

**REVIEW OF ENVIRONMENTAL FACTORS (REF)  
HUSKISSON SPS-7  
UPGRADE WORKS**

## Contents

1. PROPOSAL AND LOCATION .....	5
1.1 Proposed activity .....	5
1.2 Location .....	6
1.3 Background and justification of proposal.....	9
2. EXISTING ENVIRONMENT.....	10
2.1 Site description.....	10
2.2 Habitat and vegetation assessment .....	18
2.3 Threatened species and targeted survey results.....	27
3. ASSESSMENT OF LIKELY IMPACTS ON THE ENVIRONMENT.....	29
3.1 Impacts associated with the proposal.....	29
3.2 Threatened species impact assessment (NSW).....	30
3.2.1 Part 7A Fisheries Management Act 1994 .....	30
3.2.2 Part 7 Biodiversity Conservation Act 2016.....	31
3.3 Threatened species impact assessment (Commonwealth EPBC Act 1999) .....	50
3.4 Indigenous heritage.....	53
3.5 Non-indigenous heritage.....	56
3.6 Riparian corridors, aquatic habitat & water quality.....	56
3.6.1 Riparian corridors .....	56
3.6.2 Aquatic habitat .....	56
3.6.3 Water quality.....	59
3.7 Flood liable land .....	59
3.8 Acid Sulfate Soils.....	60
3.9 Operational impacts on residential properties .....	62
3.9.1 Sound impacts .....	62
3.9.2 Air quality and odour impacts .....	64
3.10 Potentially contaminated land .....	64
3.11 EP&A Regulation – Section 171 matters of consideration .....	65
4. APPROVALS PATHWAYS.....	70
4.1 Environmental Planning & Assessment Act 1979.....	70
4.2 Biodiversity Conservation Act 2016 .....	71
4.3 Fisheries Management Act 1994 .....	71
4.4 Marine Estate Management Act 2014 .....	72
4.5 National Parks and Wildlife Act 1974.....	74
4.6 State Environmental Planning Policy (Resilience and Hazards) 2021.....	77

4.7 Other..... 79

5. CONSULTATION WITH GOVERNMENT AGENCIES..... 81

    5.1 Transport & Infrastructure SEPP ..... 81

6. COMMUNITY ENGAGEMENT ..... 83

7. ENVIRONMENTAL SAFEGUARDS AND MEASURES TO MINIMISE IMPACTS..... 84

8. SIGNIFICANCE EVALUATION & DECISION STATEMENT..... 89

9. REFERENCES..... 90

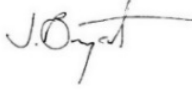
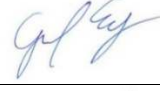

APPENDIX A – Design Plans..... 94

APPENDIX B – Threatened Species Likelihood of Occurrence ..... 95

**Document control**

Item	Details
Project	Review of Environmental Factors – Huskisson SPS-7 Upgrade Works
Client	Shoalhaven Water
Prepared By	City Services, Shoalhaven City Council

**Document status**

Version	Author / Reviewer*	Name	Signed	Date
V1.0	Author	Jeff Bryant		27/10/2023
	Reviewer	Geoff Young		30/10/2023
V1.1	Author	Jeff Bryant		15/05/2024
	Note: V1.1 includes new consideration of <i>National Parks and Wildlife Act 1994</i> (section 4.5 of this REF) in light of construction methodology requiring minor encroachment into Jervis Bay National Park. Minor related changes and references have been made (sections 1.2, 5.1, 7, 8 and 9). Other parts of the REF remain unchanged.			

\*Review and endorsement statement:

“I certify that I have reviewed and endorsed the contents of this REF document and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation, and the information it contains is neither false nor misleading”.

**Assessment and approvals overview**

Item	Details
Assessment type	Division 5.1 (EP&A Act) - Review of Environmental Factors (REF)
Proponent	Shoalhaven City Council
Determining authority / authorities	Shoalhaven City Council
Required approvals (consents, licences and permits)	Nil
Required publication	Yes: this REF must be published on the determining authority’s (Council’s) website or the NSW planning portal, in accordance with clause 171(4) EP&A Regulation 2021 and the guidelines published under cl.170, as a matter of “public interest”. Additionally, the proposal may require an approval or permit under section 200 of the <i>Fisheries Management Act 1994</i> ).

## 1. PROPOSAL AND LOCATION

### 1.1 Proposed activity

The proposed activity involves upgrading of an existing Shoalhaven Water sewer pump station (SPS7) on Montague St, Huskisson and associated rising and gravity sewer mains on McNamara Ct and Berry St, Huskisson.

The proposed upgrades would address the dilapidation of existing infrastructure and modernise and increase the capacity and efficiency of the sewage reticulation system to meet current and anticipated service demands.

As part of the proposed works, an asset protection zone (APZ) would be established around the SPS7 compound to provide a defensible space and better protection of the infrastructure in the event of bushfire. An effective APZ is largely existing around the compound. It is intended to formalise, better define the APZ and provide for its ongoing maintenance.

Proposed works would include:

- Upgrade of approx. 780m of Sewer Rising Main (DN300 to DN500), with combination of trenching and direct horizontal drilling (DHD) construction.
- Upgrade of approx. 240m of Sewer Gravity Main (DN450 to DN710), with trenching construction.
- Upgrade of SPS7 pump station including: new pumps (likely Duty-Standby with VSD pump arrangement); new pump well and new emergency storage and overflow discharge into grassed swale (within existing infrastructure footprint); bunded odour control; upgrade of electrical switch room building enclosure; and upgrade of electrical and telemetry system including new CT meter; refurbishment of Montague St pavement at entrance to SPS; and demolition of the existing building enclosure and other redundant components.
- Establishment and maintenance of an APZ comprising a 10m defensible space buffer which is clear of understorey vegetation, and with disconnected tree canopy around the SPS7 compound, and no tree canopy overhanging within 2m of the switch room building.

Note that authorisation from NPWS is required to undertake clearing (and other works) on land reserved under the *National Parks & Wildlife Act 1974*.

The APZ would be established to the standards described in NSW Rural Fire Services document *Standards for Asset Protection Zones*

[https://www.rfs.nsw.gov.au/data/assets/pdf\\_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf](https://www.rfs.nsw.gov.au/data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf) i.e.:

- Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark to be removed on a regular basis.
- Grass to be cut and kept short.
- Prune or remove trees so that there is no continuous tree canopy leading from the hazard to the asset, with tree crowns separated by two to five metres.
- No tree canopy is to overhang within two metres of the building.
- Impact on vegetation would involve the removal of one Sweet Pittosporum (*Pittosporum undulatum*) and three planted ornamental trees; and the pruning of native trees, clearing of mid-storey vegetation and possible removal of up to five Blackbutt (*Eucalyptus pilularis*) trees (non-hollow-bearing) in the vicinity of the SPS7 compound for construction of new infrastructure and establishment of the APZ; minimal removal of Swamp She-oak

(*Casuarina glauca*) suckers and saplings in the Berry St road verge; and clearing of exotic turf and native groundcovers in managed (mown) verges.

- Works would involve the implementation of prescribed safeguards and mitigation measures to prevent encroachment into sensitive vegetation (including mapped Coastal Wetland); avoid impacts on threatened species, habitat features and water quality; and ensure no increase to noise impacts on neighbouring properties (refer to Section 7).

Upgrade of Rising Mains and Gravity Mains would be undertaken over nearby adjacent alignments while retaining existing lines in-service during construction. On decommission, the redundant lines would be left in situ.

Note that as there is no existing alternative vehicle access to the sewage treatment plant, construction methodology would need to provide for some level of continued vehicle access along Berry St during construction.

Refer to Figure showing locations of proposed upgrades and Appendix A for design plans.

Shoalhaven City Council (SCC) is the proponent and the determining authority under Part 5 of the EP&A Act. The environmental assessment of the proposed activity and associated environmental impacts has been undertaken in the context of Clause 171 of the *Environmental Planning and Assessment Regulation 2021*. In doing so, this Review of Environmental Factors (REF) helps to fulfil the requirements of Section 5.5 of the Act that SCC examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

## 1.2 Location

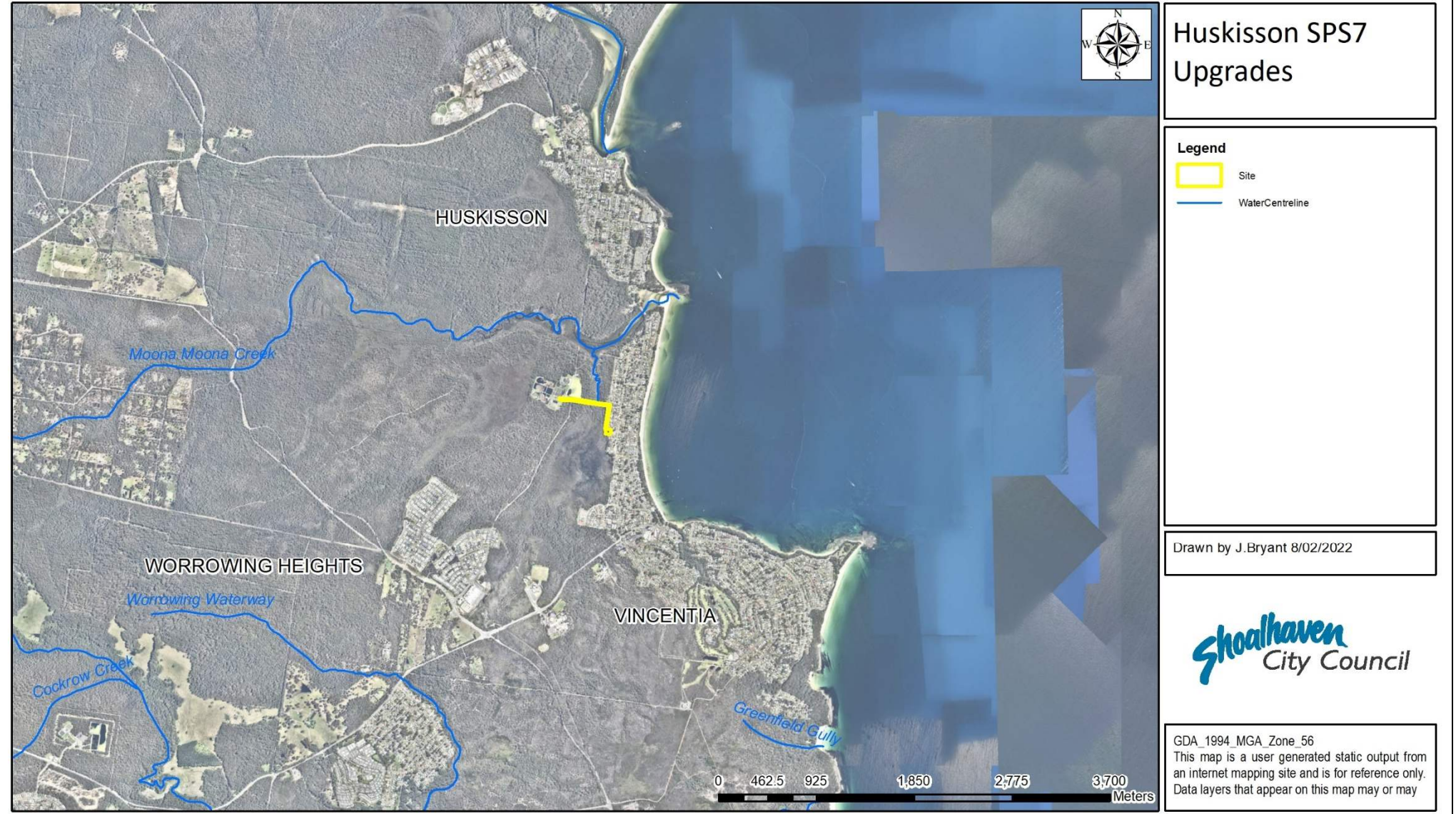
The proposed activity would be undertaken on Berry St, McNamara Ct and Montague St, Huskisson, between an existing wastewater treatment plant and an existing sewer pump station (SPS7), entirely within Council Operational Land and road reserves for which Council is the road authority. Refer to Figures 1 and 2 below.

Details of affected land are provided in Table 1.

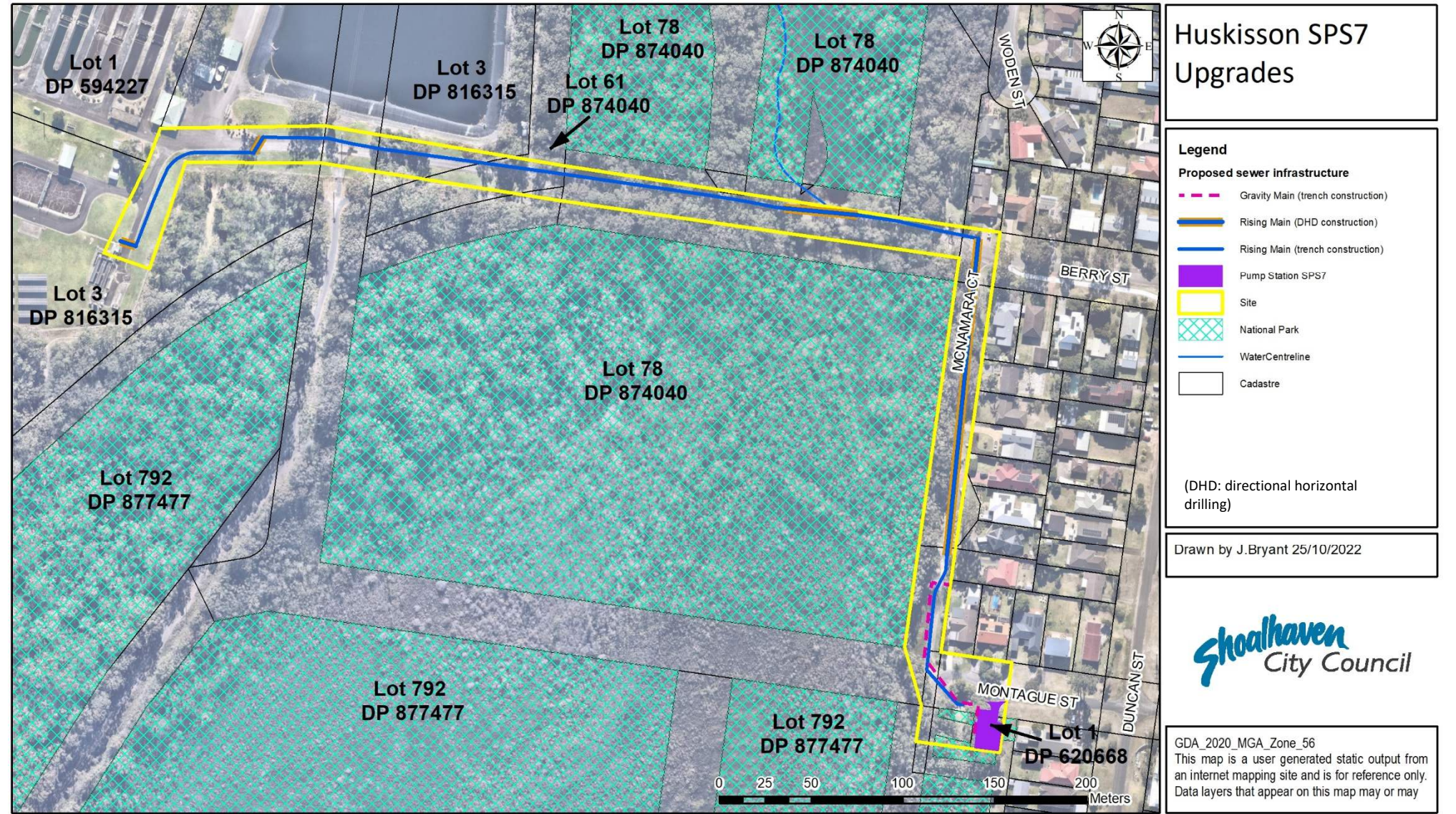
**Table 1. Property affected by the proposal**

Lot / DP	Description	Land owner / manager	Other information
-	Berry St	Shoalhaven City Council	
-	McNamara Ct	Shoalhaven City Council	
-	Montague St	Shoalhaven City Council	
-	Unnamed public road reserve	Shoalhaven City Council	
Lot 1 DP 594227	Huskisson Sewage Treatment Plant	Shoalhaven City Council	Freehold - Operational land
Lot 3 DP 816315	Huskisson Sewage Treatment Plant	Shoalhaven City Council	Freehold - Operational land
Lot 61 DP 874040	Huskisson Sewage Treatment Plant	Shoalhaven City Council	Freehold - Operational land
Lot 1 DP 620668	Sewer Pump Station SPS7	Shoalhaven City Council	Freehold - Operational land
Part Lot 792 DP 877477	Jervis Bay National Park	NSW National Parks & Wildlife Service	Authorisation required – refer to section 4.5

**Figure 1. Site location**



**Figure 2. Site showing proposed sewage infrastructure upgrades within site and relevant cadastral information**



### 1.3 Background and justification of proposal

A Wastewater Servicing Strategy was developed for Shoalhaven Water by GHD in 2013. The strategy identified capacity and performance deficiencies with the existing SPS7 including:

- Dry weather emergency storage would need to be increased by at least 69kL to meet the 179kL requirement of 4 x ADWF for projected 2041 capacity demand.
- High season wet weather surcharge was predicted to occur upstream of SPS7 in both 2011 and 2041 as a result of both backwater effects (where gradient of the hydraulic line is less than the gradient of the pipeline, due to an elevated grade line downstream) and pipe capacity (where gradient of the hydraulic line exceeds gradient of the pipeline).
- Peak wet weather inflow was predicted to exceed SPS7 capacity by almost double in 2041, with overflows predicted to occur at SPS7 and one manhole upstream from SPS7, with an additional five manholes located upstream of SPS7 predicted to be close to spill level.

Indicators of dilapidation and need for component replacement and upgrade have been observed at SPS7 by Shoalhaven Water including evidence of corrosion in the existing concrete well; incidents of breakages; structural and mechanical components of the well are noted as due for replacement; and the existing electrical building (situated above the existing well) is thought to present a risk due to Hydrogen Sulfide (H<sub>2</sub>S) gas and poor ventilation.

The current proposal involves upgrades of SPS7 and associated infrastructure (including upgrades to rising and gravity mains to allow for additional flow from the upgraded pump station), which would address the dilapidation of existing infrastructure and modernise and increase the capacity of the sewage reticulation system to meet current and anticipated service demands identified in the Wastewater Servicing Strategy (GHD 2013).

An asset protection zone (APZ) would be formalised (and established where not physically existing) around the SPS7 compound as part of the proposed works to provide a defensible space around – and better protection of – the infrastructure in the event of bushfire.

Design of the proposed alignments of the pipelines, including the use of direct horizontal drilling (DHD) in select locations, has ensured that encroachment into sensitive environments – including endangered ecological communities and mapped Coastal Wetlands – would not occur, and impacts on native vegetation and habitat features would be minimised to every practical extent.

## 2. EXISTING ENVIRONMENT

### 2.1 Site description

The site of the proposal was assessed by a Council Environmental Officer on 24<sup>th</sup> November 2022, with additional investigations including targeted surveys for threatened terrestrial orchids carried out on 24<sup>th</sup> November 2022, 24<sup>th</sup> January 2023, 20<sup>th</sup> February 2023 and 24<sup>th</sup> April 2023.

Investigations involved vegetation and habitat assessment, recording all flora species within and immediately adjacent to the subject site, determination of vegetation communities, targeted survey for potentially occurring threatened flora species (including *Banksia vincentia*, *Melaleuca biconvexa* and *Syzygium paniculatum*) and investigation of habitat availability on site for threatened fauna species and cryptic threatened flora species (including terrestrial orchids *Caladenia tessellata*, *Calochillus pulchellus*, *Cryptotylis hunteriana*, *Genoplesium baueri*, *Prasophyllum affine*, *Pterostylis ventricosa* and *Rhizanthella slateri*).

The site contains formed roads within managed road reserves having verges of varying degrees of modification and disturbance, adjacent to and flanked by natural areas or residential housing.

The western end and termination of Berry Street provides access to the existing Huskisson Wastewater Treatment Plant (WWTP). Within the WWTP, the proposal site is largely cleared and modified with managed turf containing few scattered trees or planted shrubs adjacent to the formed pavement internal access road (Photo 1). A sealed, gated, access road which is utilised as a walking and bicycle track, links the western of Berry St and an adjacent, alternative access to the WWTP with Coaster Cct in Bayswood, Vincentia (Photo 13).

Between the WWTP and McNamara Ct, Berry St contains a formed pavement (approx. 4m wide) with managed variable verges between approx. 1m and 3m wide, flanked by shrubby dry sclerophyll forest and coastal swamp forest (Photo 2).

An 3rd order (Strahler), unnamed creek tributary of Moona Moona Creek is crossed by Berry St within the site (Photo 3). A pair of twin-pipe culvert crossings (appearing to be 2 x 600mm and 2 x 450mm) occur approximately 650m upstream of Moona Moona Creek via a meandering watercourse (refer to Photo 4). In the vicinity of the crossing, the tributary exists as an approximately 50m wide swampland with emergent sedges and trees and with open waterbodies to approx. 1m deep either side of the culverts, and the largest on the northern (downstream) side approximately 15m by 20m broad (Photo 5). The crossing was approximately 7.5m wide at its most narrow between the culvert headwalls. Exotic invasive Mosquito Fish (*Gambusia holbrooki*) were observed on both sides of the culvert crossing.

Upstream of the crossing, a large swampland which is mapped as Coastal Wetland (*State Environmental Planning Policy (Resilience and Hazards) 2021*) extends to the south along Vincentia's western residential fringe, extending to the eastern part of Bayswood (Vincentia), covering approximately 55ha.

Between Berry St and Montague St, McNamara Ct contains a formed pavement which terminates in a turning circle roughly midway along the road reserve, with a broad, managed and treed verge from 4m-8m wide (approx.) fronting residential housing on the western side and a narrower verge cleared to 1.5m-4m wide (approx.) on the eastern side adjoining shrubby dry sclerophyll forest transitioning to coastal swamp forest contiguous with the swampland extending south from Berry St. Refer to Photos 6 and 7.

The southern portion of McNamara Ct contains a shared-user path (SUP) running from the turning circle through to Montague St, approx. 4m from eastern residential property boundaries, through mostly cleared land, turfed with Kikuyu grass (*Cenchrus clandestinus*) and containing two planted

ornamental trees (Liquidamber – *Liquidamber styraciflua* and Bottlebrush – *Callistemon spp.*). To the west of the SUP, a disturbed, open, shallow, modified swamp exists, approx. 12m wide and 40m long, which is partially vegetated with small and predominantly exotic sedges (Photo 8). This swamp adjoins a narrow transition zone between shrubby dry sclerophyll forest and coastal swamp forest contiguous with the swampland extending south from Berry St.

SPS7 is within a fenced compound at the western end and southern side of Montague St on Council freehold land (Lot 1 DP 620668). The compound is approximately 8m from residential properties to the east, separated by a cleared (grassed) and managed asset protection zone (APZ), extending southward along the western residential property boundaries in the vicinity of the compound. The compound itself is surrounded by predominantly cleared and managed land serving as a partial APZ, with scattered trees and shrubs and an approximately 6-15m wide, grassed buffer between the compound and shrubby dry sclerophyll forest to the west, which transitions to coastal swamp forest contiguous with the swampland extending south from Berry St. Despite the cleared and grassed understorey, existing trees occurring around the compound form a continuous canopy with the forest to the west. A raised manhole occurs approximately 25m to the west of the compound. Overflow from SPS7 currently discharges from the lid of the raised manhole with no directed dispersal and filtration. Refer to photos 9, 10, 11 and 12.

**Photo 1. Entrance to the Huskisson WWTP, facing east toward Berry St with hollow-bearing tree on right.**



**Photo 2. Berry St facing east toward culvert crossing**



**Photo 3. Berry St culvert crossing of unnamed watercourse. Note narrow landform with wetland either side**



**Photo 4. Berry St culvert crossing showing one of the two twin-pipe-culverts**



**Photo 5. Unnamed watercourse and swampland north (downstream) of Berry St**



**Photo 6. McNamara Ct showing several hollow-bearing trees**



**Photo 7. McNamara Ct turning circle**



**Photo 8. Southern end of McNamara Ct showing modified sedgeland on right**



**Photo 9. Western end of Montague St facing south-east toward SPS7**



**Photo 10. SPS7 showing existing cleared and grassed adjacent land**

Up to 5 Blackbutt trees and shrubs immediately around SPS7 and small Sweet Pittosporum on right would require removal for access and APZ



**Photo 11. Existing sewer pump station SPS7 compound**



**Photo 12. Existing manhole to the west of SPS7 where existing overflow discharge occurs.**



**Photo 13. Alternative access to Huskisson WWTP**



## 2.2 Habitat and vegetation assessment

Vegetation (NSW Plant Community Type – 2022 revised PCTs) mapped as occurring in proximity to the site (refer to Figure 3) includes:

- PCT4009 *Shoalhaven Lowland Flats Wet Swamp Forest*. This vegetation community is associated with Swamp Sclerophyll Forest on Coastal Floodplains endangered ecological community (EEC).
- PCT3654 *Shoalhaven Lowland Bloodwood Shrub Forest*. This vegetation community is not associated with any EEC.
- PCT3544 *Coastal Sands Apple-Blackbutt Forest*. This vegetation community is not associated with any EEC.
- PCT3986 *Coastal Sands Swamp Mahogany Rush Forest*. This vegetation community is associated with Swamp Sclerophyll Forest on Coastal Floodplains EEC.
- PCT4028 *Estuarine Swamp Oak Twig-rush Forest*. This vegetation community is associated with NSW Swamp Oak Floodplain Forest EEC and Commonwealth Coastal Swamp Oak Forest EEC.
- PCT4056 *Southern Estuarine Swamp Paperbark Creekflat Scrub*. This vegetation community is associated with NSW Swamp Oak Floodplain Forest EEC.
- PCT3273 *South Coast Lowland Shrub-Grass Forest*. This vegetation community is not associated with any EEC.

Native vegetation occurring along the western portion of Berry St toward the WWTP entrance is shrubby dry sclerophyll forest dominated by Scribbly Gum *Eucalyptus racemosa*, Stringybark *E. globoidea* and *E. capitellata* and Red Bloodwood *Corymbia gummifera* trees, with dense shrubby

mid-storey including Sweet Pittosporum *Pittosporum undulatum*, Bracken Fern *Pteridium esculentum*, *Hakea* species and Mat-rush *Lomandra* species. This vegetation is considered most consistent with PCT3654, with influence from PCT3273.

