



## Environmental Assessment

### Level 4



## **ENVIRONMENTAL IMPACT STATEMENT**

### ***East Seaham Road Stages 5 & 6, East Seaham***

### ***CHAPTER FIVE IMPACT ASSESSMENT***



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## **Environmental Assessment**

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#### 5. IMPACT ASSESSMENT

##### 5.1. Air Quality

This chapter describes the potential air quality impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

Key issues to be addressed from the SEARS are:

*Provide a description of potential sources of air emissions during construction and potential impacts on the environment and sensitive receivers.*

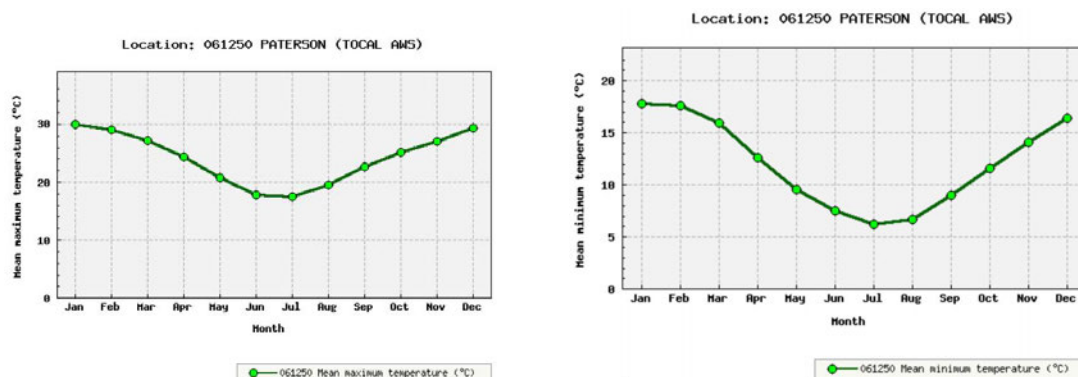
##### 5.1.1. Existing environment

##### Meteorological conditions

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. The key meteorological variants that impact air quality include wind speed, wind direction, temperature and atmospheric stability.

The nearest weather monitoring station by the Australian Government Bureau of Meteorology is Patterson (Tocal AWS) Site number: 061250 which is approximately 18 km west of the subject site. The following graphs summarise the monthly weather statistics for the locality (Australian Government Bureau of Metrology website accessed 15 February 2025).

The weather conditions for the locality of the project area are included in **Figure 5-1**, **Figure 5-2**, **Figure 5-3**, **Figure 5-4** and **Figure 5-5**.



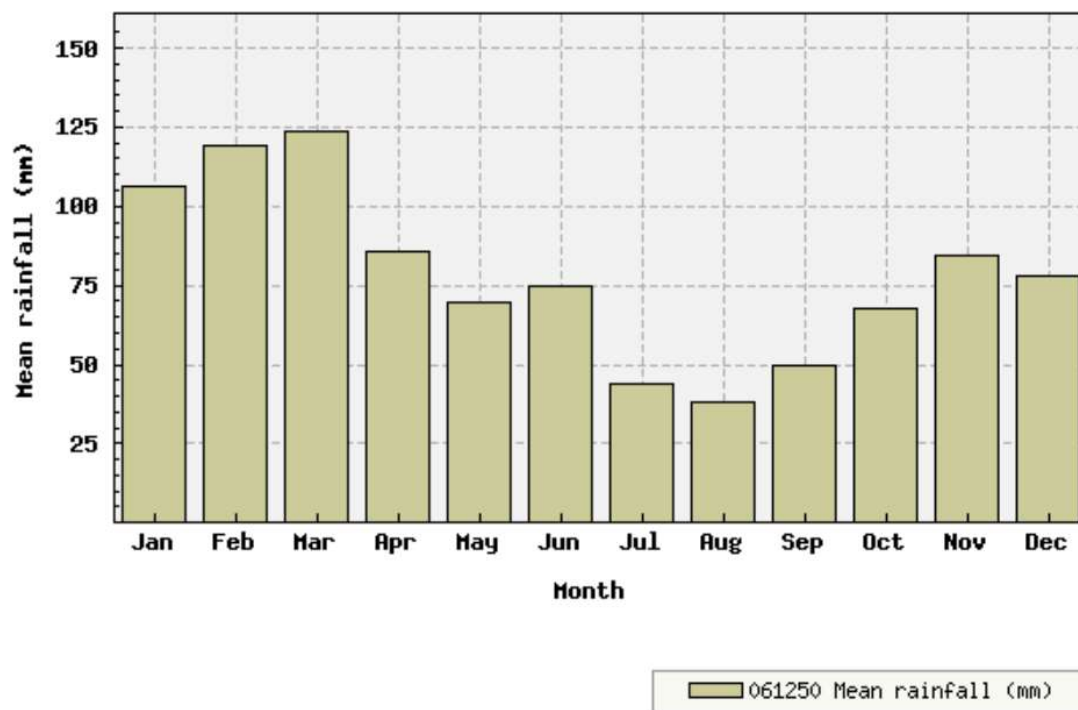
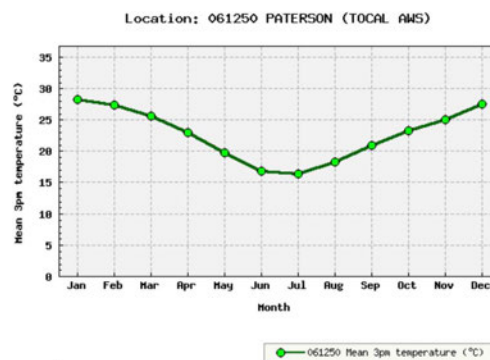
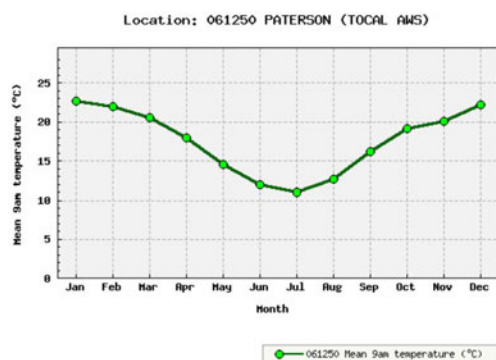
**Figure 5-1 Mean maximum and minimum temperatures**

