11 August 2021

Veronica Ku
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Level 11, 1 Smith Street
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Dear Veronica

Re: Flora and fauna assessment for North West Treatment Hub Project (Compliance Upgrade)

Project no. 34968

Biosis Pty Ltd was commissioned by Sydney Water to undertake a flora and fauna assessment to describe the ecological values and constraints associated with the proposed compliance upgrade to the North West Treatment Hub (the project), including Castle Hill Water Recycling Plant (WRP, Stage 1) and Rouse Hill WRP (Stage 2) at Lot 1 DP553269, Castle Hill and Lot 2 and Lot 3 DP 251094, Lot 22 DP 830552, Rouse Hill (the study area, Appendix 1; Figure 1.1 and Figure 1.2) in New South Wales (NSW).

The development upgrades are to address compliance requirements for treated water quality at both WRPs and wet weather overflows at Rouse Hill WRP. Upgrades for Castle Hill WRP include:

- New inlet works and flow distribution.
- Discharge main trench and 15 metre clearance corridor.
- Sealed covers on the existing primary sedimentation tank and ducting to odour control unit (OCU).
- New odour control unit.
- Additional anoxic compartment.
- Sucrose solution dosing.
- Pressurised ultra-filtration.
- Ultraviolet system upgrade.
- Sludge pump station.
- Modification of pipework.
- Potable water and system upgrades.
- Decommissioning of the existing lime dosing system, odour control unit and inlet works.
- Electrical upgrades.
- New internal roads and access

Upgrades for Rouse Hill WRP include:

- Inlet works.
- Refurbish primary sedimentation tank.
- New OCU.
- High Voltage and Low Voltage switch rooms and reticulation.

The upgrades will require the removal of native vegetation. The objective of this flora and fauna assessment is to determine the presence of any threatened ecological communities (TECs) within the study area and, where applicable, assess the impacts of the project on any threatened species, populations and/or ecological communities (entities), or their habitat, listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Biodiversity Conservation Act 2016* (BC Act) and/or *Fisheries Management Act 1994* (FM Act). This proposal is to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Identified constraints will be used to guide detailed design, with an emphasis on avoiding ecological impacts where feasible. These investigations will be used to inform the Review of Environmental Factors (REF) being prepared by Sydney Water.

Background

The study area is approximately 15.45 hectares and is defined as the proposed footprints of Castle Hill WRP and Rouse Hill WRP.

Castle Hill

The Castle Hill study area is within The Hills Local Government Area (LGA), within land zoned as SP2 Infrastructure under *The Hills Local Environmental Plan 2019* (LEP). Nearby land use is residential. Cattai Creek is present to the west, with Castle Hill Creek tributary running to the south of the study area. There are no waterways within the study area.

Access to the proposed works will be from both the existing main entrance on Wrights Road and an existing fire trail travelling from the north-east and connecting with Drawbridge Place, Kellyville. The existing discharge main located in a North West alignment from the treatment plant will be replaced via trenching.

Rouse Hill

The Rouse Hill study area is within The Hills LGA, within land zoned as IN2 Light Industrial under the LEP. Nearby land use is commercial industrial. Further, residential housing is within close proximity. Second Ponds Creek is present to the north of the study area. There are no waterways within the study area.

Method

Database and literature review

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

- Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW Environment, Energy and Science (EES) BioNet Atlas of NSW Wildlife, for items listed under the BC Act.

- NSW DPI *Biosecurity Act 2015* for Priority listed weeds for the Greater Sydney Local Land Services (LLS) area.
- EES Vegetation Information System (VIS) mapping, including:
  - *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands* (SCIVI) (DPIE 2010).
  - *Cumberland Plain Vegetation Mapping* (NPWS 2002, NPWS 2013).
- *Position Statement: Maintaining and Enhancing Biodiversity Values* (Sydney Water 2018).
- Sydney Water's *Biodiversity Offset Guideline* (Sydney Water 2019).
- *Growth Centres Conservation Plan. Exhibition draft* (Growth Centres Commission 2007).
- *Biodiversity Assessment Castle Hill WRP (ST0024)* (UBM Ecological Consultants 2018a).
- *Biodiversity Assessment Rouse Hill WRP (ST0031)* (UBM Ecological Consultants 2018b).
- *Rouse Hill Water Recycling Plant (WRP) Amplification: HDD Pipe Stringing Areas and works within ERP - Biodiversity Impact Assessment Report* (ENsure 2018).

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

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Biodiversity Conservation Act 2016* (BC Act).
- *Fisheries Management Act 1994* (FM Act).
- *Water Management Act 2000* (WM Act).
- *Biosecurity Act 2015.* (Biosecurity Act).
- SEPP (Vegetation in Non-Rural Areas) 2017.
- *The Hills Local Environmental Plan 2019* (LEP).
- *The Hills Development Control Plan 2012* (DCP).

Field investigation

A field investigation of the study area was undertaken 12-13 May 2021 by Averill Wilson. Vegetation within the study area was surveyed using the random meander technique (Cropper 1993) over four person hours.

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

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

A habitat-based assessment was completed to determine the presence of suitable habitat for threatened species previously recorded (EES 2021) or predicted to occur (Commonwealth of Australia 2021) within 5

kilometres. This list was filtered according to species descriptions, life history, habitat preference and soil preference to determine those species most likely to be present within the study area.

Results

The study area is located approximately 28 kilometres from the Sydney City Business District (CBD), in an area comprised of a range of land uses associated with the WRPs. Land surrounding the study areas consists of fragmented patches of vegetation by rural residential lots and roadways. The study area is well connected to riparian vegetation associated with Cattai Creek and Castle Hill Creek west and south of the Castle Hill impact area, and Second Ponds Creek north of the Rouse Hill impact area.

No other fauna or threatened flora were observed. It should be noted that the study area is subject to a moderate level of weed ingress. Previous ecological studies within the study area have identified individuals of Dural Land Snail *Pommerhelix duralensis* within the study area (ENsure 2018).

Castle Hill Water Recycling Plant WRP (Stage 1) and Rouse Hill WRP (Stage 2)

Stage 1 of the North West Treatment Hub Project occur on the Hawkesbury soils of the Penrith Soil Landscape (Bannerman & Hazelton 1990). In contrast, dominant geology present across stage 2 include Blacktown and Gymea soils of the Penrith Soil Landscape. The composition of the soil is highly influential on the vegetation communities observed. Descriptions of these soil types are shown below.

Hawkesbury

Hawkesbury Sandstone geology consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Rugged, rolling to very steep hills on Hawkesbury sandstone. Local relief varies from 40 to 200 metres. Slope gradients range from 25 % to 70 %. Narrow crests and ridges, narrow incised valleys, steep side slopes with rocky benches, broken scarps and boulders. Slopes are moderately inclined to precipitous. Valleys are narrow and incised.

Blacktown

Blacktown geology consisting of gently undulating rises on Wianamatta Group shales and Hawkesbury shale. Local relief to 30 metres with slopes up to 4 per cent. Broad rounded crests and ridges with gently inclined slopes. Shallow to moderately deep red and brown podzolic soils on crests, upper slopes and well-drained areas, and yellow podzolic soils and soloths on lower slopes and poor-drainage areas. This soil landscape is also characterized by its low fertility, poor soil drainage, and highly reactive plastic subsoil (Bannerman & Hazelton 1990).

Gymea

Gymea geology consists of undulating to rolling rises and low hills on Hawkesbury sandstone. Local relief of 20 to 80 metres with slopes of 10 to 25 per cent. Broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps.

The study area is directly linked to riparian vegetation, providing a good level of connectivity to bushland across the broader landscape and facilitating the movement of fauna throughout the local area. Additionally, there are small, remnant patches of native vegetation throughout the study area which also provide some connectivity to bushland, facilitating the movement of fauna throughout the landscape.

Vegetation communities

Prior to the field investigation, Biosis confirmed that various native vegetation communities including 29 TECs have been mapped in the broader landscape of both the Castle Hill and Rouse Hill locations of the study area (Tozer 2003, EES 2021), these include:

- *Sydney Turpentine-Ironbark Forest* (Critically Endangered Ecological Community (CEEC), EPBC Act and Endangered, BC Act).
- *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CEEC, EPBC Act and BC Act).
- *Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion* (Endangered Ecological Community (EEC) EPBC Act and Vulnerable Ecological Community (VEC), BC Act).
- *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC, EPBC Act and BC Act).
- *Blue Gum High Forest* (CEEC, EPBC Act and EEC, BC Act).
- *Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion* (CEEC, EPBC Act and BC Act).
- Urban Native and Exotic.

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

The vegetation of the study area located at Castle Hill comprises of four communities, including:

- PCT 835 – *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion* forming a component of TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act).
- PCT 1395 – *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion* forming a component of TEC Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC, EPBC Act and BC Act).
- Urban Native/Exotic.

The vegetation of the study area located at Rouse Hill comprises of four communities, including:

- PCT 835 – *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion* forming a component of TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act).
- PCT 1395 – *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion* forming a component of TEC Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC, EPBC Act and BC Act).
- Urban Native/Exotic.

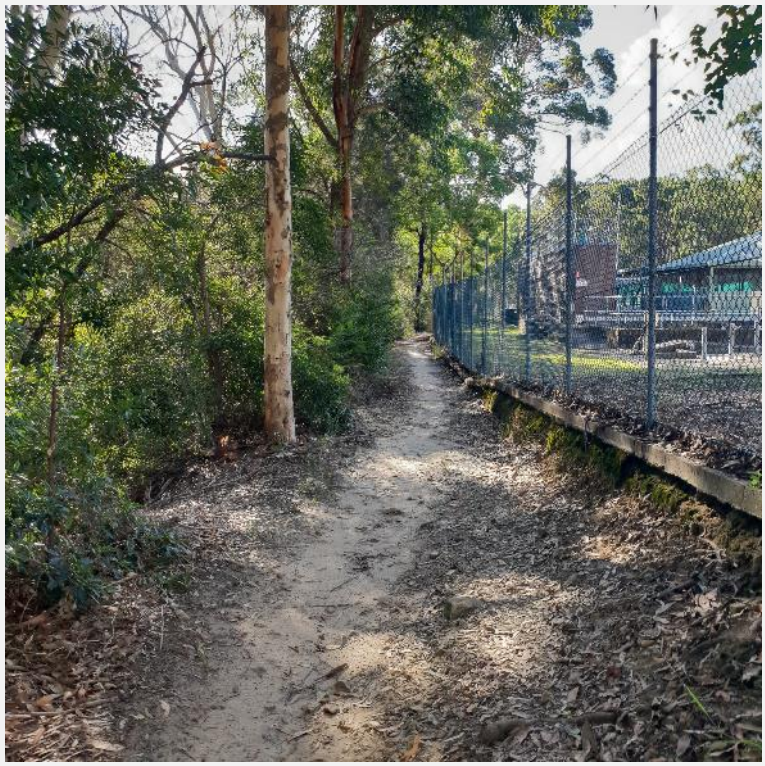
The structure, floristic composition and condition of these communities are described in Table 1 and associated photos are provided in Appendix 2.