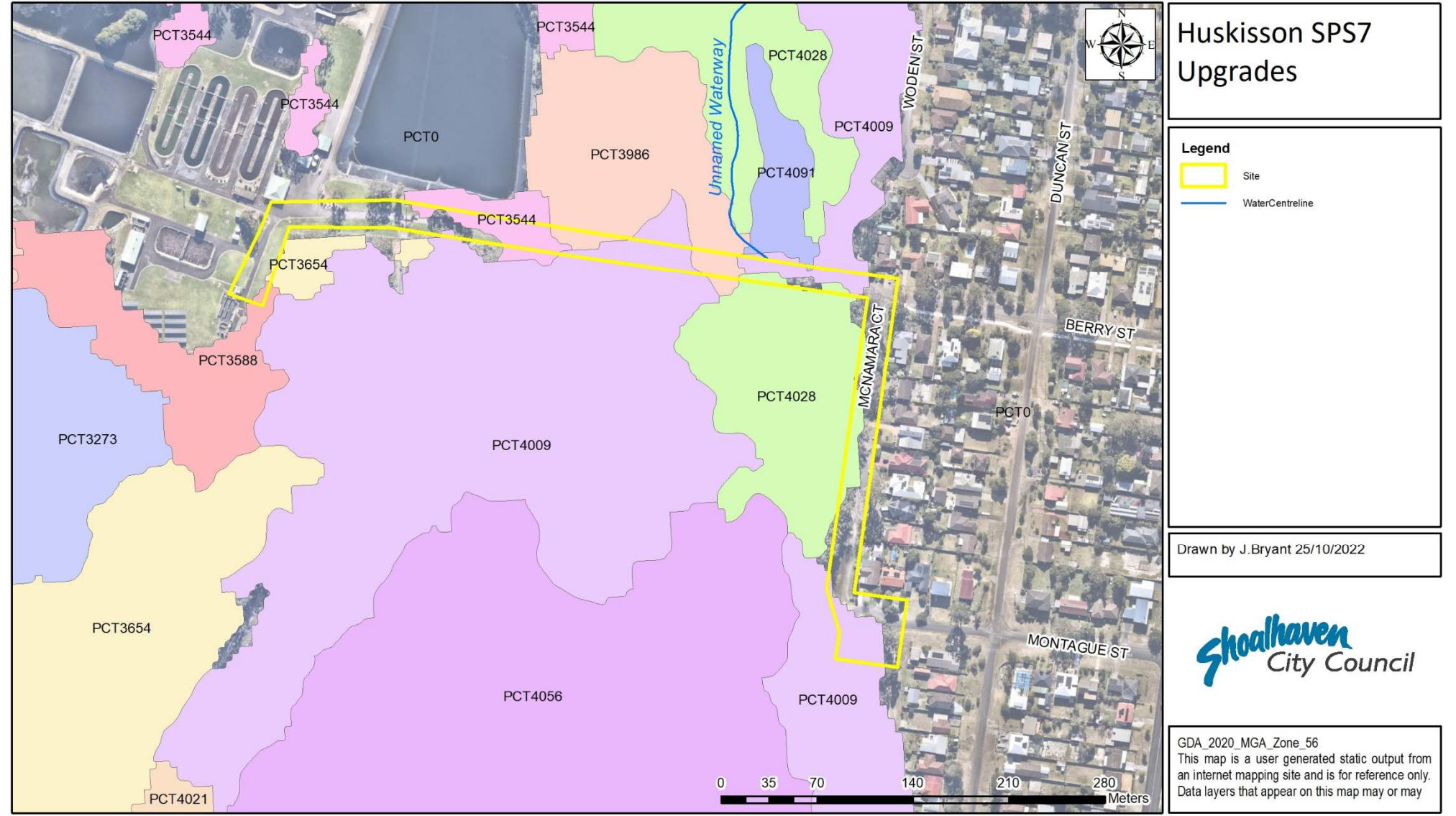
The dry sclerophyll vegetation adjacent to Berry St transitions to swampy sclerophyll vegetation consistent with PCT4009 to the north and south of Berry St, featuring Swamp Mahogany *Eucalyptus robusta*, Red-fruit Saw-sedge *Gahnia sieberiana*, Coastal Tea-tree *Leptospermum polygalifolium* subsp. *polygalifolium* and Tick Bush *Kunzea ambigua*.

The managed (mown) verge along Berry St contains large areas dominated by exotic Buffalo Grass *\*Stenotaphrum secundatum* with other exotic invasive species including Parramatta Grass *\*Sporobolus africanus*, White Clover *\*Trifolium repens* and Paddy's Lucerne *\*Sida rhombifolia*. Less disturbed areas also occur which contain native groundcover species including Kidney Weed *Dichondra repens*, Blady Grass *Imperata cylindrica*, Native Violet *Viola hederacea* and Weeping Meadow Grass *Microlaena stipoides*.

The swamp and unnamed creek tributary of Moona Moona Creek in the vicinity of the Berry St culvert crossing features emergent dense Sea Rush *Juncus kraussii* and scattered Swamp She-oak *Casuarina glauca* and Swamp Paperbark *Melaleuca ericifolia*, consistent with PCT4028, becoming PCT4056 to the south.

The open road verge along McNamara Ct contains scattered large remnant trees of PCT3654 including Scribbly Gum, Blackbutt *Eucalyptus pilularis*, Saw-tooth Banksia *Banksia serrata* and Silvertop Ash *E.sieberi*, turfed with Buffalo Grass. PCT4009 occurs on the west side of the road dominated by Swamp Mahogany, Red-fruit Saw-sedge, Coastal Tea-tree and Pouched Coral Fern *Gleichenia dicarpa*.

**Figure 3. Vegetation (NSW Plant Community Type – 2022 revised PCTs) mapped as occurring in the locality of the site**



A shallow, modified swamp adjacent to the SUP in the southern portion of McNamara Ct is dominated by exotic sedges including *Isolepis prolifera*, *Cyperus brevis* and *Juncus cognatus*, with native sedges including *Juncus planifolius* and *Cyperus polystachyos* also occurring.

Dry sclerophyll forest PCT3654 occurs to west of SPS7 at the junction of McNamara Ct and Montague St, dominated by Blackbutt trees, with disturbed understorey including Fern-leaf Wattle *Acacia filicifolia*, Black Wattle *A.mearnsii*, Sweet Pittosporum and Needlebush *Hakea sericea*.

A list of flora species recorded over the site is provided in Table 3 below.

Mapped endangered ecological communities (EECs) based on Shoalhaven Biometric mapping is presented in Figure 5. A revised map of EECs occurring in proximity to the site is presented in Figure 6 which is informed by PCT community associations, on-ground site assessment of existing vegetation and available aerial imagery. Swamp Oak Floodplain Forest EEC was observed to occur following the unnamed watercourse and is assumed to expand within the upstream swamp (not confirmed, but apparent from aerial imagery). Swamp Sclerophyll Forest EEC was observed to occur south of a narrow band of dry sclerophyll forest adjacent to Berry St and adjacent to McNamara Ct. Bands of dry sclerophyll forest occur on the corner of Berry St and south from Montague St.

Low-quality, potential threatened terrestrial orchid habitat was considered to occur along road verges where disturbance level was not high and native groundcover species occurred, with potential habitat extending into forested areas with moderately open mid-storey. Refer to Figure 5 below.

A total of eleven Hollow-bearing trees (HBTs) were recorded within the site, most occurring in the northern portion of McNamara Ct (refer to Table 2 and Figures 5 and 6 below). Hollows within these trees ranged from less than 5cm diameter up to 30cm diameter, providing potential nesting, roosting and den habitat for a range of bird, microbat and arboreal mammal species.

**Table 2. Habitat features and threatened species recorded within the site (coordinates GDA94:MGA56)**

Habitat feature	Easting	Northing	Description
1685	287285.7	6117956.5	Large Scribbly Gum with significant multiple hollows (5cm, 10cm, 15cm dia. plus 30cm chimney)
1688	287593.6	6117911.2	Large Scribbly Gum with multiple hollows (5cm, 10cm, 20cm dia.)
1689	287590.9	6117892.1	Saw-tooth Banksia with small hollows (<5cm dia.)
1690	287600.5	6117885.5	Silvertop Ash with hollow (10cm dia.)
1691	287588.9	6117880.1	Saw-tooth Banksia with small hollows (5cm dia.)
1693	287590.6	6117874.6	Scribbly Gum with hollow (20cm dia.)
1694	287598.5	6117861.2	Magenta Lilly Pilly <i>Syzygium paniculatum</i> (threatened tree)
1695	287593.4	6117847.3	Scribbly Gum with significant multiple hollows (5cm, 10cm, 25cm, 30cm dia.)
1697	287593.9	6117769.2	Very large Blackbutt with multiple hollows (5cm, 10cm dia.)
1700	287572.0	6117662.1	Large Blackbutt significant tree with possible hollows
1702	287584.8	6117668.3	Scribbly Gum with hollow (10cm dia. chimney)
1704	287585.4	6117930.9	Large stag with multiple hollows
1705	287608.6	6117681.9	Magenta Lilly Pilly <i>Syzygium paniculatum</i> (threatened tree)

Table 3. Flora species recorded over the site

**Canopy and overstorey trees**

*Corymbia gummifera* (Red Bloodwood)  
*Eucalyptus botryoides* (Bangalay)  
*Eucalyptus capitellata* (Brown Stringybark)  
*Eucalyptus globoidea* (White Stringybark)  
*Eucalyptus pilularis* (Blackbutt)  
*Eucalyptus racemosa* (Scribbly Gum)  
*Eucalyptus robusta* (Swamp Mahogany)  
*Eucalyptus sieberi* (Silvertop Ash)

**Mid-storey trees and shrubs**

*Allocasuarina littoralis* (Black She-oak)  
*Acacia filicifolia* (Fern-leaved Wattle)  
*Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle)  
*Acacia mearnsii* (Black Wattle)  
*Banksia ericifolia* (Heath-leaved Banksia)  
*Banksia serrata* (Saw-toothed Banksia)  
*Callistemon linearis* (Narrow-leaved Bottlebrush)  
*Callistemon salignus* (Willow-leaved Bottlebrush)  
*Casuarina glauca* (Swamp She-oak)  
*Exocarpus cupressiformis* (Cherry Ballart)  
*Ficinia nodosa* (Knobby Club-rush)  
*Gahnia sieberiana* (Saw Sedge)  
*Hakea salicifolia* (Willow-leaved Hakea)  
*Hakea sericea* (Needlebush)  
*Hakea teretifolia* (Needlebush)  
*Hibbertia scandens* (Golden Guinea Flower)  
*Kunzea ambigua* (Tick Bush)  
*Leptospermum juniperinum* (prickly Tea-tree)  
*Leptospermum polygalifolium* subsp. *polygalifolium* (Lemon-scented Tea Tree)  
*Melaleuca ericifolia* (Swamp Paperbark)  
*Melaleuca linarifolia* (Flax-leaved Paperbark)  
*Parsonsia straminea* (Common Silkpod)  
*Pittosporum undulatum* (Sweet Pittosporum)  
*Syzygium paniculatum* (Magenta Lilly Pilly)

**Groundcover species**

*Cynodon dactylon* (Couch)  
*Dianella caerulea* (Blue Flax Lily)  
*Diplodium* spp. (Hyacinth Orchid)  
*Entolasia marginata* (Wiry Panic Grass)  
*Gleichenia dicarpa* (Pouched Coral Fern)  
*Hardenbergia violacea* (Purple Coral Pea)  
*Juncus krausii* (Sea Rush)  
*Juncus planifolius*  
*Lomandra longifolia* (Spiny Mat-rush)  
*Lomandra* spp.  
*Machaerina juncea* (Bare Twig Rush)  
*Machaerina teretifolia*  
*Microtis* spp. (Gnat Orchid)  
*Platylobium formosum* (Handsome Flat Pea)  
*Pteridium esculentum* (Bracken Fern)

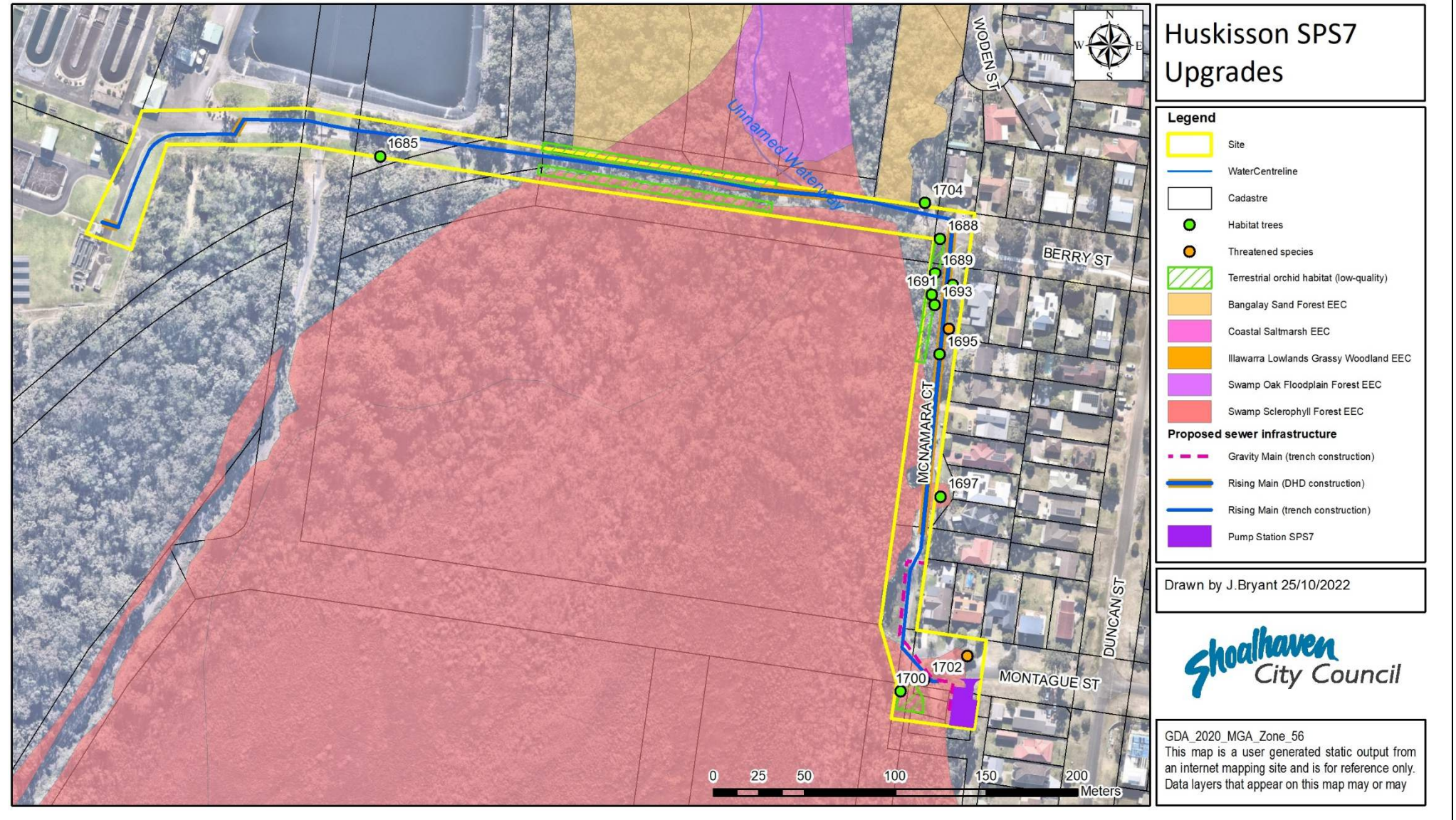
*Pultenaea villifera* (Hairy Bush Pea)  
*Schoenus* spp.  
*Selaginella uliginosa* (Swamp Selaginella)  
*Smilax glycyphylla* (Sweet Sarsparilla)  
*Triglochin microtuberosum* (Water Ribbons)

Disturbed and modified verge areas

\**Bidens pilosa* (Farmer's Friends)  
\**Cyperus eragrostis* (Umbrella Sedge)  
\**Cyperus brevis*  
*Cyperus polystachyos*  
*Dichondra repens* (Kidney Weed)  
\**Ehrharta erecta* (Panic Grass)  
\**Eragrostis curvula* (African Lovegrass)  
*Euchiton* spp. (Cudweed)  
*Gonocarpus teucroides* (Raspwort)  
\**Hypochoeris* spp. (Cat's Ears)  
*Imperata cylindrica* (Blady Grass)  
*Isolepis inundata*  
\**Isolepis prolifera*  
\**Juncus cognatus*  
*Juncus bufonius* (Toad Rush)  
*Juncus planifolius*  
*Microlaena stipoides* (Weeping Meadow Grass)  
\**Medicago* spp. (Burr Medic)  
\**Plantago lanceolata* (Plantain)  
\**Sida rhombifolia* (Paddy's Lucerne)  
\**Stenotaphrum secundatum* (Buffalo grass)  
\**Sporobolus africanus* (Parramatta Grass)  
\**Trifolium repens* (White Clover)  
*Triglochin striata* (Streaked Arrow Grass)  
*Viola hederacea* (Native Violet)

\* Denotes exotic species

Figure 5. Habitat features, threatened flora and mapped endangered ecological communities



**Figure 6. Habitat features, threatened flora with revised endangered ecological communities**

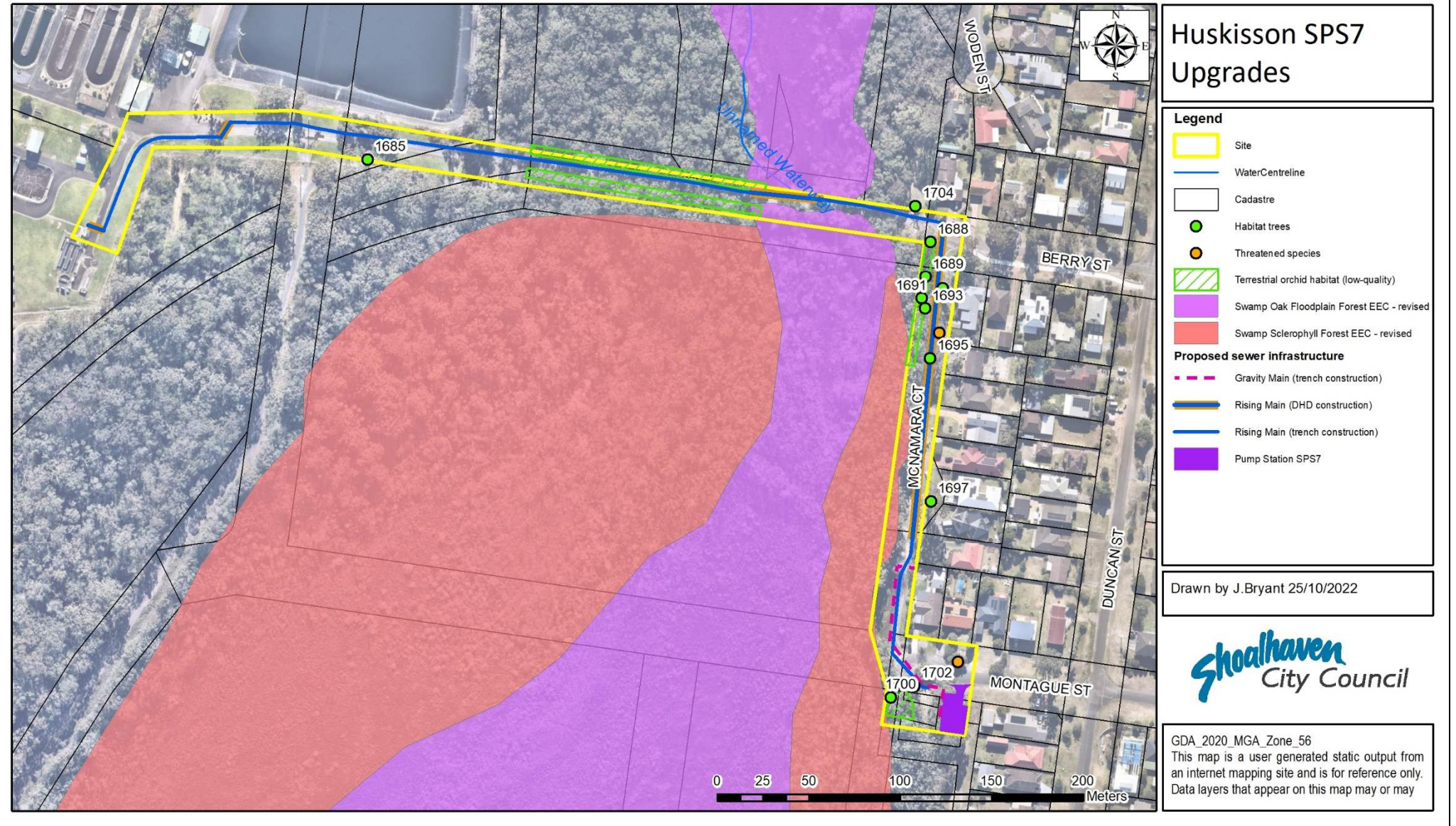
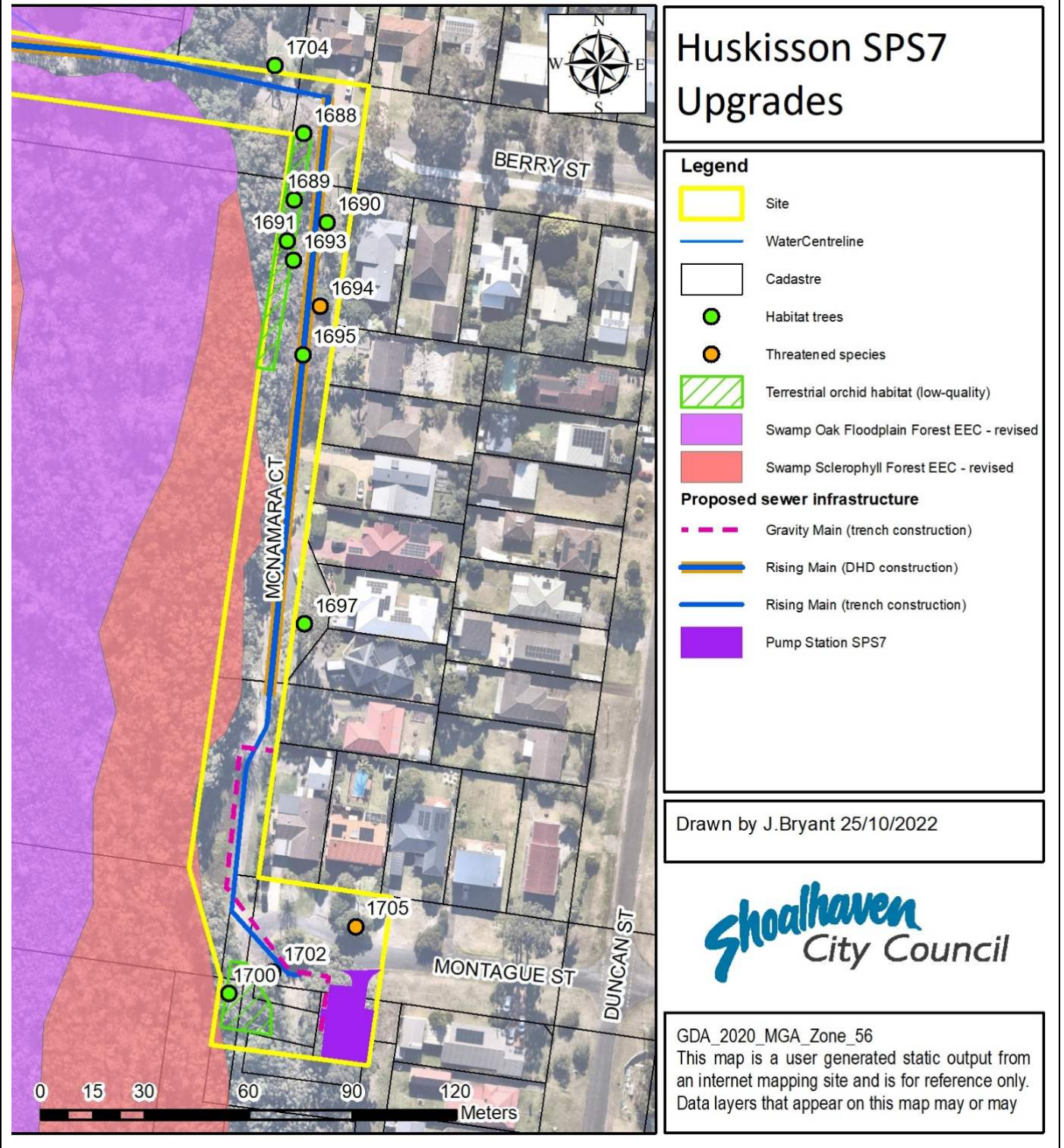


Figure 7. Habitat features - McNamara Ct detail - with revised EECs



### 2.3 Threatened species and targeted survey results

Vegetation and habitat assessment undertaken on 24<sup>th</sup> November 2022 included targeted survey for non-cryptic threatened flora species including *Banksia Vincentia*, *Melaleuca biconvexa* and *Syzygium paniculatum* and search for signs of threatened fauna species.

Two *Syzygium paniculatum* (Magenta Lilly Pilly) trees were recorded in the road verges of McNamara Ct and Montague St. This tree is a commonly planted as a street tree, but is assumed naturally occurring within the site due to the advanced age of the trees, confirmed association with existing vegetation types and absence of evidence to the contrary.

*Banksia vincentia* and *Melaleuca biconvexa* were not observed and as conspicuous species, are therefore considered not to occur on the site.

Targeted surveys for threatened terrestrial orchids *Calochilus pulchellus* and *Rhizanthella slateri*; *Cryptostylis hunteriana*; *Genoplesium baueri*; and *Pterostylis ventricosa* were carried out on 24<sup>th</sup> November 2022, 24<sup>th</sup> January 2023, 20<sup>th</sup> February 2023 and 24<sup>th</sup> April 2023 respectively, following confirmation of the species flowering at reference sites (*Calochilus pulchellus* – Vincentia; *Cryptostylis hunteriana* – Yerriyong and Burrill Lake; *Genoplesium baueri* – North Nowra; *Pterostylis ventricosa* – Falls Creek; refer to Photos 13, 14 and 15 below). Note that no reference site was known for *Rhizanthella slateri*, so this species was not confirmed as flowering, but survey was undertaken within the relevant prescribed period (NSW Government 2022). Note also that *Calochilus pulchellus* plants at the Vincentia reference site were finishing flowering and forming fruit, but still identifiable. Survey for each of these species was conducted through the terrestrial orchid habitat indicated in Figures 6 and 7, extending 5 metres from the road pavement where present, through the cleared verge and into adjacent bushland. Available habitat was considered low-quality, being disturbed and generally dominated by Buffalo grass along the mown verges. No *Calochilus pulchellus*, *Rhizanthella slateri*, *Cryptostylis pulchella*, *Genoplesium baueri* or *Pterostylis ventricosa* plants were found. It is therefore concluded that these species do not occur within or in close proximity to the site and would therefore not be impacted by the proposal.

No suitable habitat for other threatened terrestrial orchid species including *Caladenia tessellata* and *Prasophyllum affine* was considered to occur. Refer to Likelihood of Occurrence Table in Appendix B for more information.

No Glossy Black Cockatoo (*Calyptorhynchus lathami*) feed trees (i.e. *Allocasuarina littoralis* with characteristic chewed cones), nor Yellow-bellied Glider (*Petaurus australis*) feed trees (i.e. e.g. *Corymbia gummifera* or *Eucalyptus punctata* with v-shaped feeding scars) occur within or in close proximity to the site. No signs of potential threatened fauna use of the site (e.g. bandicoot diggings, owl white-wash or other threatened fauna scats) were noted.

No targeted nocturnal survey was undertaken as this was not considered necessary to inform the REF.

Photo 13 (far left). *Calochillus pulchellus* at Vincentia reference site (24<sup>th</sup> November 2022).

Photo 14 (mid-left). *Cryptostylis hunteriana* at Burrill Lake reference site (24<sup>th</sup> January 2023).

Photo 15 (mid-right). *Genoplesium baueri* at North Nowra reference site (20<sup>th</sup> February 2023).

Photo 16 (far right). *Pterostylis ventricosa* at Falls Creek reference site (21<sup>st</sup> April 2023).



### 3. ASSESSMENT OF LIKELY IMPACTS ON THE ENVIRONMENT

#### 3.1 Impacts associated with the proposal

The proposal would involve the following disturbance and direct impacts:

- Removal of native vegetation including:
  - the removal of one Sweet Pittosporum and three planted ornamental trees (Cocos Palm, Liquidamber and Bottlebrush); and
  - the pruning of native trees, clearing of mid-storey vegetation and possible removal of up to five Blackbutt trees (non-hollow-bearing) in the vicinity of the SPS7 compound for construction of new infrastructure and establishment of the APZ (10 m defendable space buffer which is clear of understorey vegetation, and with disconnected tree canopy around the SPS7 compound, and no tree canopy overhanging within 2m of the switch room building);
  - minimal removal of / impact on Swamp She-oak suckers and saplings within the Berry St road verge in the vicinity of the unnamed watercourse culvert crossing.
  - impact on native groundcovers in managed (mown) road verges.
- Excavation including for:
  - Construction of new pump well (5.0 m diameter and 5.1 m deep approx. below existing surface level) and new emergency storage well (12.0 m long x 7.0 m wide x 2.5 m deep).
  - Installation of Rising Main line (780 m of DN400 or DN450), Gravity Main line (240 m of DN600) and pits to variable depths ranging from 1.0 m to 4.6 m below existing surface level.

