, 0.65 hectares comprises scattered trees in urban parklands and ovals. The remaining 0.30 hectares forms part of a broader patch of native vegetation.



Plate 6-1. Example of Cumberland Plain Woodland in the construction footprint which comprises scattered trees with a predominantly exotic understorey

A Test of Significance in accordance with Section 7.3 of the BC Act has been conducted to assess the removal of a maximum of 0.95 hectares of CPW and has been included in Appendix G. It was determined that that a significant impact to this TEC was unlikely because:

- the area of CPW to be removed comprises scattered trees in urban parklands and ovals and does not include removal of fully structured assemblages of the community.
- the removal of up to 0.95 hectares of will occur across a very broad project footprint, including 8 kilometres of pipeline and will not be isolated to a single patch of CPW.
- The removal of scattered native trees and the edge of larger patches will not cause the remaining areas of the community in the locality (i.e. local occurrence) to be placed at risk of extinction.
- The area of CPW to be removed may provide some habitat to woodland birds and other highly mobile fauna but does not have the high habitat values of a fully structured assemblage.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act - Endangered)

A total of 0.62 hectares of Swamp Oak Floodplain Forest (SOFF) occurs within the construction footprint (Figure 6-2). SOFF within the construction footprint include re-growth assemblages and planted assemblages, in both cases having a native canopy of *Casuarina glauca* (Swamp Oak) with an absent or completely exotic understorey. SOFF occurs at two main locations, along Blacktown Creek (likely planted) and along Breakfast Creek (re-growth). The patches (0.46 hectares) along Blacktown Creek are predominantly overhanging the construction footprint and are unlikely to be impacted; some minor trimming may be required. The patch (0.16 hectares) along Breakfast Creek for part of a riparian corridor and similarly are overhanging and only likely to require trimming. An example of how native vegetation is overhanging the construction footprint, which is positioned in the shared path, is shown in Plate 6-2. An example of native vegetation overhanging a shared access track

A Test of Significance in accordance with Section 7.3 of the BC Act has been conducted to assess the removal of a maximum of 0.62 hectares of SOFF and has been included in Appendix G. It was determined that that a significant impact to this TEC was unlikely because:

- The removal of 0.62 hectares of SOFF from two separate patches (local occurrences) is unlikely to jeopardise the persistence of the remaining areas beyond the construction footprint.
- Although the total area assessed for removal is 0.62 hectares, the actual area of impact is likely to be much less and be largely restricted to trimming of some overhanging canopy trees.

- The patches of SOFF that will be impacted have a degraded understorey and the Proposal is unlikely to result in further degradation of the community.
- The Proposal will not fragment an existing patch into two or more patches, rather impacts will be contained to the edge of larger patches.



Plate 6-2. An example of native vegetation overhanging a shared access track which when mapped using aerial imagery exaggerates the actual area of impact.

River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act - Endangered)

A total of 1.16 hectares of River-flat Eucalypt Forest occurs within the Study Area with 0.39 hectares occurring in the construction footprint (Figure 6-2). The area of RFEF to be removed is from two broader patches, one along Blacktown Creek at the International Peace Park and the other along Breakfast Creek at Melrose and Harvey Park. Impacts to RFEF along Breakfast Creek (0.38 hectares) may include wholesale clearing whereas tree trimming is likely to the patches along Blacktown Creek (0.01 hectares). The areas to be removed for these patches equates to approximately 1 per cent of the patch, and less than 1 per cent of the patch, respectively.

A Test of Significance in accordance with Section 7.3 of the BC Act has been conducted to assess the removal of a maximum of 0.39 hectares of RFEF and has been included in Appendix G. It was determined that that a significant impact to this TEC was unlikely because:

- The removal of 0.39 hectares of RFEF from two separate patches (local occurrences) is unlikely to jeopardise the persistence of the remaining areas beyond the construction footprint.
- Although the total area assessed for removal is 0.39 hectares, the actual area of impact is likely to be less and be largely restricted to trimming of some overhanging canopy trees.
- The Proposal will not fragment an existing patch into two or more patches, rather impacts will be contained to the edge of larger patches.

River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (EPBC Act - Critically endangered)

A total of 0.88 hectares of River-flat Eucalypt Forest occurs within the Study Area with 0.13 hectares occurring in the construction footprint (Figure 6-2). The area of RFEF to be removed will occur from a single patch which has been historically planted and is a fully structured assemblage containing native species in all strata. The area of RFEF to be removed represents a minor proportion of the total extent of this CEEC which was measured at 10,600 hectares in 2020 (DAWE, 2020).

Assessment against the Significant Impact Criteria (DoE, 2013) has been conducted to assess the removal of a maximum of 0.13 hectares of RFEF and has been included in Appendix F. It was determined that that a significant impact to this TEC was unlikely because:

- The removal of 0.13 hectares of RFEF is unlikely to jeopardise the persistence of this CEEC.
- The Proposal will not fragment an existing patch into two or more patches, rather impacts will be contained to the edge of a larger patch.
- The area to be removed and the broader patch share similar composition and condition, with some disturbance being present. Therefore, the proposed impact to RFEF is unlikely to substantially change the composition of the broader patch or its condition.

6.1.3 Threatened species habitat

No threatened flora are considered as being impacted by the Proposal. The single Magenta Lilly Pilly located at the International Peace Park will not be impacted and impacts to adjoining areas of potential habitat will be minor (if any).

The Proposal will remove potential habitat for 30 threatened fauna species (two of which are also listed as Migratory). The threatened species and the predicted impact to associated habitat is listed below in Table 6-3.

Table 6-3 Predicted impacts to threatened fauna species.

Threatened species	BC Act	EPBC Act	Description of impacts	Habitat within the Construction footprint (ha)
Hollow dependent microbat species				
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	V	-	Removal of foraging habitat (PCTs 3320 Canopy and 4025).	1.33
Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>)	V	-		1.33
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	V	-	Removal of foraging habitat (PCTs 3320 Canopy, 4023, 4025).	1.96
Eastern Coastal Free-tailed Bat (<i>Micronomus norfolkensis</i>)	V	-	Removal of foraging habitat (PCTs 3320 Canopy, 3975, 4023, 4025).	1.97
Little Bent-winged Bat (<i>Miniopterus australis</i>)	V	-		1.97
Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>)	V	-		1.97
Southern Myotis (<i>Myotis macropus</i>)	V	-		1.97
Large forest owls				
Barking Owl (<i>Ninox connivens</i>)	V	-	Removal of foraging habitat (PCTs 3320 Canopy, 3975, 4023, 4025).	1.97
Masked Owl (<i>Tyto novaehollandiae</i>)	V	-		1.97
Powerful Owl (<i>Ninox strenua</i>)	V	-	Removal of foraging habitat (PCTs 3320 Canopy, 4023, 4025).	1.96
Raptors				

Threatened species	BC Act	EPBC Act	Description of impacts	Habitat within the Construction footprint (ha)
White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>)	V	M	Removal of foraging and potential roosting habitat (PCTs 3320 Canopy, 3975 Degraded, 4023, 4025).	1.97
Spotted Harrier (<i>Circus assimilis</i>)	V	-		1.97
Square-tailed Kite (<i>Lophoictinia isura</i>)	V	-		1.97
Little Eagle (<i>Hieraaetus morphnoides</i>)	V	-		1.97
Eastern Osprey (<i>Pandion cristatus</i>)	V	M		1.97
Black Falcon (<i>Falco subniger</i>)	V	-		1.97
Woodland birds				
Dusky Woodswallow (<i>Artamus cyanopterus cyanopterus</i>)	V	-	Removal of foraging habitat (PCTs 3320 Canopy, 3975 Degraded, 4023, 4025).	1.97
Varied Sittella (<i>Daphoenositta chrysoptera</i>)	V	-		1.97
Speckled Warbler (<i>Pyrrholaemus sagittatus</i>)	V	-	Removal of foraging habitat and general nesting habitat (PCTs:3320 Canopy, 4023, 4025)	1.96
Brown Treecreeper (<i>Climacteris picumnus victoriae</i>)	V	V		1.96
Regent Honeyeater (<i>Xanthomyza phrygia</i>)	CE	CE		1.96
Parrots				
Swift Parrot (<i>Lathamus discolor</i>)	E	CE	Removal of foraging habitat (PCTs 3320 Canopy, 3975 Degraded, 4023, 4025).	1.97
Turquoise Parrot (<i>Neophema pulchella</i>)	V	-		1.97
Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>)	E	E		1.97
South-eastern Glossy Black-Cockatoo (<i>Calyptorhynchus lathami lathami</i>)	V	V	Removal of foraging habitat (PCTs 3320 Canopy, 4023, 4025).	1.96
Little Lorikeet (<i>Parvipsitta pusilla</i>)	V	-		1.96
Other				
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	E	E	Removal of foraging and sheltering habitat (PCTs 3975, 4023, 4025).	1.02
Cumberland Plain Land Snail (<i>Meridolum corneovirens</i>)	E	-	Removal of sheltering, foraging and breeding habitat (PCT 4025).	0.39
Grey-headed flying-fox (<i>Pteropus poliocephalus</i>)	V	V	Removal of foraging habitat (PCTs 3320 Canopy, 3975 Degraded, 4023, 4025 and planted native and exotic vegetation).	2.19

Threatened species	BC Act	EPBC Act	Description of impacts	Habitat within the Construction footprint (ha)
White-throated Needletail (<i>Hirundapus caudacutus</i>)	V	V/M	Removal of foraging habitat (PCTs 3320 canopy, 3975 Degraded, 4023, 4025).	1.97

Significant impact assessments for threatened species

Impacts to threatened species and threatened species habitat from the Proposal are considered to be low/negligible for most species with a moderate or higher likelihood to occur. Potential for direct impacts to individuals/occupied habitat of a threatened species has been identified for Cumberland Plain Land Snail. No impacts are anticipated to Magenta Lilly Pilly as impacts to adjoining areas of habitat (PCT 4025) where the single individual was found will be minor. The other species known to occur (the five microbat species and GHFF), are highly mobile and while there are anticipated direct impacts to foraging resource, impacts are considered minor in nature. Impacts to all other threatened species will only occur to areas of potential habitat.

For threatened species that are mobile and able to access suitable habitat resources in the local landscape or broader Study Area, removal of small areas of habitat, particularly habitat that is not critical to completing their life cycle (i.e. breeding habitat) by the Proposal, have a low likelihood of being impacted, and still less, significantly impacted. As such, consideration against the criteria for both Significant Impact Criteria (SIC) assessments and Test of Significance (ToS) does not require detailed investigation and explanation to determine whether a significant impact is possible. As such a summary review against the criteria, instead of detailed review, has been carried out. For these species consideration against the SIC assessment and ToS criteria has been demonstrated by Table 9-5 and Table 9-6 in Appendix F and Appendix G, respectively.

For species which are less mobile and/or have habitat critical to completing their life cycle (i.e. breeding habitat, occupied habitat) which will be removed by the Proposal, a higher level of consideration/investigation is required to determine whether a significant impact is possible. This is the case for Cumberland Plain Land Snail. Consideration for impacts to Cumberland Plain Land Snail against the ToS has been explained in Appendix F.

It was determined through these significant impact assessments that the Proposal will is unlikely to have a significant impact on a threatened species listed under state (BC Act) and/or federal (EPBC Act) legislation.

6.1.4 Fauna injury and mortality

Fauna injury or mortality may occur during vegetation clearing activities or may result from collisions with work vehicles or plant, or accidental entrapment in plant or equipment. Mitigation measures would be implemented to minimise the risk of occurrence.

6.1.5 Aquatic habitats

Breakfast Creek is mapped as Key Fish Habitat and flows through the northern-western end of the Study Area although from ground-truthing does not meet the KFH criteria. Breakfast Creek and Blacktown Creek have flowing water and provides foraging habitat for common flora and fauna species. These waterways are deemed unlikely to be utilised by threatened species.

Impacts to Breakfast and Blacktown Creek are considered unlikely with works proposed outside the edges of these creeks. There are, however, potential risks associated with run-off and erosion. Significant impacts to threatened fauna including threatened fish utilising Breakfast and Blacktown Creek are not anticipated as the habitat quality has been determined to be poor, due to barriers like unculverted road crossings and concrete-lined sections as well as silt accumulation, and pollution, with the water quality not meeting recommended standards for aquatic life (Jacobs, 2025a). As such, impacts to fauna associated with this aquatic habitat is considered low with existing signs of human

impact, invasive species and pollution. Additionally, aquatic life in Breakfast Creek and Eastern Creek is unlikely to be negatively impacted by the changes in discharge concentrations (Jacobs, 2025a).

Under the scenarios assessed by Streamology (2025) in their Eco hydraulic assessment, the change in depth at Breakfast Creek and Eastern Creek for each scenario is 0.01 metres, which is not considered a significant impact. Changes to Breakfast Creek flow because of operation of the project are anticipated to be negligible to minor. As discharge will be constant, cease-to-flow events are not anticipated (Streamology, 2025).

6.1.6 Groundwater Dependent Ecosystems

A Groundwater Impact Assessment (Jacobs, 2025b) has been completed for the Proposal which reviewed the potential for groundwater drawdown and the potential requirements for dewatering. Jacobs concluded that due to the limited magnitude and extent of the expected groundwater drawdown, and the temporary nature of dewatering drawdown, impacts to GDEs are not anticipated.

Arcadis confirmed that the terrestrial GDEs present within or immediately adjoining the Construction Footprint was limited to riparian vegetation communities including PCT 4023 and PCT 4025. Based on the assessment completed by Jacobs it is considered that potential impact to these terrestrial vegetation communities as a result of removing groundwater is low and will temporary, returning to pre-construction levels within weeks of backfilling of excavations.

Quakers Hill WRRF Advanced Treatment Upgrade Biodiversity Assessment Report

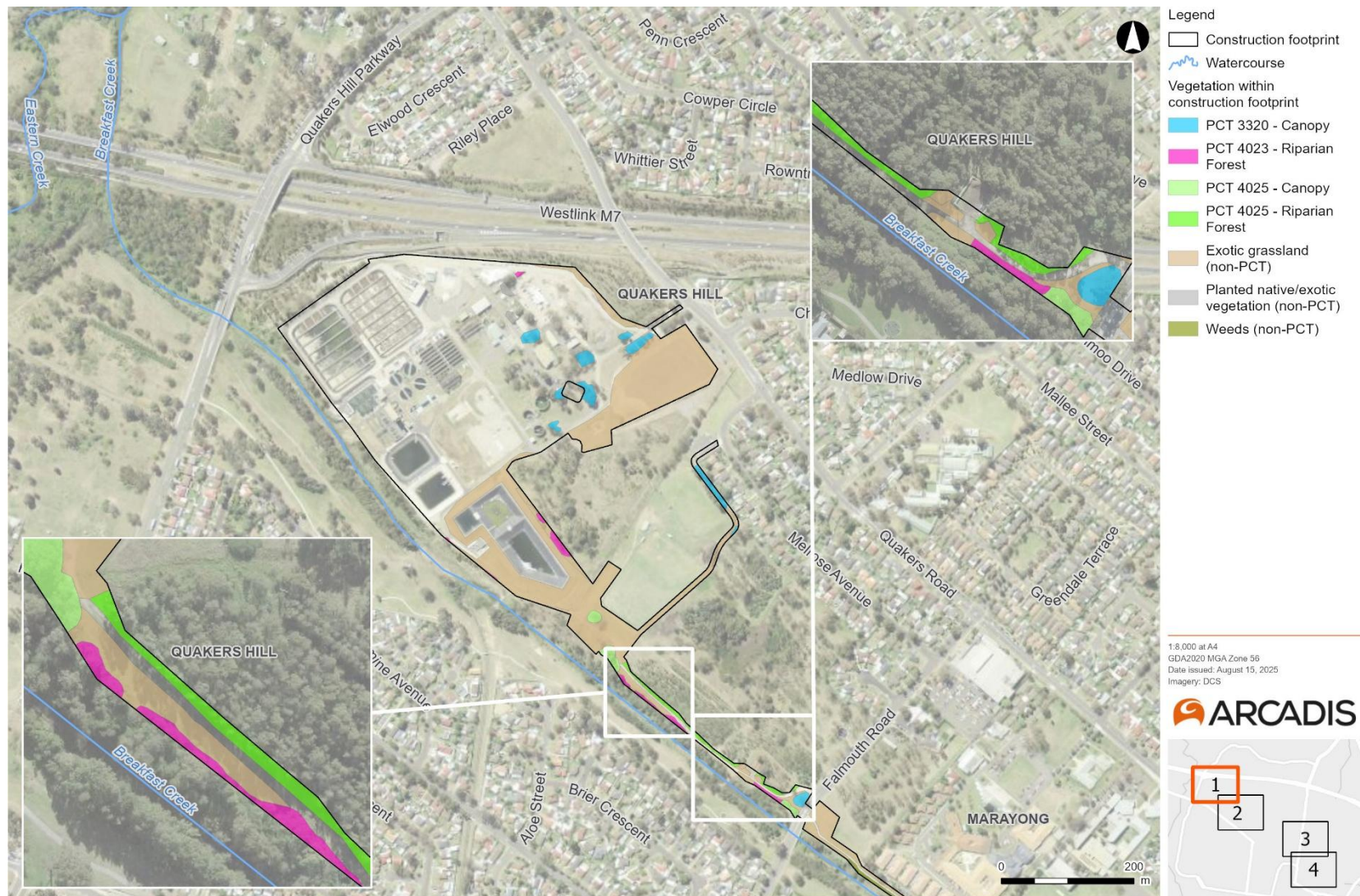


Figure 6-1 PCTs within the construction footprint (1 of 4)

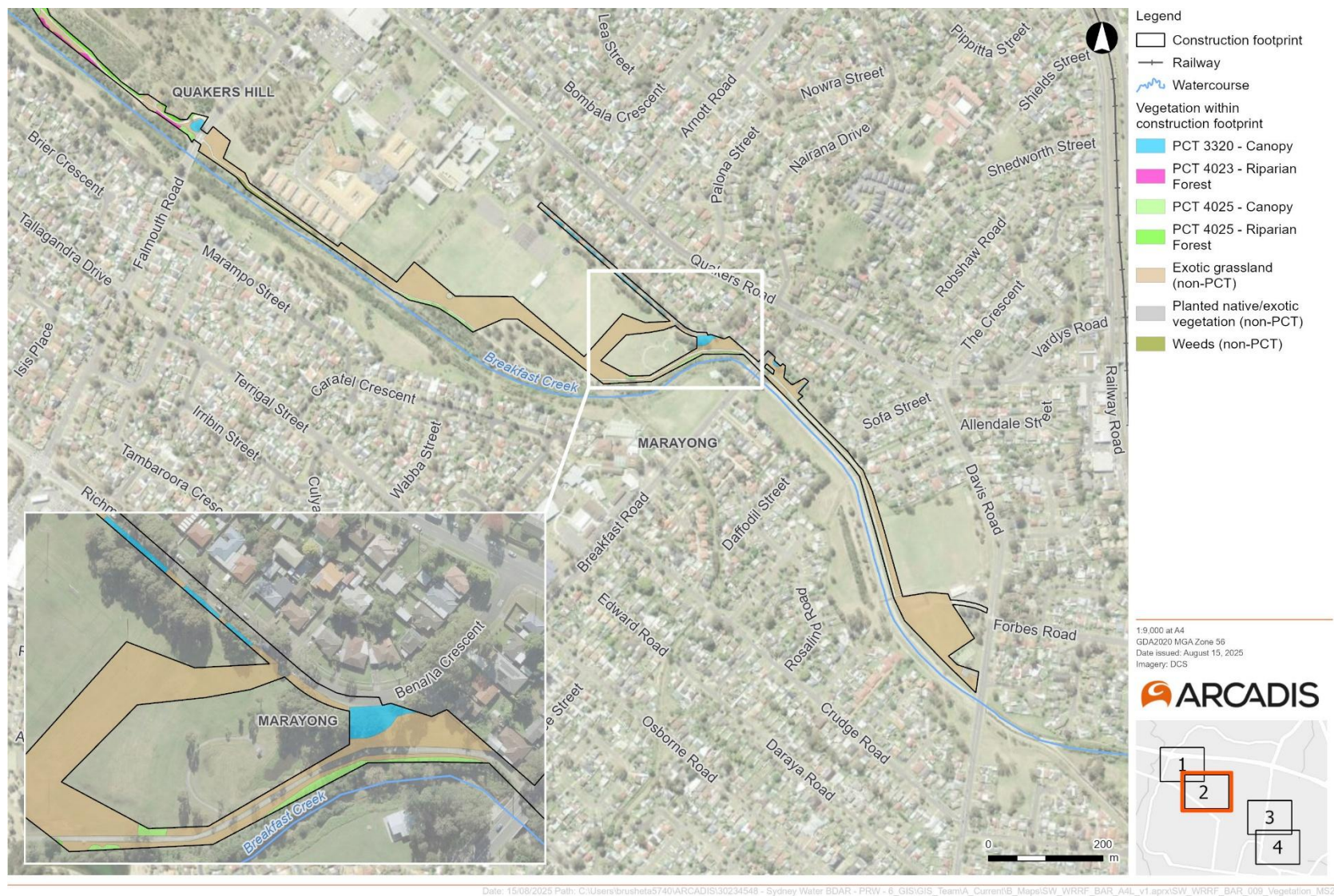


Figure 6-1 PCTs within the construction footprint (2 of 4)