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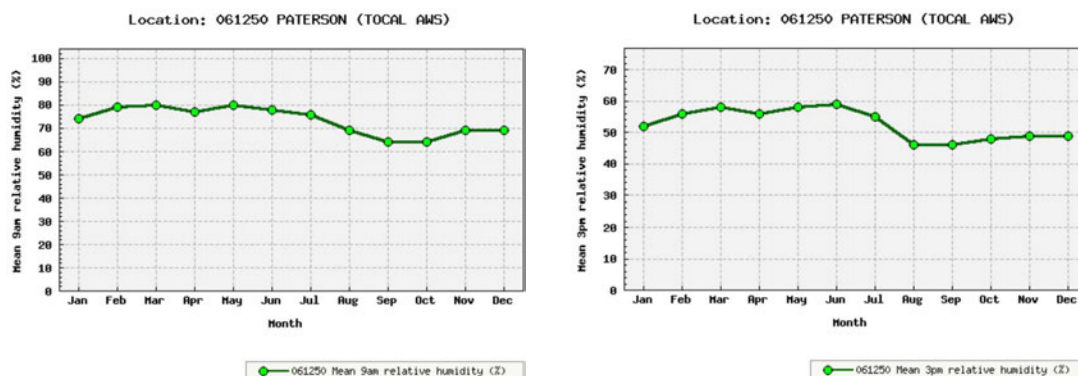
Location: 061250 PATERSON (TOCAL AWS)

**Figure 5-2 Mean rainfall****Figure 5-3 9am and 3pm mean temperature**

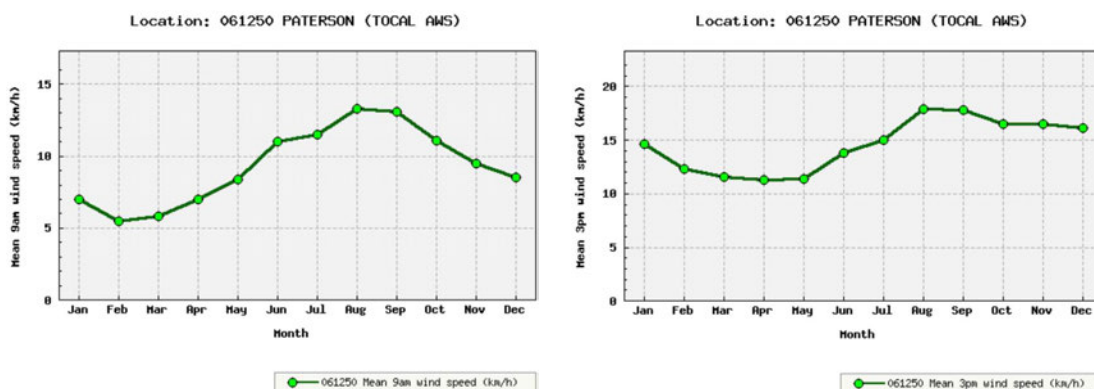


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**Figure 5-4 9am and 3pm relative humidity**



**Figure 5-5 9am and 3pm mean wind speed**

Higher temperatures occur during summer. Temperatures during summer have the potential to exceed 40 degrees centigrade during the day and heatwave conditions can occur. Higher rainfall occurs during the January to March period with winter receiving significantly lower rainfall amounts. Humidity is generally higher in the first 6 to 7 months of the year and then drops for the months of August to November, and increases again during December and January.

In the mornings calmer conditions generally persist with predominantly north easterlies and occasional westerlies occurring from January to April. During April to May wind speed increases and by winter westerly winds prevail. Later in the year, the north westerly is still the prevailing wind direction, however, gentler winds and calmer conditions are prevalent. During December the prevailing winds are south easterlies, however, the stronger and gustier westerlies still occur.

In the afternoons south easterlies with occasional westerlies prevail from December to April with stronger winds occurring than in the mornings. During May and into winter





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westerlies become more prevalent and wind speed also increases. During spring strong gusty westerlies still occur however, there is a return to the higher frequency of south easterlies.

Easterly winds are predominantly calmer under 20 km/ hr and rarely exceeding 30 to 40 km/hr. Westerlies however, are more frequently stronger up to 30 km/hr sometimes exceeding 30 to 40 km/hr.

#### Existing air quality

Air quality readings and air quality categories are updated hourly by the NSW Government's air quality monitoring network. The closest station to East Seaham is the Beresfield air quality monitoring site which is located in Francis Greenway High School, on Lawson Avenue, Beresfield. The following air pollutants and meteorological variables are currently measured at Beresfield:

- fine particles as PM<sub>10</sub>
- fine particles as PM<sub>2.5</sub>
- oxides of nitrogen (NO, NO<sub>2</sub> and NO<sub>x</sub>)
- ozone (O<sub>3</sub>)
- sulfur dioxide (SO<sub>2</sub>)
- visibility using nephelometry
- ambient temperature
- relative humidity
- wind speed and wind direction.

The air quality monitoring site is located approximately 13 km from the project area. Some meteorological variables may occur between the project area and the air quality monitoring site. The project area, unlike the air quality monitoring site, is not within an urban area and has more variable topography.

Air quality within the locality is generally categorised as good. Any decline in air quality is generally attributable to an increase in particulates. Particle pollution sources include motor vehicles, wood burning heaters and industry. During bushfires or dust storms, particle pollution can reach extremely high concentrations.

#### Sensitive receivers

Sensitive receivers within the locality include rural residential receivers and ecological receivers. There are 16 rural residential receivers within 1 km of the project area. There are 3 rural residential receivers within 100 m of the works, 1 within 200 m, 2 within 300 m, 2 within 400 m, 1 within 500 m and 7 within 1km of the works. There are no residential receivers within 50 m of the project area.



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Ecological receivers include Wallaroo National Park which is located to the east of, and adjacent to East Seaham Road, surrounding bushland and waterways on surrounding private lands and the Williams River located approximately 200 to 300 m west of the site (to which the site drains).