Table 1 Vegetation communities in the study area

Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats	
PCT	*835 – Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.*
Extent within study area	Approximately 0.97 ha of PCT 835 was recorded located over alluvial soils within the north west corner of Rouse Hill WRP.
Condition	The community is generally in moderate condition with reduce species diversity and increase weed ingress due to disturbance from the construction of the plant.
Vegetation unit description in the study area	PCT 835 occurred in areas that were lower lying and subjected to periodic wetting along the corridor of Seconds Pond Creek which included vegetation along the north-western boundary of the study area. The community contained canopy species including Forest Red Gum *Eucalyptus tereticornis*, Grey Box *Eucalyptus moluccana* and Cabbage Gum *Eucalyptus amplifolia*. Under storey species included Native Blackthorn *Bursaria spinosa*, Black She-oak *Allocasuarina littoralis,* Hickory Wattle *Acacia imperata*, and Parramatta Wattle *Acacia parramattensis.* A high incidence of weed ingress was observed in the groundcover and therefore presented as primarily depauperate of native species and included Weeping Meadow Grass *Microlaena stipoides*, Couch *Cynodon dactylon* and New Zealand Spinach *Tetragonia tetragonoides.* In areas of disturbance the area was dominated by regenerating Black She-oak and weed species including African Olive *Olea europaea* subsp. *cuspidata,* African Boxthorn *Lycium ferocissimum*, Paspalum *Paspalum dilatatum* and Morning Glory *Ipomoea indica.*
Threatened ecological community	This PCT forms a component of TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. Commonwealth EPBC Act: *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (CEEC). The community would form a contiguous patch of vegetation that occurs along Seconds Ponds Creek that form part of the same vegetation unit and therefore, satisfies listing for Good Condition as the patch is > 2 ha, has a > 50 % perennial native understorey, > 6 native species per sample trees and at least 10 large trees per ha. NSW BC Act: Critically Endangered Ecological Community. NSW BC Act: Justification: PCT 835 satisfies listing under the BC Act for River-flat Eucalypt Community due to species assemblage, location within a riverflat landscape location in the Sydney Basin Bioregion and overlying associated soils (clay soils).
Picture: *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats* ***Note that the image was taken slightly north of the study area boundary.***	

1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	
PCT	*1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*
Extent within study area	Approximately 1.11 ha of PCT 1395 was recorded within the southern corner of the Rouse Hill WRP.
Condition	The community is generally in poor condition within the study area due to low species diversity and high weed ingress from previous disturbance.
Vegetation unit description in the study area	This vegetation community within the study area is dominated by Grey Gum *Eucalyptus punctata* and scattered Broad-leaved Ironbark *Eucalyptus fibrosa*. The understorey is variable across the site with an overall lack of native species due to previous disturbances with species limited to Parramatta Wattle, Fringed Wattle *Acacia fimbriata,* Hickory Wattle, Native Blackthorn, Kangaroo Grass *Themeda triandra* with scattered Black She-oak. The understorey cover of dense Weeping Meadow Grass and Kidney Weed *Dichondra repens.* Primarily the understorey contained dense weed infestations including Cobbler's Peg *Bidens pilosa,* Paddy's Lucerne *Sida rhombifolia,* Paspalum, Green Cestrum *Cestrum parqui,* Fireweed *Senecio madagascariensis*, Asparagus Fern *Asparagus aethiopicus*, and Bridal Creeper *Asparagus asparagoides*.
Threatened ecological community	This PCT forms a component of TEC Shale Sandstone Transition Forest. Commonwealth EPBC Act: This patch of vegetation forms part of a larger patch that continues outside of the study area. Therefore this community forms part of a moderate condition class EPBC Act listed community as the patch size is > 0.5 ha, contains >30% native understorey and contains at least one hollow-bearing tree. NSW BC Act: Endangered. PCT 1395 satisfies listing requirement for Shale Sandstone Transition Forest under the BC Act due to species assemblage, located over transitional soil between the Blacktown and Gymea landscapes, occurrence of two canopy species (Grey Gum and Broad-leaved Ironbark) and location in the Sydney Basin Bioregion.
Picture: *Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland*	

Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux	
PCT	*1083 – Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion.*
Extent within study area	Approximately 0.18 ha of PCT 1083 was recorded as scattered species throughout Castle Hill WRP.
Condition	The community is generally in low condition and presenting as scattered tree species within the WRP boundaries.
Vegetation unit description in the study area	This community with the study area was characterised by scattered Narrow-leaved Stringybark *Eucalyptus sparsifolia* over maintained grassed area. This vegetation unit was confirmed due to surrounding connected vegetation type and was not subject to detailed assessment as part of this study.
Threatened ecological community	This PCT does not form part of a TEC.
Picture: *Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux*	

Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies	
PCT	*1181 – Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion.*
Extent within study area	Approximately 0.14 ha of PCT 1181 was recorded located along the north eastern boundary of the study area within Castle Hill WRP.
Condition	This community presented as a low quality edge effected community within the study area.
Vegetation unit description in the study area	This community presented similar to PCT 1255 with occurrences of Sydney Peppermint *Eucalyptus piperita* however, contained higher percentage of Sydney Red Gum *Angophora costata.* This community contained a heavily disturbed understory with native species limited to Sweet Pittosporum, Parramatta Wattle and *Kunzea ambigua.* The community contained a dense layer of Broad-leaved Privet *Ligustrum lucidum* and Small-leaved Privet *Ligustrum sinense.* Evidence of previous bush regeneration efforts were seen just outside the study area within the riparian corridor.
Threatened ecological community	This PCT does not form part of a TEC.
Picture: *Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies*	

Sydney sandstone hinterland dry sclerophyll forests	
PCT	*1255 – Sydney sandstone hinterland dry sclerophyll forests of the Sydney Basin Bioregion.*
Extent within study area	Approximately 0.25 ha of PCT 1255 was recorded along the south western and southern boundaries of Castle Hill WRP.
Condition	The community is generally in poor condition with high weed ingress and low species diversity.
Vegetation unit description in the study area	This community with the study area was characterised by a disturbed community that was subject to a high level of weed ingress located on the very edges of the study area surrounding Castle Hill WRP. Within the study area, canopy species were limited to Sydney Peppermint and Narrow-leaved Apple *Angophora bakeri*. The community was distinguished from PCT 1181 by lower occurrence of Sydney Red Gum and lower presentation of mesic species. On the southern portion of the site this community occurred as slightly better condition containing a dense mid-storey of Parramatta Wattle and Sweet Pittosporum, with an understorey containing Weeping Meadow Grass, Whiteroot *Lobelia purpurascens* and Bordered Panic *Entolasia stricta.*
Threatened ecological community	This PCT does not form part of TEC.
Picture: *Sydney sandstone hinterland dry sclerophyll forests*	

Urban native/Exotic	
PCT	Urban Native/Exotic
Extent within study area	Approximately 5.84 ha of Urban Native/Exotic was recorded. located across the majority of both sites, with 1.11 ha at Castle Hill WRP and 4.73 ha at Rouse Hill WRP. Approximately 2.25 ha is to be impacted, including 0.78 ha at Castle Hill WRP and 1.47 ha at Rouse Hill WRP. These amounts included treed and grasses areas.
Vegetation unit description in the study area	This community with the study area was characterised by a range of planted species across the two sites. Commonly planted species included Lemon Scented Gum *Corymbia citriodora,* Spotted Gum *Corymbia maculata* and Citrus Bottlebrush *Callistemon citrinus.* This unit also included areas devoid of upper stratum species and was limited to maintained grassed areas.
Picture: *Urban native/Exotic* within Castle Hill WRP	

Threatened species

Background searches identified 30 threatened flora species and 61 threatened fauna species recorded (EES 2021) or predicted to occur (Commonwealth of Australia 2021) within 5 kilometres of the study area. Those species considered most likely to have habitat within the study area based on the background research are as follows.

Flora

- Downy Wattle *Acacia pubescens* (Vulnerable, EPBC Act and BC Act).
- *Darwinia biflora* (Vulnerable, EPBC Act and BC Act).
- *Dillwynia tenuifolia* (Vulnerable, BC Act).
- *Epacris purpurascens* var. *purpurascens* (Vulnerable, BC Act).
- *Eucalyptus* sp. Cattai (Critically Endangered, EPBC Act and BC Act).
- *Hibbertia superans* (Endangered, BC Act).

- *Pultenaea parviflora* (Vulnerable, EPBC Act, Endangered, BC Act).
- *Tetratheca glandulosa* (Vulnerable, BC Act).

Fauna

- Dusky Woodswallow *Artamus cyanopterus cyanopterus* (Vulnerable, BC Act).
- Glossy Black-cockatoo *Calyptorhynchus lathami* (Vulnerable, BC Act).
- Varied Sittella *Daphoenositta chrysoptera* (Vulnerable, BC Act).
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* (Vulnerable, BC Act)
- Little Lorikeet *Glossopsitta pusilla* (Vulnerable, BC Act).
- Swift Parrot *Lathamus discolor* (Critically Endangered, EPBC Act, Endangered, BC Act).
- Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (Vulnerable, BC Act).
- Little Bent-winged Bat *Miniopterus australis* (Vulnerable, BC Act).
- Large Bent-winged Bat *Miniopterus orianae oceanensis* (Vulnerable, BC Act).
- Southern Myotis *Myotis macropus* (Vulnerable, BC Act).
- Powerful Owl *Ninox strenua* (Vulnerable, BC Act).
- Flame Robin *Petroica phoenicea* (Vulnerable, BC Act).
- Greater Broad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act).
- Dural Land Snail *Pommerhelix duralensis* (Endangered, EPBC Act and BC Act).

No threatened flora species were recorded within the study area during field investigations, or considered to occur due to the urban nature and disturbance evident within the study area. Based on the size of the study area and due to historic disturbances, the survey effort is considered comprehensive to assess the presence of the flora species within the study area. Taking all of these factors into consideration, there is a low likelihood of occurrence of the above listed threatened flora.

An assessment of the habitat values of the study area is provided in Table 2 for threatened fauna species.

Table 2 Assessment of habitat for threatened fauna species

Habitat feature	Threatened fauna association	Likelihood of occurrence or impact
Feed trees	Angophoras, Eucalypts and other flowering perennial species recorded in the study area may provide nectar resources suitable for nectivorous bird species, such as Little Lorikeet and Swift Parrot, whilst in flower. The Swamp Oak trees within the study area provide foraging resources for the Glossy Black-cockatoo and other cockatoo species.	Based on the transient nature of these species and surrounding resources and connectivity within the landscape there is not likely to be an impact to Little Lorikeet, Swift Parrot or Glossy Black-cockatoo species. There is no breeding habitat within the study area that is suitable for Glossy Black-cockatoo, as the study area contains only small to medium (5-15 cm) hollows. The study area is not located within the Swift Parrot Important Areas map (DPIE 2021a).
Vegetated areas	Large trees may provide habitat for a range of woodland bird species such as Dusky Woodswallow, Varied Sittella, and Flame Robin. The grassy understory, woody debris, and fallen timber recorded in the study area may provide habitat for Dural Land Snail.	Based on the presence of habitat features for these species, there is a moderate likelihood of presence and therefore impacts to this species are considered herein. Dural Land Snail was detected during a previous field investigation within the Rouse Hill study area and good quality habitat was located within the study area (Appendix 1; Figure 1.1 and Figure 1.2) (ENsure 2018). Impacts to this species are considered herein.
Hollow-bearing trees	Three potential hollow-bearing trees were recorded in the Rouse Hill study area and two at Castle Hill study area (Appendix 1; Figure 1.1 and Figure 1.2) containing small to medium sized hollows with dimensions of approximately 15 cm. These tree hollows may provide potential roosting and/or nesting habitat for microbats including the threatened Southern Myotis and Greater Broad-nosed Bat but is unlikely to provide roosting habitat for Powerful Owl due to the small dimensions of the hollows.	It is recommended that if possible, the hollow-bearing trees be retained as an important habitat feature in the landscape that may be used by threatened microbats, as well as providing feeding and perching habitat for other avifauna.
Rocky outcrops	There are no rocky outcrops within the study area.	No impact to threatened fauna.
Waterways (creek, river or dam)	Cattai Creek is present to the west, with Castle Hill Creek tributary running to the south of the Castle Hill study area. Second Ponds Creek is present to the north of the Rouse Hill study area. There are no waterways within the study area.	No direct or indirect impacts to threatened fauna.
Caves and shelters	There are no caves or shelters within the study area or within proximity to the study area.	No impact to threatened fauna.