Figure 6-1 PCTs within the construction footprint (3 of 4)

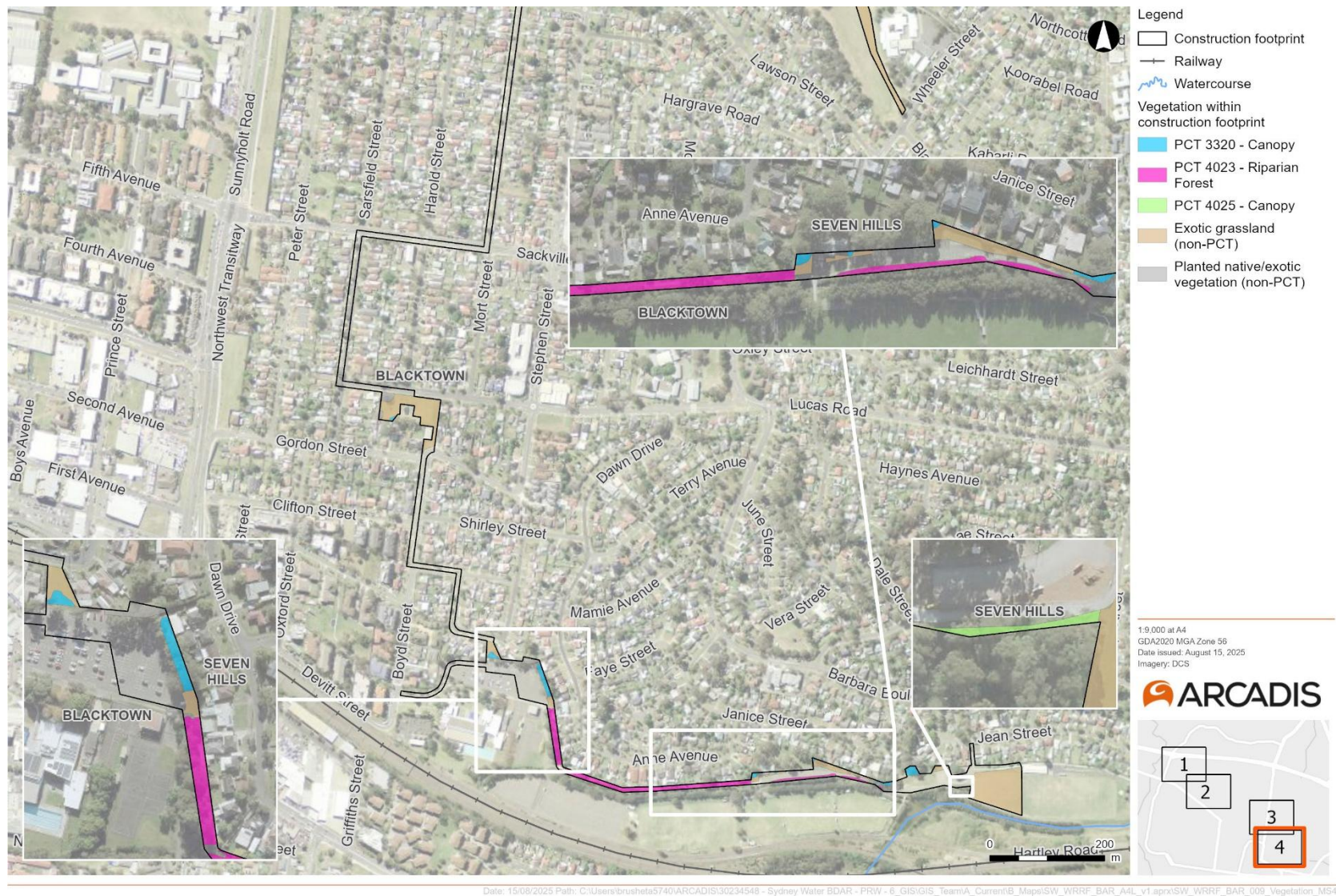


Figure 6-1 PCTs within the construction footprint (4 of 4)

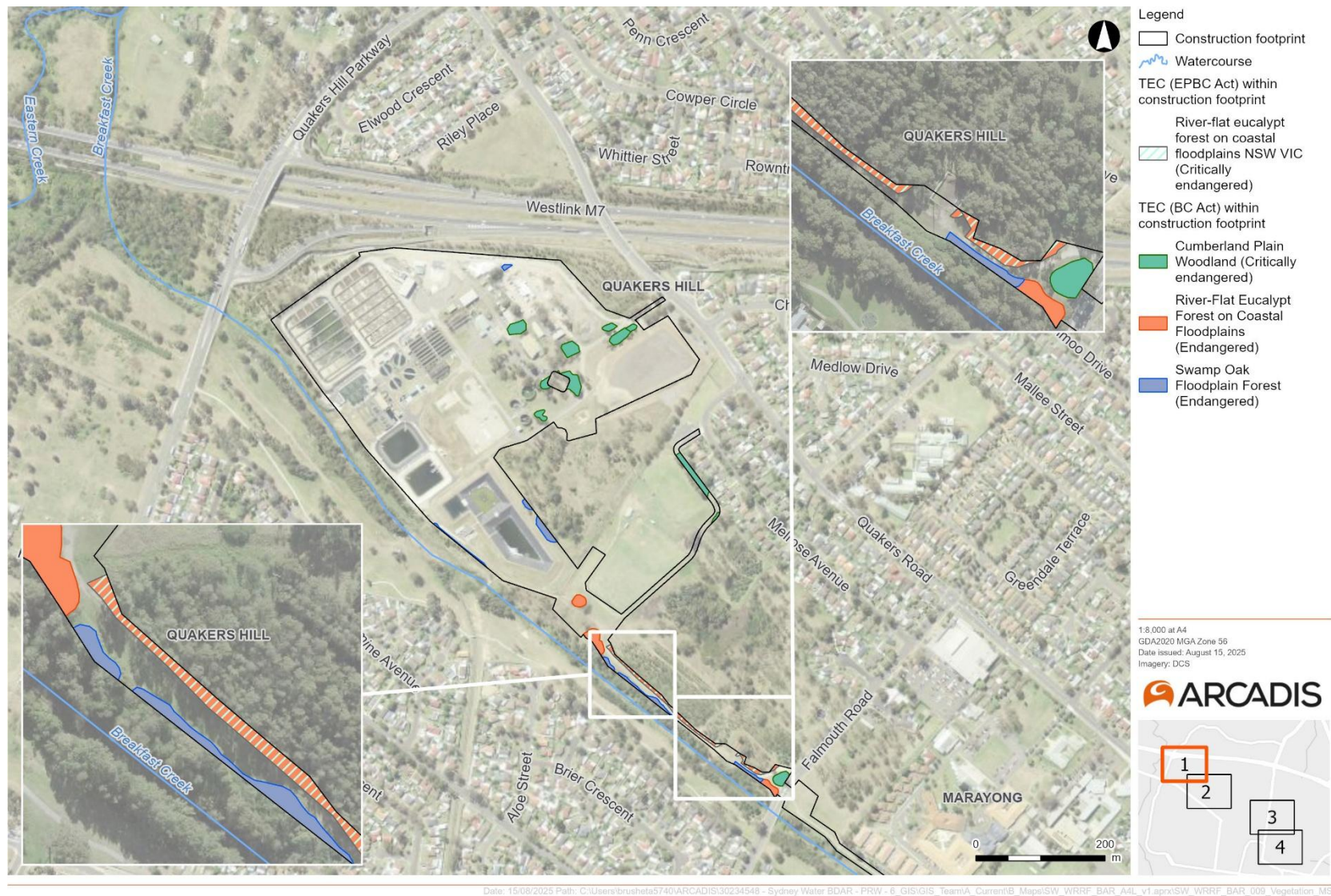


Figure 6-2 TECs within the construction footprint (1 of 4)

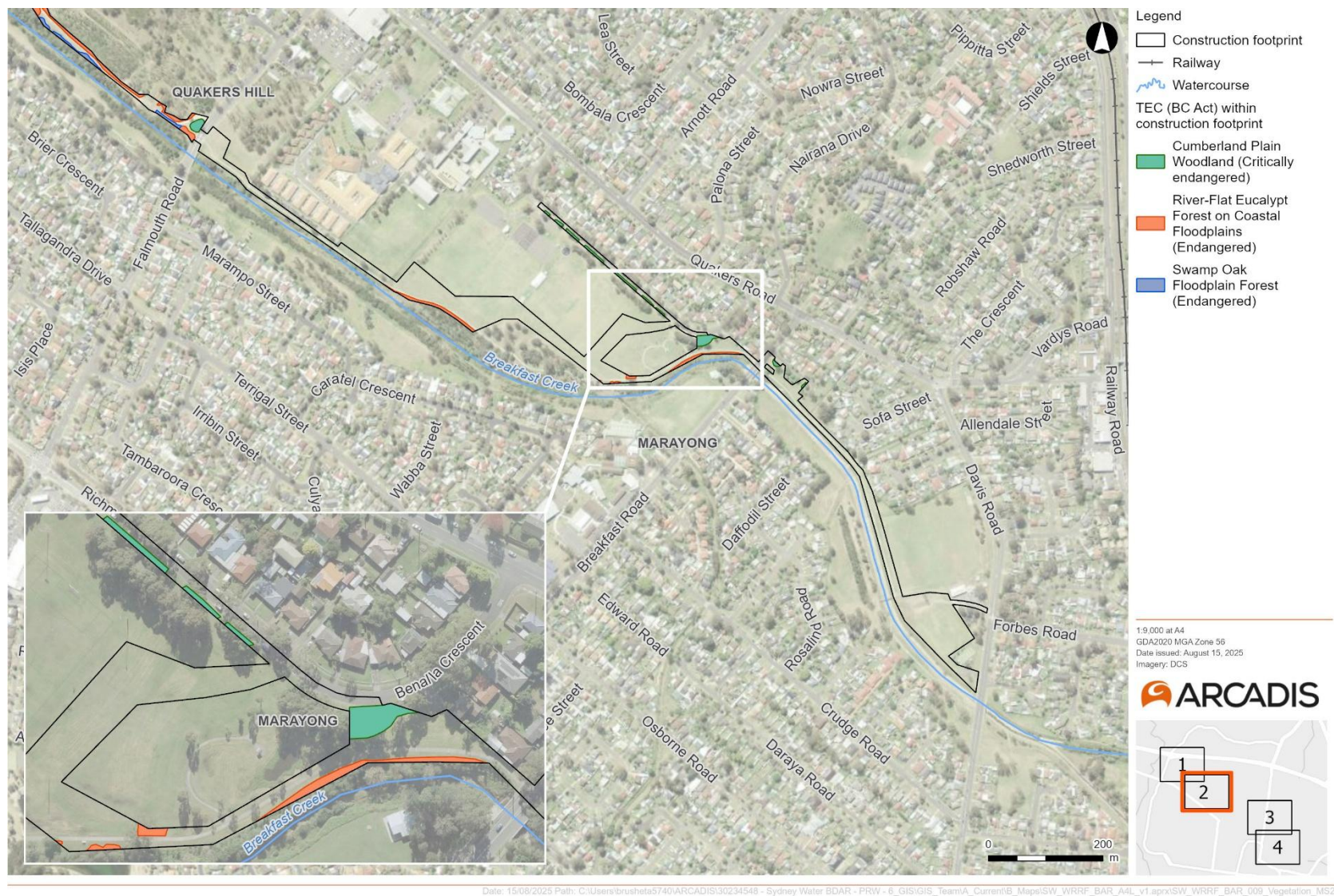


Figure 6-2 TECs within the construction footprint (2 of 4)



Figure 6-2 TECs within the construction footprint (3 of 4)

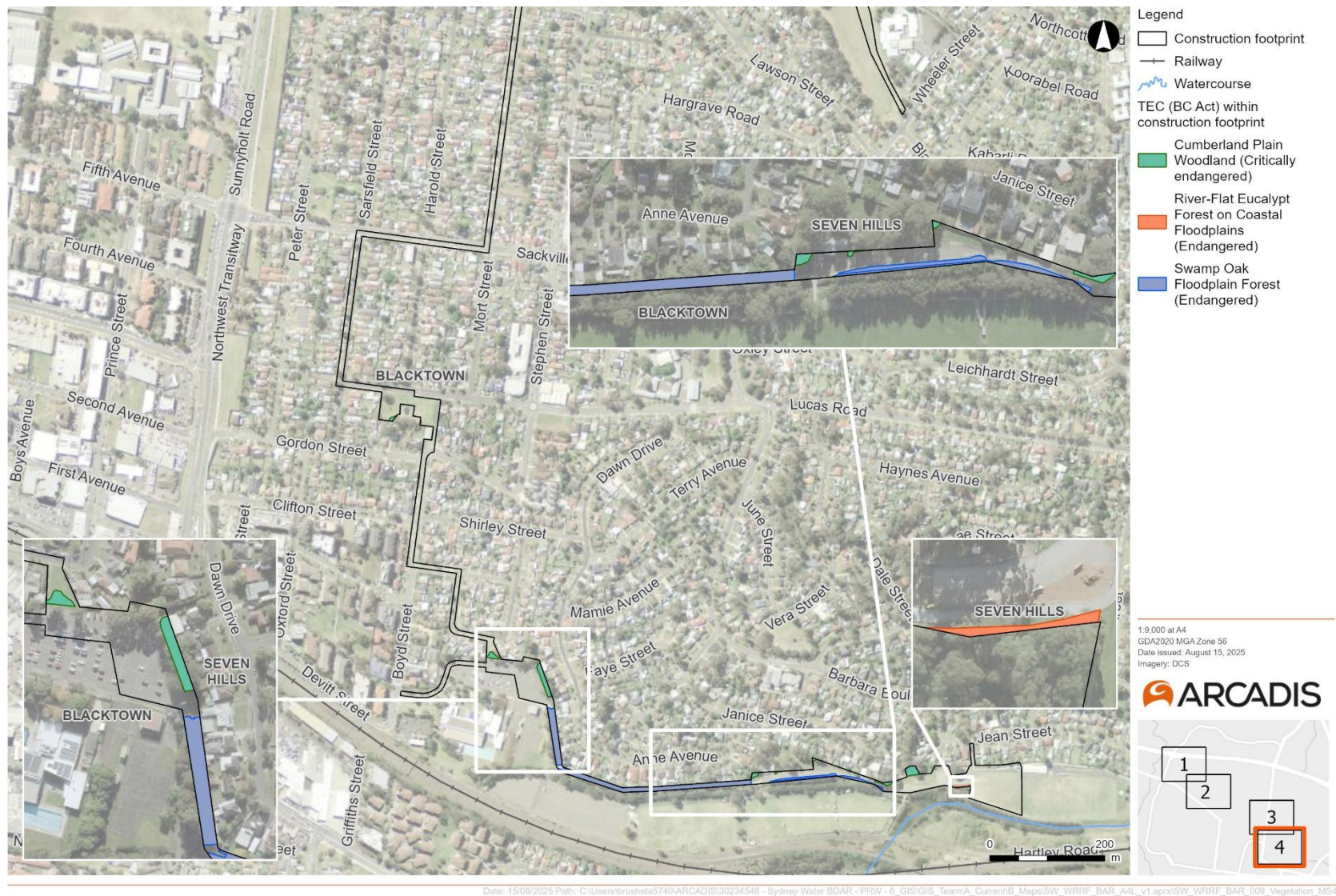


Figure 6-2 TECs within the construction footprint (4 of 4)

6.2 Indirect impacts on native vegetation and habitat

The Proposal is situated in a highly urbanised context which has signs of significant landscape modification and shaping to support residential housing, drainage infrastructure and urban amenity. A mosaic of native vegetation patches has been integrated with urban areas across the Study Area. Native vegetation is present as scattered native trees as well as small and medium sized patches.

Due to proximity of native vegetation and threatened species habitat to urban areas most areas are already subject to some level of disturbance and degradation from human impacts including rubbish dumping, introduction of exotic species including weeds and pest animals, damage to native vegetation. As such, it is considered unlikely that indirect impacts from the Proposal will exacerbate degradation of patches of native vegetation and threatened species habitat beyond the construction footprint.

There are a few key areas which adjoin the construction footprint that are most at risk to indirect impacts from the Proposal, these include:

- Patches of PCT 3320 which are equivalent to the Cumberland Plain Woodland CEEC, at Quakers Hill WRRF
- Patches of PCT 4025 which are equivalent to the River-flat Eucalypt Forest TEC under both state and federal legislation, at Melrose Park and Harvey Park
- Patches of PCT 4023 which are equivalent to the Swamp Oak Floodplain Forest EEC, along Breakfast Creek and Blacktown Creek.
- Aquatic habitats in Blacktown and Breakfast Creek

The locations of these watercourse, patches of native vegetation and TECs adjoining the construction footprint can be seen in Figure 4-3.

6.2.1 Edge effects on native vegetation

The clearing of areas of vegetation may create some new edges in PCT 4023 and 4025 and associated TECs in the construction footprint. These new edges could be subject to degradation by the establishment and spread of weeds and enriched runoff from the use of the maintenance access tracks. However, the risk of edge effects is minor due to the high composition of weeds already surrounding the construction footprint and existing proximity to roads.

6.2.2 Invasion and spread of weeds, pathogens and disease

The vegetation within the Study Area already experiences some invasion by exotic species which represent a threat to native vegetation. An increase in the movement of people, vehicles, machinery, vegetation waste and soil during the proposed works may facilitate the introduction or spread of exotic grasses and other weeds. Management measures would be required to minimise the risk of introduction and spread of weeds.

The Study Area is unlikely to support *Phytophthora cinnamomi* (Phytophthora), as there are no identified records within the locality or downstream of Breakfast Creek. Propagules of Phytophthora can be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers and movement of soil. There may be an increased risk of dispersal of Phytophthora as a result of the Proposal if appropriate management measures are not in place including hygiene protocols for plant, equipment and personnel attending the Study Area, particularly if they have been in an infected area.

6.2.3 Erosion, sedimentation and changes to hydrology

Detailed assessment have been completed for the Proposal to review the potential impact for the Proposal on Geomorphology and Hydrology (Streamology, 2025), Groundwater (Jacobs, 2025b) and Aquatic and Surface Water Quality and Aquatic Ecology (Jacobs, 2025a). These assessments provided a detailed assessment for potential direct and indirect impact from the Proposal including increased risk of erosion, sedimentation and changes to hydrology.

7 RECOMMENDATIONS

Sydney Water have developed a series of mitigation measure to ensure potential impacts on biodiversity associated with the Proposal are minimised. Those relevant to minimising impacts to flora and fauna during construction and operation of the Proposal are included in Table 7-1. Measures to minimise impacts to aquatic environments and habitats, and groundwater has been included in the Groundwater Impact Assessment (Jacobs, 2025b), Geomorphology and Hydrology Assessment (Streamology, 2025) and Aquatic and Surface Water Quality and Aquatic Ecology Assessment (Jacobs, 2025a).

Table 7-1 Sydney Water environmental mitigation measures: Flora and fauna

Item number	Description of measure
4.1	Provided it is essential for delivering the project, Sydney Water's Project Manager can approve the following vegetation removal and tree trimming, without additional environmental assessment (but only after consultation with the Environmental and Community Representatives and affected landowners). Sydney Water considers vegetation removal in these circumstances has minimal environmental impact. Any minor: • vegetation trimming or – removal of exotic vegetation or – removal of planted native vegetation – where the vegetation is not a threatened species (including a characteristic species of a threatened community or population), heritage listed, in declared critical habitat or in a declared area of outstanding biodiversity value. • Any removal of remnant vegetation where there is no net change to environmental impact (eg a different area of vegetation is removed but the total area is the same or less than assessed in the EIA). Written explanation of the application of this clause (including justification of the need for trimming or removal and any proposed revegetation) should be provided when seeking Project Manager approval. Any impacts to native vegetation and trees must be offset in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).
4.2	Offset residual impacts to native vegetation and trees in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).
4.3	Map and report native vegetation clearing greater than 0.01 ha in extent (and any associated rehabilitation) to the Sydney Water Environmental Representative. Track vegetation clearing as per SWEMS0015.26 Contractor Native Vegetation Clearing and Rehabilitation template .
4.4	Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.
4.5	Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing.
4.6	Adjust methodology (eg avoid area, hand excavate, implement exclusion fencing) to protect sensitive areas where possible (such as mature trees, known threatened species, populations or ecological communities).
4.7	Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. Do not damage tree roots unless absolutely necessary, and engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone.
4.11	Retain dead tree trunks, bush rock or logs in-situ unless they are in the impact assessment area (as shown in the Construction Environmental Management Plan (CEMP)) and moving is unavoidable. Reposition material elsewhere on the site or approved adjacent sites. If

Item number	Description of measure
	native fauna is likely to be present, a licenced ecologist should conduct a pre-clearance inspection and undertake fauna relocation.
4.12	Inspect vegetation for potential fauna prior to clearing or trimming. If fauna is present, or ecological assessment has determined high likelihood of native fauna presence (including hollow bearing trees), engage WIRES or a licenced ecologist to inspect and relocate fauna before works.
4.13	If native fauna is encountered on site, stop work and allow the fauna to move away unharassed. Engage WIRES or a licenced ecologist if assistance is required to move fauna.
4.17	If any threatened species (flora or fauna) is discovered during the works, stop work immediately and notify the Sydney Water Project Manager. Work will only recommence once the impact on the species has been assessed and appropriate control measures implemented.
4.18	If any damage occurs to vegetation outside of the impact assessment area (as shown in the CEMP), notify the Sydney Water Project Manager and Environmental Representative so that appropriate remediation strategies can be developed.
4.19	Manage biosecurity in accordance with: • <i>Biosecurity Act 2015</i> (see NSW Weedwise), including reporting new weed infestations or invasive pests • contemporary bush regeneration practices, including disposal of sealed bagged weeds to a licenced waste disposal facility. Record Pesticides and Herbicides use in accordance with SWEMS0017.
4.20	For works in council owned bushland the Delivery Contractor will consult with Councils to identify known plant pathogens or pests and management requirements. Prepare a Hygiene Management Plan if there is a risk of infestation and spread.
4.21	To prevent spread of weeds, wrap straw bales in geofabric to prevent seed spread.
4.22	Bag all plant parts and excavated topsoil that may be infested with weed propagules and dispose at a licensed waste disposal facility.
4.23	If replanting near Sydney Water pipelines refer to 'Which trees can damage wastewater pipes?' link from Sydney Water website to help identify suitable species.