The Sewer Gravity Main upgrade would be limited to the south of the site and undertaken with trenching construction, aligned to avoid habitat features and significant or sensitive environmental constraints.

The Sewer Rising Main upgrade would occur from SPS7 through to the Huskisson Sewage Treatment Plant and would be undertaken with a combination of trenching and direct horizontal drilling (DHD) construction, with DHD utilised to avoid habitat features and significant or sensitive environmental constraints, including coastal wetland and waterways.
  - Shaping of a swale channel between the SPS7 and the manhole immediately to the west to define and manage overflow discharge.

Other potential impacts on the environment, including indirect impacts have been considered, including:

- Impacts on threatened species;
- Impacts on indigenous and non-indigenous heritage;
- Impacts on water quality, the riparian zone and key fish habitat;
- Impacts associated with flood liable land;
- Impacts associated with acid sulfate soils
- Operational impacts including sound and odour.

Each of these is discussed below.

### 3.2 Threatened species impact assessment (NSW)

Section 1.7 of the EP&A Act 1979 applies the provisions of Part 7 of the NSW *Biodiversity Conservation Act 2016* and Part 7A of the *NSW Fisheries Management Act 1994* that relate to the operation of the Act in connection with the terrestrial and aquatic environment. Each are addressed below.

#### 3.2.1 Part 7A Fisheries Management Act 1994

Part 7A relates to threatened species conservation.

Berry St crosses an unnamed 3rd order (Strahler) watercourse tributary of Moona Moona Creek which forms a swampland in the vicinity of the crossing, with emergent sedges, trees and shrubs (predominantly Sea Rush *Juncus kraussii*, with scattered Swamp She-oak *Casuarina glauca* and Swamp Paperbark *Melaleuca ericifolia*) and open water bodies. Proposed works along Berry St would occur in close proximity to this watercourse and swampland.

The Berry St culvert crossing of the watercourse is situated approximately 650m upstream of Moona Moona Creek via a meandering watercourse (refer to Photo 4), with this junction occurring over 900m upstream from Jervis Bay.

No suitable habitat exists within or in close proximity to the site for threatened species listed under the Act. There are no threatened species listed under the Act which are mapped as occurring in proximity to the site<sup>1</sup>, or likely to occur in proximity to the site.

No threatened marine fauna listed under the Act, would be directly impacted by the proposal.

The proposal would not create a new barrier to movement within the creek and is unlikely to result in indirect impacts which would affect threatened aquatic species or their habitats.

Safeguards and mitigation measures including sediment and erosion controls would be implemented during construction works to minimise the risk of indirect impacts on marine fauna and habitat downstream of the site.

Operation of the infrastructure post-upgrade is not anticipated to involve any significant risk of impact on marine fauna or habitat. Refer to Section 3.6 of this REF for more information.

Further consideration of Parts 1 through 6 of the NSW DPI Threatened species assessment criteria, which considers impacts to threatened species, habitat of threatened species, and endangered ecological communities listed under the Act, is not warranted.

As demonstrated in Table 2 below (Part 7 of NSW DPI Threatened species assessment criteria), the proposal would not contribute significantly to key threatening processes, as listed under Part 7A of the Act.

It is concluded that the proposal is unlikely to result in any impact on threatened entities or their habitat; or contribute significantly to key threatening processes, as listed under Part 7A of the Act.

The proposed activity therefore does not require an Environmental Impact Statement (EIS) or Species Impact Statement (SIS) under the Act.

---

<sup>1</sup> Fisheries NSW Spatial Data Portal [https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries\\_Data\\_Portal](https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal)

**Table 4. Fisheries Management Act – Key Threatening Process Assessment**

Key Threatening Process	Assessment
Degradation of native riparian vegetation along NSW water courses	<p>Low adverse – The proposal would not involve the removal of any trees or large shrubs within a riparian corridor, but may require removal of Swamp She-oak suckers and saplings along the constructed embankments of the Berry St culvert crossing.</p> <p>Proposed excavation would occur within the constructed road and would not destabilise embankments.</p> <p>Sediment and erosion controls would minimise the risk of impacts on water quality during construction.</p>
Hook and line fishing in areas important for the survival on threatened fish species	Not applicable – proposal does not comprise or facilitate hook and line fishing.
Human-caused climate change	Not applicable – the proposal does not contribute to human-cause climate change.
Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams	Not applicable – the proposal does not involve installation or operation of in-stream structures or other mechanisms that alter flow.
Introduction of fish to waters within a river catchment outside their range	Not applicable – the proposal does not involve releasing fish.
Introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW	Not applicable – the proposal does not involve the introduction of non-indigenous fish.
Removal of large woody debris from NSW rivers and streams	Not applicable – the proposal does not involve the removal of woody debris.
The current shark meshing program in NSW waters	Not applicable – the proposal does not involve shark meshing.

### 3.2.2 Part 7 Biodiversity Conservation Act 2016

An assessment of the potential for NSW threatened flora and fauna species occurring on-site or otherwise being impacted by the proposal was undertaken. The following threatened species or endangered ecological communities are known to occur on-site or are considered to have some potential to occur on-site or be otherwise impacted by the proposal:

- Magenta Lilly Pilly *Syzygium paniculatum*
- Giant Burrowing Frog *Heleioporus australiacus*
- Green and Golden Bell Frog *Litoria aurea*
- East Coast Freetail-Bat *Micronomus norfolkensis*
- Eastern Bristlebird- *Dasyornis brachypterus*
- Eastern False Pipistrelle *Falsistrellus tasmaniensis*
- Greater Broad-nosed Bat *Scoteanax ruepelli*

- Southern Myotis (Large-footed Myotis) *Myotis Macropus*
- Australasian Bittern *Botaurus poiciloptilus*
- Australian Painted Snipe *Rostratula australis*
- Black Bittern *Ixobrychus flavicollis*
- Gang-gang Cockatoo *Callocephalon fimbriatum*
- Glossy Black-cockatoo *Calyptorhynchus lathami*
- Little Lorikeet *Glossopsitta pusilla*
- Masked Owl *Tyto novaehollandiae*
- Powerful Owl *Ninox strenua*
- Sooty Owl *Tyto tenebricosa*
- Turquoise Parrot *Neophema pulchella*
- Eastern Chestnut Mouse *Pseudomys gracilicaudatus*
- Eastern Pygmy-possum *Cercatetus nanus*
- Greater Glider *Petauroides Volans*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Southern Brown Bandicoot (eastern) *Isodon obesulus obesulus*
- White-footed Dunnart *Sminthopsis leucopus*
- Yellow-bellied Glider *Petaurus Australis*
- Giant Dragonfly *Petalura gigantea*
- *Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*
- *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*

Section 7.3 of the Act provides a 'five-part' test to determine whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Each Part is addressed below:

***Part A – In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be place at risk of extinction.***

#### Magenta Lilly Pilly (*Syzygium paniculatum*)

The Magenta Lilly Pilly is a small to medium sized rainforest tree that grows to 8 m tall. The bark is flaky and the leaves are shiny, dark-green above and paler underneath. Leaves can be up to 10 cm long. Plants produce white flower-clusters at the end of each branch, between November and February. The petals are small and are accompanied by prominent long stamens. The deep magenta fruits, which may be spherical or egg-shaped, mature in May, and contain a single seed. The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest, occurring on the south coast on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest (OEH 2019).

Two Magenta Lilly Pilly trees were found to occur within the site on McNamara Ct and Montague St. The species has commonly been planted as an ornamental street tree and the individuals recorded may have been planted, but given their advanced size and the species being associated

with locally occurring vegetation communities, they are considered to potentially be naturally occurring.

Works would avoid any impact on these trees. The individual on Montague St occurs in the road verge approximately opposite SPS7 and is outside the footprint of works. The individual on McNamara Ct occurs in an area where construction methodology would utilise direct horizontal drilling (DHD) to construct the new 700 mm pipe at a depth of approximately 1.7 m to 2.2 m beneath the road pavement and verge, thereby avoiding the need to remove trees along this alignment, and minimising impacts on the root zone.

The proposal would not affect hydraulic conditions or impact on vegetation communities or connectivity that might result in impacts on habitat affecting this species.

It is therefore considered unlikely that the proposed works will have an adverse effect on the lifecycle of the Magenta Lilly Pilly such that a local population of the species is likely to be placed at risk of extinction.

#### Threatened frogs: Giant Burrowing Frog (*Heleioporus australiacus*) and Green and Golden Bell Frog (*Litoria aurea*)

Giant Burrowing Frogs usually live along clear, small slowly flowing water courses which traverse plateaus and broad upland gullies. They also live adjacent to stream head-waters where they prefer permanently moist soaks and pondages. Many breeding sites have been found to be associated with shallow temporary ponds receiving seepage and the ponded sections of slow flowing creeks that drain ridges and plateaus. Giant Burrowing Frogs have not been recorded breeding in waters that are even mildly polluted and are adversely affected by small pH changes. Burrows are excavated into the earth around, or associated with rocks fissures or boulders, probably to take advantage of water run-off from outcroppings. It has also been reported that yabbie holes are utilised along the beds and banks of drying creeks. Opportunistic use of the excavations of small mammals may also be made. The tadpoles are quite easy to distinguish and unlikely to be confused with other species within its range and are often present over extended periods due to their slow growth rate. They can attain a very large size prior to metamorphosis (up to 75mm), are relatively short-tailed and very dark brown to blackish dorsally and bluish-grey ventrally. (NPWS 2001).

Giant Burrowing Frog is found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. It spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Most individuals will not attempt to breed every year. When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. Males show strong territoriality at breeding sites. This species breeds mainly in autumn, but has been recorded calling throughout the year. Egg masses are foamy with an average of approximately 500-800 eggs and are laid in burrows or under vegetation in small pools. After rains, tadpoles are washed into larger pools where they complete their development in ponds or ponded areas of the creekline. Tadpole development ranges from around

12 weeks duration to up to 12 months with late developing tadpoles overwintering and completing development when warmer temperatures return (OEH 2017d).

Green and Golden Bell Frog inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat for the species includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), with a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs (OEH 2022g).

A population of Giant Burrowing Frog occurs approximately 1.5 km south of the site, known to utilise ephemeral pools in narrow streams within grassy, sclerophyll forest as breeding habitat.

Records of Green and Golden Bell Frog in the surrounding locality (Huskisson – Vincentia area) are sparse – both geographically and temporally, suggesting that there are no local populations occurring near the site.

Neither of these frog species are likely to occur within the site, however, marginal suitable habitat occurs, associated with the wetland and adjacent forest.

No impact on the wetland, water quality or hydrology is likely to occur as a result of the proposal.

Vegetation removal would be minimal and would not encroach into the wetland itself.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

No habitat considered important for these species shall be removed or otherwise impacted. No fragmentation of important habitat or severing of habitat corridors will occur as a result of the proposal. The proposal would not impose barriers to movement of the species.

The proposal would improve the function and capacity of the sewage system and would therefore reduce risks associated with overflow and contamination.

It is therefore considered unlikely that the proposed works will have an adverse effect on the lifecycle of the Giant Burrowing Frog or Green and Golden Bell Frog such that a local population of these species is likely to be placed at risk of extinction.

Threatened microchiropteran bats: East Coast Freetail-Bat (*Micronomus norfolkensis*), Eastern False Pipistrelle *Falsistrellus tasmaniensis*, Greater Broad-nosed Bat *Scoteanax ruepelli* and Southern Myotis (Large-footed Myotis) (*Myotis Macropus*)

East Coast Freetail-Bat (*Micronomus norfolkensis*) occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. The species roosts mainly in tree hollows but will also roost under bark or in man-made structures. It will usually change breeding sites regularly (every few days), rendering it very difficult to confirm breeding sites. It has been known to occasionally aggregate in large breeding groups (including in buildings). It is usually solitary but has also been recorded roosting communally. The Eastern Freetail-Bat is considered to be probably insectivorous (OEH 2022b).

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) prefers moist habitats, with trees taller than 20 m. The species generally roosts in eucalypt hollows but has also been found under loose bark

on trees or in buildings, however roost requirements poorly known. It hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. It hibernates in winter. Females are pregnant in late spring to early summer (OEH 2017c).

Greater Broad-nosed Bat (*Scoteanax rueppellii*) utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. The species forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young (OEH 2022f).

Southern Myotis (*Myotis macropus*) generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. The species is dependent on waterways with pools of 3m wide or greater for foraging, with habitat surrounding the waterways (usually within 200m) being used for breeding and roosting. The species will forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December (OEH 2020b).

Microbat young are typically born around November-December, with weaning around the following January-February (Richards & Hall 2012)

The site is considered to contain suitable foraging habitat for each of these microbats above tree canopies and along flyways, in addition to roosting habitat and potential breeding habitat within hollow-bearing trees (HBTs) throughout the site.

Vegetation removal as part of the proposal would be minimal (refer to section 3.1) and would not impact foraging habitat for microbat species to more than a negligible extent.

No potential roosting or breeding habitat would be removed.

Extensive vegetation exists contiguous with the site, associated with the wetland and Jervis Bay National Park.

Tree removal would be limited to immediately around SPS7 on existing vegetation edges and would not result in fragmentation.

Hollow-bearing trees would be avoided either by the alignment or by construction methodology. Direct horizontal drilling (DHD) would be utilised along McNamara Ct for example, to avoid the need to remove any HBTs in this location.

No barriers to movement would be introduced.

Works would occur during normal construction hours, so would not affect the nocturnal foraging activities of these species.

The proposal would therefore avoid impact on breeding habitat, would avoid direct impact on individuals, and would not remove habitat which is critical to the survival of any threatened microbat species.

It is therefore considered unlikely that East Coast Freetail-Bat, Eastern False Pipistrelle, Greater Broad-nosed Bat, Large (Eastern) and Southern Myotis (Large-footed Myotis) would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the

lifecycle of these species such that a viable local population of any of these species is likely to be placed at risk of extinction.

Threatened wetland birds: Australasian Bittern (*Botaurus poiciloptilus*), Australian Painted Snipe (*Rostratula australis*) and Black Bittern (*Ixobrychus flavicollis*)

The Australasian Bittern is a large, stocky bird, reaching up to 75 cm in length. It has a long, thick neck and a straight, brownish-yellow bill. Its upper surface is mottled brown and its undersurface is buff, with dark brown stripes, except for a pale throat. The eyes are yellow and there is a pale eyebrow. The feet and legs are pale green. Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. This species favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). The Australasian Bittern hides during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January with nests built in secluded places in densely vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch (OEH 2017a).

The Australian Painted Snipe is small freshwater wader, with a long bill that droops slightly at the tip. The female has a chestnut-black hood with a bold white eye-patch and a cream stripe along the middle of the crown. The back and wings are patterned bronzy-greenish-grey with a few cream streaks and the underparts are white. The male is slightly smaller and has greyer, less contrasting patterns, but also has large cream spots on the wings. The Australian Painted Snipe is restricted to Australia. Most records are from the south-east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. The species prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. It nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Incubation and care of young is all undertaken by the male only. The species forages nocturnally on mud-flats and in shallow water, feeding on worms, molluscs, insects and some plant-matter (OEH 2017b).

The Black Bittern inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. The species feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, Black Bittern roosts in trees or on the ground amongst dense reeds. When disturbed, it freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds) or will fly up to a branch or flush for cover where it will freeze again. Black Bittern is generally solitary, but occurs in pairs during the breeding season, from December to March. Like other bitterns, but unlike most herons, nesting is solitary. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. Between three and five eggs are laid and both parents incubate and rear the young (OEH 2018a).

Suitable habitat for each of these species occurs within and in proximity to the site, associated with the wetland, particularly in proximity to the culvert crossing of the unnamed creek tributary of Moona Moona Creek on Berry Street featuring open waterbodies with emergent sedges and trees.

No impact on wetland vegetation would occur as part of the proposal.

Construction methodology in proximity to the unnamed creek crossing would utilise direct horizontal drilling (DHD) to avoid impacts on the waterway.

Vegetation removal in proximity to the waterway would be limited to the removal of Swamp She-oak suckers and saplings that occur within the road pavement and immediate shoulder, to the east and west of where DHD construction would occur on Berry Street.

Works would involve sediment and erosion controls to minimise the risk of sediment movement into waterways.

These species are shy and unlikely to occur in close proximity to Berry Street particularly during works.

Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.

It is therefore considered unlikely that Australasian Bittern, Australian Painted Snipe and Black Bittern would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of these species such that a viable local population of any of these species is likely to be placed at risk of extinction.

#### Eastern Bristlebird (*Dasyornis brachypterus*)

Eastern Bristlebirds are medium-sized, long-tailed, brown and rufous birds. They are shy and cryptic and mostly occur in dense, coastal vegetation of three disjunct areas of south-eastern Australia: Northern - southern Queensland/northern NSW, Central - Barren Ground Nature Reserve (NR), Budderoo NR, Woronora Plateau, Jervis Bay National Park (NP), Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. The central population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. Nests are elliptical domes constructed on or near the ground amongst dense vegetation. Two eggs are laid during August to February; producing more than one clutch a year is rare, and recruitment into the population is low (OEH 2018b).

Marginal habitat for this species occurs within and in proximity to the site, in heath vegetation associated with the wetland, however, optimal, intact habitat for the species occurs further west of the site and the likelihood of the species utilising habitat in proximity to site is low.

No impact on wetland vegetation would occur as part of the proposal. No removal of habitat for this species would occur.

Works would involve sediment and erosion controls to minimise the risk of sediment movement into waterways and wetland vegetation.

It is therefore considered unlikely that Eastern Bristlebird would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Threatened parrots and cockatoos: Gang-gang Cockatoo *Callocephalon fimbriatum*, Glossy Black-cockatoo (*Calyptorhynchus lathami*), Little Lorikeet (*Glossopsitta pusilla*) and Turquoise Parrot (*Neophema pulchella*)

The Gang-gang Cockatoo generally spends spring and summer in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. It may also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests. Gang-gang Cockatoo favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. Breeding is generally from Oct-Jan. (OEH 2022d). Preferred hollows are usually vertical or pointing steeply upward (Morcombe 2004).

The Glossy Black-cockatoo (*Calyptorhynchus lathami*) inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur. Black She-oak (*Allocasuarina littoralis*) and Forest She-oak (*A. torulosa*) are important foods. Inland populations feed on a wide range of She-oaks, including Drooping She-oak, *Allocasuarina diminuta*, and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping She-oak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*). The species feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Glossy Black-cockatoo is dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May (OEH 2022e). Potential nest trees contain hollows that are; (i) at least 8 m above the ground; and (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees, and may be near-vertical or vertical (NSW Government 2022).

The Little Lorikeet forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. The species feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards. The Little Lorikeet is gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries. The species roosts in treetops, often distant from feeding areas. Nests are in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like *Allocasuarina*. The nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt. However, the survival rate of fledglings is unknown (OEH 2022h).

Turquoise Parrot is a highly distinctive bird – the male having a turquoise-blue crown, face and shoulders, bright green upperparts and a yellow/orange tinted abdomen and breast. Females and immature individuals are generally duller. The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. The species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It is usually seen in pairs or small, possibly family, groups

and have also been reported in flocks of up to thirty individuals. It prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. It forages quietly and may be quite tolerant of disturbance, however, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. The Turquoise Parrot nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust (OEH 2022k).

Potential foraging habitat (i.e. Eucalypts) for Gang-gang Cockatoo and Little Lorikeet occurs over vegetated parts of the site.

Potential foraging habitat (i.e. Black She-oak *Allocasuarina littoralis*) for Glossy Black Cockatoo occurs in dry sclerophyll forest along the western end of Berry St and in proximity to SPS7 where scattered Black She-oak trees occur. No evidence of feeding by the species (i.e. crushed cones) was observed within the site during investigations.

Marginal potential foraging habitat for Turquoise Parrot occurs in more open, grassed and woodland areas of the site.

Suitable nesting hollows for each of these birds occur within the site.

Vegetation removal as part of the proposal would be minimal (refer to section 3.1) and would not impact on foraging habitat for any of these species to more than a negligible extent.

Extensive vegetation exists contiguous with the site, associated with the wetland and Jervis Bay National Park.

Tree removal would be limited to immediately around SPS7 on existing vegetation edges and would not result in fragmentation.

Hollow-bearing trees would be avoided either by the alignment or by construction methodology. Direct horizontal drilling (DHD) would be utilised along McNamara Ct for example, to avoid the need to remove any HBTs in this location.

Fragmentation resulting from canopy and understorey gaps would be negligible and is unlikely to affect the movement of any locally occurring fauna.

It is therefore considered unlikely that the Gang-gang Cockatoo, Glossy Black Cockatoo, Little Lorikeet and Turquoise Parrot would be impacted by the proposed works and the proposed activity is unlikely to have an adverse effect on the lifecycle of the species such that a viable local population of either of these species is likely to be placed at risk of extinction.

Threatened large forest owls: Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*)

The Masked Owl is a medium-sized owl to 40 - 50 cm long, with dark eyes set in a prominent flat, heart-shaped facial disc that is encircled by a dark border. It lives in dry eucalypt forests and woodlands from sea level to 1100 m. The species is a forest owl, but often hunts along the edges of forests, including roadsides. The species' typical diet consists of tree-dwelling and ground mammals, especially rats. Breeding pairs have a large home-range of up to 1000 hectares or more. The species roosts and breeds from May-Aug in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting (OEH 2017e).

The Powerful Owl (*Ninox strenua*) inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The species requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and

hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 ha can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him. Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter (generally May-Aug), but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days (OEH 2022j).

The Sooty Owl is a medium-sized owl to 45 cm long, with dark eyes set in a prominent flat, heart-shaped facial disc. It is dark sooty-grey in colour, with large eyes in a grey face, fine white spotting above and below, and a pale belly. The Sooty Owl occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests over the coast, coastal escarpment and eastern tablelands of NSW. The species roosts by day in the hollow of a tall forest tree or in heavy vegetation and hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). The Sooty Owl nests in caves and very large tree-hollows, breeding from April to August (OEH 2017f).

Suitable foraging habitat exists for large forest owls over in proximity to the site, particularly along creek lines and vegetated or grassed flyways. Potential (low-likelihood) nesting habitat occurs in larger hollows within taller trees.

Vegetation removal as part of the proposal would be minimal (refer to section 3.1) and would not impact foraging habitat for owl species to more than a negligible extent.

Extensive vegetation exists contiguous with the site, associated with the wetland and Jervis Bay National Park.

Tree removal would be limited to immediately around SPS7 on existing vegetation edges and would not result in fragmentation.

Hollow-bearing trees would be avoided either by the alignment or by construction methodology. Direct horizontal drilling (DHD) would be utilised along McNamara Ct for example, to avoid the need to remove any HBTs in this location.

No caves would be impacted.

No barriers to movement would be introduced.

Works would occur during normal construction hours, so would not affect the nocturnal foraging activities of these species.

It is therefore considered unlikely that Masked Owl, Powerful Owl or Sooty Owl would be impacted by the proposed works and the proposed activity is unlikely to have an adverse effect on the lifecycle of the species such that a viable local population of either of these species is likely to be placed at risk of extinction.

Threatened terrestrial mammals: Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*); Eastern Pygmy Possum (*Cercartetus nanus*); Southern Brown Bandicoot (*Isodon obesulus obesulus*) and White-footed Dunnart (*Sminthopsis leucopus*)

The Eastern Chestnut Mouse is a large, stocky mouse, up to twice the body length of a House Mouse, and three to four times the weight. It is chestnut-brown above and grey underneath. Its feet, which have long brown hairs on top and are pale beneath, distinguish it from the similar and coexisting Swamp Rat *Rattus lutreolus*, which has all-dark feet, and the Bush Rat *Rattus fuscipes*, with pink feet. Its sparsely hairy tail also differs from the naked tails of the two rats. In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isolated records in the Jervis Bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again. The species feeds at night via runways through the grassy and sedge understorey, within an area of less than half a hectare. It has a broad diet of grass stems, invertebrates, fungi and seeds, with the relative significance of each component varying seasonally. Eastern Chestnut Mouse has up to three litters produced from spring to autumn; this strategy allows rapid build-up of numbers in years following fire (OEH 2022a).

Eastern Pygmy-possums are tiny (15 to 43 grams) active climbers, with almost bare, prehensile (capable of curling and gripping) tails, and big, forward-pointing ears. They are light-brown above and white below. Adults have a head and body length between 70 - 110 mm and a tail length between 75 - 105 mm. The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. It is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. The Eastern Pygmy-possum feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. It also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. The species shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts). Nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks (OEH 2022c).

The Southern Brown Bandicoot is a terrestrial marsupial with a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open

forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. The Southern Brown Bandicoot nests during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees *Xanthorrhoea* spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest. Mating occurs any time of the year, usually following heavy rain. Two or three litters of 2-4 young may be produced annually. The gestation period of 11-12 days is the shortest known of any marsupial while young remarkably become independent around 60 days after being born (OEH 2017g).

The White-footed Dunnart (*Sminthopsis leucopus*) is a mouse-like marsupial carnivore with head and body length less than 10 cm. It occurs in Tasmania and along the Victorian and southern NSW coast. The Shoalhaven area is the species' northern-most limit. The White-footed Dunnart is found in a range of different habitats across its distribution, including coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest. In NSW, the species seems to favour vegetation communities with an open understorey structure (contrasting with populations in Victoria which apparently prefer dense shrub and ground layers). It is patchily distributed across these habitats and, where present, typically occurs at low densities. Breeding populations have been recorded in logged forest shortly after disturbance, but these usually do not persist as regeneration proceeds and a dense ground cover of vegetation establishes. Home range and movement patterns of this species vary according to sex. Adult females usually have small, discrete home ranges, approximately 80 metres in length. Adult males have overlapping home ranges, approximately 100 metres in length, but are capable of making regular exploratory movements of up to 1 km. White-footed Dunnarts appear to have only one short breeding season during their lifetime. In NSW and Victoria, mating occurs in late July and August. From August to September, up to ten young are born, each about 3 mm long. At two months, the young detach from the mothers' teats and are suckled in the nest for about a month before dispersing. The White-footed Dunnart is an opportunistic carnivore that feeds on a variety of ground-dwelling invertebrates and, occasionally, small lizards. They shelter in bark nests in hollows under standing or fallen timber, burrows in the ground, piles of logging debris, in the 'skirts' of grass trees (*Xanthorrhoea* spp.) and cycads (*Macrozamia* spp.) and rock crevices (OEH 2023b).

Potential habitat for each of these species occurs within and in proximity to the site, in heath vegetation associated with the wetland, including to the west of McNamara Ct and either side of Berry St, west of the culvert crossing.

Vegetation removal required for the proposal would be minimal and would not involve any clearing of heath vegetation, or result in other impacts on heath vegetation.

No impact on the wetland, water quality or hydrology is likely to occur as a result of the proposal.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

Potential or actual acid sulfate soils which are excavated in proximity to the waterway and wetland would be treated and managed appropriately.

No habitat considered important for these species shall be removed or otherwise impacted. No fragmentation of important habitat or severing of habitat corridors will occur as a result of the proposal. The proposal would not impose barriers to movement of these species.

The proposal would improve the function and capacity of the sewage system and would therefore reduce risks associated with overflow and contamination.

It is therefore considered unlikely that Eastern Chestnut Mouse, Eastern Pygmy Possum, Southern Brown Bandicoot or White-footed Dunnart would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of these species such that a viable local population of any of these species is likely to be placed at risk of extinction.