Wildthing Environmental Consultants (2025) observed the roadside vegetation to be coated in grey dust from fine gravel spreading across the road and that pluming dust was excessive when vehicles travelled the road. **Figures 5-6** and **Figure 5-7** illustrate the dust impacts



*Figure 5-6 Gravel incursion and dust on roadside vegetation (Wildthing 2025)*



*Figure 5-7 Dust from the gravel road after a vehicle passed through (Wildthing 2025)*

### Existing pollutant sources

Existing pollutants sources would include odours and emissions from vehicles on East Seaham Road and surrounding rural residential properties. The most likely common pollutant emissions would include:

- carbon monoxide (CO)
- nitrogen dioxide (NO<sub>2</sub>)
- particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>)
- hydrocarbons
- other air toxics (such as benzene, formaldehyde, toluene, xylenes).

#### 5.1.2. Impact assessment

##### Dust impacts

During works there would be potential impacts to human health and ecology (e.g. impacts to plant health) as well as nuisance due to dust emissions. Dust emissions would vary throughout the construction period and would be dependent on weather



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conditions, the intensity of the works activities and the type of work activity being undertaken.

Activities during construction have the potential to create dust emissions including:

- demolition including activities that involve the removal of existing structures such as culverts
- earthworks including soil stripping, ground levelling, excavation and landscaping. Earthworks includes excavating material (mechanical), haulage, tipping and stockpiling
- construction including construction of the new road surface and drainage infrastructure
- transport including the transport of dust and dirt by heavy vehicles to and from the construction/ demolition site and the operation and use of plant and equipment.

Dust emissions have the potential to impact on amenity, the appearance, aesthetic or values of a property and human and environmental health.

The magnitude of dust due to the scale of works and distance to sensitive receivers is considered to be a medium risk to human and ecological health.

During operation it is likely dust emissions would be reduced due to the road surface being changed from dirt to a sealed road. The sealing of East Seaham Road may encourage additional vehicle trips, however, due to the rural nature of the area and limited vehicle trips that occur a significant increase is unlikely. The vehicle trips are unlikely to increase as a result of the works. The works will result in an improvement in road quality and increased speed limit, however, due to the road surface being sealed impacts are still expected to be less than that which occurred prior to the works.

During construction and operations activities, mitigation measures such as erosion and sediment controls, good stockpile management to minimise handling and disturbance of materials, keeping excavated areas to the practical minimum, monitoring weather conditions to limit works in windy conditions which would increase dust missions, and utilising the water cart and stabilising areas as soon as practically possible, would all help to reduce dust emissions.

### Odours

Potential odours may include fume release from handling of potentially odorous chemicals and materials, and stockpiling and handling of material and waste generated by the works. The works are likely too small in size to result in offensive odours as a result of stockpiling of mulch (odorous decomposing products).



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Construction works are expected to occur for a period of approximately 11 to 13 months. Works are linear in nature and due to the scale of works and distance to sensitive receivers, odour impacts are expected to be minor. No asphalt batching plants or contaminated material handling would occur.

During operations, potential odours would be similar to that which existed prior to the works occurring from vehicle emissions and odours from surrounding rural residential land uses.

During operation and maintenance waste would be managed in accordance with statutory requirements and sufficient waste receptacles and appropriate servicing of portable toilets provided. Plant, equipment and machinery would also be operated, inspected and maintained to ensure it is in good working order and operated in accordance with the manufacturer's instructions. Implementation of these mitigation measures would help reduce potential odours.

#### Exhaust emissions

Relatively minor emissions would be generated from exhaust emissions from plant, vehicles, equipment and machinery being used during the works including carbon monoxide, oxides of nitrogen, particulate matter and some hydrocarbons. Due to the small scale of the project, these emissions would be unlikely to have a significant impact on local air quality and sensitive receivers.

Operationally the works would have emissions from vehicles using East Seaham Road. The main pollutants would include carbon monoxide, oxides of nitrogen, particulate matter and some hydrocarbons.

Pollutants generated from the combustion of fuel and emitted via the exhaust system and particulate matter from brake and tyre wear, as well as re-suspended road dust can have environmental and health impacts. Carbon monoxide is widespread in an urban environment and comes from the burning of fuels that contain carbon, such as petrol, diesel or gas in motor vehicles. Carbon monoxide is absorbed into the bloodstream much more readily than oxygen so that small amounts of it inhaled can affect bodily function. The main source of nitrous oxides in the urban atmosphere is from the combustion of fossil fuels (petrol, diesel, coal, gas), and NO<sub>2</sub> is known to affect the throat and the lungs. Particulate matter in the atmosphere can have an adverse effect on health and amenity. The health-related effects of particles are largely related to the extent to which they can penetrate the respiratory tract. A common source of particulate matter less than 10 microns (PM<sub>10</sub>) is motor vehicles. High levels of PM<sub>10</sub> particles in the air can irritate the eyes and throat, whilst finer particles can impair lung function. Hydrocarbons such as benzene have an adverse effect on human





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health, but the effects are likely to be caused by higher concentrations than the levels of exposure found at roadsides from traffic emissions.

The upgrading of East Seaham Road from the existing unsealed road to a sealed road may attract minor increases in additional traffic volume, however, the usage of East Seaham Road being a single lane road each way is expected to remain largely unchanged. The speed limit will also remain unchanged. Due to improvement in the road surface the project is expected to minimise the need for acceleration and braking due to changing road conditions which may help minimise pollutant emissions.

During operation and maintenance, plant, equipment and machinery will be operated, inspected and maintained to ensure it is in good working order and operated in accordance with the manufacturer's instructions, to help reduce potential emissions release.