Habitat feature	Threatened fauna association	Likelihood of occurrence or impact
Man-made structures	There is existing infrastructure on the site that is currently in use, but there is a low likelihood that any would be used as habitat for threatened fauna.	No impact to threatened fauna.

Based on the size of the study area, the survey effort is considered comprehensive to assess habitat presence for the species outlined in Table 2. Taking all of these factors into consideration, there is a low likelihood of impact for the above listed nomadic species.

Priority weeds

Six priority weeds for Greater Sydney LLS region, which includes The Hills LGA, that have been recorded in the study area are listed in Table 3, along with their associated Duty (where relevant to the project). Where a relevant biosecurity duty has not been identified than All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Table 3 Priority weeds within the study area

Scientific name	Common name	General biosecurity duty
Alternanthera philoxeroides	Alligator Weed	***Regional Recommended Measure*** *Land managers should prevent spread from their land.*
Asparagus aethiopicus	Asparagus Fern	No relevant measures with regard to the project.
Asparagus asparagoides	Bridal Creeper	No relevant measures with regard to the project.
Cestrum parqui	Green Cestrum	***Regional Recommended Measure*** *Land managers should mitigate spread from their land.*
Lantana camara	Lantana	No relevant measures with regard to the project.
Olea europaea* subsp. *cuspidata	African Olive	***Regional Recommended Measure*** *Core infestation area: Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets.*

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

Impact assessment

This section identifies the potential impacts of the proposed works on the ecological values of the study area and includes recommendations to assist Sydney Water to design the development to minimise impacts on ecological values.

The ecological values impacted by the proposal are described in Table 4, which includes data requirements to Sydney Water to calculate any required non-statutory offsets.

Table 4 Ecological values, impacts and recommendations

Ecological value	Impacts		Recommendations
	Castle Hill WRP	Rouse Hill WRP	
Threatened ecological communities	• No TECs are to be impacted.	• Removal of 0.54 ha of native vegetation, consisting of two TECs: – 0.07 ha of PCT 835 – *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion* forming a component of TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act). – 0.47 ha of PCT 1395 – *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion* forming a component of TEC Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC, EPBC Act and BC Act).	• Further risk of impacts to the TECs and individual native trees can be managed by implementing appropriate safeguards in further planning and carrying out the construction works including: – Avoid clearing of individual native trees if feasible. • Offsetting to follow *Sydney Water Biodiversity Offset Guidelines*: – Up to 0.54 ha of TECs may be removed.
Threatened flora/fauna habitat	• Removal of 0.33 ha of threatened flora/fauna habitat however, address above as TEC.	• Removal of 0.54 ha of threatened flora/fauna habitat, including 0.47 ha of confirmed Dural Land Snail habitat however, address above as TEC including: • 0.01 ha PCT 1083 • 0.08 ha PCT1181 • 0.26 of PCT 1255	• Pre-clearance inspections for Dural Land Snail, including relocation to adjacent retained habitats if individuals are observed during works. • Pre-clearance assessment for *Epacris purpurascens* subsp. *purpurascens* along discharge main trench.
Riparian vegetation	• Riparian vegetation to be impacted however, address above as threatened flora/fauna habitat.	• Riparian vegetation to be impacted however, addressed above as TEC.	• Ensure retained vegetation is protected by exclusion fencing and proper erosion and sedimentation controls.

Ecological value	Impacts		Recommendations
	Castle Hill WRP	Rouse Hill WRP	
Non-threatened native vegetation	• Removal of non-threatened native vegetation proposed, however is address above as threatened flora/fauna habitat.	• Removal of non-threatened native vegetation proposed, however is address above as threatened flora/fauna habitat.	• Wherever possible retain vegetation within the study area to maintain fauna habitats.
Number of locally indigenous native trees and tree hollows to be removed that are not part of a vegetation community	• None.	• Three locally indigenous trees to be removed.	• Offsetting to follow *Sydney Water Biodiversity Offset Guidelines*.
Number of non-locally indigenous native or exotic trees and tree hollows to be removed	• 23 non-locally indigenous trees/shrubs to be removed.	• Three non-locally indigenous trees/shrubs to be removed.	• Offsetting to follow *Sydney Water Biodiversity Offset Guidelines*.

The study areas are likely to form habitat for locally abundant non-threatened fauna species including birds, reptiles, mammals and aquatic species. The majority of these species are highly mobile and are unlikely to be impacted by the proposed works. Standard safeguards should be implemented on site to reduce potential impact to non-threatened fauna.

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (NES) protected under the Act. Under the EPBC Act, activities that have potential to result in significant impacts on Matters of NES must be referred to the Commonwealth Minister for Environment and Energy for assessment.

Two TEC and one threatened species listed under the EPBC Act were recorded or assessed to have a medium or greater potential to occur within the study area. Assessments against the Significant Impact Criteria (CoA 2013) have been prepared for threatened entities that are deemed likely to be subject to negative impacts (Appendix 3). The assessments concluded that a significant impact was not likely to result from the project, as the upgrades will remove a small area of potential habitat, from an area containing large tracts of more suitable habitat.

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

Biodiversity Conservation Act 2016

Two TECs and 12 threatened species (including three woodland birds and five microbats listed under the BC Act have a medium or greater likelihood of occurring within the study area. Tests of Significance (ToS) have been prepared for threatened entities that are deemed likely to be subject to negative impacts (Appendix 4) and concluded that a significant impact was not likely to result from the project as the upgrades will remove a small area of potential habitat, from an area containing large tracts of more suitable habitat, nor is the habitat to be removed considered important to the survival of the species.

Tests of Significance indicate that a significant effect is not likely to result from the proposal. A Species Impact Statement is therefore not required.

Water Management Act 2000

As a public authority, Sydney Water does not need to obtain a controlled activity approval from the Natural Resources Access Regulator (NRAR) for any controlled activities that it carries out in, on or under waterfront land.

Local Environmental Plans

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

Elements of the LEP objectives are not relevant to this assessment, as the works relate to *Division 18 Sewerage Systems* under the *State Environmental Planning Policy (Infrastructure) 2007*, and under clause 106 are considered as 'development permitted without consent' and 'exempt development', respectively. Elements of the LEP objectives are not discussed further.

Recommendations

Given there are requirements for removal of all native vegetation including canopy trees for the project from the impact area, the focus of the recommendations is to minimise disturbance to any surrounding native vegetation and fauna habitat. These recommendations are:

- To the fullest extent practicable, minimise disturbance to any native vegetation surrounding the study area.
- Where possible, any trees to be retained should be protected in accordance with Australian Standard AS4970 – 2009 Protection of trees on development sites, during construction, operation and decommissioning of the site compound.
- In the unlikely event that unexpected threatened species are identified during the project, works should cease and an ecologist contacted.
- Soil transportation should be minimised within, into or out of the study area to reduce the spread of weeds.
- Six priority weeds within The Hills Shire LGA were identified within the study area (Table 3). Appropriate measures should be implemented to minimise the spread of these species.

- Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values.
- Dural Land Snail is to be conserved through pre-clearance inspections, and relocation of individuals from the impact area. Searches should be undertaken during ideal conditions for detecting the species, which include, early evening during rain.
- Conduct a pre-clearance assessment for threatened species between the treatment plant and discharge point, to be conducted prior to trenching.
- Hollow-bearing trees are to be removed in a two-stage process:
  - Stage 1: All surrounding vegetation to be cleared and grubbed.
  - Stage 2: 24 to 48 hours later (or in accordance with approval documentation) the hollow-bearing trees are to be inspected by an ecologist. If resident fauna is observed, the hollow section is to be lowered to the ground and the animal allowed to move on of its own volition. If injured, the fauna to be taken to a WIRES carer or appropriate veterinarian for care.
- 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 engage a licenced ecologist to inspect and relocate fauna before works.

I trust that this advice is of assistance to you however please contact me if you would like to discuss any elements of this ecological advice further.

Yours sincerely

Averill Wilson

Project Botanist

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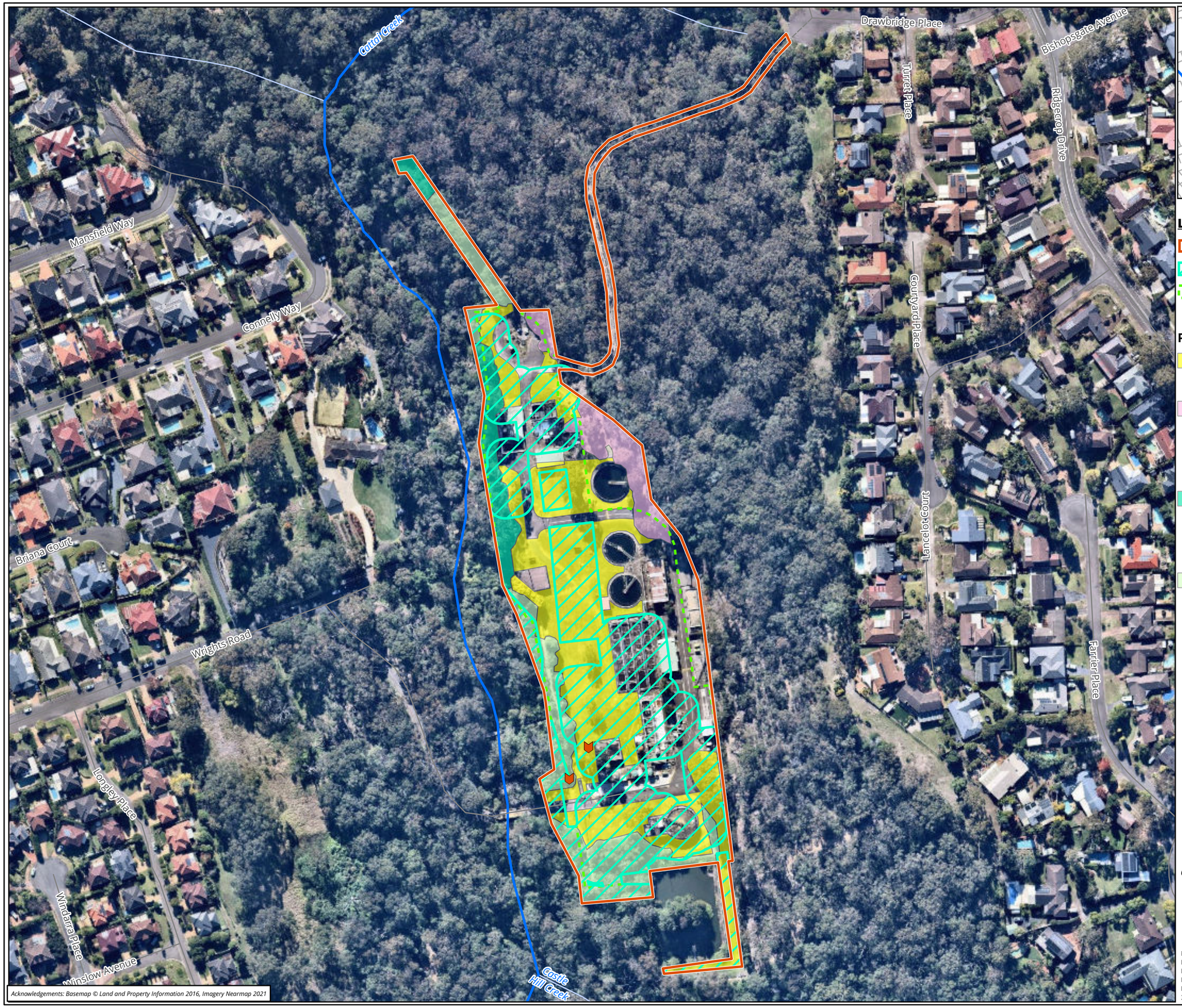
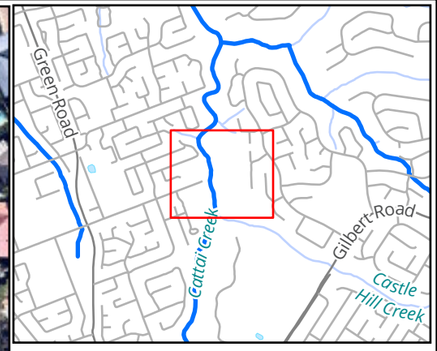
Appendices