#### Large Gliders: Southern Greater Glider *Petauroides volans* and Yellow-bellied Glider *Petaurus australis*

The Southern Greater Glider (SGG) is the largest gliding possum in Australia, with a head and body length of 35–46 cm and a long furry tail measuring 45–60 cm. The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. It shelters during the day in tree hollows and will use up to 18 hollows in their home ranges which are typically relatively small (1-3ha), but are larger in lower productivity forests and more open woodlands (up to 16 ha). Very loyal to their territory. It feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Greater Gliders are usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Females give birth to a single young in late autumn or early winter (March to June) which remains in the pouch for approximately 4 months and is independent at 9 months of age. Sexual maturity is reached in the second year. Longevity has been estimated at 15 years, so generation length is likely to be 7–8 years. The relatively low reproductive rate may render small, isolated populations in small remnants prone to extinction. The greater glider is considered to be particularly sensitive to forest clearance and to intensive logging. The greater glider is also sensitive to wildfire and is slow to recover following major disturbance. Notwithstanding relatively small home ranges, but in part because of low dispersal ability, greater gliders may be sensitive to fragmentation, have relatively low persistence in small forest fragments, and disperse poorly across vegetation that is not native forest. Modelling suggests that they require native forest patches of at least 160 km<sup>2</sup> to maintain viable populations (OEH 2023a; TSSC 2016).

The Yellow-bellied Glider (YBG) is a large, active, sociable and vocal glider. The species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. The species feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Sap is extracted by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Yellow-bellied Gliders live in small family groups of two - six individuals and are nocturnal. The species use dens, often in family groups, in hollows of large trees. The Yellow-bellied Glider is very mobile and occupies large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources. Dispersal requires continuous habitat connectivity (gliding distance around 120m). Typically produce one young per year (in high quality habitat) but during poor conditions may only breed every second year. Key threats to the species include loss of hollows (generally >30cm) and

important feed trees as a result of wildfire, in addition to landscape fragmentation. A highly vocal species with loud, high-pitched shrieks audible over 500m away (OEH 2022I).

Numerous records of YBG occur through sclerophyll forest west of the wetland and south of the Huskisson Sewage Treatment Plant.

Scattered records of SGG occur in the locality, but none in close proximity to the site (the nearest record being 1.3 km approx. south-west of SPS7).

Greater Glider is unlikely to occur within or in proximity to the site due to the disturbed history of the land and lack of availability of tall, old growth forest.

Yellow Bellied Glider may occur within and in proximity to the site. Red Bloodwood trees and other suitable food sources occur, although no characteristic glider scars were observed during site investigations.

Vegetation removal as part of the proposal would be minimal (refer to section 3.1) and would not impact foraging habitat for large glider species to more than a negligible extent.

The proposal would not involve removal of any suitable foraging or potential den habitat for Yellow Bellied Glider.

The proposal may require the removal of Blackbutt trees in proximity to SPS7 for access and establishment of the APZ, but any tree removal would be limited (up to five trees approx.), would occur on existing urban edges, would not create fragmentation or canopy gaps and would result in a negligible loss of habitat in the context of available habitat in the locality.

Extensive vegetation exists contiguous with the site, associated with the wetland and Jervis Bay National Park.

Impacts on hollow-bearing trees would be avoided either by the alignment or by construction methodology. Direct horizontal drilling (DHD) would be utilised along McNamara Ct for example, to avoid the need to remove any HBTs in this location.

No barriers to movement would be introduced.

Works would occur during normal construction hours, so would not affect the nocturnal foraging activities of these species.

It is therefore considered unlikely that Southern Greater Glider and Yellow-bellied Glider would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of these species such that a viable local population of either of these species is likely to be placed at risk of extinction.

#### Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle.

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.

Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. GHFF can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. They feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines, also foraging in cultivated gardens and fruit crops (OEH 2020a).

No GHFF camps occur in close proximity to the site. The nearest camp currently occurs at Fegen St, Huskisson, approximately 1.6 km to the north of the site<sup>2</sup>.

Foraging habitat for the Grey-headed Flying-fox exists within the site as flowering Eucalypts and Paperbarks.

This species was not observed during site surveys, however, the species is predominantly nocturnal in its feeding activities.

The proposal may require the removal of Blackbutt trees in proximity to SPS7 for access and establishment of the APZ, but any tree removal would be limited (up to five trees approx.), would occur on existing urban edges, would not create fragmentation or canopy gaps and would result in a negligible loss of habitat in the context of available habitat in the locality.

Extensive vegetation exists contiguous with the site, associated with the wetland and Jervis Bay National Park.

No barriers to movement would be introduced.

Works would occur during normal construction hours, so would not affect the nocturnal foraging activities of these species.

It is considered unlikely therefore that the Grey-headed Flying-fox would be impacted by the proposed works and the proposed activity is unlikely to have an adverse effect on the lifecycle of the species such that a viable local population of any of these species is likely to be placed at risk of extinction.

### Giant Dragonfly (*Petalura gigantea*)

The Giant Dragonfly is the third largest dragonfly in Australia and one of the largest dragonflies in the world, with males to 6 - 7.5 cm (abdomen length), females to 8 - 9.5 cm and very large larvae, up to 5 cm in length. When the dragonflies emerge from the larvae, they leave behind characteristics shells (exuviae). The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW, east of the Great Dividing Range, with known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. The species lives in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins. Males sometimes congregate waiting for females to mate with. Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under

---

<sup>2</sup> National Flying-fox Monitoring Viewer <http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>

the swamp. Larvae are slow growing and the larval stage may last 10 years or more. It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation (OEH 2021).

The main threat to the species is hydrological disturbance through longwall mining by subsidence, damage to the substrate and subsequent loss of water from the swamp. Other major threats include inappropriate fire regimes and climate change (NSW Government 2021).

Four records of the species occur in proximity to the wetland and approx. 1 km south-west of the site.

Suitable habitat for this species occurs within and in proximity to the site, associated with the wetland, particularly in proximity to the culvert crossing of the unnamed creek tributary of Moona Moona Creek on Browns Rd featuring open waterbodies with emergent sedges and trees.

No impact on the wetland, water quality or hydrology is likely to occur as a result of the proposal.

Construction methodology in proximity to the unnamed creek crossing would utilise direct horizontal drilling (DHD) to avoid impacts on the waterway.

Vegetation removal in proximity to the waterway would be limited to the removal of Swamp She-oak suckers and saplings that occur within the road pavement and immediate shoulder, to the east and west of where DHD construction would occur on Browns Rd.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.

The proposal would improve the function and capacity of the sewage system and would therefore reduce risks associated with overflow and contamination.

It is therefore considered unlikely that the proposed works will have an adverse effect on the lifecycle of the Giant Dragonfly such that a local population of this species is likely to be placed at risk of extinction.

**Part 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***

Five endangered ecological communities (EECs) are mapped as occurring in the landscape surrounding the site (based exclusively on Shoalhaven Biometric mapping), including Bangalay Sand Forest EEC, Coastal Saltmarsh EEC and Swamp Sclerophyll Forest EEC which are each indicated as being within or in close proximity to the site (refer to Figure 5).

A revised map of EECs occurring in proximity to the site is presented in Figure 6 which is informed by current NSW Plant Community Type (PCT) mapping and EEC associations, on-ground site assessment of existing vegetation and available aerial imagery. Swamp Oak Floodplain Forest EEC was observed to occur following the unnamed watercourse and is assumed to expand within the upstream swamp (not confirmed, but apparent from aerial imagery). Swamp Sclerophyll Forest

EEC was observed to occur south of a narrow band of dry sclerophyll forest adjacent to Berry St and adjacent to McNamara Ct. Bands of dry sclerophyll forest occur on the corner of Berry St and south from Montague St.

Assessments of significance are provided below for Swamp Oak Floodplain Forest EEC and Swamp Sclerophyll Forest EEC.

#### Swamp Oak Floodplain Forest

Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (SOFF) endangered ecological community is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Swamp Oak Floodplain Forest generally occurs below 20 m (rarely above 10 m) elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. The combination of features that distinguish Swamp Oak Floodplain Forest from other endangered ecological communities on the coastal floodplains include: its dominance by a tree canopy of either *Casuarina glauca* or, more rarely, *Melaleuca ericifolia* with or without subordinate tree species; the relatively low abundance of *Eucalyptus* species; and the prominent groundcover of forbs and graminoids. It generally occupies low-lying parts of floodplains, alluvial flats, drainage lines, lake margins and fringes of estuaries; habitats where flooding is periodic and soils show some influence of saline ground water. This latter habitat feature sets it apart from other floodplain communities. Swamp Oak Floodplain Forest may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. The boundaries between these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices (NSW Scientific Committee 2011a).

Within the site, vegetation in the swamp and unnamed creek tributary of Moona Moona Creek in the vicinity of the Berry St culvert crossing is consistent with PCT4028 *Estuarine Swamp Oak Twig-rush Forest*, featuring emergent dense Sea Rush *Juncus kraussii* and scattered Swamp She-oak *Casuarina glauca* and Swamp Paperbark *Melaleuca ericifolia*. PCT4028 is associated with SOFF and the vegetation and landscape characteristics present in these areas are representative of SOFF (refer to Figure 6).

Construction methodology in proximity to the unnamed creek crossing would utilise direct horizontal drilling (DHD) to avoid impacts on the waterway.

Vegetation removal in proximity to the waterway would be limited to the removal of Swamp She-oak suckers and saplings that occur within the road pavement and immediate shoulder, to the east and west of where DHD construction would occur on Browns Rd.

The proposal would not affect hydraulic conditions or impact on vegetation communities or connectivity that might result in impacts on this EEC.

No impact on the wetland, water quality or hydrology is likely to occur as a result of the proposal.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.

The proposal would therefore not result in the fragmentation or isolation of areas of SOFF and is unlikely to adversely affect the extent or composition of SOFF such that a local occurrence of the EEC would be placed at risk of extinction.

### Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (SSF) is the name given to the ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains (NSW Scientific Committee 2011b).

SSF generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and South East Corner bioregions (NSW Scientific Committee 2011b).

This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense. For example, stands dominated by *Melaleuca ericifolia* typically do not exceed 8 m in height. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent (NSW Scientific Committee 2011b).

The most widespread and abundant dominant trees include *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Paperbark) and, south from Sydney, *Eucalyptus botryoides* (Bangalay) and *Eucalyptus longifolia* (Woollybutt). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (Sweet Willow Bottlebrush), *Casuarina glauca* (Swamp She-oak) and *Eucalyptus resinifera* subsp. *hemilampra* (Red Mahogany), *Livistona australis* (Cabbage Palm) and *Lophostemon suaveolens* (Swamp Turpentine). A layer of small trees may be present, including *Acacia irrorata* (Green Wattle), *Acmena smithii* (Lilly Pilly), *Elaeocarpus reticulatus* (Blueberry Ash), *Glochidion ferdinandi* (Cheese Tree), *Melaleuca linariifolia* and *M. styphelioides* (Paperbarks). Shrubs include *Acacia longifolia*, *Dodonaea triquetra*, *Ficus coronata*, *Leptospermum polygalifolium* subsp. *polygalifolium* and *Melaleuca* spp. Occasional vines include *Parsonsia straminea*, *Morinda jasminoides* and *Stephania japonica* var. *discolor*. The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei*, *Pteridium esculentum*, *Hypolepis muelleri*, *Calochlaena dubia*, *Dianella caerulea*, *Viola hederacea*, *Lomandra longifolia*, *Entolasia marginata* and *Imperata cylindrica* (NSW Scientific Committee 2011b).

Within the site, dry sclerophyll vegetation adjacent to Berry St and west of McNamara Ct transitions to swampy sclerophyll vegetation consistent with PCT4009 *Shoalhaven Lowland Flats Wet Swamp Forest* to the north and south of Berry St, featuring Swamp Mahogany *Eucalyptus robusta*, Red-fruit Saw-sedge *Gahnia sieberiana*, Coastal Tea-tree *Leptospermum polygalifolium* subsp. *polygalifolium* and Tick Bush *Kunzea ambigua*. PCT4009 is associated with SSF and the vegetation and landscape characteristics present in these areas are representative of SSF (refer to Figure 6).

No direct impacts on this EEC are likely to occur as a result of the proposal. The EEC would be avoided with the alignment and where the alignment occurs in close proximity to the EEC along McNamara Ct, construction methodology would utilise direct horizontal drilling (DHD) to avoid

impacts on vegetation, sensitive environmental features (including the wetland) and habitat features.

The proposal would not affect hydraulic conditions or impact on vegetation communities or connectivity that might result in impacts on this EEC.

No impact on the wetland, water quality or hydrology is likely to occur as a result of the proposal.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.

The proposal would therefore not result in the fragmentation or isolation of areas of SSF and is unlikely to adversely affect the extent or composition of SCF such that a local occurrence of the EEC would be placed at risk of extinction.

***Part C – In relation to the habitat of a threatened species or ecological community:***

***(iii) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity***

***(iv) 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***

***(v) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.***

No important habitat for threatened species would be removed or otherwise significantly impacted (see Part A).

No EEC would not be fragmented or isolated, nor removed or modified to an extent that would affect the long-term survival of the EEC occurring in the locality (refer to Part B).

The proposal will therefore not affect the long-term survival of any threatened species or endangered ecological community in the locality.

***Part 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).***

No “areas of outstanding biodiversity values” have been declared in the City of Shoalhaven.

***Part 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 listed in the NSW *Biodiversity Conservation Act 2016* considered relevant to the proposed activity include:

- Clearing native vegetation

Clearing of native vegetation is listed as a key threatening process, defined by the Scientific Committee’s determination (OEH 2021) as:

*“the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands.”*

Clearing of native vegetation has been shown to:

- cause widespread fragmentation of ecological communities;
- reduce the viability of ecological communities by disrupting ecological functions;
- result in the destruction of habitat and loss of biological diversity;
- lead to soil and bank erosion, increased salinity and loss of productive land.

Removal of native vegetation associated with the proposal would be limited to: removal of one Sweet Pittosporum; the pruning of tree branches, removal of shrubs and saplings, and the possible removal of up to five trees around and over SPS7 compound to establish and maintain an effective APZ; the removal of Swamp She-oak suckers and saplings within the Berry St road verge in the vicinity of the unnamed watercourse culvert crossing; and the impact on native groundcovers within road verges.

Proposed native vegetation removal would not involve the removal of any hollow bearing trees and would occur wholly and exclusively within existing disturbed and managed land and on existing edges of vegetation.

The impact of the proposal with regard to clearing of native vegetation, is not considered to be significant as it is unlikely to lead to:

- destruction of habitat causing a loss of biological diversity and extinction of species or loss or local genotypes;
- fragmentation of populations resulting in limited gene flow between small, isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species;
- riparian zone degradation such as bank erosion leading to sedimentation that affects aquatic communities – the riparian corridor would be stabilised as a result of the works;
- disturbance of habitat which may permit the establishment and spread of exotic species which may displace native species;
- loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates; or
- significant reduction of habitat for threatened species or ecological communities.

### 3.3 Threatened species impact assessment (Commonwealth EPBC Act 1999)

A Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Report was generated on 2<sup>nd</sup> February 2023. Of those threatened species and endangered ecological communities reported as likely occurring or having habitat within the area of the report, the following were observed to occur or were considered to have potential habitat within the site, requiring further assessment:

- Magenta Lilly Pilly *Syzygium paniculatum* (V)
- Giant Burrowing Frog *Heleioporus australiacus* (V)
- Green and Golden Bell Frog *Litoria aurea* (V)
- Australasian Bittern *Botaurus poiciloptilus* (E)
- Australian Painted Snipe *Rostratula australis* (E)
- Eastern Bristlebird *Dasyornis brachypterus* (E)

- Gang-gang Cockatoo *Callocephalon fimbriatum* (E)
- Glossy Black-cockatoo *Calyptorhynchus lathami* (V)
- Greater Glider *Petauroides volans* (E)
- Grey-headed Flying-fox *Pteropus poliocephalus* (V)
- New Holland Mouse *Pseudomys novaehollandiae* (V)
- Southern Brown Bandicoot (eastern) *Isodon obesulus obesulus* (E)
- Yellow-bellied Glider *Petaurus Australis* (V)
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community (E)
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (E)

Additional highly mobile species which are not reliant on available habitat resources within the site, including migratory birds, may occur occasionally and transiently within the vicinity of the proposed activity but would not be affected by the proposal.

Table 5. EPBC Significant impact assessment

<b>Critically endangered and endangered species - Significant impact criteria</b>	
Species to consider:	
<ul style="list-style-type: none"> <li>• <b>Australasian Bittern</b></li> <li>• <b>Australian Painted Snipe</b></li> <li>• <b>Eastern Bristlebird</b></li> <li>• <b>Gang-gang Cockatoo</b></li> <li>• <b>Greater Glider</b></li> <li>• <b>Southern Brown Bandicoot (eastern)</b></li> </ul>	
<b>Criteria</b>	<b>Assessment</b>
lead to a long-term decrease in the size of a population	No direct impacts on any of these species are likely to occur. No indirect impacts on these species or habitats are likely to occur. Refer to section 3.2.2 of this REF for more information.
reduce the area of occupancy of the species	No habitat which is important or likely utilised by any of these species would be removed or otherwise impacted on as a result of the proposal.
fragment an existing population into two or more populations	No – refer above
adversely affect habitat critical to the survival of a species	No – refer above
disrupt the breeding cycle of a population	No – refer above
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No – refer above
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 introduce any invasive species. Safeguards and mitigation measures would reduce this risk.

introduce disease that may cause the species to decline	The proposed works are unlikely to introduce any disease. Safeguards and mitigation measures would reduce this risk.
interfere with the recovery of the species	No – refer above
<b><i>Vulnerable species - Significant impact criteria</i></b>	
Species to consider:	
<ul style="list-style-type: none"> <li>• <b>Magenta Lilly Pilly</b></li> <li>• <b>Giant Burrowing Frog</b></li> <li>• <b>Green and Golden Bell Frog</b></li> <li>• <b>Glossy Black-cockatoo</b></li> <li>• <b>Grey-headed Flying-fox</b></li> <li>• <b>New Holland Mouse</b></li> <li>• <b>Yellow-bellied Glider</b></li> </ul>	
<b><i>Criteria</i></b>	<b><i>Assessment</i></b>
lead to a long-term decrease in the size of an important population of a species	No direct impacts on any of these species are likely to occur. No indirect impacts on these species or habitats are likely to occur. Refer to section 3.2.2 of this REF for more information.
reduce the area of occupancy of an important population	No habitat which is important or likely utilised by any of these species would be removed or otherwise impacted on as a result of the proposal.
fragment an existing important population into two or more populations	No – refer above
adversely affect habitat critical to the survival of a species	No – refer above
disrupt the breeding cycle of an important population	No – refer above
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No – refer above
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed works are unlikely to introduce any invasive species. Safeguards and mitigation measures would reduce this risk.
introduce disease that may cause the species to decline	The proposed works are unlikely to introduce any disease. Safeguards and mitigation measures would reduce this risk.
interfere substantially with the recovery of the species	No – refer above
<b><i>Critically endangered and endangered ecological communities - Significant impact criteria</i></b>	
Communities to consider:	
<ul style="list-style-type: none"> <li>• <b>Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community (CSOF)</b></li> <li>• <b>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (CSSF)</b></li> </ul>	
<b><i>Criteria</i></b>	<b><i>Assessment</i></b>
reduce the extent of an ecological community	Direct impacts on CSOF would be limited to the removal of Swamp She-oak suckers and saplings within the Berry St road pavement and verge in the vicinity of the unnamed

	watercourse culvert crossing. This would not reduce the extent of the EEC. No direct impacts on CSSF would occur.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines adversely affect habitat critical to the survival of an ecological community	Vegetation removal would be minimal and would occur on existing disturbed edges and urban interfaces.
modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological	The proposal would not affect water quality or hydraulic conditions. Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately. The proposal would improve the function and capacity of the sewage system and would therefore reduce risks associated with overflow and contamination.
community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	No – refer above
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	No. Direct impacts would be minimal and occur on edges. Indirect impacts are unlikely.
cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	No - refer above
interfere with the recovery of an ecological community	No. Impacts would be limited to existing disturbed edges and interfaces where recovery of the EECs is not possible.

### *Conclusion of EPBC Significant Impact Assessment*

The proposal is therefore unlikely to have an adverse effect on a vulnerable, endangered, critically endangered or migratory species or its habitat, nor on the extent or integrity of an endangered ecological community such that its local occurrence is likely to be placed at risk of extinction. Further assessment and referral to the Commonwealth is therefore not required.

### 3.4 Indigenous heritage

Under Section 86 of the NSW *National Parks and Wildlife Act 1974* (NPW Act) it is an offence to disturb, damage, or destroy any Aboriginal object without an Aboriginal Heritage Impact Permit

(AHIP). The Act, however, provides that if a person who exercises 'due diligence' in determining that their actions will not harm Aboriginal objects has a defence against prosecution if they later unknowingly harm an object without an AHIP (Section 87(2) of the Act). To effect this, the NSW Department of Environment, Climate Change and Water have prepared the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (hereafter referred to as the 'Due Diligence Guidelines) to assist individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for an AHIP.

Landscape features that are regarded as indicating a higher potential for Aboriginal objects, as outlined in the NSW Department of Environment, Climate Change and Water's Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (2010) include:

- within 200m of waters, or
- located within a sand dune system, or
- located on a ridge top, ridge line or headland, or
- located within 200m below or above a cliff face, or
- within 20m of or in a cave, rock shelter, or a cave mouth.

The site contains an unnamed tributary of Moona Moona Creek.

A search on the Aboriginal Heritage Information Management System (AHIMS) on 24<sup>th</sup> November 2022 returned one record (AHIMS Site ID 58-2-0448) of an isolated silcrete artefact found on an unsealed access road located in Moon Moona Swamp approximately 750m to the west-south-west of the proposal (refer to AHIMS report in Figure 8). The AHIMS site card record referred to the site as being in poor condition and of low significance.

Site investigations included search for artefacts and other potential heritage items within works areas and adjacent land. No potential artefact, evidence of midden, nor any potential culturally modified tree were observed during site investigations, noting that ground surface visibility was low through most of the site due to groundcover vegetation.

No test excavations have been undertaken to inform the current assessment.

The Due Diligence Guidelines define disturbed land as follows:

*"Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks."*

The site of the proposed works is within cleared, disturbed and modified road reserves and operational land which has been subject to vegetation clearing, excavation and filling, and the construction and maintenance of the roads and existing sewer infrastructure. As such, it is reasonable to conclude that there is a low probability of objects occurring in area.

As the proposal would occur on disturbed land and would not impact any recorded Aboriginal sites or places, the Due Diligence Guidelines requires no further assessment, an AHIP is not required, and the activity can proceed with caution.

**Figure 8. Results of AHIMS Aboriginal heritage search**



**AHIMS Web Services (AWS)  
Search Result**

Your Ref/PO Number : Huskisson SPS7

Client Service ID : 735127

Shoalhaven City Council - Nowra

Date: 24 November 2022

PO Box 42 Bridge Rd  
Nowra New South Wales 2541

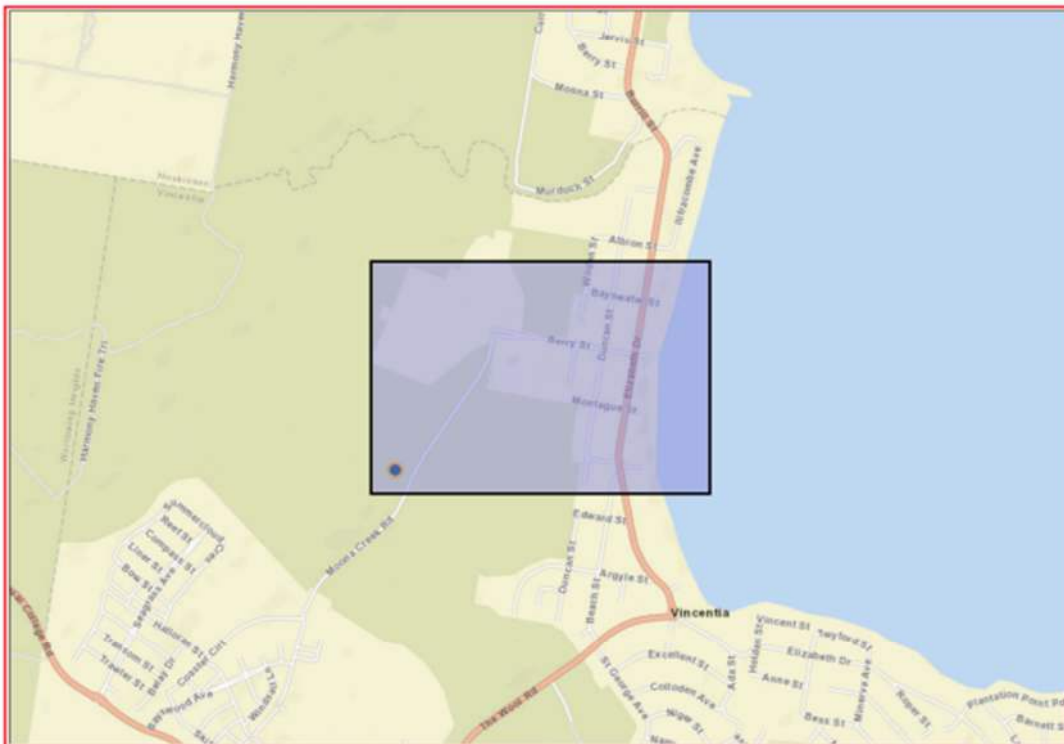
Attention: Jeff Bryant

Email: jeff.bryant@shoalhaven.nsw.gov.au

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lat, Long From : -35.0648, 150.6616 - Lat, Long To : -35.056, 150.677, conducted by Jeff Bryant on 24 November 2022.**

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

<b>1</b>	<b>Aboriginal sites are recorded in or near the above location.</b>
<b>0</b>	<b>Aboriginal places have been declared in or near the above location. *</b>

### 3.5 Non-indigenous heritage

No items of local heritage significance or any items on the State Heritage Register or listed in the Shoalhaven Local Environmental Plan occur in close proximity to the site such that the proposed works might impact them.

### 3.6 Riparian corridors, aquatic habitat & water quality

Impacts on riparian corridors, aquatic habitat and water quality were considered regarding the following:

- Likely and potential impacts on vegetation as a result of construction activities;
- Sediment movement into waterways as a result of construction activities;
- Ongoing operation of the proposed infrastructure.

#### 3.6.1 Riparian corridors

A riparian corridor associated with the unnamed tributary of Moona Moona Creek occurs within the site in the vicinity of the Berry St culvert crossing.

While the riparian corridor is uncategorised under Shoalhaven City Council mapping, for the purpose of the current study it is considered that a Category 2 riparian corridor is applicable in line with the relevant watercourse categorisation criteria (DIPNR 2004).

Management objectives for a Category 2 riparian corridor include provision of minimum 20 metre core riparian zones and additional 10 metre vegetated buffer zones from the top of banks.

Works in this location would involve only the construction of a new Rising Main, the alignment of which would involve excavation within the road pavement and near verge.

Construction methodology in proximity to the unnamed creek crossing would utilise direct horizontal drilling (DHD) to minimise impacts on the waterway and riparian vegetation.

Vegetation removal in proximity to the waterway would be limited to the removal of Swamp She-oak suckers and saplings that occur within the road pavement and immediate shoulder, to the east and west of where DHD construction would occur on Berry Street.

The road and verges through the culvert crossing are structurally sound and supported by rock revetment and concrete fill along the edges. The embankments associated with the riparian corridor are therefore unlikely to be destabilised by the proposed works.

Operation and maintenance of the infrastructure would not affect any areas in proximity to riparian corridors.

The proposal would therefore not impact on the function or integrity of any riparian corridor.

#### 3.6.2 Aquatic habitat

Berry St crosses an unnamed 3rd order (Strahler) watercourse tributary of Moona Moona Creek which forms a swampland in the vicinity of the crossing, with emergent sedges, trees and shrubs (predominantly Sea Rush *Juncus kraussii*, with scattered Swamp She-oak *Casuarina glauca* and Swamp Paperbark *Melaleuca ericifolia*) and open water bodies. Proposed works along Berry St would occur in close proximity to this watercourse and swampland.