In addition to Sydney Waters mitigation measures, it is recommended that the recommendations included in Table 7-2 are also adopted.

Table 7-2. Additional mitigation measures relevant to the Proposal

Mitigation category	Description of mitigation measure
Risk minimising practices	• Construction should occur during standard daylight hours to avoid potential indirect impacts on nocturnal fauna such as owls, amphibians, and mammals. If construction is to occur at night, then light and noise mitigation measures should be applied to mitigate impacts to native fauna. • The principles of the Arrive Clean – Leave Clean guidelines should be adopted for construction and operation of the Proposal to minimise the risk of introduction or spread of pathogens and weeds within the site or from off-site areas. These principles can be extended to invasive pest animal species including but not limited to Red imported fire ants (<i>Solenopsis invicta</i>) (CoA, 2015). • Light mitigation measures are outlined in the National Light Pollution Guidelines for Wildlife (DCCEEW, 2023). • Vehicles, equipment, materials, and footwear are to be clean on entry (free of soil, mud and/or seeds) to minimise the risk of introduction or spread of <i>Phytophthora cinnamomi</i>.

Mitigation category	Description of mitigation measure
Pre-clearing practices	• Toolbox talks should involve a printout of Cumberland Plain Land Snail (<i>Meridolum corneovirens</i>) and Priority weed species (Table 4-10). • Pre-clearance surveys will be conducted in all areas supporting native vegetation (all PCTs) as well as mixed native and exotic vegetation and weeds; which can provide potential habitat for fauna. During pre-clearance surveys all areas of habitat that have potential to conceal fauna should be demarcated. • Any occurrence of Priority weeds should be demarcated during pre-clearing surveys. • Pre-clearance surveys should be conducted prior to vegetation clearing or trimming, by a suitably qualified ecologist. the attending ecologist will identify any breeding or nesting activities by native fauna. Should an active nest be found in a tree that requires removal, it should be left in place until the chicks naturally fledge; at which point the tree may then be removed. • Targeted searches for Cumberland Plain Land Snail (<i>Meridolum corneovirens</i>) should be undertaken as part of the pre-clearing survey, however must occur within 48 hours of vegetation clearing. • During the pre-clearance surveys, any hollow-bearing trees not previously identified in or near the proposed Study Area would be marked by an ecologist so that they can be retained and avoided by contractors (where possible), or supervised during removal by an ecologist. • Any unexpected threatened species or ecological communities identified during the pre-clearing assessment should be appropriately assessed through a supplementary impact assessment.
Clearing practices:	• Identify opportunities to avoid and minimise such as trimming instead of full removal where possible. Retention should be prioritised for trees which form part of a PCT, particularly <i>Eucalyptus moluccana</i> (Grey Box), <i>Eucalyptus tereticornis</i> (Forest Red Gum) and planted native trees like <i>Eucalyptus microcorys</i> (Tallowood) that are higher value feed trees. • Native vegetation removal should follow a two staged process; whereby non-habitat vegetation is removed 24 hours prior to demarcated habitat (i.e. hollow-bearing trees) being removed. The time between the first and second stage of vegetation clearing allows reprieve for any inhabiting fauna to self-relocate, prior to habitat removal. Following the 24-hour period all demarcated habitat should be removed under the supervision of a qualified ecologist. • Where fauna species are identified in vegetation to be cleared, animals would be removed and relocated to adjacent bushland prior to felling. If this is not possible, the tree would be sectionally dismantled or soft felled under the supervision of an ecologist or wildlife carer, before relocating the animal. • Cover open trenches overnight to avoid fauna becoming trapped. Additionally, trenches should be checked each morning for possible trapped fauna.
Post clearing practices:	• Revegetation should prioritise the use of local provenance species emulating the nearest Plant Community Types. Planting/seeding palettes should be confirmed by a suitably qualified bush regenerator or ecologist.

8 BIODIVERSITY OFFSETS

Under Part 5 of the *Environmental Planning and Assessment Act 1979*, Sydney Water must assess the environmental impact of all its activities. Sydney Water developed a Biodiversity Offset Guide (the Guide) to consider possible offset options for Sydney Water activities that fall outside statutory requirements. The Guide facilitates appropriate levels of native vegetation offsets and/or tree offsets on Sydney Water Proposals.

Residual impacts to biodiversity from the Proposal that could not be avoided during design will be offset in accordance with the Guide. Offsets should be delivered for the actual area of native vegetation and habitat removal for the final area of impact. As the impact assessment (Section 6) addresses a worst-case scenario which assumes wholesale clearing within the construction footprint, the actual impacts are anticipated to be less than this. Tracking vegetation removal is recommended to be undertaken to determine the actual area of the impact following construction of the project; at which point recalculation of the offsets would be undertaken.

Under Section 4 of the Guide, the impacts to native vegetation from the Proposal is classified as a Moderate Impact. The Moderate Impact category includes larger scale impacts (≥ 100 meters²), but that are not considered to be significant.

Under this framework, offset multipliers are required for TECs, non-threatened native vegetation, and habitat area of threatened flora and/or fauna are given in Table 8-1. Vegetation and habitat impact of the Proposal will be offset in accordance with this framework.

Table 8-1 Offsetting options for vegetation

Residual loss of biodiversity values from Proposal	Offset multiplier (Moderate Impacts)
Threatened Ecological Communities	3
Non-threatened native vegetation (e.g. native remnant, riparian or planted native vegetation)	2
Habitat Area of threatened flora and/or fauna	3
Tree removal (locally native species)	3
Tree hollows	2 nest boxes or salvaged hollows (for each removed)
Tree Removal (Non-locally native or exotic tree)	1

Table 8-2 outlines the restoration requirements for the vegetation impacted in the construction footprint. To satisfy the requirements of the Guide, each restoration areas is required to be like-for-like and must restore the same TEC that is being impacted. "Mixed native and exotic vegetation" (which includes street trees) are to be offset on a ratio of 1:1 trees. As individual trees were not quantified within this area, an arborist can confirm this offset requirement during construction when certainty about the impacts to individual trees is known.

Table 8-2. A summary of offsets obligation for Proposal impacts with the Moderate Impacts multiplier

Vegetation type	Area of Impact (ha)	Required restoration (ha)
Threatened Ecological Communities		
Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act)	0.95	2.85
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act)	0.62	1.86

Vegetation type	Area of Impact (ha)	Required restoration (ha)
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (BC Act)	0.39	1.17
River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria (EPBC Act)		
Plant Community Type		
3975 - Southern Lower Floodplain Freshwater Wetland	0.01	0.02
Total	1.97	5.90

Table 8-3 outlines the offsetting options available to Sydney Water, ranked in order of offsetting priority. The first preference is that offsetting will occur on the site of impact, where possible and subject to the owner's consent, however this may not be achievable. If this is not achievable, a nearby site either owned by Sydney Water or the local Council (City of Blacktown) should be chosen. If this is not achievable, the purchase or retirement of biodiversity credits from a Biodiversity Stewardship Site should be considered.

Table 8-3. Offsetting options available to Sydney Water

Residual loss of biodiversity values resulting from works	Moderate Impacts
Threatened vegetation: Threatened flora and/or fauna habitat) Non-threatened native vegetation	On site: native revegetation or bushland restoration, AND/ OR Nearby site: native revegetation or bushland restoration, OR Sydney Water offset site bushland restoration, OR Purchase and retire biodiversity credits generated by Sydney Water Offset sites or from the open market.
Tree removal	On site: tree replacement, AND/ OR Nearby site: tree replacement.

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APPENDIX A FAUNA OBSERVATIONS

Table 9-1 Fauna observed or recorded within the Study Area, Observation: W= heard, O=visual observation

Family	Scientific Name	Common Name	Observation
Amphibia	<i>Crinia signifera</i>	Clicking Froglet	W
	<i>Limnodynastes peronii</i>	Striped Marsh Frog	W
	<i>Litoria fallax</i>	Eastern Sedge Frog	W
Aves	<i>Acanthiza nana</i>	Yellow Thornbill	W
	<i>Anhinga novaehollandiae</i>	Australasian Darter	O
	<i>Anthochaera carunculata</i>	Red Wattlebird	W
	<i>Ardea ibis</i>	Cattle Egret	O
	<i>Ardea modesta</i>	Eastern Great Egret	O
	<i>Ardea pacifica</i>	White-necked Heron	O
	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	W
	<i>Cacatua sanguinea</i>	Little Corella	O
	<i>Chenonetta jubata</i>	Australian Wood Duck	O
	<i>Columba livia</i>	Feral Pigeon	O
	<i>Corvus coronoides</i>	Australian Raven	O
	<i>Cracticus tibicen</i>	Australian Magpie	O
	<i>Cracticus torquatus</i>	Grey Butcherbird	O
	<i>Cygnus atratus</i>	Black Swan	O
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	W
	<i>Egretta novaehollandiae</i>	White-faced Heron	O
	<i>Eolophus roseicapillus</i>	Galah	O
	<i>Eudynamys orientalis</i>	Eastern Koel	W
	<i>Fulica atra</i>	Eurasian Coot	O
	<i>Gallinula tenebrosa</i>	Dusky Moorhen	O
	<i>Glossopsitta concinna</i>	Musk Lorikeet	O
	<i>Grallina cyanoleuca</i>	Magpie-lark	W
	<i>Hirundo neoxena</i>	Welcome Swallow	O
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	O
	<i>Malurus cyaneus</i>	Superb Fairy-wren	O
	<i>Manorina melanocephala</i>	Noisy Miner	O
	<i>Manorina melanophrys</i>	Bell Miner	W
	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	O
	<i>Neochmia temporalis</i>	Red-browed Finch	O
	<i>Ocyphaps lophotes</i>	Crested Pigeon	O
	<i>Pardalotus punctatus</i>	Spotted Pardalote	W
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	O
	<i>Philemon corniculatus</i>	Noisy Friarbird	O

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Family	Scientific Name	Common Name	Observation
	<i>Platycercus eximius</i>	Eastern Rosella	O
	<i>Podargus strigoides</i>	Tawny Frogmouth	OW
	<i>Porphyrio porphyrio</i>	Purple Swampphen	O
	<i>Psephotus haematonotus</i>	Red-rumped Parrot	O
	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	O
	<i>Rhipidura albiscapa</i>	Grey Fantail	W
	<i>Rhipidura leucophrys</i>	Willie Wagtail	W
	<i>Sericornis frontalis</i>	White-browed Scrubwren	W
	<i>Strepera graculina</i>	Pied Currawong	W
	<i>Streptopelia chinensis</i>	Spotted Dove	W
	<i>Sturnus tristis</i>	Common Myna	O
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	O
	<i>Threskiornis molucca</i>	Australian White Ibis	O
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	O
	<i>Turdus merula</i>	Common Blackbird	O
	<i>Vanellus miles</i>	Masked Lapwing	O
	<i>Zosterops lateralis</i>	Silvereye	W
Fish	<i>Anguilla australis</i>	Short-finned Eel	O
	<i>Gambusia holbrooki</i>	Mosquito Fish	O
	<i>Cyprinus carpio</i>	Giant European Carp	O
Gastropod	<i>Meridolum corneovirens</i>	Cumberland Plains Land Snail	O
Insecta	<i>Papilio aegeus</i>	Orchard Swallowtail	O
Mammalia	<i>Austronomus australis</i>	White-striped Free-tailed Bat	W
	<i>Felis catus</i>	Cat	O
	<i>Petaurus breviceps</i>	Sugar Glider	O
	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	O
	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	O
	<i>Rattus rattus</i>	Black Rat	O
	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	O
Reptilia	<i>Chelodina longicollis</i>	Eastern Long-necked Turtle	O
	<i>Eulamprus quoyii</i>	Eastern Water Skink	O
	<i>Intellagama lesueurii</i>	Eastern Water Dragon	O
	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	O
	<i>Tiliqua scincoides</i>	Common, Blue-tongued Skink	O

APPENDIX B FLORA OBSERVATIONS

Family	Scientific Name	Common Name	Growth Form	Exotic
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery		*
	<i>Foeniculum vulgare</i>	Fennel		*
Apocynaceae	<i>Araujia sericiflora</i>	Moth Vine		*
Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern		*
	<i>Asparagus asparagoides</i>	Bridal Creeper		*
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs		*
	<i>Cirsium vulgare</i>	Spear Thistle		*
	<i>Gnaphalium spp.</i>		Forb	
	<i>Hypochoeris radicata</i>	Catsear		*
	<i>Senecio madagascariensis</i>	Fireweed		*
Brassicaceae	<i>Lepidium spp.</i>		Forb	
Campanulaceae	<i>Lobelia purpurascens</i>	Whiteroot	Forb	
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak	Tree	
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush	Forb	
	<i>Einadia nutans</i>	Climbing Saltbush	Forb	
	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Forb	
Commelinaceae	<i>Commelina cyanea</i>	Native Wandering Jew	Forb	
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	Forb	
Cyperaceae	<i>Carex inversa</i>	Knob Sedge	Grass & grasslike	
	<i>Cyperus eragrostis</i>	Umbrella Sedge		*
Euphorbiaceae	<i>Euphorbia peplus</i>	Petty Spurge		*
Fabaceae (Caesalpinioideae)	<i>Senna pendula</i>			*
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining glycine	Other	
	<i>Indigofera australis</i>	Australian Indigo	Shrub	
	<i>Trifolium arvense</i>	Haresfoot Clover		*
Fabaceae (Mimosoideae)	<i>Acacia decurrens</i>	Black Wattle	Tree	
	<i>Acacia spp.</i>	Wattle	Shrub	
Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury		*
Goodeniaceae	<i>Brunonia australis</i>	Blue Pincushion	Forb	
Lamiaceae	<i>Plectranthus parviflorus</i>		Forb	
Loranthaceae	<i>Amyema miquelii</i>	Box Mistletoe	Other	
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow		*
	<i>Sida rhombifolia</i>	Paddy's Lucerne		*
Meliaceae	<i>Melia azedarach</i>	White Cedar	Tree	
Myrtaceae	<i>Eucalyptus amplifolia</i>	Cabbage Gum	Tree	

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Family	Scientific Name	Common Name	Growth Form	Exotic
	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Tree	
	<i>Eucalyptus moluccana</i>	Grey Box	Tree	
	<i>Eucalyptus tereticornis</i>	Forest Red Gum	Tree	
	<i>Kunzea ambigua</i>	Tick Bush	Shrub	
	<i>Kunzea spp.</i>		Shrub	
	<i>Melaleuca decora</i>		Shrub	
	<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	Shrub	
	<i>Melaleuca nodosa</i>		Shrub	
	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	Shrub	
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet		*
Oxalidaceae	<i>Oxalis exilis</i>		Forb	
	<i>Oxalis perennans</i>		Forb	
Passifloraceae	<i>Passiflora suberosa</i>	Cork Passionfruit		*
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily	Forb	
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn	Shrub	
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues		*
Poaceae	<i>Avena fatua</i>	Wild Oats		*
	<i>Bothriochloa macra</i>	Red Grass	Grass & grasslike	
	<i>Briza minor</i>	Shivery Grass		*
	<i>Bromus catharticus</i>	Prairie Grass		*
	<i>Chloris gayana</i>	Rhodes Grass		*
	<i>Chloris truncata</i>	Windmill Grass	Grass & grasslike	
	<i>Chloris ventricosa</i>	Tall Chloris	Grass & grasslike	
	<i>Cynodon dactylon</i>	Common Couch	Grass & grasslike	
	<i>Ehrharta erecta</i>	Panic Veldtgrass		*
	<i>Eragrostis curvula</i>	African Lovegrass		*
	<i>Microlaena stipoides</i>	Weeping Grass	Grass & grasslike	
	<i>Oplismenus hirtellus</i>		Grass & grasslike	
	<i>Paspalum dilatatum</i>	Paspalum		*
	<i>Pennisetum clandestinum</i>	Kikuyu Grass		*
	<i>Rytidosperma spp.</i>		Grass & grasslike	
	<i>Setaria gracilis</i>			*
	<i>Themeda triandra</i>		Grass & grasslike	
	<i>Vulpia bromoides</i>	Squirrel Tail Fesque		*
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock	Forb	
Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel		*
Rubiaceae	<i>Richardia stellaris</i>			*

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Family	Scientific Name	Common Name	Growth Form	Exotic
Sapindaceae	<i>Cardiospermum grandiflorum</i>	Balloon Vine		*
	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush	Shrub	
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum		*
	<i>Solanum nigrum</i>	Black-berry Nightshade		*
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop		*