Appendix 1 Figure 1





Legend

- Study area
- Impact area
- Development footprint
- Hollow-bearing tree

Plant Community Type

- Urban Native / Exotic
- PCT 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion
- PCT 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- PCT 1255 - Sydney sandstone hinterland dry sclerophyll forests of the Sydney Basin Bioregion

Figure 1.1 Ecological features of the study area, Castle Hill

0 10 20 30 40 50

Metres

Scale: 1:2,000 @ A3

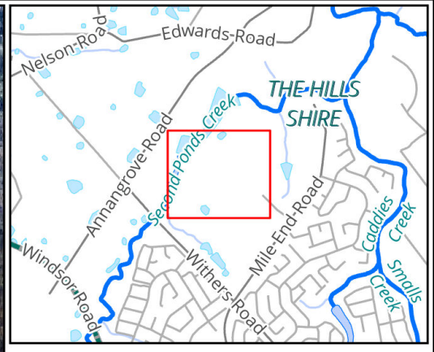
Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 06 August 2021 ,
Prepared for: AIHW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F1_EcoFeatures_CH
Project: P:\34900s\34968\Mapping\
34968_NWHub.aprx

Acknowledgements: Basemap © Land and Property Information 2016, Imagery Nearmap 2021



Legend

- Study area
- Impact area
- Hollow-bearing tree

Plant Community Types

- Urban Native / Exotic
- PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- PCT 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Bioregion

Acknowledgements: Basemap © Land and Property Information 2016, Imagery Nearmap 2021

Figure 1.2 Ecological features of the study area, Rouse Hill

0 10 20 30 40 50

Metres

Scale: 1:2,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 16 July 2021 ,
Prepared for: AIHW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F1_EcoFeatures_RH
Project: P:\34900s\34968\Mapping\
34968_NWHub.aprx

Appendix 2 Photos

Photo 1 **Loose bark and leaf litter provides habitat for Dural Land Snail**

Photo 2 **Habitat in the form of concrete slabs within the study area**

Figure 2 Epacris purpurascens subsp. purpurascen (Vulnerable, BC Act). Source: LucidApps

Appendix 3 Significant Impact Criteria assessment

The following section provides for Significant Impact Criteria assessments as outlined in the *Matters of National Environmental Significance: Significant impact guidelines 1.1* (CoA 2013) for all entities listed under the EPBC Act that have likelihood of impact or occurrence rated as medium or greater.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

Shale Sandstone Transition forest occurs as a forest or woodland community dominated by Eucalyptus species with a native species composition which is determined by the transitional geology between Wianamatta and Hawkesbury Sandstone (NSW Scientific Committee 2019).

Shale Sandstone Transition Forest in the Sydney Basin Bioregion is listed as Critically Endangered under the EPBC Act. As such an assessment against the Significant Impact Criteria has been undertaken below.

Reduce the extent of an ecological community

Shale Sandstone Transition Forest occurs on the edge of the Cumberland Plain where underlying sandstone soils influence the community which ranges from Kurrajong to Cattai in the north, Strathfield down to Campbelltown in the east, Bargo in the south, and Oakdale to Emu Plains on the west, comprising an area of approximately 2,200 km2. The community can also occur on sandstone dominated Hornsby, Woronora and Lower Blue Mountains plateaux that adjoin the Cumberland Plain.

The examples in the study area and within the locality of the study area have undergone extensive clearing and modification for development. The removal of up to 0.47 hectares of Shale Sandstone Transition which has been previously heavily disturbed from construction and operation of the Rouse Hill WRP is unlikely to significantly reduce the southern extent of this community.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

Importantly, the proposal will not result in the fragmentation of large patches of high-quality Shale Sandstone Transition Forest TEC. There is unlikely to be declines in population density or species richness within vegetation patches because of the proposal. There is also unlikely to be a significant alteration to community composition, species interactions or ecosystem functioning in the locality due to the proposal.

Under the EPBC Act, a patch is defined as a discrete and continuous area of the TEC. However, a patch may include small-scale disturbances, such as tracks or breaks or small-scale variations in vegetation that do not significantly alter its overall functionality (for instance the movement of wildlife or dispersal of plant propagules). The proposal will result in some minor fragmentation of the community, however it is unlikely to be considered significant such that it would impact the functionality of the community.

Adversely affect habitat critical to the survival of an ecological community

The Matters of National Environmental Significance Significant impact guideline (Commonwealth of Australia 2013) state the 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators),
- To maintain genetic diversity and long term evolutionary development, or
- For the reintroduction of populations or recovery of the species or ecological community.

No such habitat has been identified in a recovery plan for River-flat Eucalypt Forest, nor is it listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

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

The project is not expected to result in substantial alteration to surface water patterns. Although an overall increase in hardstand area is likely to result from the proposed works. The current levels of hardstand associated with the Rouse Hill WRP mean it is unlikely to present a significant change to current patterns.

Alterations to hydrological patterns may also occur, but the area of the TEC impacted in this is not expected to be substantial due overall distance from waterways.

As such, the project is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the TEC.

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

The project will not result in specific impacts to characteristic and functionally important species, as neither the construction or operational impacts will result in alterations to fire or flood regimes that maintain (or would potentially impact upon) the diversity of the TEC in the impact area, or broader landscape. The project will not alter management regimes of any retained vegetation, such as increased under-scrubbing or grazing, and there is no likelihood of the project resulting in an increase in harvesting of flora species.

The composition of Shale Sandstone Transitional in the Sydney Basin Bioregion may be modified because of the proposal through weed invasion and vegetation removal. However, the local occurrence of this ecological community is currently suffering from altered composition caused by a reduction in ecological function, as indicated by:

- Altered species composition.
- Altered structure.
- Disruption of ecological processes (i.e. altered drainage).
- Invasion and establishment of exotic species.

Adjoining retained vegetation may be indirectly impacted by increased weed species however, a strip of retained vegetation already impacted by significant weed species will be retained which will provide a buffer between disturbed areas a retained vegetation. The proposed works will also employ weed management to prevent further pressures from weed species on retained vegetation.

While modification of the ecological community will occur in and adjacent to the direct area of disturbance, the proposal is not considered likely to further modify the composition of the threatened ecological community such that its local occurrence is placed at risk of extinction. No flow on effects to other areas of the local occurrence will occur. The composition of the Shale Sandstone Transitional in the Sydney Basin Bioregion within the study area is predicted to remain intact after the implementation of the proposal.

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***

- ***Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community***

Weed introduction and spread and the infection of native plants by *Phytophthora cinnamomi* has been identified as being spread by construction machinery. Phytophthora infects the roots of plants and has the potential to cause dieback. Machinery associated with vegetation clearance and subsequent construction for the proposal has the potential to introduce and transmit weed propagules and Phytophthora to remaining native vegetation remnants of the species. This is a potential indirect impact to Shale Sandstone Transitional in the Sydney Basin Bioregion through the spread and transmission of weeds and pathogens into retained habitat.

This impact can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene and is unlikely to have a significant impact. It is the intention to use current best practice hygiene protocols as detailed in RMS (2011) to prevent the introduction or spread of weeds and pathogens. The proposal mitigation strategy and environmental management procedures would include guidance for preventing the introduction and/or spread of weeds and disease-causing agents such as bacteria and fungi.

No regular mobilisation of fertilisers, herbicides or other chemicals will occur because of the project.

Interfere with the recovery of an ecological community

The Shale Sandstone Transition Forest of the Sydney Basin Bioregion ecological community is covered by the Cumberland Plain Recovery Plan (DECCW 2011), a multi-entity recovery plan that has been prepared for 20 threatened species, populations and ecological communities that occur within the 'Cumberland Plain' region in western Sydney. The recovery plan has the following objectives:

- To build a protected area network, comprising public and private lands, focused on the priority conservation lands.
- To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation.
- To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program.
- To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.

The project will directly impact upon 0.47 hectare of the TEC.

Whilst the project will impact upon Shale Sandstone Transition Forest, impacts to the community are limited to a small area of vegetation within the operations boundary of the Rouse Hill WRP where canopy has been previously thinned for construction and operation of the plant. This level of residual impact will not reduce the ongoing capacity of the intact TEC retained within adjacent properties.

The project will not result in impacts likely to be adverse to any of the other objectives of the Cumberland Plain Conservation Plan, nor will it impact upon areas of high quality habitat which could support the TEC into the future, and as such it is not expected that the project will interfere with the recovery of an ecological community.

Conclusion

The proposal is predicted to result in the removal of approximately 0.47 hectares of the Shale Sandstone Transition Forest of the Sydney Basin Bioregion TEC. When the proportional impact is considered, the impact is small as the patch of the TEC is large and the vegetation proposed to be removed is currently highly altered and subject to regular pressures from within the operations of the Rouse Hill WRP. This impact is not considered important in terms of its intensity, magnitude and geographic extent.

The proposal will result in some small-scale disturbances but no large-scale alteration to overall functionality of vegetation will occur. Therefore, habitat fragmentation is considered a minor impact of the proposal regarding its context and intensity. Alteration of abiotic factors is not considered a major impact. The proposal is not considered likely to further modify the composition of the threatened ecological community such that its local occurrence is placed at risk of extinction. Weed introduction and spread and the infection of native plants by pathogens can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene.

All patches of EPBC Act listed Shale Sandstone Transition Forest of the Sydney Basin Bioregion ecological community area considered critical to the survival of this community and as the proposal includes vegetation removal it is interfering with the recovery of this ecological community.

The Department of the Environment indicates that a 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. While an area of the Shale Sandstone Transition Forest of the Sydney Basin Bioregion TEC will be impacted, the intensity, magnitude and geographic extent of the impacts are not likely to result in a significant impact.

After consideration of the factors above, an overall conclusion has been made that the proposal is unlikely to result in a significant impact to the Shale Sandstone Transition Forest TEC as the impact is not considered to be of significance having regard to its context and intensity.