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### 5.1.3. Mitigation measures

**Table 5-1 Air quality mitigation measures**

Mitigation Measures	Timing	Matter addressed		
		Dust	Odours	Emissions
<b>Documentation</b>				
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. The CEMP must be approved by Council's Environmental Risk Officer or project Support Officer or Team Leader Environmental Planning.	Pre-construction	✓	✓	✓
Prepare a plan for the management of material and stockpiling and include the plan in the CEMP. The requirements of the template QF-ENV-009 Stockpile Mgmt Plan (CAP WKS) are the minimum to be provided in the plan. The Stockpile and Material Management Plan must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.	Pre-construction	✓		
Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and include the plan in the CEMP.	Pre-construction	✓		
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the environmental mitigation measures and directions from the site manager.	Pre-construction	✓	✓	✓
<b>Notification of activities &amp; consultation</b>				
Community notification must occur in accordance with the project specific engagement plan prepared for the works. Notification of works should occur to provide advance warning of the works and potential disruptions for all sensitive land uses. Notification may consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification should include the likely noise impact of the work without understating its effect and any work activities or equipment that will be particularly noisy or noticeable. Notification should be provided a minimum of 10 working days prior to the start of works.	Pre-construction	✓	✓	
Handle enquiries and complaints in accordance with Council's complaints handling procedures and eliminate or minimise the issue	Construction	✓	✓	



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Mitigation Measures	Timing	Matter addressed		
		Dust	Odours	Emissions
where practical.	Operation			
<p>Induct all personnel working onsite including workers and contractors, to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following:</p> <ul style="list-style-type: none"> <li>• permissible hours of work (including for deliveries)</li> <li>• site sensitivities and their relevance to the proposal including:               <ul style="list-style-type: none"> <li>○ any significant waterways</li> <li>○ key fish habitat</li> <li>○ possibility of threatened species onsite and/ or adjacent to the site</li> <li>○ possibility of endangered ecological communities onsite and/ or adjacent to the site</li> <li>○ surrounding rural residential development.</li> </ul> </li> <li>• QF-ENV-008 Unexpected finds procedures (CAP WKS)</li> <li>• erosion and sediment control requirements</li> <li>• noise and vibration management requirements including any site specific and relevant mitigation measures, any limitations on high noise generation activities, and the location of the nearest sensitive receivers</li> <li>• exclusion fencing requirements</li> <li>• site compound areas and construction employee parking areas and designated loading/ unloading areas and procedures.</li> </ul>	Pre-construction	✓	✓	✓
<b>General</b>				
Demarcate the extent of works with the installation of stake rope and fluro tags or similar with fluro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.	Pre-construction Construction Operation	✓		
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation	✓	✓	✓



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Mitigation Measures	Timing	Matter addressed		
		Dust	Odours	Emissions
	(excluding CEMP)			
Conduct all activities between the daylight hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays. No work on Sundays, public holidays or night works are permitted.	Construction Operation	✓	✓	✓
<b>Monitoring and unexpected finds</b>				
Visual observations of air quality should be undertaken and documented daily on site in order to identify activities, vehicles, plant or equipment that are generating excessive air emissions. Implement additional mitigation strategies where necessary.	Construction Operation			✓
Visually monitor work sites, general work areas and stockpiles for dust generation, and water down with clean water or cover with tarpaulins in the event of dry and/ or windy conditions.	Construction Operation	✓		
Visually monitor for any of the signs of the following: <ul style="list-style-type: none"> <li>acid sulfate soils</li> <li>contamination such as odour, seepage of unusual liquids from soil or rock, unusual metal objects, discolouration or staining of the rock, unusual colours, odours or sheens on groundwater, presence of underground storage tanks, potential asbestos containing material, presence of waste or rubbish or unusual colour of the soil</li> <li>asbestos</li> <li>coal tar.</li> </ul> If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).	Construction	✓	✓	
<b>Pollution prevention</b>				
Manage construction activities to minimise water and land pollution, using the following measures: <ul style="list-style-type: none"> <li>do not carry out works such as bitumen spraying, the spraying of paint or other materials during strong winds or adverse weather conditions</li> <li>monitor weather conditions for adverse weather that may increase impacts and where possible schedule works to avoid these periods. Do not undertake works during inclement weather to minimise the risk of damage to assets and ensure there is no compromise of site safety. Where severe weather is forecast, undertake all reasonable precautions to prepare</li> </ul>	Construction Operation	✓	✓	





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Mitigation Measures	Timing	Matter addressed		
		Dust	Odours	Emissions
<p>and secure the site for a storm event and help minimise the potential for damage</p> <ul style="list-style-type: none"> <li>drive to conditions on unsealed roads and/ or onsite and signpost designated access points, routes, vehicle manoeuvring areas, parking areas and ensure site personnel, contractors and delivery trucks are aware of the requirements to help reduce site disturbance. Restrict vehicles and personnel to designated tracks, trails and parking areas. Where possible park and turn-around on hard, well drained surfaces</li> <li>inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions</li> <li>install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans. Leave controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request. Leave erosion and sediment controls in place until the site is fully stabilized</li> <li>reduce open excavations.</li> </ul>				
<p>Manage construction activities to minimise the emission of visible dust beyond the construction footprint. Dust mitigation measures for each location/ activity may include one or more of the following:</p> <ul style="list-style-type: none"> <li>visual inspection of construction sites to identify sources of dust emissions, taking into account weather conditions (particularly dry and windy conditions) and the scale, nature and intensity of construction activities</li> <li>scheduling of dust generating activities to minimise potential for elevated cumulative dust generation</li> <li>locating and managing dust generating stockpiles to be located away from sensitive human and ecological receptors</li> <li>application of measures to minimise dust generation from surfaces and stockpiles such as application of water sprays, spray seeding, and dust covers or similar</li> <li>progressive site rehabilitation or stabilisation to minimise the potential for and duration of dust generation from disturbed areas</li> <li>implementation of speed limits on unsealed roads and other trafficked surfaces</li> <li>cover all loads of material, soil, fill or other erodible matter being transported to or from the work site at all times. Coverage must be maintained for the duration of transportation and until unloaded</li> <li>providing stabilised site access and clean roads and access points as required. Implementing a wheel washing system at relevant construction site access points (with rumble grids to dislodge accumulated dust and mud prior to leaving the site)</li> </ul>	Construction Operation (where applicable)	✓		