APPENDIX C THREATENED FLORA – LIKELIHOOD OF OCCURRENCE ASSESSMENT

Table 9-2 Threatened flora likelihood of occurrence within the Study Area. Listing status: V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Cynanchum elegans</i> White-flowered Wax Plant	BC Act: E EPBC Act: E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley.	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (<i>Leptospermum laevigatum</i>) – Coastal Banksia (<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>) coastal scrub; Forest Red Gum (<i>Eucalyptus tereticornis</i>) aligned open forest and woodland; Spotted Gum (<i>Corymbia maculata</i>) aligned open forest and woodland; and Bracelet Honey myrtle (<i>Melaleuca armillaris</i>) scrub to open scrub. Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific. The fruit can take up to six months to mature. Seed production is variable and unreliable. Seeds are wind dispersed. It is considered to be unlikely that a soil seed bank for this species exists. Plants are capable of suckering from rootstock in response to occasional slashing or grazing. The fire response of the species is unknown although it has been known to reshoot following fire. Annual burning at one site has been shown to result in population decline.	1, PMST 01/01/1993	Low	Low	No suitable habitat identified.
<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>	BC Act: Not listed EPBC Act: EX	Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks.	Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone. May be an early successional species that benefits from some disturbance. Possibly out competed when overgrown by some species such as <i>Cyndon dactylon</i> .	4 18/12/2008	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Hibbertia puberula</i>	BC Act: E EPBC Act: Not listed	Recent work on this species (Toelken; Miller 2012) and its relatives have shown it to be widespread, but never common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains.	Habitat present in mapped PCTs:3320 Flowering time is October to December, sometimes into January. Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently (2012) described subspecies also favours upland swamps.	1 25/09/2022 BAMC	Low	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.
<i>Hibbertia spanantha</i> Julian's Hibbertia	BC Act: CE EPBC Act: CE	Endemic to NSW where it is restricted to six known locations. It may occur at other locations that are currently unknown.	Grows in forest with canopy species including <i>Eucalyptus pilularis</i> , <i>E. resinifera</i> , <i>Corymbia gummifera</i> and <i>Angophora costata</i> . The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. Flowering in October and November, but with an odd flower throughout the year. The soil is identified as a light clay occurring on a shale sandstone soil transition.	1 27/09/2024	Low	Low	No suitable habitat identified.
<i>Hibbertia superans</i>	BC Act: E EPBC Act: Not listed	Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey. No populations are known from a formal conservation reserve.	Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides. The fruit is dehiscent and the seed has a fleshy aril which attracts ants and encourages them to disperse the seeds. The soil seedbank is persistent. Highly sensitive to both frequent and infrequent fire and other disturbance regimes. The recommended minimum fire interval is unknown, however the recommended maximum fire interval is 25 years. An obligate seeder, it is	552 03/10/2022	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
			usually killed by fire, sometimes resprouting from the base. Flowers first appear from resprouting material about 2 years after fire.				
<i>Doryanthes palmeri</i> Giant Spear Lily	BC Act: V EPBC Act: Not listed	Giant Spear Lily occurs in far north-east NSW and south-east Queensland. In NSW, it occurs on the coastal ranges that are part of the Mt Warning Caldera. Its southern distributional limit is Mount Billen. The species is currently known from eleven sites within NSW, five of which are conservation reserves. Most populations consist of only a few hundred individuals.	Giant Spear Lily occurs on exposed rocky outcrops on infertile soils or on bare rock. It grows in a narrow band of vegetation along the cliff-tops and on steep cliff-faces or rocky ledges in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest.	1 19/02/2018	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Tetradlea glandulosa</i>	BC Act: V EPBC Act: Not listed	Restricted to the following Local Government Areas: The Hills Shire, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Northern Beaches, Ryde and Wyong. There are approximately 150 populations of this plant ranging from Sampons Pass (Yengo NP) in the north to West Pymble (Lane Cove NP) in the south. The eastern limit is at Ingleside (Northern Beaches LGA) and the western limit is at East Kurrajong (Wollemi NP). There are historical collections of this species south to Manly, Willoughby and Mosman, however these populations are now extinct. The current north-south range is approximately 65km.	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gympie, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland (Map Unit 10ar). Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. Flowers July-November however residual flowers may persist until late December. Flowering influenced by seasonal weather conditions and/or the microclimate effects (eg. exposure) of each particular site.	41 25/09/2022	Low	Low	No suitable habitat identified.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	BC Act: V EPBC Act: Not listed	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South.	Found in a range of habitat types, most of which have a strong shale soil influence. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. Killed by fire and re-establishes from soil-stored seed.	93 21/08/2024	Low	Low	No suitable habitat identified.
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	BC Act: E EPBC Act: Not listed	Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains.	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Flowers August to September. Fruit produced October. Evidence suggests the species responds slowly to fire. The species is an obligate seeder and slow growing with a maturation period likely to exceed 5 years.	26 16/01/2008	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Dillwynia tenuifolia</i>	BC Act: V EPBC Act: Not listed	The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. Other populations in western Sydney are recorded from Voyager Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities outside the Cumberland Plain include the Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains.	Habitat present in mapped PCTs:3320 In western Sydney, may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. At Yengo, is reported to occur in disturbed escarpment woodland on Narrabeen sandstone. <i>Eucalyptus fibrosa</i> is usually the dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or codominant, with <i>Melaleuca decora</i> frequently forming a secondary canopy layer. Associated species may include <i>Allocasuarina littoralis</i> , <i>Angophora bakeri</i> , <i>Aristida</i> spp. <i>Banksia spinulosa</i> , <i>Cryptandra</i> spp. <i>Daviesia ulicifolia</i> , <i>Entolasia stricta</i> , <i>Hakea sericea</i> , <i>Lissanthe strigosa</i> , <i>Melaleuca nodosa</i> , <i>Ozothamnus diosmifolius</i> and <i>Themeda australis</i> .	193 05/09/2022 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.
<i>Pultenaea parviflora</i>	BC Act: E EPBC Act: V	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce.	Habitat present in mapped PCTs:3320 May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. <i>Eucalyptus fibrosa</i> is usually the dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or co-dominant, with <i>Melaleuca decora</i> frequently forming a secondary canopy layer.	404, PMST 16/07/2024 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Pultenaea pedunculata</i> Matted Bush-pea	BC Act: E EPBC Act: Not listed	Matted Bush-pea is widespread in Victoria, Tasmania, and south-eastern South Australia. In NSW however, it is represented by just three disjunct populations, in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn (where it is locally abundant). The Cumberland Plain occurrences were more widespread (Yennora, Canley Vale and Cabramatta were lost to development) and is now found at Villawood and Prestons, and north-west of Appin between the Nepean River and Devines Tunnel number 2 (Upper Sydney Water Supply Canal).	Habitat present in mapped PCTs:3320 The Matted Bush-pea occurs in a range of habitats. NSW populations are generally among woodland vegetation but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area. The ability of stems to creep and root from the nodes has made this species a very good coloniser of bare ground in many parts of its range. Flowers appear in spring (August to December), with fruit maturing from October to January but sometimes persistent on the plant until April-May. Like other <i>Pultenaea</i> species, the seeds have an aril and are likely to be dispersed by ants. Few young plants have been seen (no seedlings) and the suggestion is that there will be germination after disturbance as well as after fire, although the fire response is unknown. In the Cumberland Plain the species favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present. In the Liverpool - Fairfield area the majority of occurrences are in lower-lying areas and often close to creek lines. Soils are moderately to poorly drained. By contrast, the Appin sites are on a plateau above the Nepean River, on soils that are not usually poorly drained.	15 06/12/2007 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Acacia bynoeana</i> Bynoe's Wattle	BC Act: E EPBC Act: V	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains.; The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). It has recently been found in the Colymea and Parma Creek areas west of Nowra.	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	14, PMST 16/12/2021	Low	Low	No suitable habitat identified
<i>Acacia pubescens</i> Downy Wattle	BC Act: V EPBC Act: V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	Habitat present in mapped PCTs:3320, 4023*, 4025* Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Longevity is unknown, but clonal species have been known to survive for many decades. Flowers from August to October. Pollination of Acacia flowers is usually by insects and birds. The pods mature in October to December. Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low. Acacia species generally have high seed dormancy and long-lived persistent soil seedbanks. It is thought that the species needs a minimum fire free period of 5 - 7 years to allow an adequate seedbank to develop.	303, PMST 01/02/2024 BAMC	Moderate	Low	Ruled out by targeted survey. Not detected on site.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
			*Although A. pubescens is not associated with PCT 4023 or 4025 on TBDC, Arcadis ecologist have found this species to occupy these PCTS on other projects. As such, PCT 4023 and 4025 have been considered habitat for this species.				
<i>Lasiopetalum joyceae</i>	BC Act: V EPBC Act: V	Has a restricted range occurring on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. Seventeen of these are reserved.	Grows in heath on sandstone.	3, PMST 01/10/2009	Low	Low	No suitable habitat identified
<i>Pilularia novae-hollandiae</i> Austral Pillwort	BC Act: E EPBC Act: Not listed	In NSW, Austral Pillwort has been recorded from suburban Sydney, Khancoban, the Riverina between Albury and Urana (including Henty, Walbundrie, Balldale and Howlong), Oolambeyan National Park near Carrathool and at Lake Cowal near West Wyalong. The populations at Lake Cowal and Oolambeyan NP are the only known extant populations in NSW, although the species is obscure and has possibly been overlooked elsewhere. The species has also been recorded in the Australian Capital Territory, Victoria, Tasmania, South Australia and Western Australia.	Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Most of the records in the Albury-Urana area were from table drains on the sides of roads. The ACT record was from a subalpine grassy plain. This species is probably ephemeral (especially in the drier parts of its range), appearing when soils are moistened by rain.	1 03/01/1966	Low	Low	No suitable habitat identified

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Callistemon linearifolius</i> Netted Bottle Brush	BC Act: V EPBC Act: Not listed	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. The species was more widespread in the past, and there are currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area.	Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.	2 12/09/2016	Low	Low	No suitable habitat identified
<i>Darwinia biflora</i>	BC Act: V EPBC Act: V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively.	Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath. Longevity is thought to be 15-20 years. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August.	678, PMST 18/11/2022	Moderate	Low	No suitable habitat identified
<i>Eucalyptus cryptica</i>	BC Act: CE EPBC Act: CE	In Sydney, <i>Eucalyptus cryptica</i> is restricted to The Hills Local Government Area, with populations found in the Kellyville-Maraylya-Glenorie region. It occurs in isolated individuals or small clusters on flat ridge	<i>Eucalyptus cryptica</i> grows as a rare emergent tree within scrub, heath, and low woodlands on sandy soils. It thrives on laterised clays over sandstone, typically on flat ridge tops. Its habitat is generally nutrient-poor and dry, occurring as scattered individuals or small groups. This species lacks representation in conservation reserves	597, PMST 14/02/2023	Moderate	Low	No suitable habitat identified

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		tops. Its distribution is highly localized.					
<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint	BC Act: V EPBC Act: V	This species is sparsely distributed but widespread on the New England Tablelands; from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally in conservation reserves. Planted as urban trees, windbreaks and corridors.	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire. Tends to grow on lower slopes in the landscape.	31 10/10/2023	Low	Low	No suitable habitat identified
<i>Eucalyptus scoparia</i> Wallangarra White Gum	BC Act: E EPBC Act: V	In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites on the Stanthorpe Plateau including one population in Girraween National Park. Only one Queensland population has more than a dozen trees.	Found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. At lower elevations can occur in less rocky soils in damp situations.	27 02/06/2021	Low	Low	No suitable habitat identified
<i>Melaleuca deanei</i> Deane's Paperbark	BC Act: V EPBC Act: V	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi	The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.	1, PMST 11/12/2007	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.					
<i>Micromyrtus minutiflora</i>	BC Act: E EPBC Act: V	Restricted to the general area between Richmond and Penrith, western Sydney.	Habitat present in mapped PCTs:3320 Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments. Sporadic flowering, June to March Response to fire and mechanical disturbance is uncertain. Regeneration may be due to resprouting or germination of soil-stored seed.	10, PMST 04/03/2008 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	BC Act: E EPBC Act: V	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	Habitat present in mapped PCTs:4025 On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	18, PMST 22/01/2025 BAMC	Moderate	High	Retained. One individual detected in PCT 4025 just outside the Study Area during targeted surveys.
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	BC Act: V EPBC Act: V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Also recorded at Munmorah; State	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>). Little is known about the ecology of the species; being leafless it is expected to have limited photosynthetic capability and probably depends upon a fungal associate to meet its	1, PMST 29/11/2021	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		Conservation Area, Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park and; Ben Boyd National Park.	nutritional requirements from either living or dead organic material. In addition to reproducing from seed, it is also capable of vegetative reproduction and thus forms colonies which can become more or less permanent at a site. On the Central Coast of NSW, populations have been recorded in woodland dominated by Scribbly Gum (<i>Eucalyptus haemastoma</i>), Brown Stringybark (<i>Eucalyptus capitellata</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and also associated with Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).				
<i>Pterostylis saxicola</i> Sydney Plains Greenhood	BC Act: E EPBC Act: E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Two populations occur within a conservation reserve (Georges River National Park; Scheyville NP).	Habitat present in mapped PCTs:3320 Occurs primarily on the Cumberland Plain along an ecological gradient from clay soils derived from Ashfield Shale to thin accumulations of humus rich sandy soils on Hawkesbury Sandstone sheets and rock shelves. Habitat ranges from grassy woodland on flat to gently sloping landscapes on shale soils, to open-forest on hilly landscapes on transitional soils, and woodland on the rims and steep sides of river valleys on sandstone soils.	3, PMST 30/06/2017 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Grevillea juniperina</i> subsp. <i>juniperina</i> Juniper-leaved Grevillea	BC Act: V EPBC Act: Not listed	Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town.	Habitat present in mapped PCTs:3320, 4025 Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest. Associated canopy species within Cumberland Plain Woodland and Shale/Gravel Transition Forest include <i>Eucalyptus tereticornis</i> , <i>E. moluccana</i> , <i>E. crebra</i> , <i>E. fibrosa</i> and <i>E. eugenioides</i> . Understorey species include <i>Bursaria spinosa</i> , <i>Dillwynia sieberi</i> , <i>Ozothamnus diosmifolius</i> , <i>Daviesia ulicifolia</i> , <i>Acacia falcata</i> , <i>Acacia parramattensis</i> , <i>Themeda australis</i> , <i>Aristida ramosa</i> , <i>Cymbopogon refractus</i> , <i>Eragrostis brownii</i> , <i>Cheilanthes sieberi</i> , <i>Dianella revoluta</i> and <i>Goodenia hederacea</i> .	1377 16/07/2024 BAMC	High	Low	Ruled out by targeted survey. Not detected on site.
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	BC Act: V EPBC Act: V	Sporadically distributed throughout the Sydney Basin with sizeable populations around Picton, Appin and Bargo (and possibly further south to the Moss Vale area) and in the Hunter at in the Cessnock - Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast.	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland.	2 28/01/2015	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Macadamia integrifolia</i> Macadamia Nut	BC Act: Not listed EPBC Act: V	Not known to occur naturally in the wild in NSW.		8 22/08/2023	Low	Low	No suitable habitat identified
<i>Persoonia hirsuta</i> Hairy Geebung	BC Act: E EPBC Act: E	<i>Persoonia hirsuta</i> has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Hilltop in the southwest, Dombarton in the southeast and the Blue Mountains to the west. <i>Persoonia hirsuta</i> has a large area of occurrence but occurs in small populations or isolated individuals.	Habitat present in mapped PCTs:4025 The Hairy Geebung is found in clayey and sandy soils in dry sclerophyll open forest, woodland and heath, primarily on the Mittagong Formation and on the upper Hawkesbury Sandstone. It is usually present as isolated individuals or very small populations. Plants are generally killed by all but the lowest intensity fire or partial burning. Fire may promote germination of soil-stored seed, although it may also kill some of the seedbank if it is of high severity. Extreme wet-dry weather cycles may also promote germination of soil- stored seed.	26, PMST 02/06/2022 BAMC	Moderate	Low	Ruled out by targeted survey. Not detected on site.
<i>Persoonia nutans</i> Nodding Geebung	BC Act: E EPBC Act: E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. The species has a disjunct distribution, with the majority of populations (and 99% of individuals) occurring in the north of the species range in the Agnes Banks, Londonderry, Castlereagh, Berkshire Park and Windsor Downs areas. Core distribution occurs within the Penrith, and to a lesser extent Hawkesbury, local government areas, with	Habitat present in mapped PCTs:3320 Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest. Peak flowering is from November to March with sporadic flowering all year round. An obligate seed regenerator. Seed germination is promoted by fire and also by physical disturbance. Although listed as a short- lived species much of the ecology is poorly known. Maturity is expected in about 10 years. Plants appear to set abundant fruit. Seed is likely	79, PMST 01/03/2023 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown local government areas. The southern and northern populations have distinct habitat differences.	to be dispersed, after consumption of the fruit, by large birds such as currawongs and large mammals such as wallabies, kangaroos and possums.				
<i>Pimelea curviflora</i> <i>var. curviflora</i>	BC Act: V EPBC Act: V	Confined to the coastal area of the Sydney and Illawarra regions. Populations are known between northern Sydney and Maroota in the north-west. New population discovered at Croom Reserve near Albion Park in Shellharbour LGA in August 2011. Formerly recorded around the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly.	Habitat present in mapped PCTs:3320 Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. Likely to be fire tolerant species capable of resprouting following fire due to the presence of a tap root. Seedlings have been observed following fire.	48, PMST 22/08/2022 BAMC	Moderate	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.
<i>Pimelea spicata</i> Spiked Rice-flower	BC Act: E EPBC Act: E	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama).	Habitat present in mapped PCTs:3320, 4023, 4025 In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. The co-occurring species in the Cumberland Plain sites are grey box (<i>Eucalyptus moluccana</i>), forest red gum (<i>E. tereticornis</i>) and narrow-leaved ironbark (<i>E. crebra</i>). Blackthorn (<i>Bursaria spinosa</i>) is often present at sites (and may be important in protection from grazing) and	332, PMST 08/03/2024 BAMC	Moderate	Low	Ruled out by targeted survey. Not detected on site.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
			kangaroo grass (<i>Themeda australis</i>) is usually present in the groundcover (also indicative of a less intense grazing history). In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites.				
<i>Rhodamnia rubescens</i> Scrub Turpentine, Brown Malletwood	BC Act: CE EPBC Act: CE	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm.	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	PMST	Low	Low	No suitable habitat identified
<i>Rhodomyrtus psidioides</i> Native Guava	BC Act: CE EPBC Act: CE	Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW.	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	PMST	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Rhizanthella slateri</i> Eastern Underground Orchid	BC Act: V EPBC Act: E	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore, usually located only when the soil is disturbed. Flowers September to November.	PMST	Low	Low	No suitable habitat identified
<i>Pterostylis gibbosa</i> Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood	BC Act: E EPBC Act: E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected (1803).	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum (<i>Eucalyptus tereticornis</i>), Woollybutt (<i>E. longifolia</i>) and White Feather Honey-myrtle (<i>Melaleuca decora</i>). Near Nowra, the species grows in an open forest of Spotted Gum (<i>Corymbia maculata</i>), Forest Red Gum and Grey Ironbark (<i>E. paniculata</i>). In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark (<i>E. crebra</i>), Forest Red Gum and Black Cypress Pine (<i>Callitris endlicheri</i>).	PMST	Low	Low	No suitable habitat identified
<i>Allocasuarina glareicola</i>	BC Act: E EPBC Act: E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	Grows in Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> . Common associated understorey species include <i>Melaleuca nodosa</i> , <i>Hakea dactyloides</i> , <i>Hakea sericea</i> , <i>Dillwynia tenuifolia</i> , <i>Micromyrtus minutiflora</i> , <i>Acacia elongata</i> , <i>Acacia brownei</i> , <i>Themeda australis</i> and <i>Xanthorrhoea minor</i> . Not killed outright by fire but resprouts from the rootstock. Spreads by vegetative means, such that clumps of up to 100s of stems may be a single individual. The time taken for the plants to flower and set seed is not known, but only those plants growing in areas unburnt for some time produced substantial numbers of fruit.	PMST	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Acacia gordonii</i>	BC Act: E EPBC Act: E	Restricted to the north-west of Sydney, it has a disjunct distribution occurring in the lower Blue Mountains in the west, and in the Maroota/Glenorie area in the east. This species is known from only a few locations and current information suggests the total number of individuals may be less than 2000, with only one population supporting greater than 400 individuals. A relatively large proportion of individuals (approximately 850) occur on conservation reserve within Blue Mountains National Park. This species is found within the Hawkesbury, Blue Mountains and Baulkham Hills local government areas.	Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops. Flowers August to September and produces fruit October to February. The fruit is a pod containing hard-coated seed. The seed ultimately forms a persistent soil stored seedbank. Is identified in Benson and McDougall (1996) as a resprouter, however it is likely that the species' ability to resprout following fire varies as anecdotal observations suggest (at least in one instance) few adults resprouted following a fire (Ross Doig pers. comm. 2002). Such variation in fire response is not unusual for Acacia. Fire promotes germination of the soil stored seedbank and seed germination will not occur in the absence of fire as the hard-coated seed requires heat to break seed dormancy, as is typical of species within Fabaceae.	PMST	Low	Low	No suitable habitat identified
<i>Genoplesium baueri</i> Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid	BC Act: E EPBC Act: E	The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. Currently the	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March.	PMST	Low	Low	No suitable habitat identified