River-flat Eucalypt Forest on Coastal Floodplains of Southern New South Wales and Eastern Victoria

River-flat Eucalypt forest occurs as a tall forest to woodland structured vegetation unit overlying alluvial soils associated with coastal river floodplains and other site where transient water accumulates (DAWE 2020). The community has been subjected to a significant reduction in extent and is continually threatened by ongoing process including vegetation clearing, weed invasion, livestock grazing and climate change (DAWE 2020, pp. 202)

River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is listed as Critically Endangered under the EPBC Act. As such an assessment against the Significant Impact Criteria has been undertaken below.

Reduce the extent of an ecological community

The community extends from Sale in Victoria to Raymond Terrace in NSW (DAWE 2020). The extent of the community has been reduced by over 70 % within this area and is at further threats due to location over productive areas of land (DAWE 2020).

The project will result in an overall reduction of less than 0.001 % of River-flat Eucalypt Forest that is likely to be directly and indirectly impacted by the current proposal, and a relatively localised impact of the TECs extent of occurrence. This has been assessed as unlikely to be a significant reduction of the extent of River-flat Eucalypt Forest.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

The proposed works will require the removal of 0.07 hectares of River-flat Eucalypt Forest.

This direct impact is likely to lead to minor increases in localised fragmentation impacts, particularly to the patches of retained vegetation immediately adjacent to the impact area. These impacts are not considered substantial and will not result is further decreases in connectivity of canopy vegetation. The increased fragmentation will not substantially reduce connectivity as the impacts occur within / adjacent to already fragmented patches of the TEC. Edge effects may increase as a result of the project, but these are again not expected to be substantial.

As the fragmentation impacts expected to occur as a result of the proposed works are localised and relatively minor in nature, they are not expected to increase impacts to Rive-flat Eucalypt Forest such that a significant impact to the TEC is likely to occur.

Adversely affect habitat critical to the survival of an ecological community

The Matters of National Environmental Significance Significant impact guideline (Commonwealth of Australia 2013) state the 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators),
- To maintain genetic diversity and long term evolutionary development, or
- For the reintroduction of populations or recovery of the species or ecological community.

No such habitat has been identified in a recovery plan for River-flat Eucalypt Forest, nor is it listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

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.

The project is not expected to result in substantial alteration to surface water patterns. Alterations to hydrological patterns may also occur, but the area of the TEC impacted in this is not expected to be substantial due to its occurrence further back from the riverbank and on higher parts of the floodplain.

Mitigation measures would ensure that downstream indirect impacts (such as sediment and nutrient transportation) would be controlled and would not impact remaining areas of River-flat Eucalypt Forest

As such, the project is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the TEC.

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

The project will not result in specific impacts to characteristic and functionally important species, as neither the construction or operational impacts will result in alterations to fire or flood regimes that maintain (or would potentially impact upon) the diversity of the TEC in the impact area, or broader landscape. The project will not alter management regimes of any retained vegetation, such as increased under-scrubbing or grazing, and there is no likelihood of the project rustling in an increase in harvesting of flora species.

The composition of River-flat Eucalypt may be modified because of the proposal through weed invasion and vegetation removal. However, the local occurrence of this ecological community is currently suffering from altered composition caused by a reduction in ecological function, as indicated by:

- Altered species composition.
- Altered structure.
- Disruption of ecological processes (i.e. altered drainage).
- Invasion and establishment of exotic species.

As the proposed works will removed 0.07 hectares of vegetation within a large (greater than 20 hectare) patch, it is unlikely that this impact will further exacerbate these pressures.

While modification of the ecological community will occur in and adjacent to the direct area of disturbance, the proposal is not considered likely to further modify the composition of the threatened ecological community such that its local occurrence is placed at risk of extinction. No flow on effects to other areas of the local occurrence will occur. The composition of the River-flat Eucalypt Forest within the study area is predicted to remain intact after the implementation of the proposal.

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
- Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community

Weed introduction and spread and the Infection of native plants by *Phytophthora cinnamomi* has been identified as being spread by construction machinery. Phytophthora infects the roots of plants and has the potential to cause dieback. Machinery associated with vegetation clearance and subsequent construction for the proposal has the potential to introduce and transmit weed propagules and Phytophthora to remaining native vegetation remnants of the species. This is a potential indirect impact to River-flat Eucalypt Forest through the spread and transmission of weeds and pathogens into retained habitat.

This impact can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene and is unlikely to have a significant impact. It is the intention to use current best practice hygiene protocols as detailed in RMS (2011) to prevent the introduction or spread of weeds and pathogens. The proposal mitigation strategy and environmental management procedures would include guidance for preventing the introduction and/or spread of weeds and disease-causing agents such as bacteria and fungi.

No regular mobilisation of fertilisers, herbicides or other chemicals will occur because of the project.

Interfere with the recovery of an ecological community

There is no Commonwealth adopted Recovery Plan for River-flat Eucalypt Forest. However, the TEC is included in the Cumberland Plain Recovery Plan (DECCW 2011), a multi-entity recovery plan that has been prepared for 20 threatened species, populations and ecological communities that occur within the 'Cumberland Plain' region in western Sydney. The recovery plan has the following objectives:

- To build a protected area network, comprising public and private lands, focused on the priority conservation lands.

- To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation.
- To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program.
- To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner

The project will directly impact upon 0.07 hectares of the TEC.

Whilst the project will impact upon River-flat Eucalypt Forest in low condition, impacts to the community are limited to a small area of vegetation within the operations boundary of the Rouse Hill WRP where canopy has been previously thinned for construction and operation of the plant. This level of residual impact will not reduce the ongoing capacity of the intact TEC retained within adjacent properties.

The project will not result in impacts likely to be adverse to any of the other objectives of the Cumberland Plain Conservation Plan, nor will it impact upon areas of high quality habitat which could support the TEC into the future, and as such it is not expected that the project will interfere with the recovery of an ecological community.

Conclusion

The proposal is predicted to result in the removal of approximately 0.07 hectares of the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria. When the proportional impact is considered, the small impact occurs within a larger patch of the TEC is large and a minimal amount of vegetation will be removed. This impact is not considered important in terms of its intensity, magnitude and geographic extent.

The proposal will result in some small-scale disturbances but no large-scale alteration to overall functionality of vegetation will occur. Therefore, habitat fragmentation is considered a minor impact of the proposal regarding its context and intensity. Alteration of abiotic factors is not considered a major impact. The proposal is not considered likely to further modify the composition of the threatened ecological community such that its local occurrence is placed at risk of extinction. Weed introduction and spread and the infection of native plants by pathogens can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene.

The Department of the Environment (2013) indicates that a 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (Department of the Environment, 2013). While an area of the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria will be impacted, the intensity, magnitude and geographic extent of the impacts are insignificant.

After consideration of the factors above, an overall conclusion has been made that the proposal is unlikely to result in a significant impact to the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria as the impact is not considered to be of significance having regard to its context and intensity.

Dural Land Snail

Dural Land Snail or Dural Woodland Snail is a land snail endemic to NSW is listed as Endangered under the EPBC Act. As such an assessment against the Significant Impact Criteria (endangered species) has been undertaken below.

Lead to the long-term decrease in the size of a population

The proposed works include the removal of 0.47 hectares of associated native vegetation from the study area, associated with Dural Land Snail (TSSC 2014). Vegetation is being removed to facilitate the WRP upgrade.

Based upon existing information for the species, the maximum total number of snails that would be supported by the area of impact is <1 individual (based upon three snails per hectare and an impact area of 0.47 hectares) (Ridgeway et al. 2014). The impacted vegetation is part of a larger patch of shale-influenced vegetation (OEH 2011), capable of supporting Dural Land Snail, which covers an area of approximately 6.54 hectares. Given the availability of connected resources and the small area of impact, the proposed works are unlikely to lead to the long term decrease in the size of a population.

Reduce the area of occupancy of the species

The vegetation being removed represents potential habitat for Dural Land Snail. As such its removal will reduce the area of available habitat for the species. The impacts are to a small area of vegetation which, given the low abundance typically displayed by the species (Ridgeway et al. 2014, Clark 2009) is expected to result in impacts to a very limited number of individuals (<1 snail, based upon a maximum recorded density of three snails per hectare and an impact area of 0.47 hectares). Therefore the reduction in area of occupancy is not likely to be significant.

Fragment an existing population into two or more populations

The proposed works include the removal of 0.47 hectares of associated native vegetation, which represents potential Dural Land Snail habitat. Clearing is to occur surrounding the WRP as part of the upgrade.

The vegetation to be removed is located within a larger, approximately 6.54 hectares, patch of shale-influenced native vegetation (OEH 2011). A total of 0.47 hectares of associated vegetation clearance is not expected to significantly fragment this patch of vegetation.

Given the impacts are unlikely to result in fragmentation of the larger vegetation patch, the proposed works are unlikely to fragment an existing population of Dural Land Snail into two or more populations.

Adversely affect habitat critical to the survival of a species

Dural Land Snail exhibits a strong preference for shale-influenced transitional landscapes and ecological communities, including the PCTs located within the study area (Ridgeway et al. 2014, NSW Scientific Committee 2015, TSSC 2014). Shale-influenced habitats within the geographic range of the species (i.e. the northwest fringes of the Cumberland Plain) are therefore considered to be of importance to the survival of the species.

However, based on the available information for maximum snail densities, the area of impact is capable of supporting <1 snail, based upon three snails per hectare and an impact area of 0.47 hectares (Ridgeway et al. 2014). Given the connection to the rest of the approximately 6.54 hectares patch of shale-influenced vegetation will not be significantly reduced, it is unlikely that the proposed works will significantly affect habitat critical to the survival of the species.

Disrupt the breeding cycle of a population

The mating behaviour of Dural Land Snail is poorly documented with studies on the species failing to observe mating behaviours despite hundreds of hours in the field (Ridgeway et al. 2014). Similarly there is no literature available on the longevity of the species (Ridgeway et al. 2014). However it is likely that the Dural Land Snail has similar longevity and reproductive traits to other related species of land snails, likely living for approximately five years and laying approximately 20 to 30 eggs after rain (Ridgeway et al. 2014, TSSC 2014).

Based upon existing information for the species, the maximum total number of snails that would be supported by the area of impact is 1 individual (based upon three snails per hectares and an impact area of 0.47 hectares) (Ridgeway et al. 2014). Impacts to a limited number of individuals are unlikely to significantly disrupt the breeding cycle of a population of Dural Land Snails in the area.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The study area and adjoining areas include shale-influenced vegetation that represent potential habitat for Dural Land Snail (OEH 2011). The proposed works include the removal of 0.47 hectares of associated native vegetation allow for upgrades to the WRP. This will result in a decrease of the availability of habitat for the species.

However, based on the documented maximum number of snails per hectare (Ridgeway et al. 2014), the removal of 0.47 hectares of associated native vegetation is expected to impact on a low number of individual snails (<1). The small amount of vegetation being removed, and expected low level of impact to Dural Land Snail as a result of the proposed works, is therefore unlikely to result in a significant decline in the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed works are unlikely to exacerbate the current level of invasive species threat operating within the study area.

Introduce disease that may cause the species to decline

There is a lack of information available in the current scientific literature on land snail diseases and neither the Preliminary Determination release by the NSW Scientific Committee (2015), or the Conservation Advice released by the Commonwealth Threatened Species Scientific Committee (2014) make any reference to disease risks for this species. Due to the lack of available information it is not possible to comment on the likelihood of the introduction of diseases that may cause a decline in Dural Land Snail.

Interfere with the recovery of the species

No recovery plan for Dural Land Snail currently exists and the Conservation Advice for the species does not recommend one (TSSC 2014).