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Mitigation Measures	Timing	Matter addressed		
		Dust	Odours	Emissions
<p>where practicable</p> <ul style="list-style-type: none"> <li>minimising the number of stockpiles onsite, avoiding stockpiling in exposed areas and ensuring long-term stockpiles are covered or stabilised</li> <li>where excessive dust occurs, water down with clean water(e.g. water cart) or cover with tarpaulins in the event of dry and/ or windy conditions</li> <li>stabilise exposed areas as soon as practically possible using turf, hydromulch, hydro seed/ sterile cover crop. Only use a hydro mulch mix of local provenance seed or sterile cover crop that is certified by the supplier as free from weeds</li> <li>monitor weather conditions for adverse weather that may increase impacts such as dust and where possible schedule works to avoid these periods. Do not undertake works during inclement weather to minimise the risk of damage to assets and ensure there is no compromise of site safety. Where severe weather is forecast, undertake all reasonable precautions to prepare and secure the site for a storm event and help minimise the potential for damage. If heavy rain is forecast in the next 24 hours, delay commencement or cease works until such time a suitable dry period of weather is forecast</li> <li>drive to conditions on unsealed roads and/ or onsite and signpost designated access points, routes, vehicle manoeuvring areas, parking areas and ensure site personnel, contractors and delivery trucks are aware of the requirements to help reduce site disturbance. Restrict vehicles and personnel to designated tracks, trails and parking areas. Where possible park and turn-around on hard, well drained surfaces</li> <li>reduce open excavations.</li> </ul>				
<p>Operate, inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions. Requirements include:</p> <ul style="list-style-type: none"> <li>ensuring air lines on pneumatic equipment do not leak and plant silencers are well maintained</li> <li>ensuring plant and equipment are fitted with approved exhaust systems (to maintain exhaust emissions within acceptable standards)</li> <li>personnel onsite are to be trained and proficient in the operation of plant, equipment and vehicular procedures for the required tasks and ways to reduce impacts</li> <li>inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions.</li> </ul>	Construction Operation		✓	✓



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Mitigation measures	Timing	Matter addressed		
		Dust	Odour	Emissions
Stockpile, spoil and waste management				
Store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required and manage all stockpiles on site in accordance with the NSW Managing Urban Stormwater: Soils and construction – Volume 1 4 <sup>th</sup> edition and the approved stockpile management plan prepared for the site. Place stockpiles at strategic locations to mitigate environmental impacts whilst facilitating material handling requirements. Establish access routes around material stockpiles that enable access from adjoining haulage routes, and store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required.	Construction	✓	✓	
Provide a sufficient number of suitable and labelled receptacles for generated waste and recyclable materials and clean receptacles as required to avoid overflows.	Construction		✓	
Remove, transport and dispose of hazardous and dangerous goods in accordance with the NSW Waste Classification Guidelines and dispose of at a waste facility licenced to accept such waste. Any transport of dangerous goods must occur with a driver possessing a dangerous goods drivers licence and dangerous goods vehicle licence. All dangerous goods transport shall be in accordance with <i>NSW Dangerous Goods (Roads and Rail Transport Act 2008 and NSW Dangerous Goods (Road and Rail) Transport Regulation 2014</i> . Ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code.	Construction Operation		✓	
Ensure the provision and regular service of portable self-contained toilets by contractors.	Construction		✓	



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### 5.2. Biodiversity

This chapter describes the potential biodiversity impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts. See the BDAR provided in **Attachment 8**.

Key issues to be addressed from the SEARS are:

*Consideration of whether the activity is likely to significantly affect threatened species in accordance with Part 7 Division 2 Section 7.8 of the Biodiversity Conservation Act 2016.*

#### 5.2.1. Existing environment

The project area is 9.58 ha which consists of an approximately 3 km section of East Seaham Road, the associated road reservation, and culverts and driveways providing access to neighbouring properties. The project area and surrounds consists of cleared land within the road reserve and a mixture of regrowth and remnant vegetation within the road reserve and on adjacent properties. To the west, the study area adjoins rural properties and for the majority of the alignment the study area adjoins Wallaroo National Park to the east.

Prior to European settlement the project area and adjoining lands would have been native bushland. European settlement was first documented in area in approximately 1830 (Biosis 2025a). The area was gradually cleared for housing, farming and agriculture with East Seaham Road being constructed between 1840 and 1860 (Wildthing Environmental Consultants 2025). The power line easement to the east of East Seaham Road was installed between 1974 and 1976 (Wildthing Environmental Consultants 2025). The majority of the project area adjoins Wallaroo National Park to the east. The National Park was formerly Wallaroo State Forest (reserved in 1922) where forestry operations occurred. Wallaroo State Forest was dedicated as Wallaroo Nature Reserve in 1999 and then reclassified as Wallaroo National Park in 2007.

#### Interim Biogeographic Regionalisation for Australia (IBRA) Subregion

The subject land is located within the NSW North Coast IBRA Bioregion and the Upper Hunter IBRA Subregion.

#### Native vegetation

Approximately 290.50 ha of native vegetation was mapped within the 405.35 ha assessment area (project area and 500 m buffer for linear development surrounding the outer boundary of the subject land, referred to as the study area). Native vegetation





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cover within the study area is approximately 72% (Wildthing Environmental Consultants 2025). See **Figure 5-8**.

The vegetation within the project area is subject to continued disturbances such as road maintenance activities, dust incursion from the gravel road noise pollution from the deteriorating gravel road (Wildthing Environmental Consultants 2025). These impacts lessen with further distance away from the road environment.



**Figure 5-8 Native vegetation**



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Native vegetation in the study area consists of:

- 1.7 ha of Plant Community Type (PCT) 3433 Hunter Coast Foothills Spotted Gum – Ironbark Grassy Forest
- 0.43 ha of PCT 4042 Lower North Riverflat Eucalypt-Paperbark Forest (Wildthing Environmental Consultants 2025).

PCT 4042 was consistent with BC Act listed endangered ecological community; Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion and the EPBC Act 1999 listed endangered ecological community; Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (Wildthing Environmental Consultants 2025).