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		species is known from just over 200 plants across 13 sites.					
<i>Asterolasia elegans</i>	BC Act: E EPBC Act: E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve.	Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>), Smooth-barked Apple (<i>Angophora costata</i>), Sydney Peppermint (<i>Eucalyptus piperita</i>), Forest Oak (<i>Allocasuarina torulosa</i>) and Christmas Bush (<i>Ceratopetalum gummiferum</i>). Ecological knowledge about this species is very limited. The species is considered to be fire sensitive and reliant on seed germination after disturbance to maintain populations. A soil seedbank appears to be established by this species, so for a number of years following fire or other disturbance the species may not be apparent but be present only as seed in the soil. The size of the seedbank depends not only on the amount of seed contributed by mature plants each season, but on the level of dormancy of the seed which can vary from year to year. The longevity of each crop of seed in the soil is probably relatively short (perhaps 5 - 10 years). Either heat or smoke or a combination of these factors may play a role in breaking soil-stored seed dormancy. Both the amount of smoke and the level of heating could influence germination success. A certain level of heat may be optimal for breaking seed dormancy (such that too little heat results in seeds staying dormant, while too much heat kills seeds).	PMST	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Haloragodendron lucasii</i>	BC Act: E EPBC Act: E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney.	Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels. Highly clonal, which implies the true population size may be considerably smaller than expected. Flowering occurs from August to November with fruits appearing from October to December. Has demonstrated an ability to resprout from its rootstock.	PMST	Low	Low	No suitable habitat identified
<i>Persoonia mollis subsp. maxima</i>	BC Act: E EPBC Act: E	Highly restricted, known from the Hornsby Heights-Mt Colah area north of Sydney in the Sydney Basin Bioregion. Occurs in three populations (described on a catchment basis) located over an approximate north-south range of 5.75 km and east-west distance of 7.5 km. Additional locations may exist outside the current distribution.	Occurs in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone. These habitats support relatively moist, tall forest vegetation communities, often with warm temperate rainforest influences. Associated species: Smooth Barked Apple (<i>Angophora costata</i>), Sydney Peppermint (<i>Eucalyptus piperita</i>), Red Bloodwood (<i>Corymbia gummifera</i>), Turpentine (<i>Syncarpia glomulifera</i>), Coachwood (<i>Ceratopetalum apetalum</i>) and Black Wattle (<i>Callicoma serratifolia</i>). Flowers late December – March. Flowers are likely to be pollinated predominantly by native bees. Self-pollination is usually unsuccessful. Long-lived, with the oldest individuals approximately 20 years of age. Age structure varies across the populations according to fire history, however, a large proportion of the population is reproductively immature. Reproductive maturity of individuals is unlikely to be reached until approximately 8 years, with peak flowering and fruiting unlikely to be reached until individuals are at least 12–15 years.	PMST	Low	Low	No suitable habitat identified. The species has not been recorded previously within 10km of the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Pomaderris brunnea</i> Rufous Pomaderris, Brown Pomaderris	BC Act: E EPBC Act: V	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria.	Habitat present in mapped PCTs:3320, 4025 Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Flowers appear in September and October. The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. The species has been found in association with <i>Eucalyptus amplifolia</i> , <i>Angophora floribunda</i> , <i>Acacia parramattensis</i> , <i>Bursaria spinosa</i> and <i>Kunzea ambigua</i> .	PMST BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.
<i>Micromyrtus blakelyi</i>	BC Act: V EPBC Act: V	Restricted to areas near the Hawkesbury River, north of Sydney. Distribution extends from north of Maroota in the north, to Cowan in the south. All known populations occur within the Baulkham Hills and Hornsby local government areas.	Typically occurs within heathlands in shallow sandy soil in cracks and depressions of sandstone rock platforms. Flowers in Spring from September to November and produces fruit (an indehiscent nut) October to November. Fire sensitive, with adults killed by fire and recruitment occurring from a soil seed bank. It is not known whether germination occurs in the absence of disturbance.	PMST	Low	Low	No suitable habitat identified
<i>Thesium australe</i> Austral Toadflax, Toadflax	BC Act: V EPBC Act: V	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	PMST	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Persicaria elatior</i> Knotweed, Tall Knotweed	BC Act: V EPBC Act: V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland.	Habitat present in mapped PCTs:3975 This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	PMST BAMC	Moderate	Low	Habitat is degraded in the Study Area.
<i>Kunzea rupestris</i>	BC Act: V EPBC Act: V	Restricted, with most locations in the Maroota - Sackville - Glenorie area and one outlier in Ku-ring-gai Chase National Park, all within the Central Coast botanical subdivision of NSW. Currently known to exist in 20 populations, 6 of which are reserved.	Grows in shallow depressions on large flat sandstone rock outcrops. Characteristically found in short to tall shrubland or heathland. Flowering occurs in spring. It has indehiscent fruits which resist soil entrapment and so may disperse many metres per week. Resprouts from the base after fire or mechanical damage. Seedlings have also been observed after fire.	PMST	Low	Low	No suitable habitat identified
<i>Olearia cordata</i>	BC Act: V EPBC Act: V	A NSW endemic with a scattered distribution generally restricted to the south-western Hunter Plateau, eastern Colo Plateau, and the far north-west of the Hornsby Plateau near Wisemans Ferry east of Maroota. Most known populations occur within conservation reserves (Wollemi National Park, Yengo	Populations are typically small and scattered. Grows in dry open sclerophyll forest and open shrubland, on sandstone ridges. Flowers November to May, with seed released from February to May, depending on environmental factors. Seed is wind dispersed and may adhere to the fur of browsers such as wallabies. Adults are capable of resprouting following fire. Abundant seedlings have been observed following fire, but seeds are also capable of germinating in the absence of fire as there is no seed dormancy with this species and germination should occur with any significant rains soon after	PMST	Low	Low	No suitable habitat identified

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		National Park and Wisemans Ferry Historic Site).	seed release. Seedlings reach maturity in 1-2 years.				
<i>Leucopogon exolasius</i> Woronora Beard-heath	BC Act: V EPBC Act: V	Woronora Beard-heath is found along the upper Georges River area and in Heathcote National Park.	The plant occurs in woodland on sandstone. Flowering occurs in August and September.	PMST	Low	Low	No suitable habitat identified
<i>Caladenia tessellata</i> Thick-lipped Spider-orchid, Daddy Long-legs	BC Act: V EPBC Act: V	The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border.	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	PMST	Low	Low	No suitable habitat identified
<i>Zieria involucreta</i>	BC Act: E EPBC Act: V	Has a disjunct distribution north and west of Sydney, in the Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains local government areas. Recent records for the species come from 22 populations in the catchments of the Macdonald, Colo and Hawkesbury Rivers between Melon Creek and Mogo Creek in the north to Little Cattai Creek (Hillside) and Wheeny Creek (Colo) in the south and from a single population in the upper	Occurs primarily on Hawkesbury sandstone. Also occurs on Narrabeen Group sandstone and on Quaternary alluvium. Found primarily in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest, although some populations extend upslope into drier vegetation. Also known from at least two atypical ridgetop locations. The canopy typically includes <i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i> (Turpentine), <i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus agglomerata</i> (Blue-leaved Stringybark) and <i>Allocasuarina torulosa</i> (Forest Oak). Ecological knowledge about this species is limited. Flowering usually takes place in spring. Plants usually first flower and set seed 3 – 5 years after germination, but maximum seed production probably does not occur until 6 – 10 years of age.	PMST	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		Blue Mountains north of Katoomba. In addition, historical records exist for at least two other localities in the eastern Blue Mountains: south of Springwood Valley Heights and north-west of Kurrajong.					
<i>Haloragis exalata</i> <i>subsp. exalata</i> Wingless Raspwort, Square Raspwort	BC Act: V EPBC Act: V	Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW.	Square Raspwort appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	PMST	Low	Low	No suitable habitat identified
<i>Commersonia prostrata</i> Dwarf Kerrawang	BC Act: E EPBC Act: E	Dwarf Kerrawang occurs on the Southern Highlands and Southern Tablelands (one plant at Penrose State Forest, one plant at Tallong, a small population near the Corang and about 2000 plants at Rows Lagoon), a larger population in the Thirlmere Lakes area (particularly among the dying reeds at the edge of the water), and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle). It is also found in Victoria.	Habitat present in mapped PCTs:3975 Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (<i>Eucalyptus pauciflora</i>) Woodland and Ephemeral Wetland floor at Rows Lagoon; Blue leaved Stringybark (<i>E. agglomerata</i>) Open Forest at Tallong; and in Brittle Gum (<i>E. mannifera</i>) Low Open Woodland at Penrose; Scribbly Gum (<i>E. haemostoma</i>) Swamp Mahogany (<i>E. robusta</i>) Ecotonal Forest at Tomago. Associated native species may include <i>Imperata cylindrica</i> , <i>Empodisma minus</i> and <i>Leptospermum continentale</i> . Appears to respond positively to some forms of disturbance (e.g. some Victorian records are from gravel road surfaces and the Tomago population is on an area previously subject to sandmining), however, there are conflicting reports about the response of the species to fire. The population at the Thirlmere lakes is most abundant in the areas of prior lake bed exposed by the dropping water levels. It is uncertain how long this may remain the case, as many of the individuals are very	BAMC	Low	Low	Habitat is degraded in the Study Area. The species has not been recorded previously within 10km of the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
			large, growing among the decomposing bases of bulrushes. It is also found among wattle thickets in the drainage line between the lakes.				
<i>Deyeuxia appressa</i>	BC Act: E EPBC Act: E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas.	Habitat present in mapped PCTs:3320, 4023, 4025 Given that <i>D. appressa</i> hasn't been seen in over 60 years, almost nothing is known of the species' habitat and ecology. Flowers spring to summer and is mesophytic (grows in moist conditions).	BAMC	Low	Low	The species has not been seen since 1941. Previous records for the species do not occur within 10km of the Study Area.
<i>Eucalyptus benthamii</i> Camden White Gum	BC Act: CE EPBC Act: V	Occurs on the alluvial flats of the Nepean River and its tributaries. There are two major subpopulations: in the Kedumba Valley of the Blue Mountains National Park and at Bents Basin State Recreation Area. Several trees are scattered along the Nepean River around Camden and Cobbitty, with a further stand at Werriberri (Monkey) Creek in The Oaks. At least five trees occur on the Nattai River in Nattai National Park. Large areas of habitat were inundated by	Habitat present in mapped PCTs:3320, 4025 Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. Recruitment of juveniles appears to be most successful on bare silt deposits in rivers and streams. The recorded elevation range for the species is from 30m ASL at Bents Basin to 750m ASL in the Kedumba population. Most of the individuals are around 60 to 300m ASL. Occurs in open forest. Associated species at the Bents Basin site include <i>Eucalyptus elata</i> , <i>E. baueriana</i> , <i>E. amplifolia</i> , <i>E. deanei</i> and <i>Angophora subvelutina</i> . Understorey species include <i>Bursaria spinosa</i> , <i>Pteridium esculentum</i> and a wide variety of agricultural weeds. The Kedumba Valley site lists <i>E. crebra</i> , <i>E. deanei</i> , <i>E. punctata</i> , <i>Leptospermum flavescens</i> , <i>Acacia</i>	BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		the formation of Warragamba Dam in 1933.	<i>filicifolia</i> and <i>Pteridium esculentum</i> among its associated species.				
<i>Eucalyptus glaucina</i> Slaty Red Gum	BC Act: V EPBC Act: V	Found in separate districts along the eastern seaboard of NSW, from near Casino, to Taree, south to Broke, and recently discovered on the eastern side of the Blue Mountains National Park near Warragamba Dam.;	Habitat present in mapped PCTs:3320 Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.
<i>Gyrostemon thesioides</i>	BC Act: E EPBC Act: Not listed	Within NSW, the species has most recently been recorded near Lake Burragorang in the Blue Mountains National Park, and near Long Point in Western Sydney. It has also been recorded in 2004 in Wollemi National Park, near the Colo River (one male plant), and historically at sites near the Georges and Nepean Rivers (more than 55 and 110 years ago respectively). Also occurs in Western Australia, South Australia, Victoria and Tasmania.	Habitat present in mapped PCTs:4023 In NSW, known from hillsides, slopes, terraces and riverbanks within 180 metres of watercourses. A fire-opportunist, with recruitment occurring from soil-stored seed bank following fire. Adult plants are killed by fire. Plants may reach maturity in less than a year and plants are presumably short-lived.	BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.
<i>Hibbertia</i> sp. <i>Bankstown</i>	BC Act: CE EPBC Act: CE	This species is endemic to New South Wales and is currently known to occur in only one population at Bankstown Airport in Sydney's southern suburbs, in the Bankstown local government area. known only from Tertiary	Habitat present in mapped PCTs:4025 The airport site is very heavily modified from the natural state, lacks canopy species and is currently a low grass/shrub association with many pasture grasses and other introduced herbaceous weeds. Soil at the site is a sandy (Tertiary) alluvium with a high silt content. The remnant at the site and soil type are consistent	BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		alluvial soil. The plant assemblage is attributable to "Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	with an inferred pre-settlement cover of Castlereagh Ironbark Forest although some remnant vegetation at and near the site (along the channel in particular) suggests Castlereagh Scribbly Gum Woodland is equally valid. Hibbertia sp. Bankstown has been observed to flower from October to December, with seed setting from October to January. Most Hibbertia species are primarily pollinated by bees, but many have specialised mechanisms requiring particular bee species, beetles or syrphid flies.				
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> Penrith LGAs	BC Act: EP EPBC Act: Not listed	Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range.	Habitat present in mapped PCTs:3320, 4023, 4025 Grows in vine thickets and open shale woodland.	71 15/05/2020 BAMC	Moderate	Low	Ruled out by targeted survey. Not detected on site.
<i>Maundia triglochinoides</i>	BC Act: V EPBC Act: Not listed	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct.	Habitat present in mapped PCTs:3975 Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Flowering occurs during warmer months. Associated with wetland species e.g. <i>Triglochin procerum</i> . Probably wind pollinated. Diaspore is the seed and root tubers, which are probably dispersed by water. Spreads vegetatively, with tufts of leaves arising along rhizome. Populations expand following flood events and contract to more permanent wetlands in times of low rainfall. Flowers November-January.	BAMC	Low	Low	Habitat is degraded in the Study Area. The species has not been recorded previously within 10km of the Study Area.
<i>Pomaderris prunifolia</i>	BC Act: EP EPBC Act: Not listed		Habitat present in mapped PCTs:3320	2 30/06/2017 BAMC	Low	Low	PCT 3320 within the Study Area is in a degraded form lacking a native understorey. Eliminating potential habitat for this species.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Senna acclinis</i> Rainforest Cassia	BC Act: E EPBC Act: Not listed	Occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland.	Habitat present in mapped PCTs:4023 Grows on the margins of subtropical, littoral and dry rainforests. Often found as a gap phase shrub. Flowering occurs in spring and summer and the fruit is ripe in summer and autumn. Primarily pollinated by a variety of bees.	BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.
<i>Wahlenbergia multicaulis</i>	BC Act: EP EPBC Act: Not listed	There are 13 known sites, two of which are in northern Sydney (Thornleigh and Mt Ku- Ring-Gai) with the remainder in western Sydney (Rookwood, Chullora, Bass Hill, Bankstown, Georges Hall, Campsie, South Granville and Greenacre).	Habitat present in mapped PCTs:3320, 4025	BAMC	Low	Low	The species has not been recorded previously within 10km of the Study Area.

APPENDIX D THREATENED FAUNA – LIKELIHOOD OF OCCURRENCE ASSESSMENT

Table 9-3 Threatened fauna likelihood of occurrence within the Study Area. Listing status: V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Pseudophryne australis</i> Red-crowned Toadlet	BC Act: V EPBC Act: Not listed	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg.	21 13/05/2022	Low	Low	No suitable habitat identified.
<i>Heleioporus australiacus</i> Giant Burrowing Frog	BC Act: V EPBC Act: V	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.	Habitat present in mapped PCTs:3975, 4025 Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Most individuals will not attempt to breed every year.	1 26/01/1997 BAMC PMST	Moderate	Low	Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Litoria aurea</i> Green and Golden Bell Frog	BC Act: E EPBC Act: V	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. Preyed upon by various wading birds and snakes.	38, PMST 25/03/2021 BAMC	Moderate	Low	Surveyed. Not detected.
<i>Oxyura australis</i> Blue-billed Duck	BC Act: V EPBC Act: Not listed	The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas.	Habitat present in mapped PCTs:3975 The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed but prefers to dive if approached. Blue-billed Ducks will feed by day far from the shore, particularly if dense cover is available in the central parts of the wetland. They feed on the bottom of swamps eating seeds, buds, stems, leaves, fruit and small aquatic insects such as the larvae of midges, caddisflies and dragonflies.	2 31/01/1989 BAMC	Moderate	Low	Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Hirundapus caudacutus</i> White-throated Needletail	BC Act: V EPBC Act: V	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south- eastern Siberia, Mongolia, the Korean Peninsula and northern Japan June- August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours sighting of White- throated Needletails as they feed. More common in coastal areas, less so inland.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 The White-throated Needletail is a migratory bird species primarily observed in eastern Australia from October to April, favouring open landscapes and areas where their prey, flying insects, are abundant. These birds are highly aerial and are most often seen soaring in the skies before storms, low-pressure troughs, and approaching cold fronts, as well as near bushfires. These weather conditions encourage swarming of flying insects, such as termites and ants, or lift insects into the air, creating ideal feeding opportunities for the White-throated Needletail	10, PMST, Mig 21/12/2021 BAMC	Moderate	Moderate	Retained. Potential habitat.
<i>Botaurus poiciloptilus</i> Australasian Bittern	BC Act: E EPBC Act: E	Australasian Bitterns are widespread but uncommon over south- eastern Australia. In NSW they may be found over most of the state except for the far north-west.	Habitat present in mapped PCTs:3975, 4023, 4025 Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands	3, PMST 08/01/2019 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			on a platform of reeds; there are usually six olive-brown eggs to a clutch.				
<i>Circus assimilis</i> Spotted Harrier	BC Act: V EPBC Act: Not listed	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	3 06/04/2014 BAMC	Moderate	Moderate	Retained. Potential habitat.
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	BC Act: V EPBC Act: Not listed	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'.	9 17/12/2021 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			Nests are large structures built from sticks and lined with leaves or grass.				
<i>Hieraaetus morphnoides</i> Little Eagle	BC Act: V EPBC Act: Not listed	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	33 23/07/2019 BAMC	Moderate	Moderate	Retained. Potential habitat.
<i>Lophoictinia isura</i> Square-tailed Kite	BC Act: V EPBC Act: Not listed	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100 square km. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	16 12/03/2024 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Pandion cristatus</i> Eastern Osprey	BC Act: V EPBC Act: Not listed	The Osprey has a global distribution with four subspecies previously recognised throughout its range. However, recent studies have identified that there are two species of Osprey - the Western Osprey with three subspecies occurring in Europe, Asia and the Americas and the Eastern Osprey occurring between Sulawesi (in Indonesia), Australia and New Caledonia. Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. Incubation of 2-3 eggs, usually by the female, is about 40 days. Female remains with young almost until they fly, usually after about nine weeks in the nest.	1 17/12/2021 BAMC Mig	Moderate	Moderate	Retained. Potential habitat.
<i>Falco subniger</i> Black Falcon	BC Act: V EPBC Act: Not listed	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 The Black Falcon inhabits arid and semi-arid regions across Australia, favouring open grasslands, savannas, shrublands, and agricultural areas. It is often found in areas with sparse trees or woodlands, using tall trees for nesting and perching. This raptor thrives in environments with abundant prey, such as birds and small mammals.	3 28/09/2014 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring					
<i>Rostratula australis</i> Australian Painted Snipe	BC Act: E EPBC Act: E	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella.	Habitat present in mapped PCTs:3975, 4023, 4025 Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Incubation and care of young is all undertaken by the male only. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	5, PMST 20/10/2012 BAMC	Moderate	Low	Habitat is degraded in the Study Area.
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	BC Act: Not listed EPBC Act: V	The Sharptailed Sandpiper spends the nonbreeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the southeast and are widespread in both inland and coastal locations and in both	Sharptailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered	48, PMST, Mig 23/10/2016	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		freshwater and saline habitats. Many inland records are of birds on passage.	bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.				
<i>Calidris ferruginea</i> Curlew Sandpiper	BC Act: CE EPBC Act: CE	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April.	Habitat present in mapped PCTs:3975, 4023 It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Curlew Sandpipers are omnivorous, feeding on worms, molluscs, crustaceans, insects and some seeds. Birds breed at 2 years of age and the oldest recorded bird is 19 years old. Most birds caught in Australia are between 3 and 5 years old.	4, PMST, Mig 23/10/2016 BAMC	Moderate	Low	Habitat is degraded in the Study Area.
<i>Gallinago hardwickii</i> Latham's Snipe	BC Act: V EPBC Act: V	Latham's Snipe is a nonbreeding visitor to southeastern Australia and is a passage migrant through northern Australia. The species has been recorded along the east coast of Australia from Cape York Peninsula	Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. The foraging habitats of Latham's Snipe are characterized by	22, PMST, Mig 28/11/2022	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		through to southeastern South Australia.	areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation). The snipe roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense teatree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable				
<i>Tringa nebularia</i> Common Greenshank	BC Act: E EPBC Act: E	The species has been recorded in most coastal regions. It is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and northwest regions	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayment's, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rocky flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and salt flats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores	1, PMST, Mig 01/11/2012	Low	Low	No suitable habitat identified.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	BC Act: E EPBC Act: E	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate rainforests. Favours old	7, PMST 10/12/2021 BAMC	Moderate	Moderate	Retained. Potential habitat