The Berry St culvert crossing of the watercourse is situated approximately 650m upstream of Moona Moona Creek via a meandering watercourse (refer to Photo 4), with this junction occurring over 900m upstream from Jervis Bay.

Works along Berry St in the vicinity of the unnamed watercourse culvert crossing would involve only the construction of a new Rising Main, the alignment of which would involve excavation within the road pavement and near verge.

Construction methodology in proximity to the unnamed creek crossing would utilise direct horizontal drilling (DHD) to minimise impacts on the waterway and riparian vegetation.

Vegetation removal in proximity to the waterway would be limited to the removal of Swamp She-oak suckers and saplings that occur within the road pavement and immediate shoulder, to the east and west of where DHD construction would occur on Berry Street. Aquatic vegetation within the watercourse and associated swampland would not be impacted on.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

Part 7 of the *Fisheries Management Act 1994* relates to protection of aquatic habitats.

Dredging and reclamation activities within water land and works involving impacts on marine vegetation require a permit under the *Fisheries Management Act 1994* (FM Act). Refer also to Section 4.2 below.

Under the *Policy and guidelines for fish habitat conservation and management* (NSW DPI 2013), DPI Fisheries focuses the application of the FM Act and FM Regulations and associated policies and guidelines on “key fish habitats”. Issue of a Fisheries Permit is typically required for activities constituting dredging or reclamation within or with potential to impact areas identified as Key Fish Habitat.

Key Fish Habitat (KFH) is mapped by NSW Department of Primary Industries (DPI) Fisheries as occurring within and in proximity to the site in association with the unnamed watercourse tributary of Moona Moona Creek and the swamp both upstream and downstream of Berry St (refer to Figure 9).

Excavation (dredging) works along Berry St would occur entirely within the road pavement and near verge and would not occur within water land (as defined under s198A of the Act),

Areas within the site mapped as KFH coinciding with McNamara Ct and Montague St are wholly land-based, contain no water land (as defined under s198A of the Act), and are associated with vegetated buffers occurring between the site and water land.

Estuarine macrophytes including mangroves and saltmarsh are mapped as occurring approximately 250m downstream of the Berry St culvert crossing (Figure 8).

No marine vegetation including mangroves, saltmarsh or seagrass was observed to occur in proximity to the site.

No marine vegetation as defined under s205 of the Act, or threatened marine fauna listed under the Act, would be directly impacted by the proposal.

Safeguards and mitigation measures including sediment and erosion controls and management of Acid Sulfate Soils would be implemented during construction works to minimise the risk of indirect impacts on marine vegetation and habitat downstream of the site.

Figure 9. Key Fish Habitat (KFH) and estuarine macrophytes mapped as occurring in proximity to the site



Macrophyte map data source: [https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries\\_Data\\_Portal](https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal)

Operation and maintenance of the infrastructure would not affect any areas in proximity to aquatic habitat.

Aquatic habitat would therefore not be significantly altered or impacted by the proposal.

Refer to section 4.3 for further consideration of the *Fisheries Management Act 1994*.

### 3.6.3 Water quality

Excavation (dredging) works along Berry St would occur entirely within the road pavement and near verge and would not occur within water land (as defined under s198A of the Act),

Safeguards and mitigation measures including sediment and erosion controls would be implemented during construction works to minimise the risk of indirect impacts on water quality and habitat downstream of the site (refer to Section 7 of this REF).

Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.

Water quality monitoring shall be undertaken during construction activities, targeting the unnamed watercourse immediately downstream of the Berry St culvert crossing. Monitoring shall involve sampling at locations above, immediately below and 100-200m downstream, with baseline data collected prior to commencement of works. Monitoring during works shall be assessed against relevant ANZECC water quality guidelines for aquatic ecosystems, as trigger values for cessation of works and implementation of additional controls to manage sediment movement or other pollution if required.

It is therefore concluded that sediment movement and the risk of impact on water quality, resulting from the construction work associated with the proposal, would be negligible.

Proposed upgrades of sewage infrastructure would not create or facilitate increased input into the sewage reticulation system but would provide for increased flow and emergency storage to manage existing and forecast service demands including containment of wet weather surcharge and peak wet weather inflow, without exceeding spill levels. Refer to section 1.3 of this REF for more information.

Overflow discharge of SPS7 would occur within a grassed swale between the pump station and existing manhole (approx. 15m to the west of the existing pump station housing) with a substantial vegetated buffer as filtration exceeding 50m to a wetland with no defined watercourse in proximity.

Post-upgrade ongoing operation of SPS7 would therefore have reduced risk of sewage spills impacting on water quality than is currently achieved.

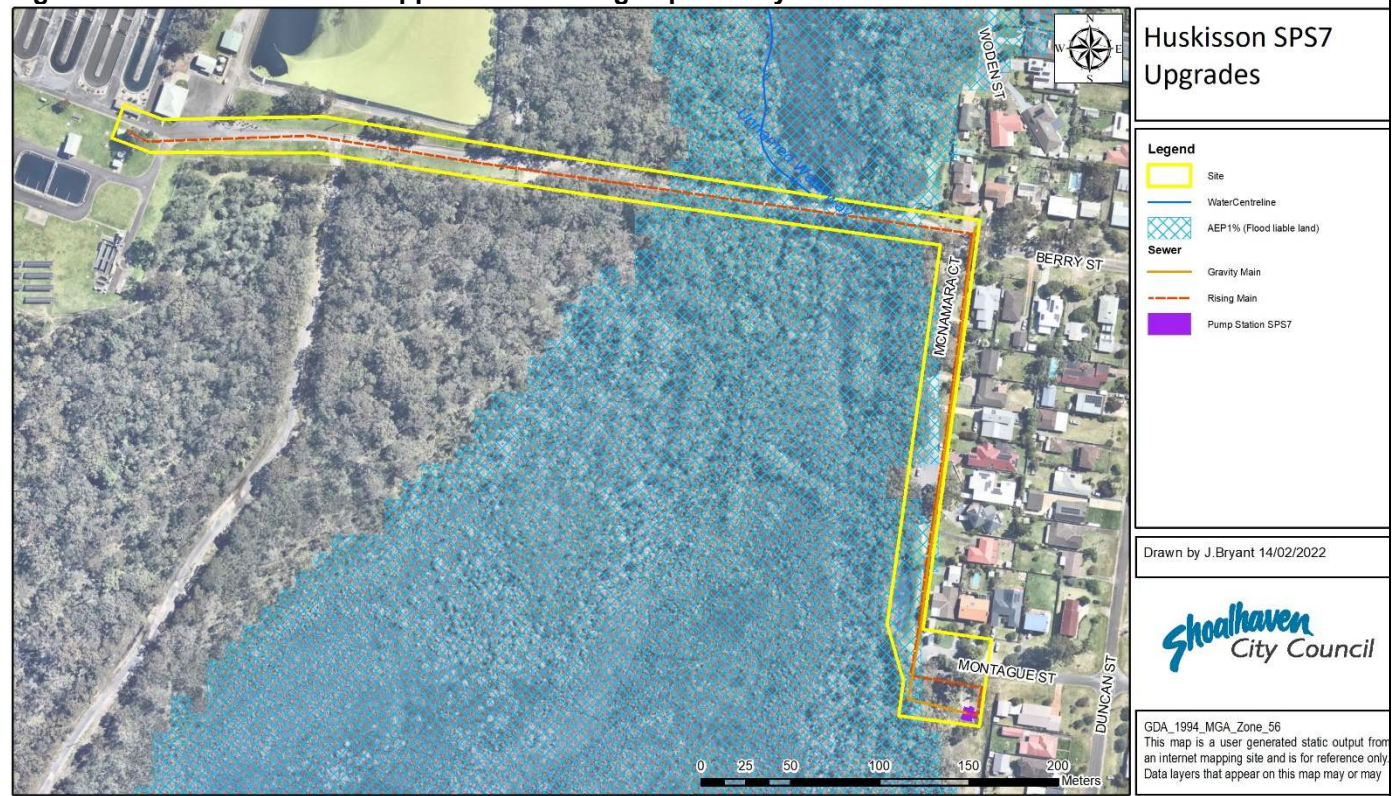
### 3.7 Flood liable land

Flood liable land is mapped as occurring within areas of the site associated with the unnamed watercourse tributary of Moona Moona Creek and the wetland (Figure 10).

The proposal would involve construction of predominantly subsurface infrastructure (i.e. Rising Main, Gravity Main, pump well and emergency storage).

Proposed upgrades of above-ground pump station infrastructure, including the electrical switch room building enclosure, would involve the replacement of existing structures with negligible increase in size.

**Figure 10. Flood liable land mapped as occurring in proximity to the site**



As such, the proposal is not anticipated to adversely affect flood behaviour or exacerbate flooding risks.

Council’s Floodplain Management Team provided the following advice with regard to construction of the upgraded SPS7 (Council reference D23/56606) which has been incorporated into the design of the proposal:

*“The SPS site is located outside the extent of the 2050 Scenario 1% AEP flood, but it is partially located within the Flood Planning Area. The 2050 scenario Flood Planning Level (FPL) of the site is 2.56m AHD. Electrical installation to be above the FPL +0.5m freeboard (being electrical installation above 3.06m AHD).”*

*“The probable maximum flood level is 3.6m AHD.”*

*“There is definitely benefit in having the electrical installations as high as possible as this would reduce the likelihood of flood inundation and associated damage. The 2050 scenario FPL is the lowest level at which electrical installations should be installed at. In general the higher the better.”*

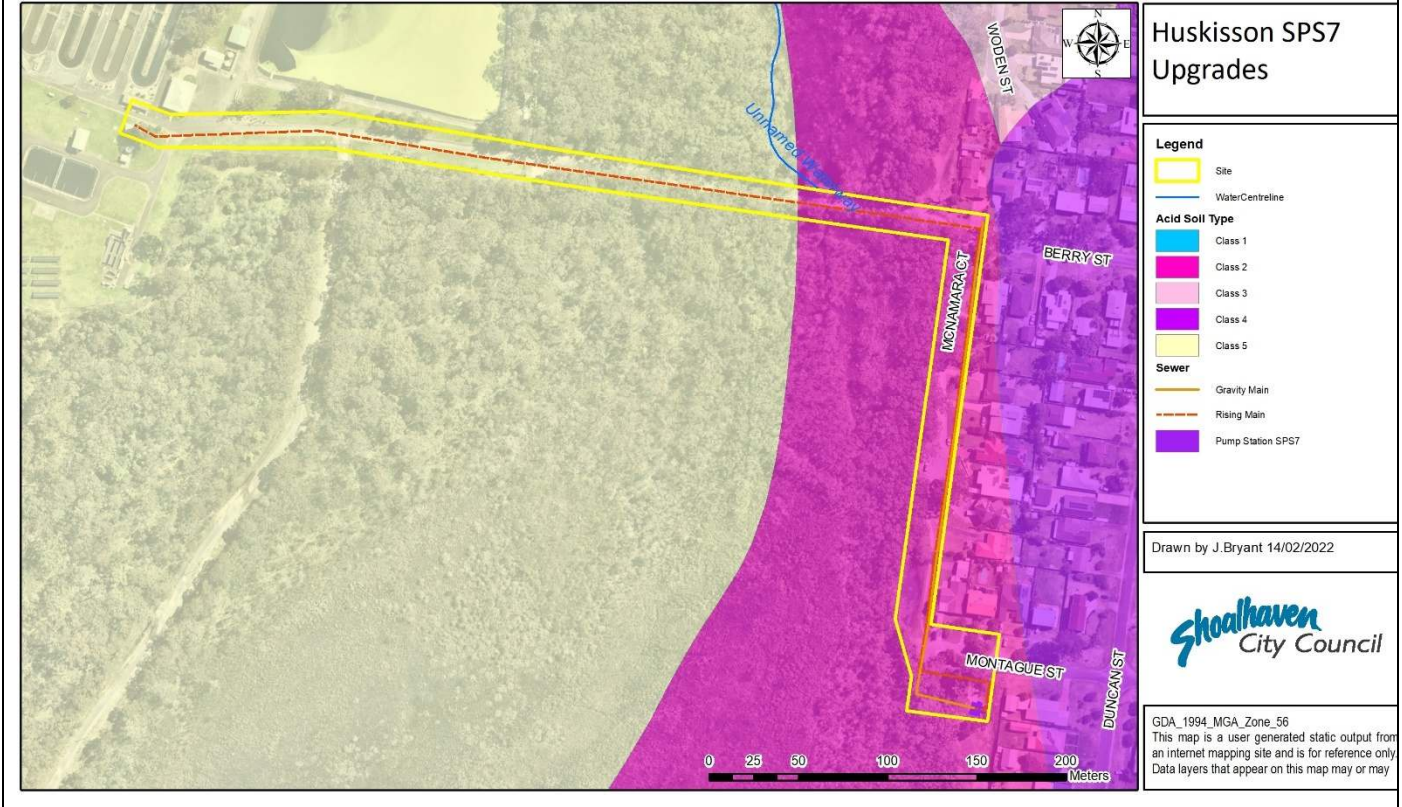
A hydraulic assessment or other further investigation is not required.

### 3.8 Acid Sulfate Soils

The eastern portion of the site including the length of McNamara Ct and the SPS7 compound is mapped as Class 2 Acid Sulfate Soils (ASS).

The *Shoalhaven Local Environment Plan 2014* indicates that a risk of A.S.S exposure exists for Class 2 A.S.S exists where any works would occur below the natural ground surface or would involve any lowering of the watertable.

**Figure 11. Acid Sulfate Soils mapped as occurring in proximity to the site**



The western portion of the site is mapped as Class 5 ASS indicating low risk of exposure of ASS or PASS.

D&N Geotechnical Pty Ltd were engaged to conduct a Preliminary Site Investigation of the Huskisson SPS 7 & Main Upgrade project which included intrusive investigation (twelve bore holes) and assessment of potential for existing soil contamination and acid sulfate soils (D&N 2023).

Boreholes drilled for this investigation typically encountered sands to clayey sands (estuarine soils) in the low-lying coastal wetland areas of the Site's east and clays (often silty to sandy) in the elevated western portion of the Site. Fill was encountered in areas associated with either road or Sewage Treatment Plant infrastructure and generally consisted of sands to silty sands with some gravel.

Field observations and laboratory testing identified indications of Acid Sulfate Soils in subsurface soils across the Site. Indications of Acid Sulfate Soils were encountered at 0.8 m below ground level (BGL) within alluvial/estuarine soils with indications of Acid Sulfate Soils identified in fill materials at BH08.

Screening did not identify the presence of Actual ASS with  $pH_F$  result ranging between 5.2 and 6.6. Oxidised  $pH_{FOX}$  results indicate oxidisable potential in all soils, with potential indications of ASS (i.e.,  $pH$  change > 1) consistently recorded indicating the presence of Potential ASS.

Sulfur and acid trail testing and comparison of the results against the NASSG (2018) guidelines indicated PASS in estuarine deposits (sands to clayey sands) below 0.8 m in depth, and potential ASS in the alluvial soils (clays) below 1.2 m in depth at lower elevations, and 1.6 m in depth at higher elevations. Titratable Actual Acidity (TAA) testing indicates the potential presence of Actual

ASS (noting field screening of soils did not identify soil pH<sub>F</sub> of > 4) in soils above 1 m BGL, including in fill materials at BH08.

The shallowest ASS encountered on Site were at 0.2 m BGL in fill materials (BH08) in Berry Street's west. Further east along Berry Street, ASS indications were identified at 0.8 m BGL within alluvial/estuarine soils. Along McNamara Court, ASS are expected to occur from below 2 m BGL (down the soil profile), while ASS indications were identified from 1 m BGL at SPS 7 on Montague Street.

Within the Huskisson Wastewater Treatment Plant, ASS indications were identified in alluvial soil from 1.6 m BGL (BH11).

D&N (2023) makes the following recommendations with regard to ASS to support the proposed upgrade works at the Site:

Given Potential Acid Sulfate Soils (PASS) were identified across the Site, generally from 0.8 m BGL in estuarine/alluvial soils and from 1.6 m BGL in alluvial soils, noting that the shallowest PASS were encountered in fill materials from 0.2 m BGL, and given the proposed upgrade works may include open trenching and underboring, it is likely these works will intercept PASS and it is therefore assessed that development and implementation of a site-specific Acid Sulfate Soil Management Plan (ASSMP) will be required.

D&N (2023) also note that if the proposed works generate surplus soil materials to be exported from Site, the generated surplus soils will require classification to support disposal, including assessment per the guidance provided in the NSW Waste Classification Guidelines, specifically Part 4: Acid sulfate soils (2014).

Any ASSMP should detail soil and water monitoring requirements during construction activities; management of groundwater; establishment of a bunded treatment area in a suitable on-site or nearby location; and treatment and disposal of potential acid sulfate soils in accordance with the NSW Acid Sulfate Soil Manual and NSW EPA guidelines.

If treatment of ASS is required, a bunded treatment area shall be established on existing clear and level ground which is at least 50m from any watercourse.

### 3.9 Operational impacts on residential properties

#### 3.9.1 Sound impacts

Elevated noise levels originating from the upgraded SPS7 pump station, impacting on adjacent residential properties is considered possible but unlikely.

The proposed modern pump-housing with acoustic dampening is anticipated to ensure no increase in noise impacts on neighbouring properties.

Council engaged consultant Harwood Acoustics to undertake an acoustic assessment which involved:

1. Measuring baseline environmental noise emissions in relation to the existing WPS.
2. Determining noise design criteria and acceptable noise levels at nearby residential premises in accordance with the NSW EPA's *Noise Guide for Local Government 2013* and *Noise Policy for Industry 2017*.
3. Providing indicative noise controls.

Harwood Acoustics (2023) identified project specific noise design goals as follows:

*Residential Receptors (R1 and R2)*

- (35 + 5 =) 40 dBA Leq, 15 minute during the day time period,
- (34 + 5 =) 36 dBA Leq, 15 minute during the evening time period, and
- (30 + 5 =) 35 dBA Leq, 15 minute during the night time period.

Noise Sources associated with WPS facilities include the pump motors as well as ventilation fans for the pump room itself. Typical reverberant sound pressure levels within similar size pump rooms are around 80 dBA Leq, 15 minute from the pump motors. If this were the case at the new SPS7, then a reduction from the pump room building of between 25 and 30 dB would be required.

**Table 6. Recommended fabrics and construction details to reduce sound pressure levels outside SPS7 (From Harwood Acoustics 2023)**

<p><i>Walls</i></p> <ul style="list-style-type: none"> <li>• Masonry (brick and core filled block combination) will be acoustically acceptable,</li> </ul> <p><i>Roof</i></p> <ul style="list-style-type: none"> <li>• The roof may be of corrugated sheet steel (Colorbond) construction,</li> <li>• Heavy duty vapour barrier is to be laid below the roof,</li> <li>• Ceilings should be fitted below the rafters / purlins and comprise two layers of 13 mm thick fire rated (or 10 mm thick sound rated) plasterboard,</li> <li>• Minimum 50 mm thick glasswool or polyester insulation should be laid between the ceiling joists (purlins or rafters) (min. density 10 kg/m<sup>3</sup>) or approved equivalent.</li> </ul> <p><i>Doors</i></p> <ul style="list-style-type: none"> <li>• All doors should be of 50 mm thick (minimum) solid core timber construction fitted with acoustic seals (permitter, threshold and meeting stile seals)</li> </ul> <p><i>Openings</i></p> <ul style="list-style-type: none"> <li>• There are to be no acoustically untreated openings in the building – the proposed ventilation weather louvres in the gable ends of the roof will not work,</li> <li>• All air should be ducted in and out and mechanically assisted.</li> </ul> <p>Depending on the ventilation requirements a combination of acoustic louvres and silencers may be required.</p> <p>Any building penetrations should be located in the western façade of the building if practicable.</p> <p>If the roof ventilation exhaust is to remain, a silencer may be required.</p>
---

In the event that existing noise production or EPA noise design goals are exceeded, post installation noise compliance assessment shall be undertaken and additional mitigations employed

as required to ensure no elevation in noise level is experienced as a result of the new sewer pump station.

Construction noise for sewer main upgrade works and the upgrade of SPS7 would be temporary and within the NSW Draft Construction Noise Guidelines (2020). Notification would be provided to nearby sensitive receivers.

### 3.9.2 Air quality and odour impacts

Proposed upgrades of sewage infrastructure would not create or facilitate increased input into the sewage reticulation system but would provide for increased flow and emergency storage to manage existing and forecast service demands including containment of wet weather surcharge and peak wet weather inflow, without exceeding spill levels. Refer to section 1.3 of this REF for more information.

Upgrade of dilapidated components is anticipated to reduce H<sub>2</sub>S gas release.

Post-upgrade ongoing operation of SPS7 is therefore anticipated to have reduced risk of odour impacts on neighbouring receivers than is currently achieved.

### 3.10 Potentially contaminated land

A potentially contaminated land record (PCL289) exists over Lot 1 DP 594227 associated with the operation of the Huskisson Sewage Treatment Works.

The proposed upgrades would involve excavation within sealed access roads and / or grassed verge areas and connection to existing inlets and would not involve any disturbance to – or the removal of – storage or treatment structures or areas.

D&N Geotechnical Pty Ltd were engaged to conduct a Preliminary Site Investigation of the Huskisson SPS 7 & Main Upgrade project which included intrusive investigation (twelve bore holes) and assessment of potential for existing soil contamination and acid sulfate soils (D&N 2023).

D&N (2023) reported the following findings with regard to contamination:

- No detected metal concentration exceeded the relevant adopted health investigation or screening levels.
- Petroleum hydrocarbons (BTEXs, TRHs and PAHs) were not detected above the limit of recording (LOR) in any soil sample analysed.
- Organochlorine and organophosphorus pesticides were not detected above the LOR in any soil sample analysed.
- Asbestos fibres were not detected in any sample analysed.

D&N made the following recommendations with regard to contamination to support the proposed upgrade works at the Site:

Preparation and implementation of a site-specific Unexpected Finds Protocol to manage potential instances of buried materials (including additional construction wastes) or impacted soils and groundwater that may be encountered on-site during construction works.

**3.11 EP&A Regulation – Section 171 matters of consideration**

Section 171(2) of the *Environmental Planning and Assessment Regulation 2021* lists the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment under Part 5 of the EP&A Act. These matters are addressed in Table 7.

**Table 7. Section 171 Matters of consideration**

Does the proposal:	Assessment	Reason
a) Have any environmental impact on a community?	Positive	<p>The proposed activity involves upgrading of an existing Shoalhaven Water sewer pump station (SPS7) on Montague St, Huskisson and associated rising and gravity sewer mains on McNamara Ct and Berry St, Huskisson.</p> <p>The proposed upgrades would address the dilapidation of existing infrastructure and modernise and increase the capacity and efficiency of the sewage reticulation system to meet current and anticipated service demands.</p>
b) Cause any transformation of a locality?	Negligible	<p>The proposal would primarily involve construction of subsurface sewer lines.</p> <p>A new sewer pump station (SPS7) would be constructed on an existing SPS site, with a larger footprint than the existing SPS. The modern housing with acoustic dampening is anticipated to ensure no increase in noise impacts to neighbouring properties. Acoustic assessment involving baseline environmental noise emissions, noise design criteria and indicative noise controls has been undertaken to inform design and future assessment and mitigation.</p> <p>The locality’s current use across all areas would remain unchanged.</p> <p>Vegetation removal would be minimal and occur only on existing edges and urban interfaces.</p>
c) Have any environmental impact on the ecosystem of the locality?	Low adverse	<p>The five-part test of significance (Section 3.2 of this REF) concludes that the proposed activity would not have a significant impact upon endangered ecological communities.</p> <p>No significant hollow-bearing trees, burrows, threatened flora species, rocky outcrops, caves or water bodies would be removed or otherwise impacted. No food resources critical to the survival of a particular species would be removed.</p> <p>Aquatic ecosystems are not likely to be affected by the proposed activity and there is not likely to be any long-term or long-lasting impact through the input of sediment and nutrient into the ecosystem (refer to Section 3.1 of this REF).</p>

		Environmental safeguards and mitigation measures (Section 7 of this REF) would be employed to minimise risk of impacts.
d) Cause a diminution of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Low adverse	<p>Impact to the recreational and scientific values of the site would be negligible.</p> <p>Impact to the aesthetic and environmental values of the locality would be low.</p> <p>The upgraded SPS7 would occur on the site of the existing SPS. Other components of the proposal are sub surface pipelines with manholes at ground surface level.</p> <p>No increase in noise impacts to neighbouring properties from the SPS is anticipated (refer to matter (c) above)</p> <p>Alignment and construction methodology have been selected to minimise environmental impacts (refer to section 3.1 through 3.10 of this REF).</p> <p>Safeguards and mitigation measures (refer to Section 7 of this REF) would minimise risks of impacts to the environment.</p>
e) Have any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, or social significance or other special value for present or future generations?	Negligible	<p>The site of the proposed activity has no significant aesthetic, architectural, cultural, historical or scientific values. As such, the proposed activity would have no significant impact on these items.</p> <p>No items in the vicinity of the work site which are listed on the State Heritage Register and the Shoalhaven Local environmental Plan would be impacted by the proposal.</p> <p>The site is not within an Aboriginal Place declared under the <i>National Parks and Wildlife Act 1974</i>.</p>
f) Have any impact on the habitat of protected fauna (within the meaning of the Biodiversity Conservation Act 2016)?	Low adverse	<p>No important habitat would be removed or otherwise impacted as part of the proposal. Habitat corridors would not be severed. Barriers to fauna movement and new threats to fauna would not be introduced. Mitigation measures (Section 7) will reduce risks further.</p>
g) Cause any endangering of any species of animal, plant or other form of life, whether living on	Low adverse	<p>The five-part test of significance, provided in Section 3.2 above, concludes that the proposed activity would not have a significant impact upon threatened fauna.</p> <p>No potentially important habitat or food resources for locally occurring threatened species would be removed or otherwise impacted by the proposal.</p>

land, in water or in the air?		No burrows, threatened flora species, rocky outcrops, caves or water bodies would be removed or otherwise impacted. No food resources critical to the survival of a particular species would be removed.
h) Have any long-term effects on the environment?	Negligible	<p>The proposed activity would not use hazardous substances or use or generate chemicals which may build up residues in the environment.</p> <p>The proposal would not affect hydraulic conditions or water quality or impact on vegetation communities or connectivity that might have flow on effects impacting on fauna.</p> <p>The proposal would improve the function and capacity of the sewage system and would therefore reduce risks associated with overflow and contamination.</p>
i) Cause any degradation of the quality of the environment?	Low-adverse	<p>The environmental safeguards (Section 6) to be undertaken would minimise impacts and risks to the quality of the environment.</p> <p>Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.</p> <p>No impact on the wetland, water quality or hydrology is likely to occur as a result of the proposal.</p> <p>No significant habitat would be removed or otherwise impacted.</p> <p>Functional vegetated buffers would not be removed and edge effects would not be introduced (clearing would occur on existing edges only).</p> <p>Erosion and sediment controls would be installed to manage potential erosion where works and disturbance would occur on slopes and in the vicinity of creeks and watercourses.</p> <p>Works would be undertaken entirely through previously cleared and modified land.</p> <p>The proposal would not intentionally introduce noxious weeds, vermin, or feral animals into the area or contaminate the soil.</p>
j) Cause any risk to the safety of the environment?	Low adverse	<p>Works would primarily occur within existing road verges and existing disturbed and modified land.</p> <p>The alignment and construction methodology including use of direct horizontal drilling (DHD) would avoid impacts on habitat and sensitive environmental features.</p> <p>Excavation and construction works would involve the installation and maintenance of sediment and erosion</p>

		controls to minimise impacts associated with water contamination and sediment movement and deposition.
k) Cause any reduction in the range of beneficial uses of the environment?	Low adverse	<p>The footprint of SPS7 would be increased but would occur within the existing site. The local environment would remain relatively unchanged.</p> <p>The proposal would not affect the future potential use of the surrounding environment.</p>
l) Cause any pollution of the environment?	Low adverse	<p>The proposal would involve a temporary and local generation of noise during construction. However, this is not anticipated to negatively affect any sensitive receivers such as schools, childcare centres and hospitals.</p> <p>No increase in noise impacts to neighbouring properties from SPS7 when in operation is anticipated (refer to section 3.9.1).</p> <p>It is unlikely that the activity (including the environmental impact mitigation measures) would result in spillages, dust, odours, vibration or radiation.</p>
m) Have any environmental problems associated with the disposal of waste?	Low adverse	<p>Spoil generated from excavation works would be tested and (if required) treated in accordance with an acid sulfate soil management plan (ASSMP).</p> <p>Waste material would be utilised in accordance with relevant EP&amp;A resource recovery orders and exemptions or otherwise disposed of at a licenced facility.</p>
n) Cause any increased demands on resources (natural or otherwise) which are, or are likely to become, in short supply?	Low adverse	<p>The amount of resources that would be used are not considered significant and would not increase demands on current resources such that they would become in short supply.</p>
o) Have any cumulative environmental effect with other existing or likely future activities?	Low adverse	<p>The assessed low adverse or negligible impacts of the proposal are not likely to interact.</p> <p>The current proposal would not affect any habitat corridor or reduce any significant vegetation.</p> <p>Mitigation measures (Section 7) shall be implemented to minimise the risk of cumulative environmental effects.</p>

p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	Negligible	The proposed activity would have no effect on coastal processes including those projected under climate change conditions.  The site is not located in a coastal hazard area.
q) Any applicable local strategic planning statement, regional strategic plan or district strategic plan made under Division 3.1 of the Act	Positive	The proposed activity is consistent with Planning Priority 2 (Delivering Infrastructure) of the <i>Shoalhaven 2040</i> Strategic Land-use Planning Statement <a href="https://doc.shoalhaven.nsw.gov.au/displaydoc.aspx?record=D20/437277">https://doc.shoalhaven.nsw.gov.au/displaydoc.aspx?record=D20/437277</a>  The proposed activity is not inconsistent with the Illawarra Shoalhaven Regional Plan 2041 (ISRP): <a href="https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/Plans-for-your-area/Regional-plans/Illawarra-Shoalhaven-Regional-Plan-05-21.pdf">https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/Plans-for-your-area/Regional-plans/Illawarra-Shoalhaven-Regional-Plan-05-21.pdf</a>
r) Any other relevant environmental factors	N/A	

## 4. APPROVALS PATHWAYS

### 4.1 Environmental Planning & Assessment Act 1979

Section 4.1 (Development that does not need consent) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) states that:

*“If an environmental planning instrument provides that specified development may be carried out without the need for development consent, a person may carry the development out, in accordance with the instrument, on land to which the provision applies.”*

In this regard, section 2.126(6) of the *NSW State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP) provides that (underline added for emphasis):

*“Development for the purpose of sewage reticulation systems may be carried out without consent on any land in the prescribed circumstances.”*

Development carried out by or in behalf of a public authority constitutes development carried out in the prescribed circumstances, pursuant to s2.126(1) (TISEPP).