The proposed works include the removal of 0.47 hectares of associated habitat for the species which may result in impacts to a very limited number of individuals. Given the small area of vegetation to be removed and the expected minimal impact to the species, the proposed works are unlikely to substantially interfere with the recovery of the species.

Conclusion

Based on the available information in the scientific literature and the minimal impacts to potential habitat within the study area, it is concluded that the proposed project impacts are unlikely to lead to a significant impact on Dural Land Snail.

Appendix 4 Tests of Significance

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

The Shale Sandstone Transition Forest is listed as a CEEC under the BC Act. Shale sandstone Transition Forest is an open forest, with dominant canopy trees including Forest Red Gum, Grey Gum *Eucalyptus punctata*, White Stringybark *Eucalyptus globoidea*, Thin-leaved Stringybark, Red Ironbark *Eucalyptus fibrosa*, and Narrow-leaved Ironbark (NSW Scientific Committee 2019). The shrub stratum is usually sparse and is usually dominated by Blackthorn *Bursaria spinosa* with, grasses such as kangaroo grass *Themeda triandra*, Hedgehog Grass *Echinopogon ovatus*, and other herbs including Kidney Weed *Dichondra repens* making up the often mesic ground stratum. The ecological community occurs in Sydney Basin and is heavily fragmented, with only 22 % of its original extent remaining intact. It occurs on the edge of the Cumberland Plain, where clay soil from shale rock intergrades with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. Remnants mostly occur in the Bankstown, Baulkham Hills, Blacktown, Campbelltown, Hawkesbury, Liverpool, Parramatta, Penrith, Sutherland and Wollondilly local government areas.

Within the study area the vegetation is characterised by a dominant Grey Gum canopy layer with scattered Broad-leaved Ironbark, the understorey is heavily disturbed however contains scattered native shrub species including Parramatta Wattle, Fringed Wattle and Native Blackthorn. The ground layer contains primarily weed species, especially on the edges of the vegetation unit however, small pockets of primarily native species including Weeping Meadow Grass, Kidney Weed and Kangaroo Grass are present.

As outlined in the Threatened Species Test of Significance Guidelines (DECCW 2018), the following key terms are relevant to this ToS:

- Subject site: the area directly affected by the proposal (referred to as Impact Area).
- Study area: the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account (Appendix 1; Figure 1.1 and Figure 1.2).
- Local occurrence: the ecological community that occurs within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

The local occurrence of Shale Sandstone transition forest in the broader area extends to the south-west which has been confirm by previous studies (ENsure 2018, UBM Ecological Consultants 2018b) and covers an approximate area of 6.64 hectares of mapped PCT 1395 vegetation surrounding the study area.

The total direct impact to Shale Sandstone Transition Forest as a result of the proposed works is expected to be approximately 0.47 hectares.

(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,

Shale Sandstone Transition forest is not a threatened species and therefore this question does not apply.

(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.

The local occurrence of Shale Sandstone Transition is considered to be vegetation that forms part of the same vegetation community that is contiguous and continuous with the vegetation within the study area. This patch totals approximately 6.54 hectares in size and up to 0.47 hectares of vegetation is to be removed for the proposed works. The overall patch presents in generally good condition with relatively low weed ingress and higher native diversity in all stratum. The vegetation to be removed by the proposed works is located within the operations footprint of the Rouse Hill WRP, occurs on the north most extent of the patch and has been subjected to edge effects and disturbance. The vegetation to be directly removed does not comprise any ecological components critical to the survival of the TEC in the locality. Although, the removal of 0.47 hectares is likely to reduce the availability of habitat for the TEC within the locality it is unlikely, due to the low condition and native species diversity that removal of this vegetation will result in an adverse effect that the local occurrence would be placed at risk of extinction.

The removal of 0.47 hectare of TEC from the local occurrence will result in removal of native vegetation species. The species to be removed are proportionally represented within the retained areas of vegetation and are not considered at a risk of being made absent from the local occurrence of the TEC. Therefore, it is unlikely the works will substantially and adversely modify the composition such that the local occurrence would 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,

The proposed works will result in the direct removal of 0.47 hectares of habitat for the TEC, however areas contiguous to that being removed will be retained. The vegetation to be removed is heavily influence by edge effects, operation of the water recycling plant, previous disturbance. The vegetation to be removed shows a distinct lack or reduction in mid storey and ground stratum native species, whilst areas to be retained maintain higher levels of native species in all stratum.

The removal of 0.47 hectare of TEC from the local occurrence is likely to increase fragmentation of the local community however, the local occurrence already occurs within a fragmented landscape. Removal of 0.47 of lower quality vegetation with reduce species diversity is not likely to increase the negative pressures on the patch. Furthermore, the proposed work will retain a strip of vegetation that has already been subject to edge effects that will provide a buffer for the better quality retained vegetation such that it is unlikely to be subjected to further edge effects that would see the patch quality decline.

The area of habitat to be directly and indirectly impacted by the proposed works is not considered important to the long term survival of the 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).

The proposed works does not impact on any 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.

The proposed works have the potential to result in the following key threatening processes which are listed under the Schedule 4 of the BC Act and which are considered relevant to Shale Sandstone Transition Forest:

- Clearing of native vegetation.

The proposed road access requires clearing of land where this community occurs, resulting in the removal 0.47 hectares of the TEC.

Conclusion

The proposed works are unlikely to significantly impact Shale Sandstone Transition Forest for the following reasons:

- The proposed works are localised, the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works.
- The proposed works is unlikely to significantly alter floristic or structural diversity of the retained portions of the EEC.
- The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes.

Therefore, no further assessment is required and a SIS or BDAR is not required.

River-flat Eucalypt Forest Endangered Ecological Community

River-flat Eucalypt Forest is listed as an EEC under Schedule 2 of the NSW BC Act. River-flat Eucalypt Forest is found on river flats of coastal floodplains across eastern NSW and is characterised by tall open canopies of Eucalypts, typically occurring as part of a mosaic with other floodplain forest communities. The composition of the tree stratum varies considerably across the range of the community however the most widespread and abundant dominant trees include Forest Red Gum, Cabbage Gum, Rough-barked Apple, and Broad-leaved Apple, Blue Box *Eucalyptus baueriana*, Bangalay *Eucalyptus botryoides*, River Peppermint *Eucalyptus elata*, Swamp Gum *Eucalyptus ovata*, Sydney Blue Gum *Eucalyptus saligna*, and Flooded Gum *Eucalyptus grandis* ((NSW Scientific Committee 2011).

As outlined in the Threatened Species Test of Significance Guidelines (DECCW 2018), the following key terms are relevant to this ToS:

- Impact area: the area directly affected by the proposal.
- Study area: the impact area and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account (Appendix 1; Figure 1.1 and Figure 1.2).
- Local occurrence: the ecological community that occurs within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

The local occurrence of River-flat Eucalypt Forest include vegetation mapped within the study area and extends east and west of the study area long the riparian corridor with contains greater than 20 hectares of vegetation.

The total direct impact to River-flat Eucalypt Forest as a result of the proposed works is expected to be approximately 0.07 hectares.

(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,

Not applicable.

(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.***

The small area of River-flat Eucalypt Forest forms part of a localised patch along the riparian corridors along Second Pond's Creek. The vegetation is located on the southern extent of the linear patch with large amounts of the TEC extending east and west from the impact area. Although, the proposed works will reduce the overall extent of the TEC the impact will be localised and unlikely to place the local occurrence at risk of extinction. The patch directly impacted by the proposal is also considered unlikely to substantially modify the composition of the TEC in the locality, due to the degraded and edge effect nature of the vegetation within the proposed works footprint.

(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,***

Approximately 0.07 hectares of River-flat Eucalypt Forest may be permanently removed as a result of the proposed works this is a small portion of the habitat available to the local occurrence of the community along the Second Ponds Creek riparian corridor.

The patch of the TEC directly impacted by the proposed works has the potential to result in minor increases to fragmentation of the locally occurring TEC along the riparian corridors. The removal of a small amount of the TEC within a larger patch is unlikely to fragment or isolate the patch such that the local occurrence is at risk of extinction.

The area of habitat directly impacted by the proposed works is not considered important to the long term survival of the 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).

The proposed works will not impact on an area declared as 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.

The proposed works have the potential to result in the following key threatening processes which are listed under the Schedule 4 of the BC Act and which are considered relevant to River-flat Eucalypt Forest:

- Clearing of native vegetation.

The proposed works requires clearing of land where this community occurs. A total of 0.07 hectares of this community will be directly removed by the proposed works.

Conclusion

The proposed works are unlikely to significantly impact River-flat Eucalypt Forest for the following reasons:

- The proposed works are localised and small-scale, and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works.
- The proposed works is unlikely to significantly alter floristic or structural diversity of the retained portions of the EEC.
- The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes.

Therefore, no further assessment is required and a SIS or BDAR is not required.

Conclusion

The proposed works are unlikely to significantly impact River-flat Eucalypt Forest on Coastal Floodplains for the following reasons:

- The proposed works will result in a small removal of vegetation within a large patch.
- The proposed works is unlikely to significantly alter floristic or structural diversity of the retained patches of the TEC.
- The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes.

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

Dural Land Snail

The Dural Land Snail or Dural Woodland Snail is a land snail endemic to NSW currently listed as Endangered under the BC Act. It is has a large dark red-brown to yellow shell (10.6 - 23.0 millimetres in height, 14.7 - 23.5 millimetres in width) with a moderately elevated spire (Clark 2009, Stanisic et al. 2010). The shell whorls are rounded to angulate with a weak to strong peripheral angulated ridge (NSW Scientific Committee 2015, Stanisic et al. 2010, Clark 2009). It is morphologically similar to, and can be mistaken for, the related species Cumberland Plain Land Snail *Meridolum corneovirens* and *Meridolum sheai* (TSSC 2014, Clark 2009).

Dural Land Snails exhibit a strong preference for shale-influenced transitional landscapes and are typically observed resting in exposed areas, such as exposed rock or leaf litter, or sheltering beneath leaves, rocks and light woody debris (Ridgeway et al. 2014). Snails have also been recorded sheltering at the base of Grey Gum *Eucalyptus punctata* trees in bark fragments (Ridgeway et al. 2014).

The species is associated with the following listed ecological communities:

- *Blue Gum High Forest of the Sydney Basin Bioregion.*
- *Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest.*
- *Turpentine-Ironbark Forest in the Sydney Basin Bioregion.*
- *Shale/Sandstone Transition Forest* (TSSC 2014).

The distribution of Dural Land Snail includes the western side of the Hornsby Plateau, north of Sydney, and along the foothills of the Blue Mountains (Clark 2009, Stanisic et al. 2010). Key localities include Calabash Road (Arcadia), Galston Park (Galston), and Wiseman's Ferry (Stanisic et al. 2010). It is also documented from a number of conservation reserves including the Blue Mountains National Park, Marramarra National Park, Yengo National Park, Berowra Valley Regional Park, Parr State Conservation Area, and Yellomundee Regional Park.

As the Dural Land Snail is listed under the BC Act, a test for determining whether the proposed works are likely to significantly affect the species in accordance with section 7.3 of the BC Act has been undertaken below.

There are 71 records of Dural Land Snail (DPIE 2021b) within five kilometres of the study area.