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 7 cm in diameter or larger in eucalypts and 3 metres or more above the ground.				
<i>Calyptorhynchus lathami lathami</i> South-eastern Glossy Black-Cockatoo	BC Act: V EPBC Act: V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia.	Habitat present in mapped PCTs:3320, 4023, 4025 Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak (<i>Allocasuarina diminuta</i> and <i>A. gymnanthera</i>). Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak but also recorded in open woodlands dominated by Belah (<i>Casuarina cristata</i>). Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	25, PMST 16/08/2024 BAMC	Moderate	Moderate	Retained. Potential habitat
<i>Lophochroa leadbeateri</i> Pink Cockatoo	BC Act: V EPBC Act: E	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are	1 06/01/2020	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that.	at least 1 km apart, with no more than one pair every 30 square kilometres.				
<i>Lathamus discolor</i> Swift Parrot	BC Act: E EPBC Act: CE	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 mostly occurs on the coast and south west slopes.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Forest Red Gum (<i>E. tereticornis</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>).	91, PMST 27/07/2022 BAMC	Moderate	Moderate	Retained. Potential habitat. Not within Important Habitat Mapping.
<i>Neophema pulchella</i> Turquoise Parrot	BC Act: V EPBC Act: Not listed	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to	5 20/02/2022 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			December. It lays four or five white, rounded eggs on a nest of decayed wood dust.				
<i>Polytelis swainsonii</i> Superb Parrot	BC Act: V EPBC Act: V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild.	Inhabit Box-Gum, Box-Cypress-pine and Boree woodlands and River Red Gum forest. In the Riverina superb parrots nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum forest or woodland. On the South West Slopes and Southern Tablelands nest trees can be in open Box-Gum woodland or isolated living or dead paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Superb Parrots nest in tree hollows with an entrance diameter of 6 cm or wider, and that are at least 3.5 m above the ground. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January, with nesting typically from October to late December. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	1 12/09/1984	Low	Low	No suitable habitat identified.
<i>Ninox connivens</i> Barking Owl	BC Act: V EPBC Act: Not listed	The Barking Owl is found throughout continental Australia except for the central arid regions. Although still common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the	6 16/12/2013 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Many populations crashed as woodland on fertile soils was cleared over the past century, leaving linear riparian strips of remnant trees as the last inhabitable areas.	higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as <i>Acacia</i> and <i>Casuarina</i> species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch.				
<i>Ninox strenua</i> Powerful Owl	BC Act: V EPBC Act: Not listed	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. Recent increases in population density across Sydney and some	Habitat present in mapped PCTs:3320, 4023, 4025 The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (<i>Syncarpia glomulifera</i>), Black She-oak (<i>Allocasuarina littoralis</i>), Blackwood (<i>Acacia melanoxylon</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Cherry Ballart (<i>Exocarpos cupressiformis</i>) and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example, in southern NSW, Ringtail Possum make up the	131 03/08/2023 BAMC	High	High	Retained. Potential forging habitat.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		other semi-urban areas do not seem to be solely due to increased awareness of this flagship species.	bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls.				
<i>Tyto novaehollandiae</i> Masked Owl	BC Act: V EPBC Act: Not listed	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 1000 hectares or more, depending on prey availability. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	13 24/04/2024 BAMC	Moderate	Moderate	Retained. Potential habitat.
<i>Tyto tenebriosa</i> Sooty Owl	BC Act: V EPBC Act: Not listed	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently.	Habitat present in mapped PCTs:3320 Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>) or Sugar Glider (<i>Petaurus breviceps</i>). Nests in very large tree-hollows.	3 15/05/2023 BAMC	Moderate	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	BC Act: V EPBC Act: V	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of <i>Climacteris picumnus victoriae</i> runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper <i>Climacteris picumnus picumnus</i> which then occupies the remaining parts of the state.	Habitat present in mapped PCTs:3320, 4023, 4025 Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Gregarious and usually observed in pairs or small groups of 8 to 12 Birds.	2, PMST 30/06/2022 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Anthochaera phrygia</i> Regent Honeyeater	BC Act: CE EPBC Act: CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are very few breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley, Mudgee/Wollar, Lower Hunter Valley and the Bundarra-Barraba region.	Habitat present in mapped PCTs:3320, 4023, 4025 The Regent Honeyeater inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. In the last 10 years Regent Honeyeaters have been recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. Ironbark (<i>E. fibrosa</i>) can also contribute	22, PMST 21/08/2010 BAMC	Moderate	Moderate	Retained. Potential forging habitat. Not within Important Habitat Mapping.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subspecies)	BC Act: V EPBC Act: Not listed	The Black-chinned Honeyeater has two subspecies, with only the nominate (<i>gularis</i>) occurring in NSW. The other subspecies (<i>laetior</i>) was formerly considered a separate species (Golden-backed Honeyeater) and is found in northern Australia between central Queensland west to the Pilbara in Western Australia.	Habitat present in mapped PCTs:3320 Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares.	6 25/08/2013 BAMC	Moderate	Low	No suitable habitat identified.
<i>Daphoenositta chrysoptera</i> Varied Sittella	BC Act: V EPBC Act: Not listed	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy and often re-uses the same fork or tree in successive years. Generation length is estimated to be 5 years.	74 08/11/2022 BAMC	Moderate	Moderate	Retained. Potential forging habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	BC Act: V EPBC Act: Not listed	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. Primarily eats invertebrates, mainly insects, which are captured whilst hovering or sallying above the canopy or over water. Also frequently hovers, sallies and pounces under the canopy, primarily over leaf litter and dead timber. Also occasionally take nectar, fruit and seed. Depending on location and local climatic conditions (primarily temperature and rainfall), the dusky woodswallow can be resident year round or migratory.	107 17/11/2023 BAMC	High	Moderate	Retained. Potential forging habitat.
<i>Melanodryas cucullata cucullata</i> South-eastern Hooded Robin	BC Act: E EPBC Act: E	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies <i>cucullata</i>) is found from Brisbane to Adelaide and	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. May breed any time between July and November, often rearing several broods. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 m to 5 m above the ground. The nest is defended by both sexes with displays of injury-	1, PMST 24/07/1988	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies <i>picata</i> . Two other subspecies occur outside NSW.	feigning, tumbling across the ground. A clutch of two to three is laid and incubated for fourteen days by the female. Two females often cooperate in brooding.				
<i>Petroica boodang</i> Scarlet Robin	BC Act: V EPBC Act: Not listed	The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter.	Habitat present in mapped PCTs:3320, 3975, 4023 The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.	9 01/01/2013 BAMC	Moderate	Low	Habitat is degraded in the Study Area.
<i>Petroica phoenicea</i> Flame Robin	BC Act: V EPBC Act: Not listed	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that	Habitat present in mapped PCTs:3320, 4025 Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter, birds migrate to drier more	2 16/05/2018 BAMC	Moderate	Low	Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands.	open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following regeneration. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas.				
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	BC Act: V EPBC Act: E	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Mostly nocturnal, although will hunt during the day; spend most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl. Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated	12 30/04/2021 BAMC PMST	Moderate	Low	Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			creeklines. Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years.				
<i>Phascolarctos cinereus</i> Koala	BC Act: E EPBC Act: E	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range.	Habitat present in mapped PCTs:3320, 4023, 4025 Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.	15 05/11/2023 BAMC PMST	Moderate	Low	Surveyed. Not detected. Despite associated PCTs presented, vegetation within the Study Area is considered too urban and fragmented to support this species.
<i>Cercartetus nanus</i> Eastern Pygmy-possum	BC Act: V EPBC Act: Not listed	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes.	Habitat present in mapped PCTs:3320, 4023, 4025 Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understorey, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities. Feeds largely on nectar and pollen collected	1 16/11/1999 BAMC	Moderate	Low	Surveyed. Not detected.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests.				
<i>Petaurus australis</i> Yellow-bellied Glider	BC Act: V EPBC Act: V	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Habitat present in mapped PCTs:4025 Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Live in small family groups of two - six individuals and are nocturnal. Den, often in family groups, in hollows of large trees. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	8 07/02/2023 BAMC PMST	Moderate	Low	No suitable habitat identified. Patch size insufficient.
<i>Petaurus norfolcensis</i> Squirrel Glider	BC Act: V EPBC Act: Not listed	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Habitat present in mapped PCTs:3320, 4023, 4025 Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for	3 18/02/2024 BAMC	Moderate	Low	Surveyed. Not detected.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.				
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	BC Act: V EPBC Act: V	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often 20 km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.	1705, PMST 25/06/2024 BAMC	High	Known	Retained. Observed on site.
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	BC Act: V EPBC Act: Not listed	The Yellow-bellied Sheath-tail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia -	Habitat present in mapped PCTs:3320, 4025 Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial	41 11/03/2024 BAMC	Moderate	Moderate	Retained. Potential habitat.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes.	territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.				
<i>Micronomus norfolkensis</i> Eastern Coastal Free-tailed Bat	BC Act: V EPBC Act: Not listed	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	143 11/03/2024 BAMC	Moderate	Known	Retained. Species recorded on passive recorder and suitable foraging habitat present.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	BC Act: E EPBC Act: E	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.	Habitat present in mapped PCTs:3320, 4023, 4025 Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in caves, overhangs, mine adits and concrete structures such as derelict buildings. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest	12, PMST 25/11/2024 BAMC	Moderate	Low	Surveyed. Not detected.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			months. It is uncertain whether mating occurs early in winter or in spring.				
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	BC Act: V EPBC Act: Not listed	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania.	Habitat present in mapped PCTs:3320, 4025 Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer.	78 11/03/2024 BAMC	Moderate	Known	Retained. Species recorded on passive recorder and suitable foraging habitat present..
<i>Myotis macropus</i> Southern Myotis	BC Act: V EPBC Act: Not listed	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.	105 05/03/2024 BAMC	Moderate	Moderate	Retained. Tentative call recorded on passive recorder and suitable foraging habitat present..
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	BC Act: V EPBC Act: Not listed	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m.	Habitat present in mapped PCTs:3320, 4023, 4025 Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been	87 11/03/2024 BAMC	Moderate	Known.	Retained. Species recorded on passive recorder and suitable foraging habitat present..

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.				
<i>Vespadelus troughtoni</i> Eastern Cave Bat	BC Act: V EPBC Act: Not listed	The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT.	Habitat present in mapped PCTs:3975 Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	4 19/11/2022	Low	Low	Surveyed. Not detected.
<i>Miniopterus australis</i> Little Bent-winged Bat	BC Act: V EPBC Act: Not listed	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Eastern	67 11/03/2024 BAMC	Moderate	Known	Retained. Species recorded on passive recorder and suitable foraging habitat present..

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
			Bentwing-bats (<i>Miniopterus schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. Only five nursery sites /maternity colonies are known in Australia.				
<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat	BC Act: V EPBC Act: Not listed	Eastern Bentwing-bats occur along the east and north-west coasts of Australia.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.	250 11/03/2024 BAMC	High	Known	Retained. Species recorded on passive recorder and suitable foraging habitat present.
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	BC Act: E EPBC Act: Not listed	Lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. known from over 100 different locations, but not all are currently occupied, and they are usually isolated	Habitat present in mapped PCTs:3320, 4025 Primarily inhabits Cumberland Plain Woodland (a critically endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest, which are also listed communities. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. Can dig several centimetres into soil to escape	579 16/07/2024 BAMC	High	Known	Retained. Observed on site.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		from each other as a result of land use patterns.	drought. Is a fungus specialist. Unlike the Garden Snail, does not eat green plants. It is generally active at night. Little is known of its biology, including breeding biology. It is known to be hermaphroditic, laying clutches of 20-25 small, round, white eggs in moist, dark areas (such as under logs), with the eggs taking 2-3 weeks to hatch. There is a suggestion that the species breeds throughout the year when conditions are suitable.				
<i>Pommerhelix duralensis</i> Dural Land Snail	BC Act: E EPBC Act: E	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. There is currently a degree of uncertainty about the distribution and identity of the snails in this and related species. <i>Pommerhelix duralensis</i> in the strict sense is found in an area of north-western Sydney between Rouse Hill - Cattai and Wiseman's Ferry, west from Berowra Creek. North of the Hawkesbury and Wiseman's Ferry there is an entity with morphologically similar	The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris. Migration and dispersal is limited, with overnight straight-line distances of under 1 metre identified in the literature and studies. The species is active from approximately one hour after dusk until dawn and no confirmed diurnal activity is reported. It exhibits no roost-site behaviour. The species is known to aestivate, and secretes an epiphragm to protect against desiccation. The main food sources are hyphae and fruiting bodies of native fungi. It is other detritus may be consumed. Reproduction rates are very low, with few eggs (about 32) per season. Mortality is 90% in the first year, and 99.8% within four-five years.	44, PMST 02/04/2023	Low	Low	No suitable habitat identified.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		shells but which have not had the DNA sequenced. The species is definitely found within the Local Government Areas of The Hills Shire, Hawkesbury Shire and Hornsby Shire. Records from the; Blue Mountains City, Penrith City; and Parramatta City may represent this species. Occurrence in Wollondilly Shire is considered unlikely considering current knowledge.					
<i>Numenius madagascariensis</i> Eastern Curlew, Far Eastern Curlew	BC Act: Not listed EPBC Act: CE	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. The Eastern Curlew breeds in Russia and north-eastern China but its	Habitat present in mapped PCTs:3975 It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. May also roost on wooden oyster leases or other similar structures The Eastern Curlew is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects. The birds may delay breeding until three to four years of age.	PMST, Mig	Moderate	Low	Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		distribution is poorly known. During the non-breeding season a few birds occur in southern Korea and China, but most spend the non-breeding season in north, east and south-east Australia.	Within Australia, immature birds, which do not migrate, move northward in winter.				
<i>Macquaria australasica</i> Macquarie Perch	BC Act: Not listed EPBC Act: E	Native to southeastern Australia. Historically widespread throughout the Murray-Darling Basin, its population has dramatically declined due to habitat loss, overfishing, and barriers like dams. Remaining populations are fragmented, primarily in upland streams, with significant groups in Victoria and the ACT.	Inhabit cool, clear, freshwater environments such as upland rivers and streams with rocky substrates. They prefer shaded areas provided by overhanging vegetation and rely on deep pools and riffles for shelter and breeding. Stable water quality and temperature are essential, making them highly sensitive to environmental changes and degradation.	PMST	Low	Low	Habitat is degraded in the Study Area (Jacobs, 2025a).
<i>Erythrotriorchis radiatus</i> Red Goshawk	BC Act: E EPBC Act: E	This unique Australian endemic raptor is distributed sparsely through northern and eastern Australia, from the western Kimberley Division of northern Western Australia to north-eastern Queensland and south to far north-eastern NSW, and with scattered records in central Australia. The species is very rare in NSW, extending south to	Habitat present in mapped PCTs: 3975, 4023 Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Adults appear to occupy territories throughout the year and breeding territories are traditionally used from year to year. Adults have large home-ranges, estimated in the Northern Territory to be	PMST	Low	Low	Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens.	as great as about 120 km ² for females and 200 km ² for males.				
<i>Dasyornis brachypterus</i> Eastern Bristlebird	BC Act: E EPBC Act: E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border.	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species. The Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, habitat in northern NSW requires frequent fires to maintain habitat condition and suitability.	PMST	Low	Low	No suitable habitat identified.
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	BC Act: E EPBC Act: E	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within	Nocturnal. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live	PMST	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		approximately 250 km of Sydney.	young from January to March, which is a relatively low level of fecundity.				
<i>Petauroides volans</i> Greater Glider (southern and central)	BC Act: E EPBC Act: E	The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria.	Habitat present in mapped PCTs:3320, 4023, 4025 Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Recorded using hollows with a minimum diameter of 8 cm. Occupy a relatively small home range with an average size of 1 to 3 ha. Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. Very loyal to their territory.	PMST BAMC	Low	Low	No records within 10km of Study Area. Habitat is degraded in the Study Area. Patch size insufficient.
<i>Limosa lapponica baueri</i> Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	BC Act: Not listed EPBC Act: E	The Bar-tailed Godwit is a migratory wader which undertakes the largest non-stop flight of any bird. The trans-Pacific route from its breeding grounds in the Arctic to its non-breeding grounds in the southern hemisphere covers over 11,000 km.	Habitat present in mapped PCTs:3975 It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms. It often occurs around beds of seagrass, and sometimes in nearby saltmarsh or the outer margins of mangrove areas. It forages at low to mid tide in shallow water or along the water's edge on sandy substrates on intertidal flats, banks and beaches or on soft mud substrates.	PMST Mig	Low	Low	No records within 10km of Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Isoodon obesulus obesulus</i> Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south- eastern)	BC Act: E EPBC Act: E	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south- west Western Australia and the northern tip of Queensland.	Habitat present in mapped PCTs:3975, 4023, 4025 Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit- bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees <i>Xanthorrhoea</i> spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest. Mating occurs any time of the year, usually following heavy rain. Two or three litters of 2-4 young may be produced annually. The gestation period of 11-12 days is the shortest known of any marsupial while young remarkably become independent around 60 days after being born.	PMST	Low	Low	No records within 10km of Study Area. Habitat is degraded in the Study Area.
<i>Mixophyes balbus</i> Stuttering Frog, Southern Barred Frog (in Victoria)	BC Act: E EPBC Act: V	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north- eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east	Habitat present in mapped PCTs:4025 Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Feed on insects and smaller frogs. Breed in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. As the tadpoles grow they move to deep	PMST	Low	Low	No records within 10km of Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		NSW. It is the only <i>Mixophyes</i> species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species.	permanent pools and take approximately 12 months to metamorphose.				
<i>Notamacropus parma</i> Parma Wallaby	BC Act: V EPBC Act: V	The species once occurred in north-eastern NSW from the Queensland boarder to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to south of the Bruxner Highway between Tenterfield and Casino.;	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. Typically feed at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas. During the day they shelter in dense cover.	PMST	Low	Low	No suitable habitat identified.
<i>Grantiella picta</i> Painted Honeyeater	BC Act: V EPBC Act: V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to	Inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> . Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	PMST	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		be found in the north of its distribution.					
<i>Pycnoptilus floccosus</i> Pilotbird	BC Act: V EPBC Act: V	The Pilotbird is endemic to southeastern Australia, primarily found in Victoria, New South Wales, and the Australian Capital Territory. It inhabits mountainous regions, including the Great Dividing Range, and is most common in temperate rainforests and wet sclerophyll forests.	The Pilotbird lives in dense, moist undergrowth of sclerophyll forests and wet temperate rainforests in southeastern Australia, especially in regions with thick shrub layers and leaf litter. It prefers areas with ferns and tangled vegetation, which provide cover for foraging. Its habitat is often associated with high-altitude zones and cooler climates.	PMST BAMC	Low	Low	No suitable habitat identified.
<i>Falco hypoleucos</i> Grey Falcon	BC Act: V EPBC Act: V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW.	Habitat present in mapped PCTs:3975, 4023, 4025 Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid.	PMST	Low	Low	No records within 10km of Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Aprasia parapulchella</i> Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	BC Act: V EPBC Act: V	The Pink-tailed Legless Lizard is primarily known from the Central and Southern Tablelands and the South Western Slopes, with a confirmed outlier record on the Hay Plains north of Hay. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory.	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays 2 eggs inside the ant nests during summer; the young first appear in March. Not all sites are rocky. For instance, on the Hay Plains the species has been recorded from a disturbed ants nest in chenopod shrubland and the West Wyalong population occurs in mallee woodland.	PMST	Low	Low	No suitable habitat identified.
<i>Pachyptila turtur subantarctica</i> Fairy Prion (southern)	BC Act: Not listed EPBC Act: V	The species as a whole has a circumpolar distribution and probably frequents subtropical waters during the nonbreeding period. It has been recorded breeding on subantarctic and cool temperate islands in the Southern Hemisphere. Breeding is currently known from only from two rock stacks off Macquarie Island, one near Langdon Point, the other near Davis Point.	Burrows are usually in crevices, in hollows beneath cushions of <i>Colobanthus miscodes</i> or in burrows in peaty soil held together by a thick cover of <i>Cotula plumosa</i> . Fairy prions (southern) build their nests in a dry chamber at the end of a burrow, or, if there is no suitable chamber at the end, about threequarters of the way along a rock crevice.	PMST	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Prototroctes maraena</i> Australian Grayling	BC Act: Not listed EPBC Act: V	The Australian Grayling is endemic to southeastern Australia, ranging from southern Queensland to Victoria and Tasmania. Its populations are patchy and primarily restricted to coastal river systems. In NSW, it occurs in rivers with suitable flow and substrate, particularly in southeastern regions. Habitat disruption caused by dams, water extraction, and pollution has significantly reduced its range.	The Australian Grayling inhabits freshwater rivers, streams, and estuaries, typically with cool, clear, fast flowing water and gravel or sandy substrates. It is a migratory species that moves between freshwater and estuarine environments to complete its lifecycle, requiring access to both habitats. In NSW, it is primarily found in coastal rivers and streams, but it is unlikely to occur in inland wetlands lacking connectivity to estuaries.	PMST	Low	Low	No suitable habitat identified (Jacobs, 2025a).
<i>Stagonopleura guttata</i> Diamond Firetail	BC Act: V EPBC Act: V	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over	Habitat present in mapped PCTs:3320, 4023, 4025 Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Usually encountered in flocks of between 5 to 40 birds, occasionally more. Groups separate into small colonies to breed, between August and January. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially	PMST BAMC	Low	Low	No records within 10km of Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		the rest of NSW, though is very rare west of the Darling River.	for roosting. Appears to be sedentary, though some populations move locally, especially those in the south.				
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	BC Act: E EPBC Act: V	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. However, the distribution of the species across its original range has declined significantly in the west and south and has become more fragmented. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit.	Habitat present in mapped PCTs:3320 Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Highly territorial and have strong site fidelity with an average home range size of about 15 ha. Males tend to have larger home ranges than females. The home range consists of a refuge area and a foraging range linked by habitually used commuting routes. Females settle in or near their mother's range, while males mainly disperse between female groups within colonies, and less commonly between colonies. Dominant males associate and breed with multiple females. Breeding occurs throughout the year with a peak in births between February and May, especially in the southern parts of the range and at higher altitudes.	PMST	Low	Low	No records within 10km of Study Area. Habitat is degraded in the Study Area.
<i>Pseudomys novaehollandiae</i> New Holland Mouse, Pookila	BC Act: Not listed EPBC Act: V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Genetic evidence indicates that the New Holland Mouse once formed a single continuous population on mainland Australia and	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Distribution is patchy in time and space, with peaks in abundance during early to mid-stages of vegetation succession typically induced by fire	PMST	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		the distribution of recent subfossils further suggest that the species has undergone a large range contraction since European settlement.					
<i>Neophema chrysostoma</i> Blue-winged Parrot	BC Act: V EPBC Act: V	Blue winged parrots breed on mainland Australia south of the Great Dividing Range in southern Victoria from Port Albert in Gippsland west to Nelson, and sometimes in the far southeast of South Australia, and the northwestern, central and eastern parts of Tasmania	Blue winged parrots inhabit a range of habitats from coastal, subcoastal and inland areas, through to semiarid zones. They tend to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semiarid zones. The species can also be seen in altered environments such as airfields, golf courses and paddocks. Pairs or small parties of blue winged parrots forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs	PMST	Low	Low	No suitable habitat identified.
<i>Sternula nereis nereis</i> Australian Fairy Tern	BC Act: Not listed EPBC Act: V	Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier Archipelago near Karratha. The subspecies has been known from New South Wales (NSW) in the past, but it is unknown if it persists there (Birdlife International 2010; Garnett & Crowley 2000).	The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayment's of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline (Higgins & Davies 1996; Lindsey 1986a). The bird roosts on beaches at night (Higgins & Davies 1996).	PMST	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Aphelocephala leucopsis</i> Southern Whiteface	BC Act: V EPBC Act: V	The Southern Whiteface is widely distributed across inland southeastern Australia, including NSW, Victoria, South Australia, and parts of Queensland. It is most common in semiarid and temperate areas, but its range is fragmented due to habitat loss from land clearing and agriculture. In NSW, it is more likely to occur in western and southern regions, with a low likelihood of being found in coastal or urban landscapes.	The Southern Whiteface inhabits dry open woodlands, grasslands, and shrublands, often in areas with scattered trees or low shrubs. It prefers habitats with a sparse or patchy ground layer, which it uses for foraging. The species is commonly associated with semiarid environments and open agricultural areas. In NSW, it is generally found in the west and south of the state, avoiding densely forested or heavily urbanized regions.	PMST	Low	Low	No suitable habitat identified.
<i>Charadrius leschenaultii</i> Greater Sand Plover, Large Sand Plover	BC Act: V EPBC Act: V	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the	Habitat present in mapped PCTs:3975 Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders. Diet includes insects, crustaceans, polychaete worms and molluscs. Prey is detected visually by running a short distance, stopping to look, then running to collect the prey.	PMST, Mig	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		Clarence and Richmond estuaries.					
<i>Ixobrychus flavicollis</i> Black Bittern	BC Act: V EPBC Act: Not listed	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland.	Habitat present in mapped PCTs:3975 Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. When disturbed, freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds), or will fly up to a branch or flush for cover where it will freeze again. Generally solitary, but occurs in pairs during the breeding season, from December to March. Like other bitterns, but unlike most herons, nesting is solitary. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. Between three and five eggs are laid and both parents incubate and rear the young.	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.
<i>Ephippiorhynchus asiaticus</i> Black-necked Stork	BC Act: E EPBC Act: Not listed	The species <i>Ephippiorhynchus asiaticus</i> comprises two subspecies, <i>E. a. asiaticus</i> in India and south-east Asia, and <i>E. a. australis</i> in Australia and New Guinea. In Australia, Black-necked Storks are widespread in coastal and	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Storks usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley and rarely occurs south of Sydney. .	regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish). Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat). In NSW, breeding activity occurs May - January; incubation May - October; nestlings July - January; fledging from September. Parents share nest duties and in one study about 1.3-1.7 birds were fledged per nest.				
<i>Limosa limosa</i> Black-tailed Godwit	BC Act: V EPBC Act: E	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed.	Habitat present in mapped PCTs:3975, 4023, 4025 Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have been recorded in wet fields and sewerage treatment works. Forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loaf on low banks of mud, sand and shell bars. Frequently recorded in mixed flocks with Bar-tailed Godwits.	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Irediparra gallinacea</i> Comb-crested Jacana	BC Act: V EPBC Act: Not listed	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in south-eastern NSW (possibly in response to unfavourable conditions further north).	Habitat present in mapped PCTs:3975, 4023, 4025 Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation. Forage on floating vegetation, walking with a characteristic bob and flick. They feed primarily on insects and other invertebrates, as well as some seeds and other vegetation. Breed mainly in spring and summer in NSW, with clutches recorded from September to April. The nest is a platform or shallow cup of vegetable material, though eggs sometimes laid directly onto a large leaf with no nest built. The male builds the nest, incubates the eggs and broods the young. Eggs that roll into the water from a nest are usually retrieved.	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.
<i>Stictonetta naevosa</i> Freckled Duck	BC Act: V EPBC Act: Not listed	The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat.	Habitat present in mapped PCTs:3975 Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. Nests are usually located in dense vegetation at or near water level.	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		The species may also occur as far as coastal NSW and Victoria during such times.					
<i>Glossopsitta pusilla</i> Little Lorikeet	BC Act: V EPBC Act: Not listed	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.	Habitat present in mapped PCTs:3320, 4023, 4025 Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards. Gregarious, travelling and feeding in small flocks (10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries. Roosts in treetops, often distant from feeding areas.	33 17/11/2023 BAMC	Moderate	Moderate	Retained. Potential habitat.
<i>Varanus rosenbergi</i> Rosenberg's Goanna	BC Act: V EPBC Act: Not listed	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia.	Habitat present in mapped PCTs:3320, 4025 Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
<i>Chthonicola sagittata</i> Speckled Warbler	BC Act: V EPBC Act: Not listed	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive.	Habitat present in mapped PCTs:3320, 4023, 4025 The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding.	33 21/05/2023 BAMC	Moderate	Moderate	Retained. Potential habitat.
<i>Epthianura albifrons</i> White-fronted Chat	BC Act: V EPBC Act: Not listed	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near	Habitat present in mapped PCTs:3975 Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Nests are usually built about 23 cm above the ground (but have been found up to 2.5 m above the ground). Two to three eggs are laid in each clutch, and the complete nesting cycle from nest-building to independent young is approximately 50 days. Birds can breed at one year of age and are estimated to live for five years.	BAMC	Low	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site visit	After site visit	
		waterways in the western part of the state.					
<i>Burhinus grallarius</i> Bush Stone-curlew	BC Act: E EPBC Act: Not listed	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range.	Habitat present in mapped PCTs:3320, 3975, 4023, 4025 Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	BAMC	Low	Low	Surveyed. Not detected.