Additionally section 2.127 (TISEPP) provides that (underline added for emphasis):

*“Development for any of the following purposes carried out by or on behalf of a public authority is exempt development if the development is in connection with a sewerage system and complies with section 2.20—*

...

*(b) routine maintenance or associated landscaping works, including the following, if any disturbance to soil or vegetation is no greater than necessary—*

- (i) removal of litter, silt or debris from any part of the sewerage system,*
- (ii) harvesting of macrophytes associated with a treatment system,*
- (iii) excavations to expose a pipeline for inspection or testing and the creation of temporary stockpiles associated with pipeline maintenance or replacement,*
- (iv) flushing or relining of a pipeline if access is by a manhole,*
- (v) maintenance of access tracks or fire trails (including access tracks along or to corridors, pipelines or other infrastructure),*
- (vi) painting, servicing or minor alteration of existing equipment,*
- (vii) alterations to existing enclosures or buildings,*
- (viii) maintenance or replacement of sewerage system components that does not increase capacity (or increases capacity only to a minimal extent),*

...”

Section 2.20 (TISEPP) provides general requirements for exempt development.

The construction of Sewer Rising Main, Sewer Gravity Main, upgrade of SPS7, demolition of redundant SPS7 components and establishment of an APZ, each constitute an ‘activity’ for the purposes of Part 5 of the EP&A Act and can be carried out by (or on behalf of) a public authority as development without consent. Environmental assessment under Part 5 of the EP&A Act is required, including consideration of matters outlined in Section 171 of the EP&A Regulation 2021. This REF provides this assessment and ensures that Council as determining authority in consideration of the activity, meets its obligation under s5.5 of the EP&A Act, to examine and take

into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

#### 4.2 Biodiversity Conservation Act 2016

The proposed development complies with the *Biodiversity Conservation Act 2016* for the following reasons:

- The proposed activity is unlikely to have a significant impact on threatened species and/or threatened ecological communities listed in the schedules of the Act. There is, therefore, no requirement to 'opt in' to the Biodiversity Offset Scheme.
- The design and mitigation measures (Section 7 of this REF) would ensure that no *serious and irreversible impacts on biodiversity values* (as defined by the BC Act) occur at the site of the proposed activity.
- The proposed activity is not within an area declared to be of "outstanding biodiversity value" as defined in the Act and Regulations.

Because of the above considerations, neither a species impact statement nor a biodiversity development assessment report is required for the proposed activity.

It is also a defence to a prosecution for an offence under Part 2 of the Act (harming animals, picking plants, damaging the habitat of threatened species or ecological communities *etc*) if the work was essential for the carrying out of an activity by a determining authority within the meaning of Part 5 of the Environmental Planning and Assessment Act 1979 after compliance with that Part.

The activity will not remove vegetation that is listed under Schedule 1 Threatened Species, Schedule 2 Threatened ecological communities and Schedule 6 Protected Plants. Therefore, the activity is considered permissible as this REF has been prepared and determined in accordance with the EP&A Act.

Refer to Section 3.2 for more information.

#### 4.3 Fisheries Management Act 1994

Dredging and reclamation works in water land, and the harm of marine vegetation are regulated under Part 7 of the *Fisheries Management Act 1994*.

Section 200 of the Act prescribes circumstances where a local government can carry out dredging or reclamation, *i.e.*:

- Under the authority of a permit ("Fisheries Permit"), or
- Work authorised under the Crown Land Management Act 2016, or
- Work authorised by a relevant public authority (other than a local government authority).

Under the *Policy and guidelines for fish habitat conservation and management* (NSW DPI 2013), DPI Fisheries focuses the application of the FM Act and FM Regulations and associated policies and guidelines on "key fish habitats". Issue of a Fisheries Permit is typically required for activities constituting dredging or reclamation within or with potential to impact areas identified as Key Fish Habitat.

Key Fish Habitat (KFH) is mapped by NSW Department of Primary Industries (DPI) Fisheries as occurring within and in proximity to the site in association with the unnamed watercourse tributary

of Moona Moona Creek and the swamp both upstream and downstream of Berry St (refer to Figure 9 above).

Works along Berry St in the vicinity of the unnamed watercourse culvert crossing would involve only the construction of a new Rising Main, the alignment of which would involve excavation entirely within the road pavement and near verge and would not occur within water land (as defined under s198A of the Act),

Areas within the site mapped as KFH coinciding with McNamara Ct and Montague St are wholly land-based, contain no water land (as defined under s198A of the Act), and are associated with vegetated buffers occurring between the site and water land.

Section 205 of the Act regulates the harm of marine vegetation.

Estuarine macrophytes including mangroves and saltmarsh are mapped as occurring approximately 250m downstream of the Berry St culvert crossing (Figure 8).

No marine vegetation including mangroves, saltmarsh or seagrass was observed to occur in proximity to the site.

No marine vegetation as defined under s205 of the Act would be directly impacted by the proposal.

Safeguards and mitigation measures including sediment and erosion controls complemented by water quality monitoring would be implemented during construction works to minimise the risk of indirect impacts on marine vegetation and habitat downstream of the site.

It is therefore concluded that a NSW DPI Fisheries Permit would not be required for the proposal as works would not involve dredging or reclamation within water land, nor would works involve harm to regulated marine vegetation.

The proposal was nevertheless referred to NSW DPI Fisheries for comment. Fisheries Manager Mick Bettanin confirmed that based on the provided information (refer SCC D23/436801), the works could proceed without a permit (refer SCC D23/440113).

In other considerations of the Act, the proposed activity:

- would not affect declared aquatic reserves (Part 7, Division 2 of the Act);
- would not involve blocking the passage of fish (s.219);
- would not involve disturbance to gravel beds where salmon or trout spawn (s.208 of the Act);
- does not involve the release of live fish (Part 7, Division 7);
- does not involve the construction of dams and weirs (s.218);
- would not result in the blocking of the passage of fish;
- would not impact declared threatened species of endangered ecological communities (Part 7A);
- does not constitute a declared key threatening process (Part 7A); and
- would not use explosives in a watercourse (Clauses 70 and 71 of the *Fisheries Management (General) Regulation 2019*).

#### *4.4 Marine Estate Management Act 2014*

Moona Moona Creek Sanctuary Zone of Jervis Bay Marine Park occurs upstream of the Burrill St – Elizabeth Dr bridge, Huskisson and approximately 650m downstream of the Berry St culvert crossing via a meandering unnamed watercourse tributary of Moona Moona Creek (Figure 12).

Section 56(3) of the Act sets out the requirements for consideration of the impacts of development without consent (i.e. a Part 5 activity under the EP&A Act) on marine parks or aquatic reserves in the locality of the development as follows:

*“A determining authority must not carry out, or grant an approval to carry out, an activity on land that is in the locality of a marine park or an aquatic reserve in purported compliance with Part 5 of the Environmental Planning and Assessment Act 1979 unless—*

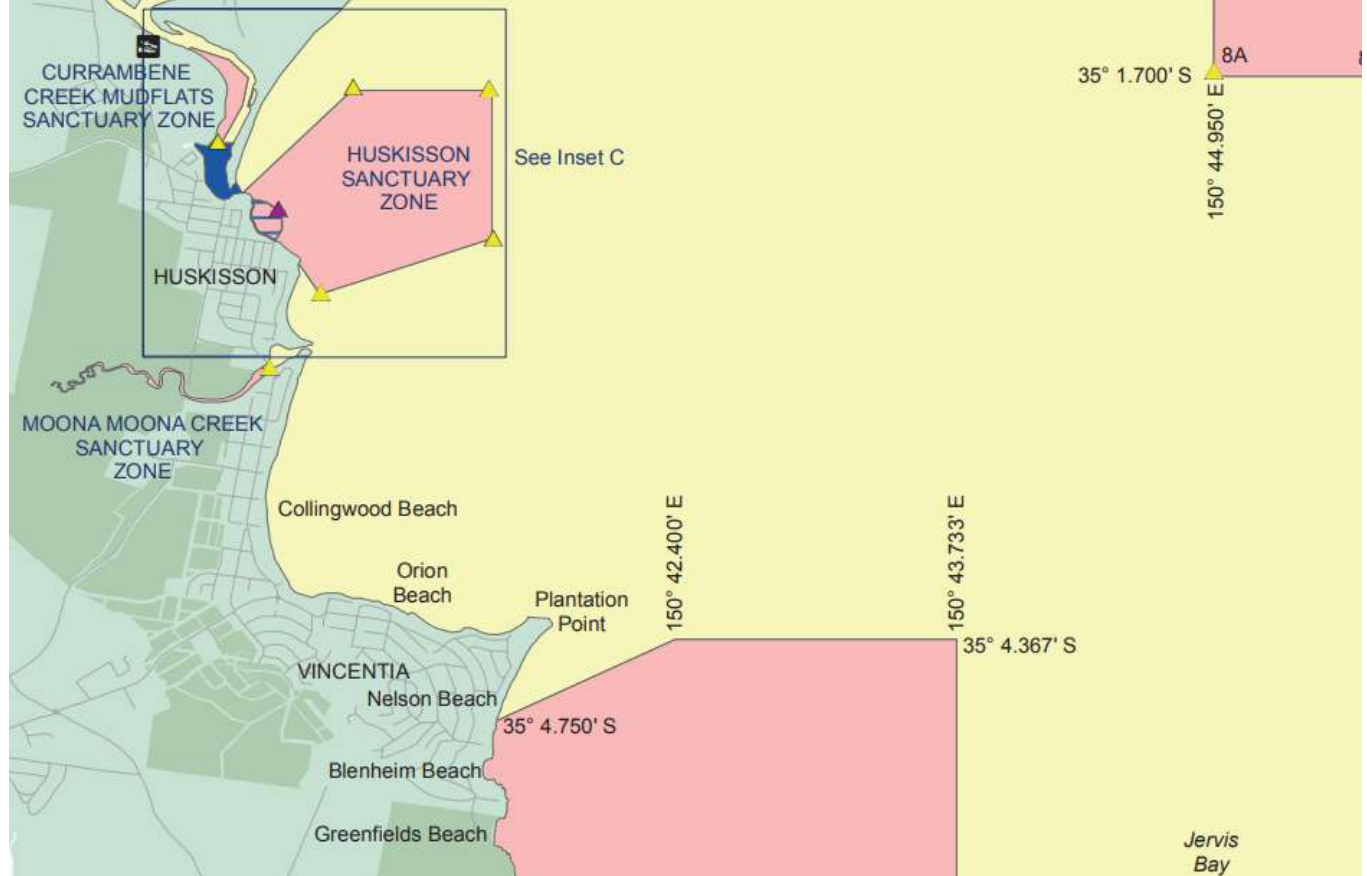
*(a) the determining authority has taken into consideration the purposes of marine parks or aquatic reserves, the regulations and any advice given to it by the relevant Ministers on the impact on the marine park or aquatic reserve of the carrying out of an activity in the locality, and*

*(b) if the determining authority is of the opinion that the proposed activity is likely to have an effect on the plants or animals within the marine park or aquatic reserve or their habitat, the determining authority has consulted with the relevant Ministers.”*

The key objectives of the Jervis Bay Marine Park Operational Plan (Marine Parks Authority 2003) are:

- Conserving marine biodiversity
- Maintaining ecological processes
- Providing opportunities for ecologically sustainable use
- Supporting public appreciation, enjoyment and understanding of the marine park

**Figure 12. Jervis Bay Marine Park Zoning Map (excerpt) showing Moona Moona Creek Sanctuary Zone**



(Source: [https://www.dpi.nsw.gov.au/data/assets/pdf\\_file/0010/656326/Jervis-Bay-Marine-Park-Zoning-Map.pdf](https://www.dpi.nsw.gov.au/data/assets/pdf_file/0010/656326/Jervis-Bay-Marine-Park-Zoning-Map.pdf))

No development would occur within the marine park itself. Works would occur at least 650m upstream from Moona Moona Creek Sanctuary Zone.

Works along Berry St in the vicinity of the unnamed watercourse culvert crossing would involve only the construction of a new Rising Main, the alignment of which would involve excavation entirely within the road pavement and near verge and would not occur within the watercourse itself.

Safeguards and mitigation measures including sediment and erosion controls complemented by water quality monitoring would be implemented during construction works to minimise the risk of indirect impacts on marine vegetation and habitat downstream of the site.

It is therefore concluded that the proposed activity is not likely to have an effect on the plants or animals within the marine park or their habitat.

#### *4.5 National Parks and Wildlife Act 1974*

##### Works affecting Jervis Bay National Park

Works would be undertaken over a small (6 m x 2 m) area within Jervis Bay National Park (Part Lot 792 DP 877477), to the immediate west of the SPS7 compound on Lot 1 DP 620668.

A notification regarding the project works occurring adjacent to Jervis Bay National Park was sent to National Parks and Wildlife Service – Shoalhaven (NPWS) on 30th October 2023 with a draft of this REF. At that time, it was intended that no works would occur on NPWS land and no indirect impacts on NPWS land were likely to occur.

It has become apparent that the construction of a proposed manhole for the new sewer pump station would require minor encroachment into a disturbed area of Lot 792 DP 877477 (Jervis Bay National Park).

Authorisation is being sought to carry out works affecting National Park land.

No infrastructure would be constructed within the National Park, but disturbance to the land involving excavation to a depth of approximately 5.4 m over the 6 m x 2 m area would be required to facilitate construction of a manhole for the storage, i.e. to install formwork.

The boundary of the National Park would be delineated as an excluded zone, with only the approved area of encroachment to be impacted by works. Stockpiling of excavated soil and construction materials would occur on nearby Council land.

The proposed manhole location is determined by the gravity main alignment and pump station configuration, which has been designed as optimally as possible within the constraints of a relatively small site. The current configuration allows pipe alignments to avoid mapped Coastal Wetland areas, minimises removal of trees and allows the retention of two existing power poles.

The location of encroachment on NPWS land is within a managed asset protection zone along the bushland-residential interface (south of Montague St and west of Duncan St), with a grassed buffer containing scattered trees and shrubs. No native vegetation occurs within the proposed area of encroachment. Impacts would therefore be limited to disturbance of the ground.

It is anticipated that the timeframe of encroachment would be up to 4 months (2 months construction program and allowance for weather delays).

Upon completion of construction of the manhole, disturbed National Park land would be restored and remediated to its existing condition with turf grass. Following remediation of the site, there would be no ongoing maintenance or other routine activities associated with the sewer pump station which would impact on the National Park.

**Figure 13. Plan showing area of encroachment into NPWS land**



**Figure 14. Approximate area of encroachment into NPWS land**



### Consideration of the National Parks and Wildlife Act 1994

Under the National Parks and Wildlife Act 1994 (NP&W Act), operations and activities must be consistent with the relevant plan of management over the reserve (s81, NP&W Act). Similarly, the National Parks and Wildlife Regulation 2019 (NP&W Reg) stipulates that a National Park (or any part of a Park), must not be used for any use other than for which it is reserved (cl.6(2)(d), NP&W Reg).

Note also, that under s2.126(8) Transport & Infrastructure SEPP, the provision to carry out the proposed development for the purpose of sewage reticulation systems as development without consent (s2.126(6)), is subject to following condition:

*“Development for the purpose of water recycling facilities or sewage reticulation systems may be carried out on land reserved under the National Parks and Wildlife Act 1974 only if the development is authorised by or under that Act.”*

The Jervis Bay Park & Woollamia Nature Reserve Plan of Management (2011) (PoM) includes provision for easements, maintenance and upgrades associated with water, sewerage, power and telecommunications infrastructure (under Section 7: Other uses). The proposal is therefore consistent with the PoM and by extension, is consistent with the Act and therefore complies with section 2.126(6) the Transport & Infrastructure SEPP.

Furthermore, because the proposal would occur on an existing disturbed area, it would not compromise the objectives of the Park’s PoM (NPWS 2011):

- conserve biodiversity, maintain ecosystem functions, protect geological and geomorphological features and natural phenomena and maintain natural landscapes;
- conserve places, objects, features and landscapes of cultural value;
- protect the ecological integrity of one or more ecosystems for present and future generations;
- promote public appreciation and understanding of the park’s natural and cultural values;
- provide for sustainable visitor use and enjoyment that is compatible with conservation of natural and cultural values;
- provide for sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of natural and cultural values; and
- provide for appropriate research and monitoring.

Additionally, section 156A(2) of the NP&W Act provides that the undertaking of works which are essential for the carrying out of an activity pursuant to an approval of a determining authority within the meaning of Part 5 of the EP&A Act (as is the case with the proposed activity), is a defence against the damaging of reserved land.

Authorisation shall be obtained prior to commencement of any works affecting NPWS land.

### Other considerations under the NP&W Act

The Act provides the basis for the legal protection and management of Aboriginal sites in NSW. Under Sections 86 and 90 of the Act it is an offence to disturb an Aboriginal object or knowingly destroy or damage, or cause the destruction or damage to, an Aboriginal object or place, except in accordance with a permit of consent under section 87 and 90 of the Act.

As there are no recorded sites or visible objects within areas that would be affected by the proposed activity and negligible risk of impacting on unrecorded artefacts, the Due Diligence

Guidelines requires no further assessment as it is reasonable to conclude that there is a low probability of objects occurring in the area of the proposed activity and an AHIP is not required. Refer to Section 3.4 for more information.

#### *4.6 State Environmental Planning Policy (Resilience and Hazards) 2021*

The NSW *State Environmental Planning Policy (Resilience and Hazards) 2021* (RHSEPP) provides development controls and land-use planning frameworks associated with coastal management; hazardous and offensive development; and remediation of land.

Parts of the site are mapped as Coastal Wetland for the purpose of the RHSEPP (Figure 15), including either side of the Berry St road reserve in proximity to the wetland and unnamed creek tributary of Moona Moona Creek, and to the west of McNamara Ct and SPS7.

Section 2.7(1) of the RHSEPP regulates that development consent is required where: the clearing of native vegetation; harm of marine vegetation; or the carrying out of earthworks, levee construction, draining of the land or environmental protection works; or any other development, is carried out on land identified as “Coastal Wetlands” or “Littoral Rainforest”.

Furthermore, development for which consent is required by subsection 2.7(1), other than development for the purpose of environmental protection works, is declared to be designated development.

Section 2.7 of the TISEPP provides that the RHSEPP prevails over the TISEPP with regard to development on land within and in proximity to coastal wetlands and littoral rainforest (s2.7 and s2.8 RHSEPP), in addition to coastal protection works (s2.16 RHSEPP).

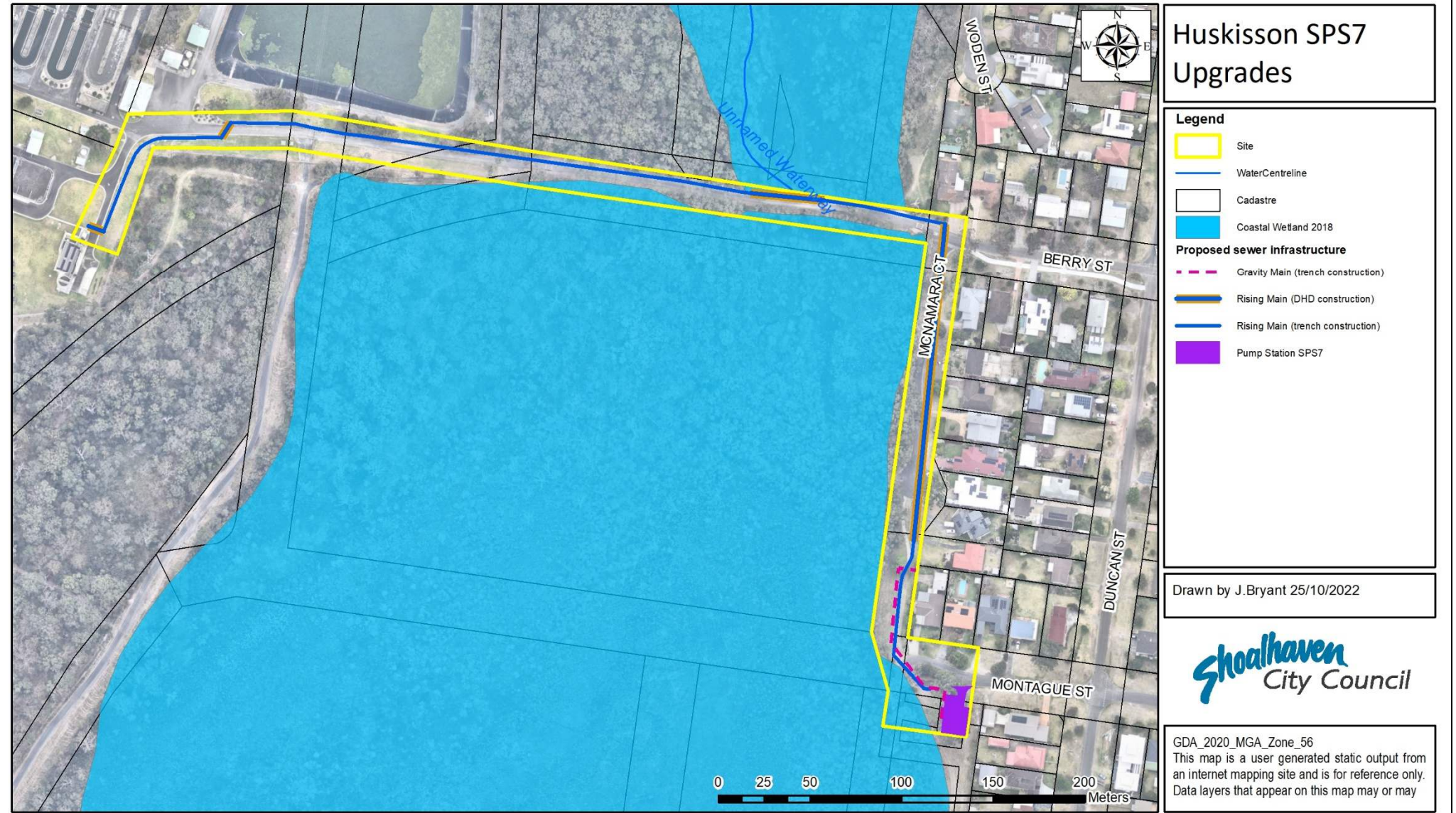
Note that s2.74 (TISEPP) provides that emergency works, routine maintenance works or exempt development carried out under Chapter 2 (TISEPP) prevails over the RHSEPP with regard to development on land within and in proximity to coastal wetlands and littoral rainforest (s2.7 and s2.8 RHSEPP).

Works that can be carried out as exempt development under the TISEPP could therefore be undertaken without triggering the requirement for development consent under the RHSEPP.

The proposal, including construction methodology has been designed to avoid habitat features and sensitive environmental features to every practical extent. The current alignment and use of direct horizontal drilling (DHD) would avoid impacts on coastal wetlands where occurring within the site.

No direct impacts would occur on coastal wetlands that would trigger requirement for development consent under section 2.7(1) of the RHSEPP.

**Figure 15. Coastal Wetland mapped as occurring in proximity to the site**



Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition.

Potential or actual acid sulfate soils which are excavated in proximity to the waterway would be treated and managed appropriately.

The proposal would not affect hydraulic conditions or water quality.

The proposal would improve the function and capacity of the sewage system and would therefore reduce risks associated with overflow and contamination.

No indirect impacts on the wetland are likely.

No further consideration is warranted.

Other considerations of the RHSEPP are not relevant to the current proposal.

#### 4.7 Other

A summary of other relevant legislation and permissibility is provided in Table 8 below.

**Table 8. Summary of other relevant legislation and permissibility**

<b>NSW STATE LEGISLATION</b>
<b><i>Environmental Planning and Assessment Act 1979 (EP&amp;A Act)</i></b>
Permissible <input checked="" type="checkbox"/> Not permissible <input type="checkbox"/>
The Transport and Infrastructure SEPP provides for the proposed works to be undertaken without development consent (refer above). In circumstances where development consent is not required, the environmental assessment provisions outlined in Part 5 of the Act are required to be complied with. This REF fulfils this requirement.
<b><i>Shoalhaven Local Environmental Plan 2014 (SLEP)</i></b>
Permissible <input checked="" type="checkbox"/> Not permissible <input type="checkbox"/>
Under the SLEP the proposed activity may have required development consent. The provisions of Transport and Infrastructure SEPP, however, prevail over the SLEP where there is an inconsistency by virtue of Section 3.28 of the EP&A Act. Consequently, development consent is not required.
<b><i>Protection of the Environment Operations Act 1997</i></b>
Permissible <input checked="" type="checkbox"/> Not permissible <input type="checkbox"/>
The proposed activity does not constitute scheduled development work or scheduled activities as listed in Schedule 1 of the Act. The proposed activity (upgrade of reticulation infrastructure) therefore does not require an environmental protection licence. Operation of the sewage treatment plant is covered by Environmental Protection Licence (EPL) 2419.
<b><i>Heritage Act 1977</i></b>

Permissible  Not permissible

The proposed activity would not disturb an item of state heritage significance. The proposal would occur in a previously disturbed area and constitutes 'minor works' under '*Relics of local heritage significance: a guide for minor works with limited impact*'. The proposal would not result in any direct impacts on heritage items or values. Works can be undertaken with caution under an applicable exception from an excavation permit under s139(1) and (2) of the *Heritage Act 1977*. Refer to s3.5 of this REF for more information.