(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,

The mating behaviour of Dural Land Snail is poorly documented with studies on the species failing to observe mating behaviours despite hundreds of hours in the field (Ridgeway et al. 2014). Similarly there is no literature available on the longevity of the species (Ridgeway et al. 2014). However it is likely that the Dural Land Snail has similar longevity and reproductive traits to other related species of land snails, likely living for approximately five years and laying approximately 20 to 30 eggs after rain (TSSC 2014, Ridgeway et al. 2014). The species is never abundant (Clark 2009), with the maximum total number of recorded individuals (mature and otherwise) per hectare being three individuals (Ridgeway et al. 2014, TSSC 2014). However this information is based on a single study and it is possible densities may be higher in some populations (TSSC 2014).

The proposed works include the removal of 0.47 hectares of associated native vegetation. Vegetation is being removed to facilitate the upgrade to the WRP. The vegetation to be removed is associated with Dural Land Snail (TSSC 2014).

Based upon existing information for the species, the maximum total number of snails that would be supported by the area of impact is <1 individual (based upon three snails per hectare and an impact area of 0.47 hectares) (Ridgeway et al. 2014). The impacted vegetation is part of a larger patch of shale-influenced vegetation (OEH 2011), capable of supporting Dural Land Snail, which covers an area of approximately 6.54 hectares. Given the availability of connected resources and the small area of impact, the proposed works are unlikely 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,***

Not applicable.

(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,***

The proposed works include the removal of 0.47 hectares of associated native vegetation which represents potential Dural Land Snail habitat. Clearing is to occur primarily to facilitate upgrades to the WRP.

The vegetation to be removed is located within a larger, approximately 6.54 hectare, patch of shale-influenced native vegetation (OEH 2011). The small area of vegetation clearance is not expected to significantly fragment this patch of vegetation.

Dural Land Snail exhibit a strong preference for shale-influenced transitional landscapes and ecological communities, including the native vegetation located in the study area (Ridgeway et al. 2014, NSW Scientific Committee 2015, TSSC 2014). Shale-influenced habitats within the geographic range of the species (i.e. the northwest fringes of the Cumberland Plain) are therefore considered to be of importance to the survival of the species. However, based on the available information for maximum snail densities, the area of impact is capable of supporting <1 snail, based upon three snails per hectare and an impact area of 0.47 hectares (Ridgeway et al. 2014). Given the connection to the rest of the approximately 6.54 hectare patch of shale-influenced vegetation will not be significantly reduced, it is unlikely that the proposed works will significantly impact the long-term survival of the species.

(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),

The proposed works are not located within the vicinity of, and are unlikely to have an adverse effect on, any declared areas of outstanding biodiversity values.

(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.

The Conservation Advice for Dural Land Snail provided by the Commonwealth Department of the Environment and Energy Threatened Species Scientific Committee (2014), identified the following threats to the species:

- Clearing of habitat.
- Fragmentation of habitat.
- Inappropriate fire regimes.
- Habitat modification for bushfire asset protection.
- Habitat modification through underscrubbing (removal of creepers/vines and shrubs).
- Predation by the introduced Common Blackbird *Turdus merula.*

The proposed works include the clearing potential habitat for the species, through the removal of 0.47 hectares of associated native vegetation. However given the connectivity to the larger 6.54 hectare patch of shale-influenced vegetation that will not be significantly impacted by the proposed works. This clearing is not considered to significantly increase the impact of threatening process on the species.

The proposed works are unlikely to increase the impact of any of the other threats to the species highlighted under the Threatened Species Scientific Committee Conservation Advice (2014).

Conclusion

In consideration of the five factors listed above (a - e) the proposed works are considered unlikely to result in a significant impact to Dural Land Snail due to:

- The small amount of habitat being removed.
- The availability of similar habitat directly connected to impact area.
- The maintenance of existing connectivity within the larger vegetation patch.

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

Glossy Black-cockatoo

Glossy Black-cockatoo, Vulnerable under the BC Act, is a medium-sized cockatoo with a diagnostic combination of black-brown head, neck and underbody, red or orange-red panel in tail, and otherwise black plumage. Adult females also exhibit extensive patches of yellow feathering on head and neck. The species is closely associated with *Allocasuarina* spp. and *Casuarina* spp. dominated woodlands, or open sclerophyll forest where the middle stratum is *Allocasuarina* spp. They feed almost exclusively on the seed of *Allocasuarina* spp. but occasionally also take wood-boring insect larvae. The species is dependent on hollow-bearing trees for breeding habitat as they nest in the hollows formed in the trunk, stump, spout or limbs of eucalypt trees, living or dead (Higgins 1999, DPIE 2017).

The study area includes two hollow-bearing trees but these do not represent suitable nesting hollows for Glossy Black-cockatoo. *Allocasuarina* spp. and *Casuarina* spp. trees are also present within the study area which represent foraging resources for the species. In coastal and tablelands areas preferred feed trees are Forest Oak *Allocasuarina torulosa* and Black She-oak *Allocasuarina littoralis*, with some foraging occurring on Horsetail She-oak *Casuarina equisetifolia* (DEC 2004). Black Oak is present in the study area.

The proposed works include potential impacts to the hollow-bearing trees as well as the removal of Black She-oak. As the Glossy Black-cockatoo is listed under the BC Act, and due the presence of potential foraging habitat within the study area, a test for determining whether the proposed works are likely to significantly affect the species in accordance with section 7.3 of the BC Act has been undertaken below.

There are 19 records of Glossy Black-cockatoo (DPIE 2021b) within five kilometres of the study area.

(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,

The direct impacts resulting from the proposed works that have the potential to impact upon the life cycle of Glossy Black-cockatoo include the reduction or degradation of suitable foraging habitat. The proposed works include the removal of two hollow-bearing trees that do not constitute potential breeding habitat, as well as the removal of several Swamp Oak and She-Oak trees which represent foraging habitat. The removal of these trees will reduce the availability of resources within the immediate area. However, given the contiguous nature of the vegetation within a large tract of good quality bushland, with a variety of similar habitats nearby, the removal is not considered significant. Recommendations have been included for the

protection of trees to be retained within the vicinity of the proposed works which will ensure potential impacts to Glossy Black-cockatoo habitat are minimised.

Indirect impacts resulting from the proposed works that have the potential to impact Glossy Black-cockatoo include the introduction and spread of invasive weeds that would result in degradation of their foraging habitat. As the vegetation impacts are restricted to already disturbed vegetation, the spread of invasive weeds into unaffected areas is expected to be minimal. Recommendations have been provided to ensure good soil transportation practices during the proposed works to minimise the risk of introduction and proliferation of weed species.

Given the small scale of impact associated with the proposed works, the recommendations provided within this assessment report for the mitigation of these impacts, and the wide availability of suitable high-quality resources within the locality, it is unlikely that the proposed works will have an adverse effect on the life cycle of Glossy Black-cockatoo 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,***

Not applicable.

(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,***

The proposed upgrade works will result in impacts to two hollow-bearing trees, which are not suitable as nesting habitat for Glossy Black-cockatoo, as well as Swamp Oak and She-Oak trees, representing potential foraging resources for the species.

Habitat connectivity within the locality is moderate as the study area is located with a residential area but connected to adjacent riparian vegetation. Given the minor vegetation clearing associated within the proposed works, and its location within an already disturbed region, the removal of two unsuitable hollow-bearing trees and Swamp Oak and She-Oak trees is considered unlikely to significantly contribute to any fragmentation of habitat.

Given the wide availability of higher quality resources within the adjacent riparian vegetation, the removal of vegetation from the study area is unlikely to significantly impact the species, such that the long-term survival of the species within the locality is placed at risk. Recommendations are included to protect trees to be retained which will further ensure any impact to foraging habitat for the species is minimalised.

(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),

The proposed works will not impact on an area declared as 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.

Key threatening processes relevant to the Glossy Black-cockatoo that may be exacerbated by the proposed works include clearing of native vegetation, removal of hollow-bearing trees, and fragmentation of habitat leading to long distances between nesting and foraging habitats which can have energetic consequences for foraging efficiencies, and hence impact on chick growth and survival leading to population decline (NSW Scientific Committee 2008).

The impacts to two hollow-bearing trees (unsuitable for breeding habitat) and removal of Swamp Oak and She-Oak trees will reduce the availability of foraging resources within the immediate locality of the study area. However, the habitats being removed are located within a disturbed region and will not result in any further fragmentation of habitat for the species. The study area is also located within a moderately contiguous patch of good quality vegetation, with similar habitat nearby. As such the proposed removal of vegetation is not considered to significantly contribute to any of the key threatening process for the species.

Conclusion

In consideration of the above two factors (a-e), the proposed activity is not likely to significantly impact Glossy Black-cockatoo individuals within the study area or wider locality, as:

- The proposed upgrade works will only result in the removal of two hollow-bearing trees that do not constitute breeding habitat and Swamp Oak and She-Oak trees within an area of high availability of similar resources within the locality. As such the removal of these habitats is unlikely to constitute a significant impact.
- The proposed works do not significantly contribute to a KTP for Glossy Black-cockatoo.

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

Woodland birds

Several threatened woodland birds are considered to have a moderate or greater likelihood of being present within the study area, including Dusky Woodswallow, Varied Sittella and Flame Robin. These three species are listed as a vulnerable species under the BC Act.

Dusky Woodswallow

Dusky Woodswallow are found over a broad range of habitats, primarily inhabiting dry open Eucalypt forests and woodland, yet can be found in moist forest or rainforest. Dusky Woodswallows can be resident or migratory birds depending on location. Populations in NSW migrate to south-eastern Queensland after breeding in Spring.

Dusky Woodswallow nest in open cup shaped nests, generally occurring in shrubs or low trees. Dusky Woodswallow primarily eat insects whilst flying high but can also forage under canopy over leaf litter or dead timber (OEH 2017a).

Dusky Woodswallow is threatened by a number of processes including loss and fragmentation habitat through land-clearing, aggressive exclusion by over abundant noisy miners and reduction in availability of food resources due to overgrazing and removal of leaf litter (OEH 2017a).

Dusky Woodswallow was not recorded during field investigations (no targeted survey was undertaken). There are 13 records of Dusky Woodswallow (DPIE 2021b) within five kilometres of the study area. There is

potential for the study area to be used occasionally by this species for foraging, although it is unlikely that individuals rely upon resources in the study area.

Varied Sittella

The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. The species usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts.

The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.

Varied Sittella is threatened by a number of processes including loss and fragmentation habitat through land-clearing, aggressive exclusion by over abundant noisy miners and reduction in availability of food resources due to overgrazing and infestation of weeds.

There are 19 records of Varied Sittella (DPIE 2021b) within five kilometres of the study area. The species was not recorded during field investigations (no targeted survey was undertaken). There is potential for the study area to be used occasionally by this species for foraging, although it is unlikely that individuals rely upon resources in the study area.

Little Lorikeet

Little Lorikeet is distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 metres and 15 metres, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.

There are 18 records of Little Lorikeet (DPIE 2021b) within five kilometres of the study area. The species was not recorded during field investigations (no targeted survey was undertaken). There is potential for the study area to be used occasionally by this species for foraging and breeding in hollow-bearing trees, although it is unlikely that individuals rely upon resources in the study area.

Flame Robin

Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands.

The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet consists mainly of invertebrates.

Flame Robin is threatened by a number of processes including loss and fragmentation habitat through land-clearing, aggressive exclusion by over abundant noisy miners, predation by over-abundant populations of Pied Currawong and reduction in availability of food resources due to overgrazing.

There is one record of Flame Robin (DPIE 2021b) within five kilometres of the study area. The species was not recorded during field investigations (no targeted survey was undertaken). There is potential for the study area to be used occasionally by this species for foraging, although it is unlikely that individuals rely upon resources in the study area.