APPENDIX E MIGRATORY SPECIES – LIKELIHOOD OF OCCURRENCE ASSESSMENT

Table 9-4 Listed migratory species likelihood of occurrence within the Study Area. Listing status: V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Apus pacificus</i> Fork-tailed Swift	BC Act: Not listed EPBC Act: Mig	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs	In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and teatree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand dunes.	9, Mig 02/02/2019	Low	Low	No suitable habitat identified.
<i>Hirundapus caudacutus</i> White-throated Needletail	BC Act: V EPBC Act: V	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Peninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours sighting of White-	Habitat present in mapped PCTs:3320, 3975, 4023, 4025	10, PMST, Mig 21/12/2021 BAMC	Moderate	Moderate	Retained. Potential habitat.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		throated Needletails as they feed. More common in coastal areas, less so inland.					
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	BC Act: Not listed EPBC Act: V	The Sharptailed Sandpiper spends the nonbreeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the southeast and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. They are widespread in most regions of New South Wales (NSW) and Victoria, especially in coastal areas, but they are sparse in the southcentral Western Plain and east Lower Western Regions of NSW, and northeast and northcentral Victoria	Sharptailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	48, PMST, Mig 23/10/2016	Low	Low	No suitable habitat identified.
<i>Calidris ferruginea</i> Curlew Sandpiper	BC Act: CE EPBC Act: CE	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater	Habitat present in mapped PCTs:3975, 4023 It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on	4, PMST, Mig 23/10/2016 BAMC	Moderate	Low	Habitat is degraded in the Study Area..

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April.	exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores.				
<i>Calidris melanotos</i> Pectoral Sandpiper	BC Act: Not listed EPBC Act: Mig	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands	10, Mig 24/12/2015	Low	Low	No suitable habitat identified
<i>Gallinago hardwickii</i> Latham's Snipe	BC Act: V EPBC Act: V	Latham's Snipe is a nonbreeding visitor to southeastern Australia and is a passage migrant through northern Australia. The species has been recorded along the east coast of Australia	Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close	22, PMST, Mig 28/11/2022	Low	Low	No suitable habitat identified

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		from Cape York Peninsula through to southeastern South Australia. The range extends inland over the eastern tablelands in southeastern Queensland and to west of the Great Dividing Range in New South Wales. The species is widespread in Tasmania and is found in all regions of Victoria except for the northwest. Most birds spend the nonbreeding period at sites located south of the Richmond River in New South Wales. The species is occasionally recorded at sites located to the west of the core range. It is also an irregular visitor to Norfolk Island and Lord Howe Island, and possibly to Macquarie Island.	to humans or human activity. The foraging habitats of Latham's Snipe are characterized by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation). The snipe roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense teatree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable				
<i>Tringa nebularia</i> Common Greenshank	BC Act: E EPBC Act: E	The species has been recorded in most coastal regions. It is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and northwest regions	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rockflats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use	1, PMST, Mig 01/11/2012	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
			artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores				
<i>Cuculus optatus</i> Oriental Cuckoo	BC Act: Not listed EPBC Act: Mig	The Oriental Cuckoo has a wide distribution, breeding across northern Asia, including Siberia, and migrating to Australasia during the nonbreeding season. In NSW, it is an uncommon visitor during spring and autumn migration, with sightings recorded in a variety of habitats, particularly along the east coast.	The Oriental Cuckoo inhabits a variety of habitats, including forests, woodlands, open grasslands, and wetlands, often near water sources. It prefers areas with dense vegetation, which provide cover and support for its parasitic breeding behaviour. In NSW, it is a rare passage migrant, generally observed in forested or shrubby areas during migration.	2, Mig 02/08/1999	Low	Low	No suitable habitat identified
<i>Numenius madagascariensis</i> Eastern Curlew, Far Eastern Curlew	BC Act: Not listed EPBC Act: CE	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River; and ICOLLs of the south coast. The Eastern Curlew	Habitat present in mapped PCTs:3975 It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. May also roost on wooden oyster leases or other similar structures. The Eastern Curlew is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects.	PMST, Mig	Moderate	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		breeds in Russia and north-eastern China but its distribution is poorly known. During the non-breeding season a few birds occur in southern Korea and China, but most spend the non-breeding season in north, east and south-east Australia.					
<i>Ardenna grisea</i> Sooty Shearwater	BC Act: Not listed EPBC Act: V	In Australia, the Sooty Shearwater breeds on islands off New South Wales (NSW) and Tasmania. The species occurs off the coast of southeast Queensland in small numbers and is a moderately common migrant and visitor to Victoria and South Australia	The Sooty Shearwater forages in pelagic (open ocean) subtropical, subantarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the nonbreeding season. Sooty Shearwaters may forage inshore occasionally, especially during rough weather.	PMST, Mig	Low	Low	No suitable habitat identified
<i>Charadrius leschenaultii</i> Greater Sand Plover, Large Sand Plover	BC Act: V EPBC Act: V	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the	Habitat present in mapped PCTs:3975 Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders. Diet includes insects, crustaceans, polychaete worms and molluscs. Prey is detected visually by running a short distance, stopping to look, then running to collect the prey.	PMST, Mig	Moderate	Low	No records within 10km of the Study Area. Habitat is degraded in the Study Area.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries.					
<i>Actitis hypoleucos</i> Common Sandpiper	BC Act: Not listed EPBC Act: Mig	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia.	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags	Mig	Low	Low	No suitable habitat identified.
<i>Phaethon lepturus</i> White-tailed Tropicbird	BC Act: Not listed EPBC Act: Mig	The White tailed Tropicbird is widely distributed across the tropical and subtropical oceans, including the Indian Ocean, Pacific Ocean, and Atlantic Ocean. It breeds on remote islands in tropical regions, with occasional individuals straying as far south as NSW and eastern Australia during migration.	The White tailed Tropicbird is typically found in tropical and subtropical marine environments, including offshore islands and oceanic waters. It nests on cliffs and rocky islands in tropical regions. In NSW waters, it is an extremely rare visitor, with sightings limited to offshore locations.	Mig	Low	Low	No suitable habitat identified.

Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
<i>Calonectris leucomelas</i> Streaked Shearwater	BC Act: Not listed EPBC Act: Mig	The Streaked Shearwater ranges widely across the western Pacific Ocean, particularly in Australasian seas during its nonbreeding season. Breeding populations are concentrated on islands in the North Pacific, with individuals migrating south to NSW and eastern Australia. Sightings in NSW are occasional, usually in deep pelagic waters.	The Streaked Shearwater nests primarily on offshore islands in the western Pacific, including Japan, Korea, and Taiwan. It spends most of its life in pelagic waters, often near ocean currents where prey is abundant. In NSW waters, it is a rare visitor, typically found in offshore waters during migration or foraging.	Mig	Low	Low	No suitable habitat identified.
<i>Limosa lapponica</i> Bar-tailed Godwit	BC Act: E EPBC Act: Mig	The Bar-tailed Godwit has a global distribution spanning the Arctic, where it breeds, and migrates south to Australasia during the nonbreeding season. In NSW, it is a regular visitor to coastal wetlands, particularly during its annual migration from breeding grounds in Alaska or Siberia.	The Bar-tailed Godwit prefers intertidal mudflats, sandflats, and coastal wetlands, particularly estuaries and sheltered bays. It is rarely found inland, as it relies on tidal areas for feeding. In NSW, it is commonly observed in coastal areas, but unlikely to occur in inland wetland waterbodies.	Mig	Low	Low	No suitable habitat identified.
<i>Motacilla flava</i> Yellow Wagtail	BC Act: Not listed EPBC Act: Mig	The Yellow Wagtail has a widespread distribution across Europe, Asia, and Africa, migrating south to Australasia during the nonbreeding season. In NSW, sightings are rare and sporadic, often restricted to coastal areas	The Yellow Wagtail prefers open grasslands, wet meadows, and agricultural areas, often near water sources. It is rarely associated with wetlands dominated by waterbodies. In NSW, it is an extremely rare visitor, typically found in open habitats during migration.	1 12/09/1984 Mig	Low	Low	No suitable habitat identified.

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Species	Listing status	Distribution	Habitat	Records (BioNet, PMST, BAMC, & most recent record)	Likelihood of Occurrence		Justification
					Before site survey	After site survey	
		or open farmland during migration.					
<i>Pandion haliaetus</i> Osprey	BC Act: Not listed EPBC Act: Mig	The Osprey has a global distribution, occurring across tropical and temperate regions. In NSW, it is a regular visitor or resident along coastal waterways, particularly in areas with abundant fish and suitable nesting sites. It is unlikely to occur in inland wetlands without large waterbodies.	The Osprey is typically found near coastal waters, estuaries, lakes, and large rivers, where fish are abundant. It requires tall structures for nesting and prefers areas with minimal human disturbance. In NSW, it is generally observed in coastal areas, not inland wetlands.	1 17/12/2021 BAMC Mig	Moderate	Moderate	Retained. Potential habitat.

APPENDIX F **SIGNIFICANT IMPACT CRITERIA ASSESSMENTS (EPBC ACT)**

Significant Impact Criteria assessments have been prepared for all threatened species or ecological communities considered to have a moderate or higher likelihood of occurrence and will be impacted by the Proposal. Assessments have been prepared in accordance with the *Matters of National Environmental Significance: Significant impact guidelines* (Commonwealth Department of the Environment, 2013) and address the following significant impact criteria, dependent on the species listing status under the EPBC Act:

An action is likely to have a significant impact on a **vulnerable species** if there is a real chance or possibility that it will:

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

An action is likely to have a significant impact on a **critically endangered or endangered species** if there is a real chance or possibility that it will:

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

Table 9-5. Assessment against the SIC for threatened species which have potential to be impacted by the Proposal.

EPBC Act listed species	Listing Status	Significant Impact Criteria									Likelihood of significant impact (Low, Moderate, High)	Justification
		i	ii	iii	iv	v	vi	vii	viii	ix		
Fauna												
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	E	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
Brown Treecreeper (eastern subspecies) (<i>Climacteris picumnus victoriae</i>)	V	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
Swift Parrot (<i>Lathamus discolor</i>)	CE	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
Regent Honeyeater (<i>Xanthomyza phrygia</i>)	CE	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
White-throated Needletail (<i>Hirundapus caudacutus</i>)	V	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
Glossy Black-cockatoo (<i>Calyptorhynchus lathami</i>)	V	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>)	E	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely
Grey-headed flying-fox (<i>Pteropus poliocephalus</i>)	V	N	N	N	N	N	N	N	N	N	Low	The SI Criteria have been considered for this species and significant impacts are unlikely

Threatened Ecological Community

River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

An action is likely to have a significant impact on a critically endangered or endangered community if there is a real chance or possibility that it will:

a. reduce the extent of an ecological community	The Proposal will result in the removal of a maximum of 0.13 ha of the listed community which occurs as PCT 4025 in the Study Area. The area to be removed represent a minor proportion of the total extent of this CEEC which was measured at 10,600 hectares in 2020 (DAWE, 2020).
b. fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The Proposal will remove 0.13 ha of the listed community from the edges of existing patches. The Proposal will not fragment an existing larger patch into two or more small patches. The Proposal will result in an increase in fragmentation between patches of PCT 4025, however this increase will be minor (<5m) and will not significantly reduce the connectivity between patches for fauna and flora dispersal. Therefore, it is considered that the Proposal is unlikely to fragment or increase fragmentation of the community such that the community will decline in the locality.
c. adversely affect habitat critical to the survival of an ecological community	The Proposal will result in the removal of 0.13 ha of the listed community as strips of vegetation along the edges of larger patches. The area of the community to be removed or the broader patch which may experience impacts beyond the construction footprint as a result of the Proposal is not considered crucial for: i. the long-term maintenance of the ecological community (including the maintenance of species essential to the survival of the ecological community, such as pollinators). ii. to maintain genetic diversity and long-term evolutionary development; or iii. for the reintroduction of populations or recovery of the ecological community (DoE 2013). Therefore, it is considered that the Proposal is unlikely adversely affect habitat critical to the survival of the ecological community.
d. modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Environmental management measures will be implemented to protect areas of the community to be retained within or adjacent to the construction footprint from sedimentation and changes in surface water drainage through fencing, signage and sediment control. Therefore, it is considered that the Proposal is unlikely to modify or destroy abiotic factors necessary for survival of the ecological community.
e. cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	A maximum of 0.13 ha of the community will be completely removed. The area of RFEF to be removed has a species composition which is similar to the broader patch. The areas of the community adjacent to the construction footprint in the broader patch will be retained and protected from construction impacts through fencing, signage and sediment control. Therefore, the removal of 0.13 ha of RFEF from the Proposal will not cause a substantial change in the composition of the retained areas of the community outside of the construction footprint.
f. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - Assisting invasive species, that are harmful to the listed ecological community, to become established, or - Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which	The Proposal will remove strips of RFEF from the edges of larger patches of the community. Removal of these strips of vegetation is likely to cause some edge disturbance to the vegetation to be retained which could reduce the quality of vegetation adjacent to the areas of removal. However, the degree of reduction in vegetation quality is considered unlikely to be 'substantial' due to the current condition of the broader patch already showing some signs of disturbance. Therefore, it is considered that the Proposal is unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the ecological community.

An action is likely to have a significant impact on a critically endangered or endangered community if there is a real chance or possibility that it will:

kill or inhibit the growth of species in the ecological community, or	
g. interfere with the recovery of an ecological community	The Proposal will result in the removal of 0.13 ha of the listed community. The removal of any areas of RFEF does not contribute to the recovery of the entity.
Conclusion	The Proposal would remove a maximum of 0.13 ha of River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria, which is a minor proportion of the total extent of this CEEC which was measured at 10,600 hectares in 2020 (DAWE, 2020). The area of RFEF to be removed comprises two strips of the community on the edges of larger patches. The Proposal would not result in the fragmentation of a patch but would minorly increase distances (<5m) between patches of the community. The area to be removed and the broader patch share similar composition and condition, with some disturbance being present. Therefore, the proposed impact to RFEF is unlikely to substantially change the composition of the broader patch or its condition. Based on the assessment above, the removal of a maximum of 0.13 ha of the RFEF CEEC is unlikely to constitute a significant impact. Therefore, a referral to the Commonwealth Minister for the Environment is not required.

APPENDIX G TESTS OF SIGNIFICANCE (BC ACT)

Tests of significance have been prepared for all threatened species or ecological communities considered to have a moderate to high likelihood of occurrence in the Proposal area. Tests have been prepared in accordance with the *Threatened Species Test of Significance Guidelines* (OEH, 2018) and address the following five factors as required by section 7.3 of the BC Act:

- (a) *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*
- (b) *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity*
 - (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*
- (c) *in relation to the habitat of a threatened species or ecological community—*
 - (i) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
 - (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
 - (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,*
- (d) *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*
- (e) *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

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Table 9-6. ToS for threatened species which have potential to be impacted by the Proposal.