PCT 3433 is a forest formation with a mixed grassy and shrubby understorey, and due to its location within the lower North Coast / Hunter Region the vegetation falls within the Hunter Macleay Dry Sclerophyll Forest vegetation class. PCT 3433:

- is dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Red Ironbark) with *Eucalyptus paniculata* (Grey Ironbark) and *Eucalyptus crebra* (Narrow-leaved Ironbark) co-dominating in patches
- has *Eucalyptus tereticornis* (Forest Red Gum) occurring throughout with *Eucalyptus umbra* (Broad-leaved White Mahogany) occurring in the south of the Study Area, and a very scattered occurrence of *Eucalyptus punctata* (Grey Gum) and occasional *Eucalyptus moluccana* (Grey Box) in the north
- includes a dense, to sparse in areas, mid-storey which is dominated by *Melaleuca nodosa* (Prickly-leaved Paperbark) with *Bursaria spinosa* (Blackthorn), *Acacia falcata*, *Acacia irrorata* (Green Wattle), *Persoonia linearis* (Narrow-leaved Geebung) also occurring.
- the shrub layer is scattered and dominated by *Pultenaea villosa* (Hairy Bush-pea), *Jasminum volubile*, *Hibbertia aspera* (Rough Guinea Flower), *Leucopogon juniperinus* (Prickly Beard-heath), *Breynia oblongifolia* (Coffee Bush) and *Daviesia ulicifolia* (Grose Bitter Pea)
- the ground layer is dominated by a mixture of grasses and forbs including *Aristida vagans* (Threeawn Speargrass), *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass), *Themeda triandra* (Kangaroo Grass), *Lobelia purpurascens* (Whiteroot), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush) and *Lepidosperma laterale* (Variable Sword-sedge). The climber *Parsonsia straminea* (Common Silkpod) also dominates in some areas.

PCT 4042 is a forest formation that occurs on the edge of the larger floodplain of the Williams River. Due to this landform location and vegetation structure the vegetation falls within the Coastal Floodplain Wetland vegetation class. The PCT:



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- is dominated by *Eucalyptus tereticornis* (Forest Red Gum), with *Corymbia maculata* (Spotted Gum) and *Eucalyptus paniculata* (Grey Ironbark) also occurring
- has occasional occurrences of *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus umbra* (Broad-leaved White Mahogany)
- midstorey is dominated by *Melaleuca linariifolia* (Flax-leaved Paperbark), *Melaleuca styphelioides* (Prickly-leaved Tea Tree), *Alphitonia excelsa* (Red Ash) and *Backhousia myrtifolia* (Grey Myrtle)
- shrub and ground layer are dominated by *Pittosporum multiflorum* (Orange Thorn), *Breynia oblongifolia* (Coffee Bush), *Jasminum volubile*, *Microlaena stipoides* var. *stipoides*, *Dichondra repens* (Kidney Weed) and *Dianella caerulea* var. *producta*. A number of climbers and ground creepers occur within the community including *Parsonsia straminea* (Common Silkpod), which dominates in some areas, and *Geitonoplesium cymosum* (Scrambling Lily), *Pandorea pandorana* (Wonga Wonga Vine) and *Cissus antarctica* (Water Vine). The exotic species *Lantana camara* (Lantana) also dominates the understorey in portions of the community.

See **Figure 5-9**, **Figure 5-10**, **Figure 5-11** and **Figure 5-12** for the location of PCTs within the road reserve.





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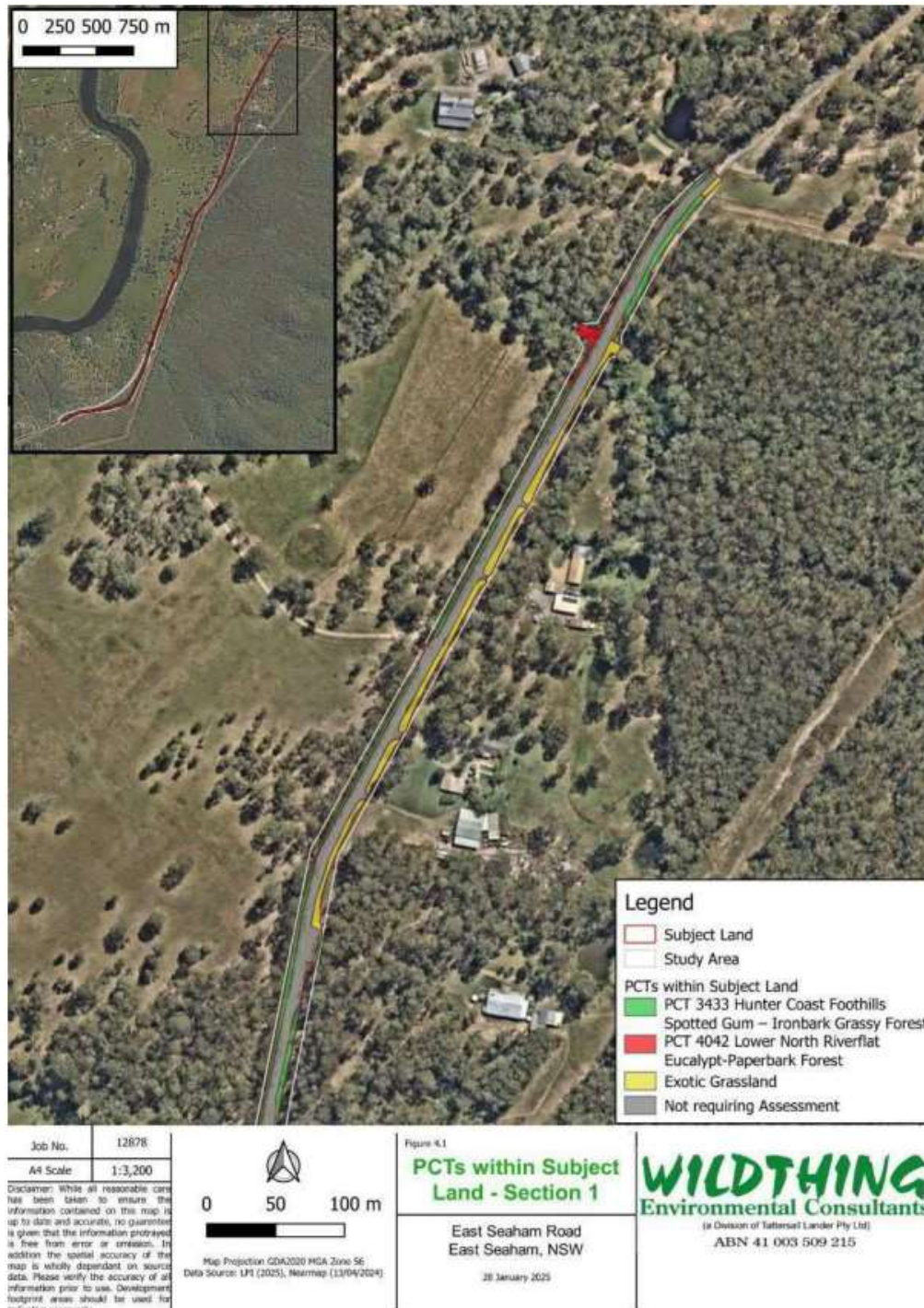