(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,

Impacts likely to have an adverse effect on the life cycle of woodland birds include direct mortality, disturbance to nesting sites, loss of nesting and sheltering habitat – primarily, loss and fragmentation of foraging habitat particularly extensive areas of continuous forest and areas of high productivity.

The proposal will remove up to 0.86 hectares of native vegetation and two hollow-bearing trees. The habitat to be removed is within a moderate sized patch of native vegetation. It is likely that if woodland birds use the study area for foraging, sheltering and nesting then the local population would use the entire patch of bushland. The bushland patch contains areas within that would provide higher productivity areas for foraging with areas containing more open shrub layer, access to riparian corridors and higher diversity of flora species. Direct mortality of individuals will be avoided by implementing preclearance surveys and a two stage hollow-bearing tree clearance as part of the proposed vegetation removal. These mitigation measures will reduce the potential impact on any threatened woodland birds. The small area of foraging and sheltering habitat proposed for removal could impact individuals, however, the small scale of clearance proposed with added mitigation measures, within an area containing larger continuous areas of more suitable habitat, is considered unlikely to affect a viable local population of each species such that it could 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,***

Not applicable.

(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,***

The proposed action will result in the removal of up to 0.86 hectares of potential foraging, sheltering and nesting habitat within a larger patch.

Proposed works have the potential to modify adjoining bushland by increasing edge effects, sedimentation and accidental modification by workers. Recommendations contained within the report aim to minimise indirect impact from the works and when implemented will ensure that indirect impacts of adjoining bushland is unlikely.

The proposed works will alter a small area of vegetation (0.86 hectares) within a large patch of good quality bushland. The patch of bushland provides ample good condition foraging for threatened woodland birds. The removal of this bushland will not likely fragment or isolate any adjoining habitat areas.

The small area of potential foraging habitat proposed for removal (0.86 hectares) would represent a small proportion of available habitat for these species in the local area. The site is located within a larger area of bushland which would provide better habitat potential than the area to be impacted by the proposed works.

(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),

The project will not be carried out in an area designated within the Biodiversity Values Map and the proposed works will impact an area of foraging habitat.

The proposed vegetation clearance will not have any direct or indirect adverse effect on any declared area of outstanding biodiversity value.

(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.

Key threatening processes of relevance to the threatened woodland birds include clearing of native vegetation. Clearing of native vegetation will be limited to 0.86 hectares in a large patch of bushland which contains better quality foraging habitat. It is unlikely that the removal of the vegetation will increase the impact of the key threatening process of clearing of native vegetation.

Conclusion

In light of the consideration of the above five factors (a-e), the proposed activity is not likely to significantly impact threatened woodland bird species within the study area or wider locality, as:

- The proposal will remove a small area (up to 0.86 hectares) of potential foraging habitat, from an area containing large tracts of more suitable habitat.
- The habitat to be removed is not considered important to the survival of the species.
- The proposal does not significantly contribute to a KTP for these species.

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

Hollow-roosting microchiropterans

Eastern False Pipistrelle

Eastern False Pipistrelle, listed as Vulnerable under the BC Act, is a relatively large species of microbat with dark brown to reddish fur on its back, a paler grey belly and a body length of about 65 millimetres. The species is found on the south-east coast and ranges of Australia, extending from Southern Queensland down to Victoria and Tasmania, including coastal areas of NSW (DPE 2017a).

The species generally prefers moist habitats, with trees taller than 20 metres. It typically roosts in hollows within Eucalyptus trees in colonies of three to 80 individuals, but has also been found under loose bark on trees on in buildings. They are an insectivorous species, feeding primarily on larger prey items including beetles and moths and occasionally bugs, ants and flies. They typically hunt within or just the below the tree canopy, favouring gaps and spaces within the forest (Churchill 2008).

Eastern Coastal Free-tailed Bat

Eastern Coastal Free-tailed Bat, listed as Vulnerable under the BC Act, has a characteristically hairless faces with wrinkled lips and triangular ears. The species is found along the east coast of Australia ranging from

south Queensland to southern NSW in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.

The species generally roosts in tree hollows but will also roost under bark or in man-made structures. It has been recorded roosting both solitary as well as in a communal roost. The species is most likely to be insectivorous (DPE 2017b).

Little Bent-winged Bat

Little Bent-winged Bat, listed as Vulnerable under the BC Act, is the smallest of the bent-winged bats with uniform dark chocolate-brown fur on its back tending to slightly lighter on the belly. It has a distinctly short muzzle and domed head. The species is a cave-dwelling bat however it is known to roost in caves, abandoned mines, tunnels, stormwater drains, and occasionally buildings. It is insectivorous, feeding primarily on beetles, moths and flies, but is also known to frequently consume spiders. They hunt their prey by flying rapidly with considerable manoeuvrability between the shrub and canopy layers of densely wooded forests (Churchill 2008). The species occurs of the east coast of Australia, ranging from Cape York in Queensland to Wollongong in NSW (DPIE 2019).

Southern Myotis

Southern Myotis, listed as Vulnerable under the BC Act, is a species of Microchiropteran (commonly referred to as microbats) identified by its disproportionately large feet and widely-spaced toes. The species has a wide distribution within the coastal band (i.e. less than 100 kilometres inland), occurring from north-west Australia, across the top-end and south to western Victoria.

The species generally roosts in groups of 10 to 15 individuals, preferably close to water in a number of different habitat structures including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. The species forages over streams and pools, catching insects and fish by raking its feet across the water surface (DPE 2017c).

Greater Broad-nosed Bat

Greater Broad-nosed Bat, Vulnerable under the BC Act, is a large powerful species of Microchiropteran that grows up to 95 millimetres long. It has a broad head a short square muzzle and is coloured dark reddish-brown above and slightly paler below. Its larger size is used to distinguish it from other broad-nosed bats. The species occurs in gullies and river system that drain the Great Dividing Range and ranges from north-eastern Victoria up to the Gold Coast in Queensland.

The species utilises a variety of habitats including woodland, moist and dry Eucalyptus forests and rainforest, however it is most commonly found in tall wet forests. It generally roosts in tree hollows however it is also known to utilised man-made structures. The species forages after sunset along creek and river corridors in search of beetles and other large, slow-flying insects (OEH 2017b).

Impacts

Two hollow-bearing trees with small to medium sized hollows (5 – 15 centimetres) will be removed by the proposed works which represent potential roosting habitat for hollow-dependent microbat species including Southern Myotis, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, and Greater Broad-nosed Bat. Large-eared Pied Bat is a cave-dependent species and does not utilise hollow-bearing trees for roosting purposes.

Approximately 0.86 hectares of native vegetation will be impacted which represents potential foraging resources for the insectivorous microbats Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, and Little Bent-winged Bat.

Whilst no microbats were encountered during the field survey (no targeted surveys were undertaken), there are known records of all aforementioned microbat species within 5 kilometres of the study area (DPIE 2021b). As these microbat species are listed under the BC Act and the proposed works include potential impacts to roosting and foraging habitats, a test for determining whether the proposed works are likely to significantly affect these species in accordance with section 7.3 of the BC Act is required and has been undertaken below.

(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,

Impacts likely to have an adverse effect on the life cycle of Microchiropterans include clearing of native forest and woodland vegetation, particularly older patches of vegetation containing hollow-bearing trees, leading to a loss in foraging and roosting habitats. The proposed works will result in the removal of up to 0.86 hectares of native vegetation, including two hollow-bearing trees with small to medium sized hollows (5 – 15 centimetres). The vegetation being removed represents potential foraging resources for insectivorous microbat species that feed above or within the forest canopy which includes Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, and Little Bent-winged Bat. The hollow-bearing trees represents potential roosting habitat for hollow-bearing tree dependent microbats which includes Southern Myotis, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, and Greater Broad-nosed Bat.

However, given the availability of other suitable hollow-bearing trees within the locality, and the large amounts of foraging habitat within the locality, the removal of two hollow-bearing trees is not considered significant. Recommendations for the staged removal of these habitat trees under ecological supervision will further ensure the impacts to any roosting microbats are minimised. The vegetation to be removed by the proposed works is also primarily located in an area of infrastructure, already subject to edge effects. It is likely that this vegetation does not afford the same foraging opportunities as those of the surrounding more intact vegetation. Given the highly mobile nature of microbat species is therefore highly unlikely that the vegetation being impacted by the proposed works is relied upon to any significant degree by any microbats foraging within the locality.

Given the small scale of impact associated with the proposed works, the recommendations provided within this assessment report for the mitigation of these impacts, and the wide availability of suitable high-quality resources within the locality, it is unlikely that the proposed works will have an adverse effect on the life cycle of Microchiropteran species within the locality such that a viable local population of any of these 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,***

Not applicable.

(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,***

The proposed works include impacts to 0.86 hectares of native vegetation, including two hollow-bearing trees with small to medium sized hollows (5 – 15 cm) which represent foraging and roosting habitat for microbat species.

Fragmentation is already evident within the study area due to previous vegetation clearing undertaken to allow for the construction of buildings, plant, and associated road infrastructure for the existing WRP. However connectivity across the study area and with the surrounding vegetation is high due to the high retention of canopy trees and high quality of retained vegetation. The proposed works are unlikely to result in further fragmentation or significantly reduce habitat connectivity across the study area due to the small scale of disturbance associated with the proposed works, restricted to pre-disturbed patches.

The native vegetation that will be potentially impacted by the proposed works primarily represents marginal foraging habitat for insectivorous microbats and breeding/roosting habitat for hollow-dependent microbats. However, these resources are widely available within the locality. Given the highly mobile nature of microbat species, the wide availability of suitable high-quality resources, and the low risk of habitat fragmentation, the proposed scope of works are not considered to constitute a significant impact to the long term survival of microbats within 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),

The proposed works will not have an adverse effect on any declared areas of outstanding biodiversity value.

(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.

Key threatening processes relevant to microbats include clearing of native vegetation, loss of hollow-bearing trees, high frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition, artificial light spill into foraging and roosting habitats, and anthropogenic climate change.

The removal of up to 0.86 hectares of native vegetation, including two hollow-bearing trees with small to medium sized hollows (5 – 15 centimetres), will reduce the availability of resources within the immediate study area. However, given the contiguous nature of the vegetation with a large tract of good quality bushland with a variety of suitable hollow-bearing trees, the removal is not considered to significantly contribute to the key threatening process of native vegetation clearing and hollow-bearing tree removal for the species.

Recent bushfires along the eastern coast of Australia during the summer of 2019-2020 resulted in the loss of habitat for many of NSW's native entities. These fires likely resulted in the disruption of life cycle processes for many threatened fauna species, including microbats, and have been linked to anthropogenic climate change. The vegetation within the study area was not directly impacted by these fires. Due to the lack of information at this stage it is unclear the extent of to which microbat species have been impacted by these bushfires and further loss of habitat may place increased pressure on the species. However, given the small scale of impacts associated with the proposed works it is unlikely that the proposed works alone would result in a significant worsening of these key threatening processes.

As such it is unlikely that the proposed works will increase the impact of a key threatening process for microchiropteran species.

Conclusion

In consideration of the above five factors (a-e), the proposed activity is not likely to significantly impact microchiropteran species within the study area or wider locality, as:

- The proposed works will only result in potential impacts to 0.86 hectares of native vegetation, including two hollow-bearing trees with small to medium sized hollows (5 – 15 centimetres). Given the high availability of similar resources within the study area and surrounding connected areas, the removal of this vegetation is unlikely to constitute a significant impact.
- The proposed works do not significantly contribute to a KTP for microbat species.

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