**Water Management Act 2000**

Permissible  Not permissible

- Local councils are exempt from s.91E(1) of the Act in relation to all controlled activities that they carry out in, on or under waterfront land by virtue of clause 41 of the *Water Management (General) Regulation 2018*.
- The proposal would not interfere with the aquifer and therefore an interference licence is not required (s.91F).

**COMMONWEALTH LEGISLATION**

**Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EP&BC Act)**

Permissible  Not permissible

The proposed activity would not be undertaken on Commonwealth land and no matters of National Environmental Significance are likely to be significantly impacted by the proposed activity (Section 3.3). The proposed activity is therefore not a controlled action and does not require commonwealth referral.

**Commonwealth *Native Title Act 1993***

Permissible  Not permissible

The proposal would occur entirely within public roads for which Council is the roads authority and within Council freehold operational land.

It is therefore assumed that Native Title has been extinguished as a Previous Exclusive Possession Act. No procedural rights are applicable.

## 5. CONSULTATION WITH GOVERNMENT AGENCIES

### 5.1 Transport & Infrastructure SEPP

Note that consultation under Chapter 2, Part 2.2 of the Transport & Infrastructure SEPP applies only to relevant development undertaken as development without consent under the provisions of Chapter 2.

#### Section 2.10 – Development with impacts on council-related infrastructure or services

No impacts to stormwater management systems, water infrastructure, public places, nor excavation of footpaths, such as described under s2.10(1) TISEPP would occur.

The proposal would affect the sewage system for which Shoalhaven Water who is undertaking the works, is also the authority.

The proposal would temporarily impact the form and function of a public road for which Council, is the road authority.

Notification to Council's Road Asset Manager and District Engineer – Basin shall be provided with opportunity to comment.

#### Section 2.11 – Development with impacts on local heritage

No listed heritage items occur in proximity to the proposal. Refer to Section 3.5 of this REF for more information.

Consultation under s2.11 TISEPP is therefore not required.

#### Section 2.12 – Development with impacts on flood liable land

The proposal would occur on land which is mapped as being flood liable.

Consultation with Council's Floodplain Management Team has been undertaken.

Refer to Section 3.7 of this REF for more information.

#### Section 2.13 – Consultation with State Emergency Service—development with impacts on flood liable land

The proposal would occur on land which is mapped as being flood liable (refer to Section 3.7 of this REF).

However, the proposal does not constitute a relevant provision under s2.13(2) TISEPP.

Consultation under s2.13 TISEPP is therefore not required.

#### Section 2.14 – Development with impacts on certain land within the coastal zone

The proposal would not occur within a coastal vulnerability area. Consultation is therefore not required.

### Section 2.15 – Consultation with public authorities other than councils

In consideration of the consultation requirements specified under s2.15 TISEPP:

- would be undertaken on or adjacent to land reserved under the *National Parks and Wildlife Act 1974* or in Zone E1 or in equivalent zones: i.e. Jervis Bay National Park Lot 792 DP 877477 and Lot 78 DP 874040.
- does not comprise a fixed or floating structure in or over navigable waters
- would not increase the amount of artificial light in the night sky and located on land within the dark sky region as identified on the dark sky region map
- would not be undertaken within Defence communications facility buffer (only relevant to the defence communications facility near Morundah)
- would not be undertaken on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*

Consultation in accordance with Section 2.15 TISEPP was commenced and is ongoing with National Parks and Wildlife Service (NPWS) for proposed works occurring adjacent to and affecting NPWS land (Jervis Bay National Park Lot 792 DP 877477 and Lot 78 DP 874040).

Refer to section 4.5 of this REF for more information.

### Section 2.16 – Consideration of Planning for Bush Fire Protection (PBP)

The proposed activity is not a type applicable to this clause *i.e.* health services facilities, correctional centres and residential accommodation. Consideration of PBP is therefore not required.

### Summary

Notification of the proposed temporary impact to the form and function of Berry St, McNamara Ct and Montague St shall be provided to Council's Road Asset Manager and District Engineer – Basin, with opportunity to comment.

Consultation in accordance with Section 2.15 TISEPP was commenced and is ongoing with National Parks and Wildlife Service (NPWS) for proposed works occurring adjacent to and affecting NPWS land (Jervis Bay National Park Lot 792 DP 877477 and Lot 78 DP 874040). Refer to section 4.5 of this REF for more information.

## 6. COMMUNITY ENGAGEMENT

In accordance with Council's Community Engagement Policy, the proposal constitutes a *Local Area – Low Impact* activity. Formal community engagement is not required.

This Review of Environmental Factors (REF) was placed on Council's website for public exhibition from 8<sup>th</sup> November to 29<sup>th</sup> November 2023: <https://www.shoalhaven.nsw.gov.au/Projects-Engagement/Major-Projects-Works/HuskissonVincentia-SPS-7-Rising-Main-and-Gravity-Main-Upgrades> . No submissions were received.

Landowners and residents immediately adjacent to the site shall be advised of notified of the proposal and advised of works timeframes, any proposed and likely disruptions to property access, and any likely impact on landscaping encroachments within road reserves.

## 7. ENVIRONMENTAL SAFEGUARDS AND MEASURES TO MINIMISE IMPACTS

Safeguard / Measure	Responsibility
<b>Works planning, approvals, consultation &amp; notification</b>	
<p>1. Design of SPS7 shall:</p> <p>a) provide for electrical installation to be above the Flood Planning Level (FPL) + 0.5m freeboard (i.e. electrical installation shall be at minimum 3.06m AHD).</p> <p>b) incorporate recommendations in Table 6 of this REF to reduce sound pressure levels outside SPS7</p>	<p>Project Manager; Design Consultant</p>
<p>2. Acid Sulfate Soils</p> <p>a) An acid sulfate soil management plan (ASSMP) shall detail soil and water monitoring requirements during construction activities; management of groundwater; establishment of a bunded treatment area in a suitable on-site or nearby location; and treatment and disposal of potential acid sulfate soils in accordance with the NSW Acid Sulfate Soil Manual and NSW EPA guidelines.</p> <p>b) If treatment of ASS is required, a bunded treatment area shall be established on existing clear and level ground which is at least 50m from any watercourse.</p>	<p>Project Manager; Construction Contractor;</p>
<p>3. Authorisation to carry out required works affecting Jarvis Bay National Park shall be obtained from NSW National Parks and Wildlife Service prior to commencement of any works affecting this land.</p>	<p>Project Manager; SCC Environmental Officer</p>
<p>4. Notification of the proposed temporary impact to the form and function of Berry St, McNamara Ct and Montague St shall be provided to Council's Road Asset Manager and District Engineer – Basin, with opportunity to comment.</p>	<p>Project Manager; SCC Environmental Officer</p>
<p>5. A Construction Environmental Management Plan (CEMP) shall be produced by the contractor(s) which includes but is not limited to:</p> <p>a) Sediment and erosion controls;</p> <p>b) Construction methodology with details for constrained areas including Berry St culvert crossing;</p> <p>c) A site-specific Unexpected Finds Protocol to manage potential instances of buried materials (including additional construction wastes) or impacted soils and groundwater that may be encountered on-site during construction works.</p>	<p>Construction Contractor</p>
<p>6. Landowners and residents immediately adjacent to and within 50m (minimum) of the site, shall be notified via letter</p>	<p>Project Manager</p>

Safeguard / Measure	Responsibility
of the proposal and advised of works timeframes, noise and vibrational impacts, any proposed and likely disruptions to property access, and any likely impact on landscaping encroachments within road reserves.	
7. This REF must be published on the determining authority's (Council's) website (i.e. public exhibition) or the NSW planning portal, in accordance with clause 171(4) EP&A Regulation 2021 and the guidelines published under cl.170, as requiring an approval or permit under section 200 of the <i>Fisheries Management Act 1994</i> ).	Project Manager; SCC Environmental Officer
<b>Site Establishment</b>	
8. An appropriate traffic management plan shall be developed and implemented to minimise disruption and reduce risk of incident along affected areas of Berry St, McNamara Ct and Montague St during works.	Construction Contractor
9. Alternative vehicular access to the Huskisson Wastewater Treatment Plant (WWTP) shall be established along the sealed access between the WWTP and Coaster Cct Vincentia during works which prevent access along Berry St in the vicinity of the unnamed creek crossing.	Project Manager; Wastewater Operations Manager; Construction Contractor
10. Any construction compound(s), machinery, vehicles and stockpiles shall be located within existing cleared areas of the road reserve, the SPS7 site or Huskisson WWTP, and shall not encroach into native vegetation or National Parks & Wildlife Service (NPWS) land. A buffer of minimum 3 m to tree trunks and 10 m to watercourses shall be maintained.	Project Manager; Construction Contractor
11. All machinery to be used shall be cleaned, degreased and in good working order prior to entering the site.	Construction contractor
12. The contractor shall keep an emergency spill kit on-site at all times with procedures to contain and collect any leakage or spillage of fuels, oils and greases from plant and equipment.	Construction contractor
13. No major equipment maintenance works shall be undertaken on-site.	Construction contractor
14. To avoid the risk of pollution from machinery, refuelling shall generally be done off site, however if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray shall be used to catch any accidentally spilt fuel.	Construction contractor
<b>Construction works</b>	
15. Erosion and sediment controls in accordance with the 'Blue Book' (Landcom 2004) shall be installed and maintained to prevent the entry of sediment into waterways including but not limited to:	Construction Contractor

Safeguard / Measure	Responsibility
<ul style="list-style-type: none"> <li>In-stream combination hydrocarbon boom and silt curtain(s) within the unnamed watercourse and wetland downstream of site, encompassing sections of work while maintaining fish passage through at least one culvert at any time.</li> <li>Sediment fencing downslope of compound / stockpile areas.</li> <li>Sediment fencing and or straw-bale barriers as appropriate, downslope of works along Berry St and McNamara Ct, and downslope of SPS7.</li> </ul> <p>Erosion and sediment controls shall be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion is minimal.</p>	
<p>16. Water quality monitoring shall be undertaken during construction activities, targeting pH, nutrients (N,P), electrical conductivity, dissolved oxygen and turbidity in the unnamed watercourse immediately downstream of the Berry St culvert crossing. Monitoring shall involve sampling at locations above, immediately below and 100-200m downstream, with baseline data collected prior to commencement of works. Monitoring during works shall be assessed against relevant ANZECC water quality guidelines for aquatic ecosystems, as trigger values for cessation of works and implementation of additional controls to manage pollution if required.</p>	<p>Construction Contractor; Environmental Consultant</p>
<p>17. NPWS land boundaries, Coastal Wetlands and significant habitat features (including hollow-bearing trees) in proximity to works shall be delineated and protected from encroachment and other impacts during adjacent works.</p> <p>No vegetation clearing or other works shall occur within Coastal Wetlands.</p> <p>No vegetation clearing or other works shall occur within NPWS land unless authorisation from NPWS is obtained.</p>	<p>Construction Contractor</p>
<p>18. Tree protection measures in accordance with AS4970 – <i>Protection of trees on development sites</i> shall be implemented to minimise the risk of impact to the structural root zones of trees to be retained.</p>	<p>Construction Contractor</p>
<p>19. Tree removal and pruning shall be limited to that required to carry out the works as proposed and to establish an asset protection zone (APZ) in accordance with NSW Rural Fire Services’ <i>Standards for Asset Protection Zones</i> <a href="https://www.rfs.nsw.gov.au/data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf">https://www.rfs.nsw.gov.au/data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf</a> including:</p>	<p>Construction Contractor</p>

Safeguard / Measure	Responsibility
<ul style="list-style-type: none"> <li>• Prune or remove trees so that there is no continuous tree canopy leading from the hazard to the asset, with tree crowns separated by two to five metres.</li> <li>• No tree canopy is to overhang within two metres of the building.</li> </ul>	
20. No machinery, vehicles or stockpiles shall encroach into native vegetation.	Construction Contractor
21. No machinery shall operate within the water.	Construction Contractor
22. Excavation works shall be undertaken in accordance with the ASSMP.	Construction Contractor
23. Dewatering (if required) shall be in accordance with the ASSMP, and shall involve appropriate filtration and energy dissipation, e.g. discharging of pumped water into bunding of geofabric-wrapped straw bales (or similar) on a grassed area with a 20 m (minimum) buffer to the creek to allow to slow infiltration into the groundwater for filtration of sediment. Sediment fencing shall be installed across the slope at low point of infiltration area. The inlet pipe shall be covered with a 6 mm mesh screen to prevent fish being drawn into the pump. Monitoring of pools and relocation of any aquatic fauna shall be undertaken.	Construction Contractor
24. In the event that any wildlife be significantly disturbed or injured during works, Council’s Environmental Officers are to be contacted on 4429 3405, or if unavailable, Wildlife Rescue – South Coast should be contacted on 0418 427 214, to rescue and relocate the animal(s).	Construction Contractor
25. Any waste material shall be contained within the land-based site during construction and then be removed to an authorised waste disposal facility or an appropriate storage area for reuse elsewhere. No material shall be placed in any location or in any manner that would allow it to enter the waterway. Stockpiles of debris and construction materials shall be stored at least 10 metres outside the top of the creek banks. General refuse shall be disposed of to a covered container stored at the site. No waste shall be burnt or buried on-site or disposed of in the waterway.	Construction contractor
26. If engineering fill is imported to the site, all conditions prescribed in the applicable Resource Recovery Exemptions shall be complied with, including: <ul style="list-style-type: none"> <li>• ensuring the producer of the waste has complied with the applicable Order such as testing and validation</li> <li>• ensuring the material has met all chemical and other material requirements specified in the applicable Order</li> </ul>	Construction contractor

Safeguard / Measure	Responsibility
<ul style="list-style-type: none"> <li>• keeping a written record of the following for a period of six years:               <ul style="list-style-type: none"> <li>○ the quantity of material received</li> <li>○ the name and address of the supplier</li> </ul> </li> </ul>	
<p>27. If Virgin Excavated Natural Material (VENM) is taken to the site (i.e. without chemical testing and validation):</p> <ol style="list-style-type: none"> <li>a. the material must meet the definition of VENM (<a href="http://www.epa.nsw.gov.au/waste/virgin-material.htm">http://www.epa.nsw.gov.au/waste/virgin-material.htm</a>)</li> <li>b. the supplier must fill out and complete the <i>VENM Certificate</i></li> </ol> <p>The completed <i>VENM Certificate</i> shall be kept for at least six years and provided to the EPA upon any request.</p>	Construction contractor
<p>28. Any waste generated on site shall be reused in accordance with relevant Resource Recovery Orders and Exemptions, or otherwise disposed of at a licenced waste facility.</p>	Construction Contractor
<p>29. Staff working at the site will be instructed to stop work immediately on identification of any suspected Aboriginal heritage artefact. If any objects are found, NSW Department of Planning, Industry and Environment (ph:131 555) shall be contacted.</p>	Construction Contractor
<p>30. Disturbed road verges and other grassed or vegetated areas shall be stabilised following construction with jute mesh and seeding and /or hydromulch containing suitable grass species.</p>	Construction Contractor;
<p>31. Remediation of construction compound areas shall involve removal of all stockpiled material, dressing and turfing or seeding of grassed areas, as required to return the area to its existing state prior to establishment of the compound.</p>	Construction Contractor;
<b>Post construction</b>	
<p>32. An asset form shall be trimmed to file 44574E on commissioning of the assets in Accordance with POL15/8 Asset Accounting Policy section 3.1.4 and POL16/79 Asset Management Policy section 3.3.</p>	Project Manager
<p>33. In the event that existing noise production or EPA noise design goals are exceeded, post installation noise compliance assessment shall be undertaken and additional mitigations employed as required to ensure no elevation in noise level is experienced as a result of the new sewer pump station.</p>	Project Manager

## 8. SIGNIFICANCE EVALUATION & DECISION STATEMENT

This Review of Environmental Factors has assessed the likely environmental impacts, in the context of Part 5 of the Environmental Planning and Assessment Act 1979, of a proposal by Shoalhaven City Council for the upgrade of an existing Shoalhaven Water sewer pump station (SPS7) on Montague St, Huskisson and associated rising and gravity sewer mains on McNamara Ct and Berry St, Huskisson.

In consideration of the proposal as described in Section 1, in accordance with any design plans referred to in this report, and assuming the implementation of all proposed safeguards and mitigation measures (Section 7), it is determined that:

1. It is unlikely that there will be any significant environmental impact as a result of the proposed activity and an Environmental Impact Statement is not required.
2. The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, and a Species Impact Statement / BDAR is not required.
3. The following statutory approvals, licences, permits and external government consultations are required (refer to Section 7 safeguards and mitigation measures for more information):
  - Authorisation from NSW National Parks and Wildlife Service to carry out works affecting Jervis Bay National Park (refer s4.5 of this REF).
4. The proposed activity may proceed.

In accepting and adopting this REF, Shoalhaven City Council commits to ensuring the implementation of the proposed safeguards and mitigation measures identified in this report (Section 7) to minimise and/or prevent detrimental environmental impacts.

**Determined by:**

Robert Horner  
Executive Manager  
Shoalhaven Water Utilities

Date:

## 9. REFERENCES

- ASSMAC (Acid Sulfate Soils Management Advisory Committee). 1998. *NSW Acid Sulfate Soils Assessment Guidelines*. Available at:  
<https://www.environment.nsw.gov.au/resources/soils/ASS-Manual-2-Assessment-Guidelines.pdf>
- D&N Geotechnical (2023). *Huskisson SPS 7 & Main Upgrade – Preliminary Site Investigation and Preliminary Sampling and Analysis Report*. Consultant report to BG&E Pty Ltd. SCC reference D23/430655.
- DAWE (Department of Agriculture, Water and the Environment, Australian Government). 2021. *Species Profiles and Threats Database* (online database). Available at  
<https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- DECCW (Department of Environment, Climate Change and Water, NSW) 2010 Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales.
- DIPNR (NSW Department of Infrastructure, Planning and Natural Resources). 2004. *Riparian Corridor Management Study covering all of the Wollongong Local Government Area and Calderwood Valley in the Shellharbour Local Government Area*.
- DoE (Department of Environment, Commonwealth of Australia). 2013. *Matters of National Environmental Significance Significant Impact Guidelines 1.1*. Available at:  
<http://155.187.2.69/epbc/guidelines-policies.html>
- EES (Environment, Energy and Science – NSW Department of Planning, Industry and the Environment). 2020. *Surveying threatened plants and their habitats*.
- Fisheries Scientific Committee 2007 *Determination: Degradation of Native Riparian Vegetation along New South Wales Water Courses*.  
[https://www.dpi.nsw.gov.au/data/assets/pdf\\_file/0009/636534/FR19-riparian-vegetation.pdf](https://www.dpi.nsw.gov.au/data/assets/pdf_file/0009/636534/FR19-riparian-vegetation.pdf)
- GHD. 2013. *Wastewater Servicing Strategy*. Consultant report to Shoalhaven Water. Council reference D15/376711.
- Harwood Acoustics. 2023. *Environmental Noise Assessment – Upgrade Sewer Pump Station at Montague St. Huskisson, NSW 2540*. Consultant report to Shoalhaven City Council (SCC reference D23/497084).
- Jones, D.L. 1988. *Native orchids of Australia*. Reed Books Pty Ltd: Frenches Forest, NSW.
- Klaphake, V. 2010. *Eucalypts of the Sydney region* (2nd edn.). Van Klaphake: Byabarra, NSW.
- Marine Parks Authority. 2003. *Operational plan for Jervis Bay Marine Park*. Available at:  
[https://www.dpi.nsw.gov.au/data/assets/pdf\\_file/0006/656295/jbmp-operational-plan.pdf](https://www.dpi.nsw.gov.au/data/assets/pdf_file/0006/656295/jbmp-operational-plan.pdf)
- Morcombe, M. 2004. *Field Guide to Australian Birds*. Steve Parish Publishing, Australia.
- NPWS (NSW National Parks & Wildlife Service). (2001). *Environmental Impact Assessment Guideline: Giant Burrowing Frog*. Available at:  
<https://www.environment.nsw.gov.au/resources/nature/Giantburrowingfrogeia0501.pdf>
- NPWS (NSW National Parks & Wildlife Service). (2011). *Jervis Bay National Park & Woollamia Nature Reserve Plan of Management*. Available from:

<https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/jervis-bay-national-park-wollamia-nature-reserve-plan-of-management-110221.pdf>

NSW Government. 2022. *Threatened Biodiversity Data Collection* (online database). Available at: [https://www.environment.nsw.gov.au/AtlasApp/UI\\_Modules/TSM\\_/Default.aspx](https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx)

NSW Scientific Committee. 2011a. *Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing - NSW Scientific Committee - final determination*. Available from: <https://www.environment.nsw.gov.au/determinations/SwampOakFloodplainEndSpListing.htm>

NSW Scientific Committee. 2011b. *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act*. Available at: <https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2011-2012/Swamp-Sclerophyll-Forest-on-Coastal-Floodplains-of-the-NSW-North-Coast-minor-amendment-Determination>

NSW Scientific Committee. 2021a. *Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands - key threatening process listing*. Available at: <https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2000-2003/Alteration-to-the-natural-flow-regimes-key-threatening-process-listing>

NSW Scientific Committee. 2021b. *Clearing of native vegetation - key threatening process listing*. Available at: <https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/clearing-of-native-vegetation-key-threatening-process-listing>

OEH (NSW Office of Environment and Heritage). 2017a. *Australasian Bittern – profile*. Available at: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10105>

OEH (NSW Office of Environment and Heritage). 2017b. *Australian Painted Snipe – profile*. Available at: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10734>

OEH (NSW Office of Environment and Heritage). 2017c. *Eastern False Pipistrelle – profile*. Available at: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10331>

OEH (NSW Office of Environment and Heritage). 2017d. *Giant Burrowing Frog - profile*. Available from: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10544>

OEH (NSW Office of Environment and Heritage). 2017e. *Masked Owl – profile*. Available from: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10820>

OEH (NSW Office of Environment and Heritage). 2017f. *Sooty Owl – profile*. Available from: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10821>

- OEH (NSW Office of Environment and Heritage). 2017g. *Southern Brown Bandicoot (eastern) - profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10439>
- OEH (NSW Office of Environment and Heritage). 2018a. *Black Bittern – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10441>
- OEH (NSW Office of Environment and Heritage). 2018b. *Eastern Bristlebird – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10206>
- OEH (NSW Office of Environment and Heritage). 2019. *Magenta Lilly Pilly – profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10794>
- OEH (NSW Office of Environment and Heritage). 2020a. *Grey-headed Flying-fox - profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697>
- OEH (NSW Office of Environment and Heritage). 2020b. *Southern Myotis – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10549>
- OEH (NSW Office of Environment and Heritage). 2021. *Giant Dragonfly – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10600>
- OEH (NSW Office of Environment and Heritage). 2022a. *Eastern Chestnut Mouse – Profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10687>
- OEH (NSW Office of Environment and Heritage). 2022b. *Eastern Coastal Free-tailed Bat – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10544>
- OEH (NSW Office of Environment and Heritage). 2022c. *Eastern Pygmy-possum – Profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10155>
- OEH (NSW Office of Environment and Heritage). 2022d. *Gang-gang Cockatoo – profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10975>
- OEH (NSW Office of Environment and Heritage). 2022e. *Glossy Black-Cockatoo – profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10140>
- OEH (NSW Office of Environment and Heritage). 2022f. *Greater Broad-nosed Bat – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10748>
- OEH (NSW Office of Environment and Heritage). 2022g. *Green and Golden Bell Frog - profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10483>
- OEH (NSW Office of Environment and Heritage). 2022h. *Little Lorikeet – profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20111>
- OEH (NSW Office of Environment and Heritage). 2022i. *New Holland Mouse - profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20253>

- OEH (NSW Office of Environment and Heritage). 2022j. *Powerful Owl – profile*. Available from:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562>
- OEH (NSW Office of Environment and Heritage). 2022k. *Turquoise Parrot – profile*. Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10555>
- OEH (NSW Office of Environment and Heritage). 2022l. *Yellow-bellied Glider – Profile*. Available  
at: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10601>
- OEH (NSW Office of Environment and Heritage). 2023a. *Southern Greater Glider – Profile*.  
Available at:  
<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20306>
- OEH (NSW Office of Environment and Heritage). 2023b. *White-footed Dunnart – profile*. Available  
at: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10758>
- Richards, G.C. & Hall, L.S. 2012. *A natural history of Australian bats: Working the night shift*.  
CSIRO Publishing: Collingwood, Victoria.

**APPENDIX A – Design Plans**

**“HUSKISSON SPS 7, RISING MAIN AND GRAVITY MAIN UPGRADE”**

**Draft detailed design**

**BG&E, 28/07/2023**

**Drawing set: BE23020**

**SCC reference: D23/430626**

## APPENDIX B – Threatened Species Likelihood of Occurrence

### NSW Threatened Species Likelihood of Occurrence Table

The table of likelihood of occurrence evaluates the likelihood of threatened species to occur on the subject site. This list is derived from previously recorded species within a 5 km radius (taken from NSW BioNet Atlas) around the subject site. Ecology information unless otherwise stated, has been obtained from the *Threatened Biodiversity Profile Search* on the NSW OEH (Office of Environment & Heritage) online database (<https://www.environment.nsw.gov.au/threatenedspeciesapp/>).

#### Likelihood of occurrence in study area

1. Unlikely – Species, population or ecological community is not likely to occur. Lack of previous recent (<25 years) records and suitable potential habitat limited or not available in the study area.
2. Likely – Species, population or ecological community could occur and study area is likely to provide suitable habitat. Previous records in the locality and/or suitable potential habitat in the study area.
3. Present – Species, population or ecological community was recorded during the field investigations.

#### Possibility of impact

1. Unlikely – The proposal would be unlikely to impact this species or its habitats. No NSW *Biodiversity Conservation Act 2016* “Test of Significance” or EPBC Act significance assessment is necessary for this species.
2. Likely – The proposal could impact this species, population or ecological community or its habitats. A NSW *Biodiversity Conservation Act 2016* “Test of Significance” and/or EPBC Act significance assessment is required for this species, population or ecological community.

**Note that where further assessment is deemed required, this is undertaken within the REF as a Test of Significance (in the case of NSW listed species) or an EPBC Significant Impact Assessment (in the case of Commonwealth listed species).**

## Review of Environmental Factors Part 5 Assessment EP&A Act 1979

<b>Endangered Ecological Community name</b>	<b>Status</b>	<b>Likelihood of presence within areas impacted by the activity</b>
<i>Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (BC Act)</i>	Endangered - NSW BC Act	Shoalhaven Biometric based mapping shows the EEC occurring immediately adjacent to the site in two narrow locations to the north of Berry St, either side of the waterway and wetland, however current PCT mapping does not indicate vegetation associated with the EEC occurring in proximity to the site and site investigations did not observe any occurrence of the EEC.
<i>Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (BC Act)</i> <i>Subtropical and Temperate Coastal Saltmarsh (EPBC Act)</i>	Endangered - NSW BC Act  Vulnerable - Commonwealth EPBC Act	Shoalhaven Biometric based mapping shows the EEC occurring within 20m of the site, downstream along the waterway to the north of Berry St, however current PCT mapping does not indicate vegetation associated with the EEC occurring in proximity to the site and site investigations did not observe any occurrence of the EEC.
<i>Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion (BC Act)</i> <i>Illawarra and south coast lowland forest and woodland ecological community (EPBC Act)</i>	Endangered - NSW BC Act  Critically Endangered - Commonwealth EPBC Act	Does not occur on-site and is not mapped as occurring in close proximity to the site (nearest records approx. 2.4km to the south-west of the site).
<i>Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (BC Act)</i> <i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community (EPBC Act)</i>	Endangered - NSW BC Act  Endangered - Commonwealth EPBC Act	Mapped as occurring within and in proximity to the site, associated with wetland areas. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.
<i>Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (BC Act)</i> <i>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (EPBC Act)</i>	Endangered - NSW BC Act	Mapped as occurring within and in proximity to the site, associated with wetland areas. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.