Figure 5-9 PCTs present within the road reserve





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Figure 5-10 PCTs present within the road reserve



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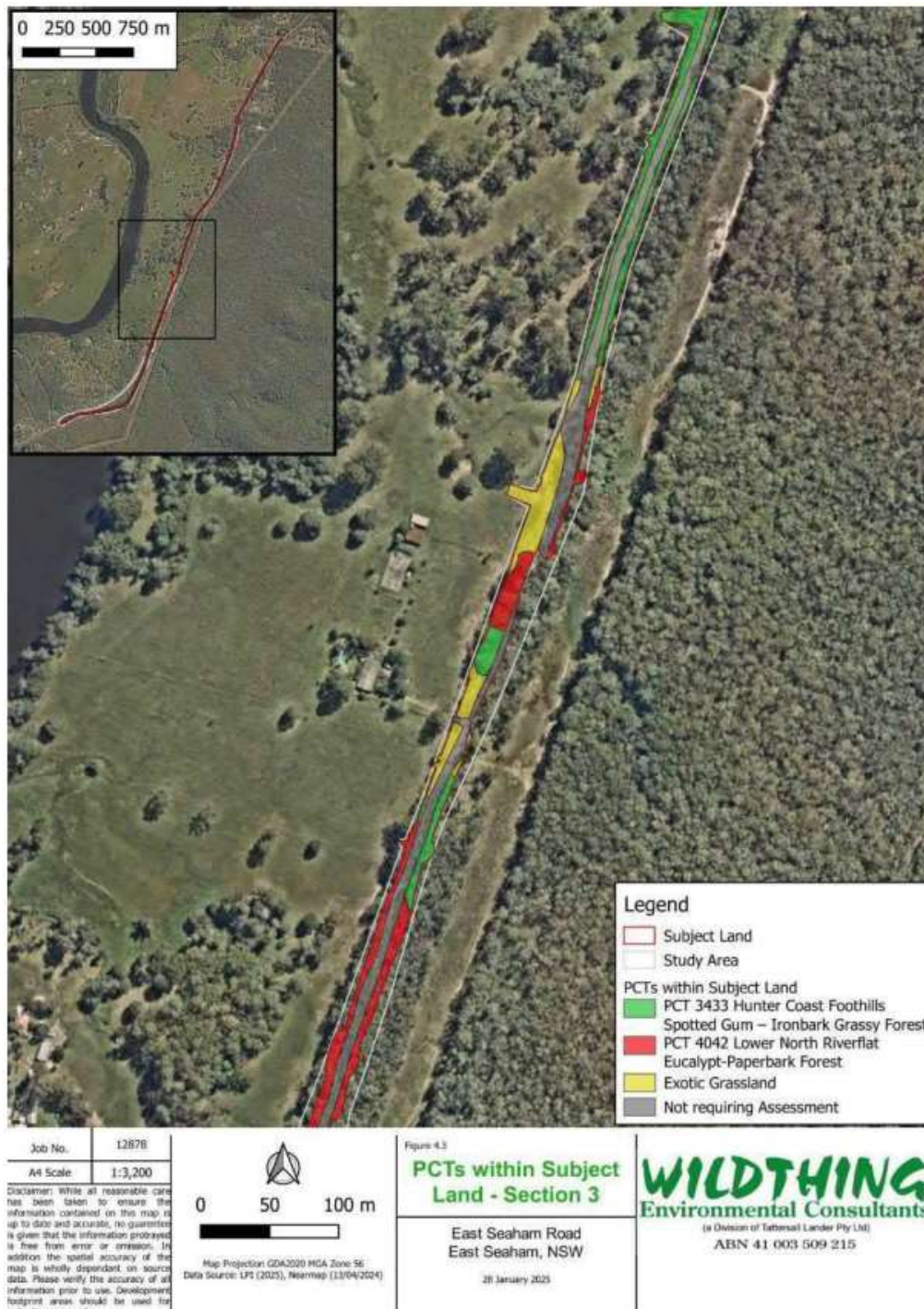


Figure 5-11 PCTs present within the road reserve





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Figure 5-12 PCTs present within the road reserve



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#### Threatened species

Targeted threatened species surveys identified the following threatened species listed under the BC Act within the subject, where targeted surveys were not conducted the species was assumed present:

- *Pterostylis chaetophora* was recorded in the subject land and has potential habitat in all vegetation zones
- *Ninox strenua* (Powerful Owl) was recorded in the subject land
- *Phascogale tapoatafa* (Brush-tailed Phascogale) was recorded in the subject land
- *Miniopterus australis* (Little Bent-winged Bat) was recorded during bat call surveys
- *Pteropus poliocephalus* (Grey-headed Flying Fox) was observed feeding on flowering eucalypt trees during nocturnal surveys. No breeding camps were observed within the study area or are known to occur in the surrounding area
- *Petaurus norfolkensis* (Squirrel Glider) has been assumed present under the precautionary principal as some remote camera images could not positively be identified as Sugar or Squirrel Glider. Suitable canopy species for the species are present in PCT 3433 and PCT 4042
- *Phascolarctos cinereus* (Koala) has been assumed present due to the number of species records within and in proximity to the study area
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat), *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Calyptorhynchus lathami lathami* (South-eastern Glossy Black Cockatoo), *Pomatostomus temporalis temporalis* (Grey-crowned Babbler) and *Daphoenositta chrysoptera* (Varied sittella) were observed or recorded during surveys
- *Corybas dowlingii* (Red Helmet Orchid) has been assumed present as targeted species surveys were not carried out during the appropriate survey period
- *Rutidosia heterogama* (Heath Wrinklewort) has been assumed present as flora surveys conducted did not target this species specifically (Wildthing 2025).

#### Koalas and the Port Stephens Comprehensive Koala Plan of Management (CKPoM)

The Port Stephens CKPoM has been prepared for the Port Stephens LGA in accordance with the now repealed SEPP 44 Koala Habitat Protection. The current Koala SEPP replicates the objectives and provisions of SEPP 44.

The principal aim of the Port Stephens CKPoM is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and to reverse the current trend of Koala population decline.