BC Act listed species	Listing Status	Criteria					Likelihood of significant impact (Low, Moderate, High)	Justification
		a	b	c	d	e		
Fauna								
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	E	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Barking Owl (<i>Ninox connivens</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Black Falcon (<i>Falco subniger</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Brown Treecreeper (eastern subspecies) (<i>Climacteris picumnus victoriae</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Cumberland Plain Land Snail (<i>Meridolum corneovirens</i>)	E	N	N/A	N	N	N	Low	<u>A detailed assessment has been included for this species below, due to its identification on site and the direct impacts anticipated from the Proposal.</u>
Dusky Woodswallow (<i>Artamus cyanopterus cyanopterus</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Eastern Coastal Free-tailed Bat (<i>Micronomus norfolkensis</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely

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BC Act listed species	Listing Status	Criteria					Likelihood of significant impact (Low, Moderate, High)	Justification
		a	b	c	d	e		
Eastern Osprey (<i>Pandion cristatus</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>)	E	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Glossy Black-cockatoo (<i>Calyptorhynchus lathami</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Grey-headed flying-fox (<i>Pteropus poliocephalus</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Little Bent-winged Bat (<i>Miniopterus australis</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Little Eagle (<i>Hieraaetus morphnoides</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Little Lorikeet (<i>Parvipsitta pusilla</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Masked Owl (<i>Tyto novaehollandiae</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely

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BC Act listed species	Listing Status	Criteria					Likelihood of significant impact (Low, Moderate, High)	Justification
		a	b	c	d	e		
Powerful Owl (<i>Ninox strenua</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Regent Honeyeater (<i>Xanthomyza phrygia</i>)	CE	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Southern Myotis (<i>Myotis macropus</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Speckled Warbler (<i>Pyrrholaemus sagittatus</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Spotted Harrier (<i>Circus assimilis</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Square-tailed Kite (<i>Lophoictinia isura</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Swift Parrot (<i>Lathamus discolor</i>)	E	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Turquoise Parrot (<i>Neophema pulchella</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Varied Sittella (<i>Daphoenositta chrysoptera</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely

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BC Act listed species	Listing Status	Criteria					Likelihood of significant impact (Low, Moderate, High)	Justification
		a	b	c	d	e		
White-throated Needletail (<i>Hirundapus caudacutus</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely
Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>)	V	N	N/A	N	N	N	Low	The ToS criteria have been considered for this species and significant impacts are unlikely

Threatened Fauna

Cumberland Plain Land Snail

Factor	Endangered Species <i>Meridolum corneovirens</i> (Cumberland Plain Land Snail)
Species information	Cumberland Plain Land Snail (CPLS) inhabits Cumberland Plain Woodland. This community is a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. CPLS lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. Little is known of its biology, including breeding biology, however, is known to lay eggs in moist, dark areas (such as under logs).
Proposed impacts	The removal of 0.39 ha of PCT 4025.
a. <i>Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction</i>	The removal of 0.39 ha of PCT 4025 is unlikely to have an adverse effect that would place a local population at risk of extinction. While CPLS have been found within the study area, the vegetation they have been found are part of larger patches in the area. The translocation of CPLS individuals during pre-clearing surveys would reduce the risk that a local population of CPLS would be impacted.
b. <i>Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction</i>	Not applicable.
c. <i>In relation to habitat of a threatened species or community:</i> i. <i>extent to which habitat is likely to be removed or modified</i> ii. <i>whether an area of habitat is likely to become fragmented or isolated from other areas of habitat</i> iii. <i>importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community</i>	i. The Proposal would result in the removal of 0.39 ha of PCT 4025. ii. The habitat to be removed is along edges of larger patches of vegetation. The removal of this small area is unlikely to result in a significant reduction of connectivity in the region. iii. The removal of 0.39 ha of PCT 4025 is unlikely to be important to the long-term survival of this species.
d. <i>Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for this species.
e. <i>Whether the Proposal is or is part of a key threatening process or is likely to increase the impact of a key threatening process</i>	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, one is relevant to the potential impacts of the Proposal on these species: i. Clearing of native vegetation – The removal of 0.39 ha of PCT 4025 that contains potential breeding and foraging habitat for this species would be cleared for the Proposal. This does not represent a significant area of habitat for this species in the locality.
Conclusion	The removal 0.39 ha of PCT 4025 by the Proposal is not considered to be a significant area of habitat nor of importance to the long-term survival of this species in the locality. As a result, it is considered unlikely that the Proposal represents a significant impact on this species. A Species Impact Statement is not required for this species.

Threatened Ecological Communities

Cumberland Plain Woodland in the Sydney Basin Bioregion

Factor	Critically Endangered Ecological Community Cumberland Plain Woodland in the Sydney Basin Bioregion
Ecological community information	Cumberland Plain Woodland in the Sydney Basin Bioregion is listed as Critically Endangered under the BC Act. Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rain shadow area to the west of Sydney's Central Business District. The mean annual rainfall of this area is typically in the range of 700-900 mm and is generally lower than that received on more elevated terrain that partially surrounds the plain. The community typically occurs on flat to undulating or hilly terrain up to about 350 metres elevation but may also occur on locally steep sites and at slightly higher elevations. Cumberland Plain Woodland typically comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Based on the location and soil characteristics of the Proposal site, woodland vegetation in areas mapped as PCT 3320 meets the definition of the Cumberland Plain Woodland Critically Endangered Ecological Community (CEEC).
Local occurrence	<i>The local occurrence of an ecological community is defined as the ecological community that occurs within the Proposal site and may also include adjacent areas if the ecological community in the Proposal site forms part of a larger contiguous area of that ecological community and functional connectivity across the boundary of the Proposal site can be demonstrated.</i> For this significance assessment, vegetation associated with CPW within the construction footprint has been separated into: – The patches present in the North-west of the construction footprint, around the Quakers Hill WRRF/Melrose Park which are contiguous with patches of CPW in the broader Study Area and locality, and – Scattered trees which constitute CPW at Harvey Park, Cavanagh Reserve, Boyd Street Reserve and at the International Peace Park. The CPW patches with contiguous vegetation, comprise 0.30 ha, and scattered trees comprise the remaining 0.65 ha. Contiguous vegetation has been considered patches of PCT 3320 connected within 100m. From mapping patches of vegetation mapped on the SVTM as 3320 connected by 100ms of separation, the local occurrence for the patches at Quakers Hill WRRF/Melrose Park is considered 19.95 ha. The majority of which, occurs within Melrose Park, and Western Sydney Parklands, as Breakfast Creek flows into Eastern Creek. The scattered trees occur in a highly urbanised context. CPW is present as isolated and fragmented occurrences of characteristic tree species in these locations and is largely unmapped on the SVTM, as this would characteristically be, street trees, remnant trees on the edges or parks or individual trees within private property boundaries. The scattered trees to be removed occurs within a mosaic of street trees. The local occurrence in these locations is considered to comprise scattered trees rather than a patch, as such quantifying the local occurrence of these scattered is difficult.
Proposed impacts	The Proposal would remove 0.95 ha of low condition woodland characteristic of PCT 3320, which has been determined to meet the criteria for listing as Cumberland Plain Woodland as described under the BC Act.

Factor	Critically Endangered Ecological Community Cumberland Plain Woodland in the Sydney Basin Bioregion
	The patches of PCT 3320 to be removed have a similar structure and composition across the construction footprint, comprising <i>Eucalyptus moluccana</i> (Grey Box) and <i>Eucalyptus tereticornis</i> (Forest Red Gum) trees with a highly disturbed, predominantly exotic understorey. No fully structured assemblages of PCT 3320 will be removed by the Proposal. Of the 0.95 ha, 0.30 ha is contiguous with other patches of PCT 3320. The remaining 0.65 ha occurs as scattered trees and is not considered to form part of a contiguous patch in the locality.
a. Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction	Not applicable.
b. Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction	The removal of 0.95 ha of Cumberland Plain Woodland will reduce the local occurrence of this Critically Endangered Ecological Community (CEEC). The area of CPW proposed for removal is low condition woodland, comprised of native trees characteristic of the CEEC with an absence of native mid and understorey species. For the contiguous patch present near Quakers Hill WRRF/Melrose Park, the removal of 0.30 ha of CPW from the edge of a contiguous patch with an approximate extent of 19.95 ha, represents a loss of 1.5 per cent of its local occurrence. This loss is considered unlikely to place the local occurrence at risk of extinction with the large contiguous patches of this vegetation, present in the Study Area and locality, being retained. These patches being retained are connected to a large patch at Melrose Park and contiguous vegetation following Eastern Creek, all along Western Sydney Park lands. Additionally, the remaining 0.65 ha to be removed, occurs as scattered native trees characterise of CPW including <i>Eucalyptus moluccana</i> (Grey Box) and <i>Eucalyptus tereticornis</i> (Forest Red Gum), in urban areas and along the edges of parks. This occurrence of CPW is highly modified and fragmented across the landscape. The removal of these scattered trees is not considered to place the local occurrence at risk of extinction, as they are considered to form part of a mosaic of scattered trees characteristic of CPW in the locality, which will remain following construction of the Proposal. The extent of CPW to be removed represents a small fraction of the estimated local occurrence of the community, and its removal is unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
c. In relation to habitat of a threatened species or community: i. <i>extent</i> to which habitat is likely to be removed or modified ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat iii. importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community	i. A maximum of 0.95 ha of CPW will be removed by the Proposal ii. The vegetation being removed is already in a fragmented, isolated and degraded state. Removal of this vegetation will not significantly further fragment the habitat. Although, scattered trees will be removed, in an already isolated environment, these trees were not considered to form part of or be connected to a larger patch. iii. The area of CPW to be removed is already mostly isolated. The vegetation to be removed is of low importance and will not impact the long-term survival of the ecological community.
d. Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Cumberland Plain Woodland.

Factor	Critically Endangered Ecological Community Cumberland Plain Woodland in the Sydney Basin Bioregion
e. Whether the proposal is or is part of a key threatening process or is likely to increase the impact of a key threatening process	Schedule 4 of the BC Act provides a list of the 'key threatening processes' (KTPs). Of the KTPs listed in Part 4, Division 5 of the BC Act, several are applicable to the Proposal. Of those, the following are relevant to Cumberland Plain Woodland: i. Removal of native vegetation - Native vegetation which constitutes the CPW community would be cleared for the Proposal, however the extent of CPW to be removed represents a small percentage of the local occurrence. ii. Invasion of native plant communities by exotic perennial grasses – exotic perennial grasses are present within the patch of CPW in the Study Area and on adjoining lands. The Proposal is unlikely to exacerbate the KTP by introducing novel exotic perennial grasses or increasing the cover of present exotic grass species within retained areas of CPW adjoining the site. There are mitigation measures in place to prevent additional clearing of CPW, more than what has been assessed for removal in this assessment and minimise the introduction and spread of pathogens and weeds across the Construction Footprint and into adjoining areas.
Conclusion	In consideration of the above five factors, the Proposal is considered unlikely to have a significant impact on the critically endangered ecological community Cumberland Plain Woodland in the locality. Consequently, preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required for impacts to this TEC.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Factor	Endangered Ecological Community Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
Ecological community information	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is listed as Endangered under the BC Act. The Swamp Oak Floodplain Forest (SOFF) is known from the local government areas spanning Tweed in northern NSW down to Bega Valley along the coast but may occur elsewhere in these bioregions. SOFF is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally, occurs below 20 m (rarely above 10 m) elevation. Characteristic tree species in the Swamp Oak Floodplain Forest are <i>Casuarina glauca</i>, with subordinate assemblages of <i>Acmena smithii</i> (<i>lilly pilly</i>), <i>Glochidion</i> spp. (cheese trees) and <i>Melaleuca</i> spp. (paperbarks). Based on the location and soil characteristics of the Proposal, the vegetation in areas mapped as PCT 4023 is considered to fall within the definition of the Swamp Oak Floodplain Forest EEC.
Local occurrence	<i>The local occurrence of an ecological community is defined as the ecological community that occurs within the Proposal site and may also include adjacent areas if the ecological community in the Proposal site forms part of a larger contiguous area of that ecological community and functional connectivity across the boundary of the Proposal site can be demonstrated.</i> For this significance assessment, vegetation associated with SOFF within the construction footprint has been separated into: - The patches present in the North-west of the construction footprint, from the Quakers Hill WRRF along Breakfast Creek to Harvey Park, and - The patches present in the South-east of the construction footprint, along Blacktown Creek at the International Peace Park. The SOFF patches are 0.16 ha and 0.46 ha respectively. As there is no vegetation associated with PCT 4023 mapped on the SVTM within the Study Area, in order to assess the local occurrence, ground-truthed vegetation data was used, to map PCT 4023 that is contiguous (connected by less than 100m) from PCT 4023 within the construction footprint. The local extent contiguous to the North-western patches along Breakfast Creek is 4.44 ha, of which removal of 0.15 ha, comprises a 3.42 percent loss. The local extent contiguous to the South-eastern patches along Blacktown Creek is 1.55 ha, of which removal of 0.46 ha, comprises a 29.55 percent loss. Furthermore, in this portion, the removal of SOFF, is comprised of trimming of canopy trees, as opposed to wholesale clearing. For this assessment, a worst-case scenario of clearing has been precautionarily assessed, however, in practice, clearing in this area will result in the retention of trees, with only trimming proposed.
Proposed impacts	The Proposal will impact a maximum of 0.62 ha of the listed community.
a. <i>Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction</i>	Not applicable.
b. <i>Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its</i>	Impacts to approximately 0.62 ha of Swamp Oak Floodplain Forest for the Proposal represents a small/moderate reduction in the extent of the potential local occurrence of the community; 30 percent loss for the patch along Blacktown Creek and 3 percent loss at Breakfast Creek.

Factor	Endangered Ecological Community Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
<i>local occurrence is likely to be placed at risk of extinction</i>	For both patches of SOFF, surrounding Breakfast and Blacktown Creek, the removal of a sum total 0.62 ha, represents a small loss of poor-quality SOFF that is contiguous to vegetation that will be retained. The area to be impacted is in an already modified condition, with evidence of invasive vegetation. The patch represents a small fraction of the estimated local occurrence of the community, and Proposal impacts are unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
c. <i>In relation to habitat of a threatened species or community:</i> i. <i>extent to which habitat is likely to be removed or modified</i> ii. <i>whether an area of habitat is likely to become fragmented or isolated from other areas of habitat</i> iii. <i>importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community</i>	i. The Proposal would result in the impacts to 0.62 ha of Swamp Oak Floodplain Forest. ii. The vegetation being removed by the Proposal exists in a long, thin patch that extends from the International Peace Park to the Blacktown Aquatic Centre. The vegetation is bordered by urban development, trainlines and manicured parks. As this patch is already highly isolated from other vegetation, the removal of any vegetation will not further isolate this area. iii. Impacts to 0.62 ha of Swamp Oak Floodplain Forest is unlikely to jeopardise the long-term survival of the community in the locality as the vegetation is already modified and subject to disturbance from invasive species.
d. <i>Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Swamp Oak Floodplain Forest.
e. <i>Whether the Proposal is or is part of a key threatening process or is likely to increase the impact of a key threatening process</i>	Schedule 4 of the BC Act provides a list of the 'key threatening processes' (KTPs). Of the KTPs listed in Part 4, Division 5 of the BC Act, several are applicable to the Proposal. Of those, the following are relevant to Swamp Oak Floodplain Forest: i. Removal of native vegetation - Native vegetation would be cleared for the Proposal, however the extent of vegetation to be removed represents a small area of the local occurrence of the EEC. ii. Invasion of native plant communities by exotic perennial grasses – exotic perennial grasses are present throughout the Proposal site. Including within the patch of Swamp Oak Floodplain Forest. The Proposal may exacerbate the KTP by facilitating the spread of seeds or fragments of plant, via plants or contaminated topsoil. This could include area of Swamp Oak Floodplain Forest, although it is noted that the patch of TEC in vicinity to the Proposal already have exotic flora present in the ground layer.
Conclusion	In light of the consideration of the above five factors, the Proposal is not likely to have a significant impact on the endangered ecological community Swamp Oak Floodplain Forest, as: i. Impacts to 0.62 ha of the community would not adversely affect the extent of the ecological community to a level that its local occurrence is likely to be placed at risk of extinction; and ii. The Proposal will not fragment any patches and will not increase fragmentation between patches or cause any areas of suitable habitat to become unviable. Consequently, preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required for impacts to this TEC.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Factor	Endangered Ecological Community River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
Ecological community information	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions is an ecological community associated with silts, clay-loams and sandy loams on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The canopy is characterised by <i>Eucalyptus tereticornis</i> Forest Red gum, <i>E. amplifolia</i> Cabbage Gum, <i>Angophora floribunda</i> Rough-barked Apple and <i>A. subvelutina</i> Broad-leaved Apple.
Local occurrence	For this significance assessment, vegetation associated with RFEF within the construction footprint has been separated into: The patches present in the North-west of the construction footprint, around the Quakers Hill WRRF/Harvey Park which are connected to contiguous native vegetation, a single stand of vegetation at Lynwood Park and a thin strip of vegetation at the International Peace Park. The patches of RFEF are 0.37, 0.01 and 0.005 ha respectively. Contiguous vegetation has been considered patches of PCT 4025 connected within 100m. From mapping patches of vegetation mapped on the SVTM as 4025 connected by 100ms of separation, the local occurrence for the patches at Quakers Hill WRRF/Harvey Park is considered >306 ha. This vegetation is connected along Breakfast Creek connecting to Western Sydney Parklands, along Eastern Creek. Removal of 0.38 ha of a 306.24 ha patch equates to the removal of 0.13 percent. The other patches of vegetation at Lynwood and the International Peace Park are scattered trees which occur in a highly urbanised context. From similarly mapping contiguous vegetation for PCT 4025 using the SVTM, these stands are considered part of 11.21 ha and 0.81 ha patches. The removal of 0.01 ha of a 11.21 ha patch as Lynwood Park, equates to removal of 0.10 percent; and removal of 0.005 of a 0.81 ha patch equates to 0.58 percent at the International Peace Park. At the International Peace Park, vegetation is proposed for trimming as opposed to wholesale clearing. This assessment considers a worst case-scenario however it is likely that reduction in impacts will occur in practice, reducing impacts to these trees.
Proposed impacts	The Proposal would remove approximately 0.39 hectares of PCT 4025, which is associated with the River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.
a. <i>Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction</i>	Not applicable.
b. <i>Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction</i>	The Proposal would result in a total removal of 0.39 hectares of TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions listed as Endangered under the BC Act. There is a low risk of extinction due to the relatively small area impacted and the connectivity to Western Sydney Parklands adjacent to Breakfast Creek.
c. <i>In relation to habitat of a threatened species or community:</i> i. <i>extent to which habitat is likely to be removed or modified</i>	i. The Proposal would result in a total removal of 0.39 hectares of TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions listed as Endangered under the BC Act. ii. The vegetation being removed by the Proposal is mainly situated along Breakfast Creek in Blacktown and is connected to other patches of vegetation along the riparian corridor. Only the edges of this vegetation will be impacted and connectivity will be preserved, with a large patch of vegetation at Harvey Park within the Study Area being retained. Therefore, isolation and

Factor	Endangered Ecological Community River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
ii. <i>whether an area of habitat is likely to become fragmented or isolated from other areas of habitat</i> iii. <i>importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community</i>	fragmentation are unlikely. Patches will not be fragmented by the Proposal with only the edges of existing patches being targeted from trimming and clearing. iii. Impacts to 0.39 ha of River-Flat Eucalypt Forest is unlikely to jeopardise the long-term survival of the community in the locality as the vegetation is part of a large contiguous patch, with impacts restricted to the edge of patches.
d. <i>Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for this Threatened Ecological Community.
e. <i>Whether the Proposal is or is part of a key threatening process or is likely to increase the impact of a key threatening process</i>	Schedule 4 of the BC Act provides a list of the 'key threatening processes' (KTPs). Of the KTPs listed in Part 4, Division 5 of the BC Act, several are applicable to the Proposal. Of those, the following are relevant to River-Flat Eucalypt Forest: i. Removal of native vegetation - Native vegetation would be cleared for the Proposal, however the extent of vegetation to be removed represents a small area of the local occurrence of the EEC. ii. Invasion of native plant communities by exotic perennial grasses – exotic perennial grasses are present throughout the Proposal site. Including within the patch River-Flat Eucalypt Forest. The Proposal may exacerbate the KTP by facilitating the spread of seeds or fragments of plant, via plants or contaminated topsoil. This could include area of River-Flat Eucalypt Forest, although it is noted that the patch of TEC in vicinity to the Proposal already have exotic flora present in the ground layer.
Conclusion	Following consideration of the above five factors, the Proposal is unlikely to have a significant impact on River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions in the area of the proposed works, or the wider locality, as: ii. The Proposal would not reduce the extent of the ecological community, and would not substantially modify its composition such that its local occurrence is likely to be placed at risk of extinction. iii. Substantially fragment or isolate any habitat for the community; and iv. The Proposal is unlikely to increase the impact of any key threatening processes. Consequently, preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required for impacts to this TEC.