## Review of Environmental Factors Part 5 Assessment EP&A Act 1979

<i>Species name</i>	<i>Status</i>	<i>Habitat requirements (www.environment.nsw.gov.au)</i>	<i>Likelihood of presence within areas impacted by the activity</i>
<b>FLORA</b>			
<i>Banksia vincentia</i>	NSW BC Act Critically endangered	Low sedgeland and grassy heath, sometimes amongst emergent mallee <i>Eucalyptus gummifera</i> and other tall shrubs of Banksia and Hakea. Found on coastal sands over clay on sandstone. One population known, containing 14 individuals	Does not occur. A conspicuous species not detected during surveys. No suitable habitat present.
<i>Caladenia tessellata</i> Thick lip Spider orchid	Vulnerable EPBC Act Endangered NSW BC Act	The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	Unlikely to occur. Typical habitat of grassy sclerophyll woodland or open heathland is not present within the site. Targeted surveys undertaken during the species' confirmed flowering period did not detect the species. Refer to section 2.2 in this REF.
<i>Calochilus pulchellus</i> Pretty Beard Orchid	Endangered NSW BC Act	The habitat of this species varies considerably. At Vincentia the species grows in dense low wet heath in wet sand over sandstone. In Booderee National Park it grows in a tall heathy association. In Morton National Park on the Little Forest Plateau it occurs in low heath among scattered clumps of emergent eucalypts and Banksia in shallow coarse white sand over sandstone, in a near-escarpment area subject to strong orographic precipitation.	Unlikely to occur. Marginal, low-potential habitat for the species is present within the site. Targeted surveys undertaken during the species' confirmed flowering period did not detect the species. Refer to section 2.2 in this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<i>Cryptostylis hunteriana</i> Leafless tongue Orchid	Vulnerable EPBC Act Vulnerable NSW BC Act	Occurs in a wide variety of habitats from moist sandy soil to dense heathland, sedgeland and verges of fire trails. The larger populations typically occur in woodland dominated by Scribbly Gum ( <i>Eucalyptus sclerophylla</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ) and Black Sheoak ( <i>Allocasuarina littoralis</i> ); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid ( <i>C. subulata</i> ) and the Tartan Tongue Orchid ( <i>C. erecta</i> ).	Unlikely to occur. Marginal, low-potential habitat for the species is present within the site. Targeted surveys undertaken during the species' confirmed flowering period did not detect the species. Refer to section 2.2 in this REF.
<i>Eucalyptus sturgissiana</i> Ettrema Mallee	Vulnerable NSW BC Act	The Ettrema Mallee is mostly restricted to the Northern Budawang Range in Morton National Park, with a few occurrences on the nearby coastal plain. Usually grows as an emergent in low shrub-heath. Grows on sandy, swampy soils. Little is known of this species' ecology.	Does not occur. No suitable habitat present.
<i>Genoplesium baueri</i> Bauer's Midge Orchid	Endangered EPBC Act Endangered NSW BC Act	Grows in dry sclerophyll forest and moss gardens over sandstone.	Unlikely to occur. Marginal, low-potential habitat for the species is present within the site. Targeted surveys undertaken during the species' confirmed flowering period did not detect the species. Refer to section 2.2 in this REF.
<i>Melaleuca biconvexa</i> Biconvex Paperbark	Vulnerable EPBC Act Vulnerable NSW BC Act	Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Does not occur. A conspicuous species not detected during surveys.
<i>Prasophyllum affine</i> Jervis Bay Leek Orchid	Endangered NSW BC Act	Highly localised species, known from 4 sites with 93% on private property. Found in heathland and sedge in well drained sandy soil (Stephenson 2011)	Unlikely to occur. No heathland or sedgeland vegetation is present within the site.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<i>Pterostylis ventricosa</i>	Critically endangered NSW BC Act	Predominantly in more open areas of tall coastal eucalypt forest often dominated by one or more of the following tree species:- Turpentine, Spotted Gum, Grey Ironbark, Blackbutt, White Stringybark, Scribbly Gum and Sydney Peppermint. Often favours more open areas such as along powerline easements and on road verges where the tree overstorey has been removed or thinned. Grows in a range of groundcover types, including moderately dense low heath, open sedges and grasses, leaf litter, and mosses on outcropping rock. Soil type ranges from moisture retentive grey silty loams to grey sandy loams. Sometimes found in skeletal soils on sandstone rock shelves	Unlikely to occur. Suitable habitat is not present. Soil is predominantly sand, not a loam.
<i>Rhizanthella slateri</i> Eastern Australia Underground Orchid	Endangered EPBC Act  Vulnerable NSW BC Act	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. Flowers September to November.	Unlikely to occur. Targeted surveys undertaken during the species' reported flowering period did not detect the species. Refer to section 2.2 in this REF.
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	Vulnerable EPBC Act  Endangered NSW BC Act	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	Species confirmed as present on site. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.
<b>AMPHIBIANS</b>			
Giant Burrowing Frog <i>Heleioporus australiacus</i>	Vulnerable EPBC Act Vulnerable NSW BC Act	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. While in these areas, individuals burrow below the soil surface or in the leaf litter. Individual frogs occupy a	Possibly occurring in proximity to the site. Potential habitat occurs associated with the waterway and wetland. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		series of burrow sites, some of which are used repeatedly. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. Frogs breed after heavy rain mainly in late summer and Autumn from February to April. Eggs usually laid out of water in a moist burrow in sandy clay banks of smaller creeks, dams or ephemeral pools in forest (Anstis 2017).	
Green and Golden Bell Frog <i>Litoria aurea</i>	Vulnerable <i>EPBC Act</i> Endangered <i>NSW BC Act</i>	Marshes, dams and stream-sides, particularly those containing bullrushes ( <i>Typha</i> spp.) or spikerushes ( <i>Eleocharis</i> spp.). Optimum habitat for the species includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow ( <i>Gambusia holbrooki</i> ), with a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas (OEH 2017).	Possibly occurring in proximity to the site. Potential habitat occurs associated with the waterway and wetland. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.
<b>REPTILES</b>			
Green Turtle <i>Chelonia mydas</i>	Vulnerable <i>EPBC Act</i> Vulnerable <i>NSW BC Act</i>	Ocean-dwelling species spending most of its life at sea. Eggs are laid in holes dug in beaches throughout their range.	Unlikely to occur. No suitable habitat present within or in close proximity to the site.
Hawksbill Turtle <i>Eretmochelys imbricata</i>	<i>EPBC Act</i> Vulnerable	Marine, nesting on islands in the Great Barrier Reef and Western Australia.	Unlikely to occur. No suitable habitat present within or in close proximity to the site.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<b>MICRO-CHIROPTERAN BATS</b>			
East Coast Freetail-Bat <i>Micronomus norfolkensis</i>	Vulnerable NSW BC Act Vulnerable EPBC Act	Small tree hollows/fissures in bark for roosting in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Possibly occurring within the site. Foraging and potential roosting habitat is present. Further assessment has been undertaken in section 3.2.2 of this REF.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	NSW BC Act Vulnerable	<p>Prefers moist habitat that contains trees greater than 20 m high with a dense understorey. They are fast flyers.</p> <p>Roosts in hollow trunks of eucalyptus trees, in colonies of 3 – 80. Also may roost in caves and old wooden buildings. This species changes roost every night. Roosts on consecutive nights are usually less than 750 m apart. This species has a home range of up to 136 ha (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW).</p> <p>Although they prefer habitat with a dense understorey, they prefer to forage along flyways to avoid the thick understorey. They prefer continuous forest and avoid remnant vegetation. However, they have been recorded in open forests (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW).</p>	Possibly occurring within the site. Foraging and potential roosting habitat is present. Further assessment has been undertaken in section 3.2.2 of this REF.
Greater Broad-nosed Bat <i>Scoteanax ruepelli</i>	Vulnerable NSW BC Act	<p>Found mainly in gullies and river systems that drain the Great Dividing Range, it utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, below 500m, though it is most commonly found in tall wet forest.</p> <p>Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m</p>	Possibly occurring within the site. Foraging and potential roosting habitat is present. Further assessment has been undertaken in section 3.2.2 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

Large (Eastern) Bentwing-bat <i>Miniopterus orianae oceanensis</i>	NSW BC Act Vulnerable	Specific caves are known maternity sites with other caves being primary roosting habitat outside breeding period. Also uses derelict mines, storm-water tunnels, buildings and other man-made structures. Hunts in forested areas, catching moths and other flying insects above the tree tops.	Possibly occurring transiently within or in proximity to the site outside of construction hours. No roosting habitat is present. No important habitat would be removed or otherwise impacted.
Southern Myotis (Large-footed Myotis) <i>Myotis macropus</i>	Vulnerable <i>NSW BC Act</i>	This species is predominantly roosts in caves, however, is known to roost in trees and man-made structures close to water. Roosts are generally located close to water, where the bats forage in small groups of three or four. They have a strong association with streams and permanent waterways in areas that are vegetated rather than cleared (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW They feed on small fish, prawns and aquatic macroinvertebrates. They have a preference towards large still pools, rather than flowing streams. They will also forage an aerial insects flying over water. They use their large feet to capture prey items (Churchill 2008).	Possibly occurring within the site. Foraging and potential roosting habitat is present. Further assessment has been undertaken in section 3.2.2 of this REF.
<b>BIRDS</b>			
Australasian Bittern <i>Botaurus poiciloptilus</i>	<i>NSW BC Act</i> Endangered <i>EPBC Act</i> Endangered	Occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. It favours wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. The species favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over muddy or peaty substrate.	Possibly occurring within or in close proximity to the site. Further assessment has been undertaken in section 3.2.2 and 3.3 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>Knowledge of the breeding ecology of the Australasian Bittern is relatively poor. Available data indicate that the Australasian Bittern breeds in relatively deep, densely vegetated freshwater swamps and pools, building its nests in deep cover over shallow water. In rushland, it may avoid breeding in the densest areas; alternatively, this may simply reflect the accessibility of the few nests that have been found. If population density is high, it may resort to open wetlands for nesting, e.g. in stunted Acacia, but this may be exceptional behaviour. It is clear that a complexity of habitat is required in order for foraging and breeding to occur in one location. The species requires shallow water, less than 30 cm deep with medium to low density reeds, grasses or shrubs for foraging and needs deeper water, with medium to high density reeds, rushes or sedges for nesting.</p>	
<p>Australian Painted Snipe <i>Rostratula australis</i></p>	<p>NSW BC Act Endangered EPBC Act Endangered</p>	<p>Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Incubation and care of young is all undertaken by the male only. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.</p>	<p>Possibly occurring within or in close proximity to the site. Further assessment has been undertaken in section 3.2.2 and 3.3 of this REF.</p>
<p>Black Bittern <i>Ixobrychus flavicollis</i></p>	<p>Vulnerable NSW BC Act</p>	<p>Terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation that may comprise grassland, woodland forest rainforest and mangroves.</p>	<p>Possibly occurring within or in close proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		Roosts in trees or on ground amongst dense reeds, nests in branches overhanging water	
Common Sandpiper <i>Actitis hypoleucos</i>	Migratory EPBC Act	<p>The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.</p> <p>Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks.</p>	Unlikely to occur. No suitable habitat is present.
Common Tern <i>Sterna hirundo</i>	Migratory EPBC Act	<p>Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh</p>	Unlikely to occur. No suitable habitat is present.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>and, in bad weather, in coastal sand-dunes or coastal embayments.</p> <p>Common Terns forage in marine environments, often close to the shore, including sheltered embayments and in the surf-zone, but also well out to sea. They also forage in near-coastal terrestrial wetlands, including estuaries, rivers and swamps. Common Terns roost on unvegetated, intertidal sandy ocean beaches, sandy islands, shores of estuaries or lagoons, and sandbars, as well as on rocky shores, rock platforms or rocks protruding above the surface of the water</p> <p>Common Terns nest on the ground in the open, usually on bare substrates, occasionally near vegetation or in it, or on a floating mat of vegetation. They usually nest on islands, either marine or in lakes, only sometimes on mainland beaches or promontories or salt or freshwater marshes.</p>	
<p>Crested Tern <i>Thalasseus bergii</i></p>	<p>Migratory EPBC Act</p>	<p>Crested Terns inhabit coastal areas, offshore waters, beaches, bays, inlets, tidal rivers, salt swamps, lakes and larger rivers. The species breeds during Sep-Jan in the south and Mar-Jun in the north in large, dense colonies on small islands. Nesting occurs on sand or shingle among low vegetation behind the beaches (Pizzey &amp; Knight 2012; Morcombe 2011)</p>	<p>Unlikely to occur. No suitable habitat is present.</p>
<p>Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i></p>	<p>Vulnerable NSW BC Act</p>	<p>The Dusky Woodswallow is often reported in woodlands is eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the great Diving Range and farther west. It is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalyptus, including mallee associations. It have also been recorded in shrublands and</p>	<p>Possibly occurring transiently within or in proximity to the site. No breeding or other important habitat occurs.</p>

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>heathlands and carious modified habitats including regenerating forests; very occasionally in moist forests of rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with course woody debris. Birds are often observed in farmland usually at the edges of forests, woodlands or in roadside remnants or wind breaks with dead timber. Nesting occurs from late September to late February, with eggs present between October and early December. They nest in an open shallow untidy cup, frequently in an open hollow, crevice or stump.</p>	
<p>Eastern Bristlebird- <i>Dasyornis brachypterus</i></p>	<p>Endangered EPBC Act Endangered NSW BC Act</p>	<p>Sedgeland/heathland/dry sclerophyll and woodlands- / requires thick shrub/heath layer for shelter, nesting and foraging</p>	<p>Possibly occurring. Marginal foraging and nesting habitat occurs in proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>
<p>Eastern Curlew <i>Numenius madagascariensis</i></p>	<p>Critically Endangered EPBC Act</p>	<p>Most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms (Marchant &amp; Higgins 1993). The numbers of Eastern Curlew recorded during one study were correlated with wetland areas. Mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh,</p>	<p>Unlikely to occur. No suitable habitat is present.</p>

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The birds are rarely seen on near-coastal lakes and in grassy areas.	
Eastern Ground Parrot <i>Pezoporus wallicus wallicus</i>	Vulnerable NSW BC Act	The Eastern Ground Parrot occurs in near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground. When flushed, birds fly strongly and rapidly for up to several hundred metres, at a metre or less above the ground (OEH 2013)	Unlikely to occur. No suitable habitat is present.
Eastern Osprey <i>Pandion cristatus</i>	NSW BC Act Vulnerable	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Possibly occurring transiently over the site. Unlikely to utilise habitat within the site. No large stick nests were observed during surveys. No important habitat for the species would be affected by the proposal.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	Vulnerable NSW BC Act	Tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting	Possibly occurring. Suitable foraging and nesting habitat occurs within and in close proximity to the site. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.
Glossy Black-cockatoo <i>Calyptorhynchus lathami</i>	Vulnerable NSW BC Act	The GBC inhabits open forest and woodlands of the coast where stands of she-oak occur. In the Jervis Bay region they feed almost exclusively on the seeds of the black she-oak <i>Allocasuarina littoralis</i> , shredding the cones with their bill	Possibly occurring. Suitable foraging and nesting habitat occurs within and in close proximity to the site. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<p>Latham's Snipe <i>Gallinago hardwickii</i></p>	<p>EPBC Act: Migratory</p>	<p>In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.</p> <p>In Australia, Latham's Snipe occurs in a wide variety of permanent and ephemeral wetlands. They usually occur in open, freshwater wetlands that have some form of shelter (usually low and dense vegetation) nearby. They generally occupy flooded meadows, seasonal or semi-permanent swamps, or open waters, but various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains. The structure and composition of the vegetation that occurs around these wetlands is not important in determining the suitability of habitat. As such, snipe may be found in a variety of vegetation types or communities including tussock grasslands with rushes, reeds and sedges, coastal and alpine heathlands, lignum or tea-tree scrub, button-grass plains, alpine herbfields and open forest.</p> <p>Latham's Snipe sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers. These habitats are most commonly used when the birds are on migration. They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches, ricefields, orchards, saltworks, and</p>	<p>Possibly occurring within or in close proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>
---	----------------------------	---	--

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>sewage and dairy farms. They can also occur in various sites close to humans or human activity (e.g. near roads, railways, airfields, commercial or industrial complexes).</p> <p>The foraging habitats of Latham's Snipe are characterized by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation). The snipe roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable.</p>	
<p>Little Eagle <i>Hieraaetus morphnoides</i></p>	<p>Vulnerable NSW BC Act</p>	<p>Occupies open eucalypt forest, woodland or open woodland. She-oak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter</p>	<p>Possibly occurring transiently over the site. Unlikely to utilise habitat within the site. No large stick nests were observed during surveys. No important habitat for the species would be affected by the proposal.</p>
<p>Little Lorikeet <i>Glossopsitta pusilla</i></p>	<p>Vulnerable NSW BC ACT</p>	<p>Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are</p>	<p>Possibly occurring. Suitable foraging and nesting habitat occurs within and in close proximity to the site. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.</p>

## Review of Environmental Factors Part 5 Assessment EP&A Act 1979

		limited. Riparian trees often chosen, including species like <i>Allocasuarina</i>	
Little Tern <i>Sternula albifrons</i>	Endangered NSW BC Act Migratory EPBC Act	Mostly exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above the high tide mark near estuary mouths or adjacent to coastal lakes and islands. Nests in a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles.	Unlikely to occur. No suitable habitat is present.
Masked Owl – <i>Tyto novaehollandiae</i>	Vulnerable NSW BC Act	Dry eucalypt forests and woodlands from sea level to 1100 m. Inhabits forest but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Requires old growth elements-hollow bearing tree resources for nesting and prey source.	Possibly occurring. Potential foraging and nesting habitat occurs within and in close proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.
Pied Oystercatcher <i>Haematopus longirostris</i>	Endangered NSW BC Act	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	Unlikely to occur. No suitable habitat is present.
Powerful Owl <i>Ninox strenua</i>	Vulnerable NSW BC Act	Coastal Woodland, Dry Sclerophyll Forest, wet sclerophyll forest and rainforest- Can occur in fragmented landscapes Roosts in dense vegetation comprising species such as	Possibly occurring. Potential foraging and nesting habitat occurs within and in close proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. requires old growth elements-hollow bearing tree resources for nesting and prey resource. Nests in large tree hollows in large eucalypts that are at least 150yrs old. Often in riparian areas. Large home range	
Regent Honeyeater <i>Anthochaera phrygia</i>	Critically endangered EPBC Act Critically endangered NSW BC Act	Temperate woodlands and open forests- and drier coastal woodlands in some years (flowering coastal woodlands and forests including box-ironbark woodland, and riparian forests-that exhibit large numbers of mature trees, high canopy cover and abundance of mistletoes) Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>Eucalyptus microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemos</i> , <i>E. moluccana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>C. maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> , and <i>Angophora floribunda</i> . Nectar and fruit from the mistletoes <i>Amyema miquelii</i> , <i>A. pendula</i> and <i>A. cambagei</i> are also eaten during the breeding season.	Possibly occurring transiently within or over the site. Unlikely to utilise habitat within the site. No favoured feed trees occur. No breeding habitat occurs. No important habitat for the species would be affected by the proposal.
Ruddy Turnstone <i>Arenaria interpres</i>	Migratory EPBC Act	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In southern Australia the Ruddy Turnstone prefers rockier coastlines and	Unlikely to occur. No suitable habitat is present.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>is less numerous on large embayments with extensive mudflats.</p> <p>The Ruddy Turnstone mainly forages between lower supralittoral and lower littoral zones of foreshores, from strand-line to wave-zone. They often forage among banks of stranded seaweed or other tide-wrack. They are also known to forage on exposed rocky platforms, coral reefs and mudflats. In the south-east Gulf of Carpentaria they feed only on mangrove mudflats, especially those near shingle beaches. Sometimes they feed around coastal lagoons and sewage treatment ponds, occasionally among low vegetation in saltmarsh, on exposed beds of seagrass, or among dunes on coral cays. They have sometimes been known to forage in grassy areas above the tideline, in short pasture, or in ploughed paddocks.</p> <p>The Ruddy Turnstone roosts on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris. They have also been observed roosting on rocky islets among grassy tussocks, and on mudflats and sandflats. They sometimes fly around, or land on, ships at sea</p>	
Scarlet Robin <i>Petroica boodang</i>	Vulnerable <i>NSW BC Act</i>	The Scarlet Robin is primarily a resident in dry forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.	Possibly occurring transiently within or over the site. No important habitat for the species would be affected by the proposal.
Short-tailed Shearwater <i>Ardenna tenuirostris</i>	Migratory <i>EPBC Act</i>	Coastal, oceanic.	Unlikely to occur. No suitable habitat is present.
Sooty Owl <i>Tyto tenebricosa</i>	Vulnerable <i>NSW BC Act</i>	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests	Possibly occurring. Potential foraging and nesting habitat occurs within and in close proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<p>Sooty Oystercatcher <i>Haematopus fuliginosus</i></p>	<p>Vulnerable <i>NSW BC Act</i></p>	<p>Shore bird. Found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The availability of suitable nesting sites may limit populations. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks.</p>	<p>Unlikely to occur. No suitable habitat is present.</p>
<p>Square-Tailed Kite <i>Lophoictinia isura</i></p>	<p><i>Vulnerable NSW BC Act</i></p>	<p>Summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses large hunting ranges of more than 100km<sup>2</sup>. Breeding is from July to February, with nest sites generally located along or within 200m of riparian areas, near watercourses, in a fork or on large horizontal limbs.</p>	<p>Possibly occurring transiently over the site. Unlikely to utilise habitat within the site. No large stick nests were observed during surveys. No important habitat for the species would be affected by the proposal.</p>
<p>Turquoise Parrot <i>Neophema pulchella</i></p>	<p>Vulnerable <i>NSW BC Act</i></p>	<p>Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.</p>	<p>Possibly occurring. Suitable foraging and nesting habitat occurs. Further assessment has been undertaken in section 3.2.2 of this REF.</p>

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

Varied Sittella <i>Daphoenositta chrysoptera</i>	Vulnerable <i>NSW BC Act</i>	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Possibly occurring transiently within or over the site. No important habitat for the species would be affected by the proposal.
Wedge-tailed Shearwater <i>Ardenna pacificus</i>	Migratory <i>EPBC Act</i>	A pelagic, marine bird known from tropical and subtropical waters. The species tolerates a range of surface-temperatures and salinities, but is most abundant where temperatures are greater than 21 °C and salinity is greater than 34.6 ‰. In tropical zones the species may feed over cool nutrient-rich waters. The species has been recorded in offshore waters of eastern Victoria and southern NSW, mostly over continental slope with sea-surface temperatures of 13.9–24.4 °C and usually off the continental shelf in north-west Australia.	Unlikely to occur. No suitable habitat is present.
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	<i>NSW BC Act</i> Vulnerable  Migratory <i>EPBC Act</i>	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterized by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats. The species is mostly recorded in coastal lowlands, but can occupy habitats up to 1400 m above sea level on the Northern Tablelands of NSW and up to 800 m above sea level in Tasmania and South Australia. Birds have been recorded at or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds. They also occur at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and even urban areas. Breeding has been	Possibly occurring transiently over the site. Unlikely to utilise habitat within the site. No large stick nests were observed during surveys. No important habitat for the species would be affected by the proposal.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>recorded on the coast, at inland sites, and on offshore islands. Breeding territories are located close to water, and mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest (including rainforest), closed scrub or in remnant trees on cleared land.</p> <p>Forages over large expanses of open water; this is particularly true of birds that occur in coastal environments close to the sea-shore, where they forage over in-shore waters. However, the White-bellied Sea-Eagle will also forage over open terrestrial habitats (such as grasslands). Birds may move to and congregate in favorable sites during drought or food shortage.</p>	
<p>White-throated Needletail <i>Hirundapus caudacutus</i></p>	<p>Migratory <i>EPBC Act</i></p>	<p>Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats, and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes. They are sometimes recorded above islands well out to sea.</p>	<p>Possibly occurring transiently within or over the site. No important habitat for the species would be affected by the proposal.</p>

<b>MAMMALS</b>			
Eastern Chestnut Mouse <i>Pseudomys gracilicaudatus</i>	Vulnerable <i>NSW BC Act</i>	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes It is a social animal, living predominantly in burrows shared with other individuals Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire	Possibly occurring in proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.
Eastern Pygmy-possum <i>Cercatetus nanus</i>	Vulnerable <i>NSW BC Act</i>	Rainforest, sclerophyll forest & woodland to heath – but heath & woodland preferred. Forages on banksias, eucalypts & bottlebrushes.	Possibly occurring in proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.
Greater Glider <i>Petauroides Volans</i>	Vulnerable <i>EPBC Act</i>	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha. Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. Very loyal to their territory.	Possibly occurring in proximity to the site. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Vulnerable <i>EPBC Act</i> Vulnerable <i>NSW BC Act</i>	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possibly occurring. Suitable foraging habitat is present. Further assessment has been undertaken in sections 3.2.2 and 3.3 of this REF.

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<p>Humpback Whale <i>Megaptera novaeangliae</i></p>	<p>Vulnerable EPBC Act Vulnerable NSW BC Act</p>	<p>The population of Australia's east coast migrates from summer cold-water feeding grounds in Subantarctic waters to warm-water winter breeding grounds in the central Great Barrier Reef. They are regularly observed in NSW waters in June and July, on northward migration and October and November, on southward migration</p>	<p>Unlikely to occur. No suitable habitat is present.</p>
<p>New Holland Mouse <i>Pseudomys novaehollandiae</i></p>	<p>Vulnerable NSW BC Act</p>	<p>Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes It is a social animal, living predominantly in burrows shared with other individuals Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire</p>	<p>Possibly occurring in proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>
<p>Southern Brown Bandicoot (eastern) <i>Isodon obesulus obesulus</i></p>	<p>Endangered EPBC Act Endangered NSW BC Act</p>	<p>Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees <i>Xanthorrhoea</i> spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest.</p>	<p>Possibly occurring in proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

<p>White-footed Dunnart <i>Sminthopsis leucopus</i></p>	<p>Vulnerable NSW BC Act</p>	<p>Dry sclerophyll forests, sedgeland or heathland-coastal dune vegetation, coastal forest, tussock grassland and woodland and forest post disturbance – open understorey layer. They shelter in bark nests in hollows under standing or fallen timber, burrows in the ground, piles of logging debris, large grass clumps such as provided by Grass Trees <i>Xanthorrhoea</i> spp. and Cycads <i>Macrozamia</i> spp. and rock crevices</p>	<p>Possibly occurring in proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>
<p>Yellow-bellied Glider - <i>Petaurus Australis</i></p>	<p>Vulnerable NSW BC Act</p>	<p>Forest with old growth elements. Large Eucalypt Hollows for denning- Inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia mid storey. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.</p>	<p>Possibly occurring in within or in proximity to the site. Potential den habitat exists. Further assessment has been undertaken in section 3.2.2 of this REF.</p>
<p><b>INSECTS</b></p>			
<p>Giant Dragonfly <i>Petalura gigantea</i></p>	<p>NSW BC Act Endangered</p>	<p>Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins. Adults fly over the swamp and along its margins hunting for flying insects. Males sometimes congregate waiting for females to mate with. Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and</p>	<p>Possibly occurring within or in close proximity to the site. Further assessment has been undertaken in section 3.2.2 of this REF.</p>

**Review of Environmental Factors  
Part 5 Assessment EP&A Act 1979**

		<p>humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under the swamp. Larvae are slow growing and the larval stage may last 10 years or more. It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation.</p>	
--	--	---	--