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A preliminary assessment was conducted by Wildthing Environmental Consultants (2025) to review the Koala Habitat Planning Map (Port Stephens CKPoM 2012). According to the Koala Habitat Planning Map, the majority of the subject land has been designated as 'Link over Cleared' in the south of the subject land and 'Mainly Cleared' in the north of the subject land. Small patches of 'Preferred Koala Habitat' with small areas of '50 m Buffer over Cleared', '50 m Buffer over Marginal' and 'Link over Cleared' are also mapped as occurring in the south and centre of the subject land and generally followed the watercourse present.

A field survey was conducted to determine the ecological communities present onsite, assess the level of koala activity and identify any koala feed tree species present.

During survey Wildthing Environmental Consultants (2025) found that the existing mapping was inconsistent with the on-ground assessment. The Port Stephens CKPoM assessment therefore found the study area to be largely composed of 'Preferred Koala Habitat' with smaller areas of '50 m Buffer over Cleared' and 'Mainly Cleared' land (Wildthing Environmental Consultants 2025). An updated Koala habitat map was developed and is provided in **Figure 5-13**.

Within the Port Stephens CKPoM, 3 species of Eucalypt were identified as Koala food trees, being *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus parramattensis subsp. decadens* (Drooping Red Gum) and *Eucalyptus tereticornis* (Forest Red Gum). One Koala food tree species; *Eucalyptus tereticornis* was identified within the subject land (Wildthing Environmental Consultants 2025). Specimens of *E. tereticornis* were identified throughout the subject land and with the forested areas of both PCTs within the project area with specimens identified clumped in the south and centre of the subject land, scattered within the north of the subject land and clumped on the western side of the road in the far north of the project area (Wildthing Environmental Consultants 2025).

Wildthing Environmental Consultants (2025) during field survey assessed the level of current koala activity, and no Koalas were observed within the study area during fieldwork. According to BioNet Records (DCCEEW 2025a) a number of recent records of Koalas occur within and in proximity to the subject land (Wildthing Environmental Consultants 2025).

#### Habitat trees and koala feed trees

484 significant trees were recorded within the project area which included 61 hollow-bearing trees, 403 koala feed trees and 20 trees that were both hollow-bearing and koala feed trees (Wildthing Environmental Consultants 2025). For locations of the trees see **Figure 5-14**, **Figure 5-15**, **Figure 5-16** and **Figure 5-17**.





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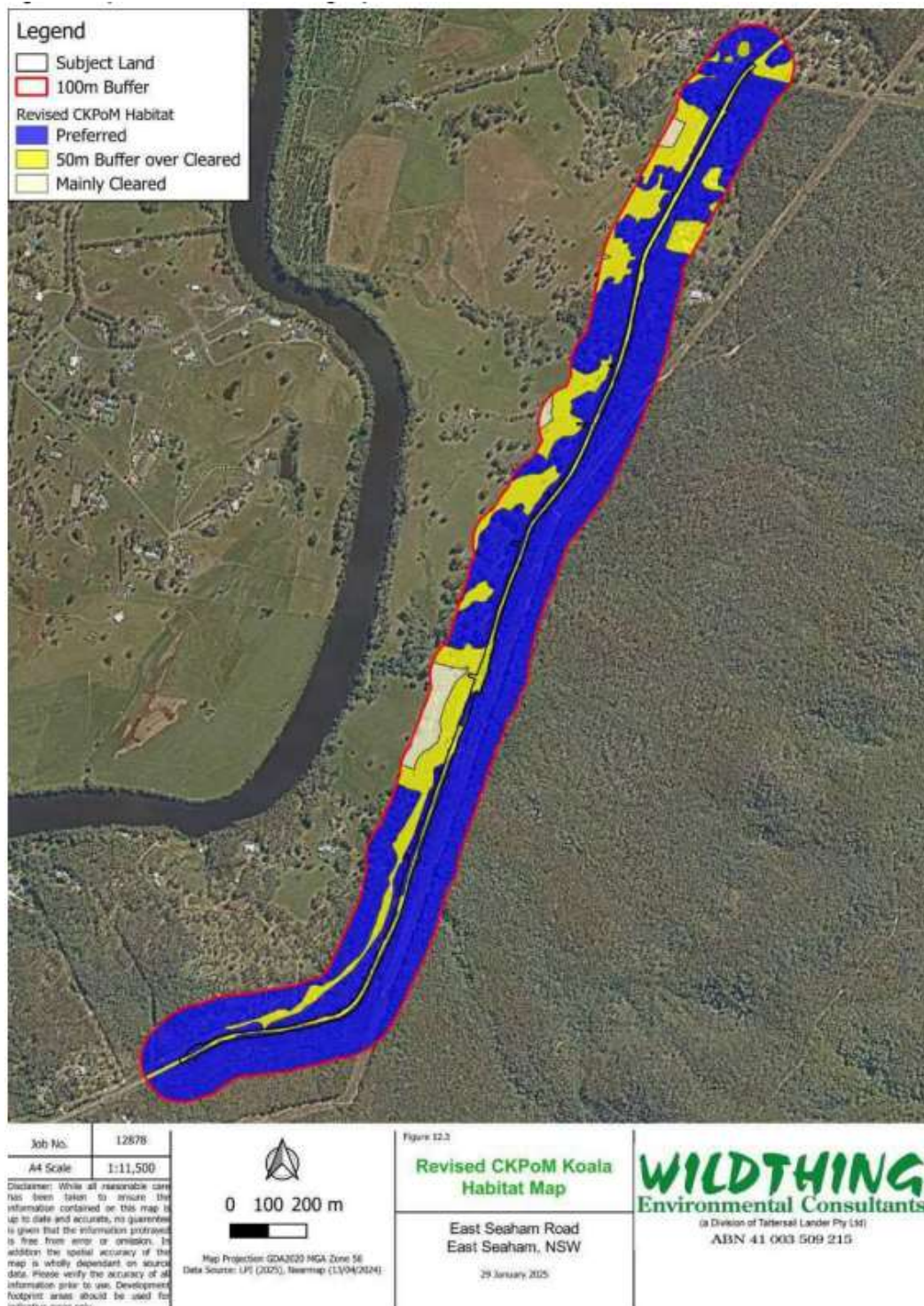


Figure 5-13 Revised CKPoM mapping





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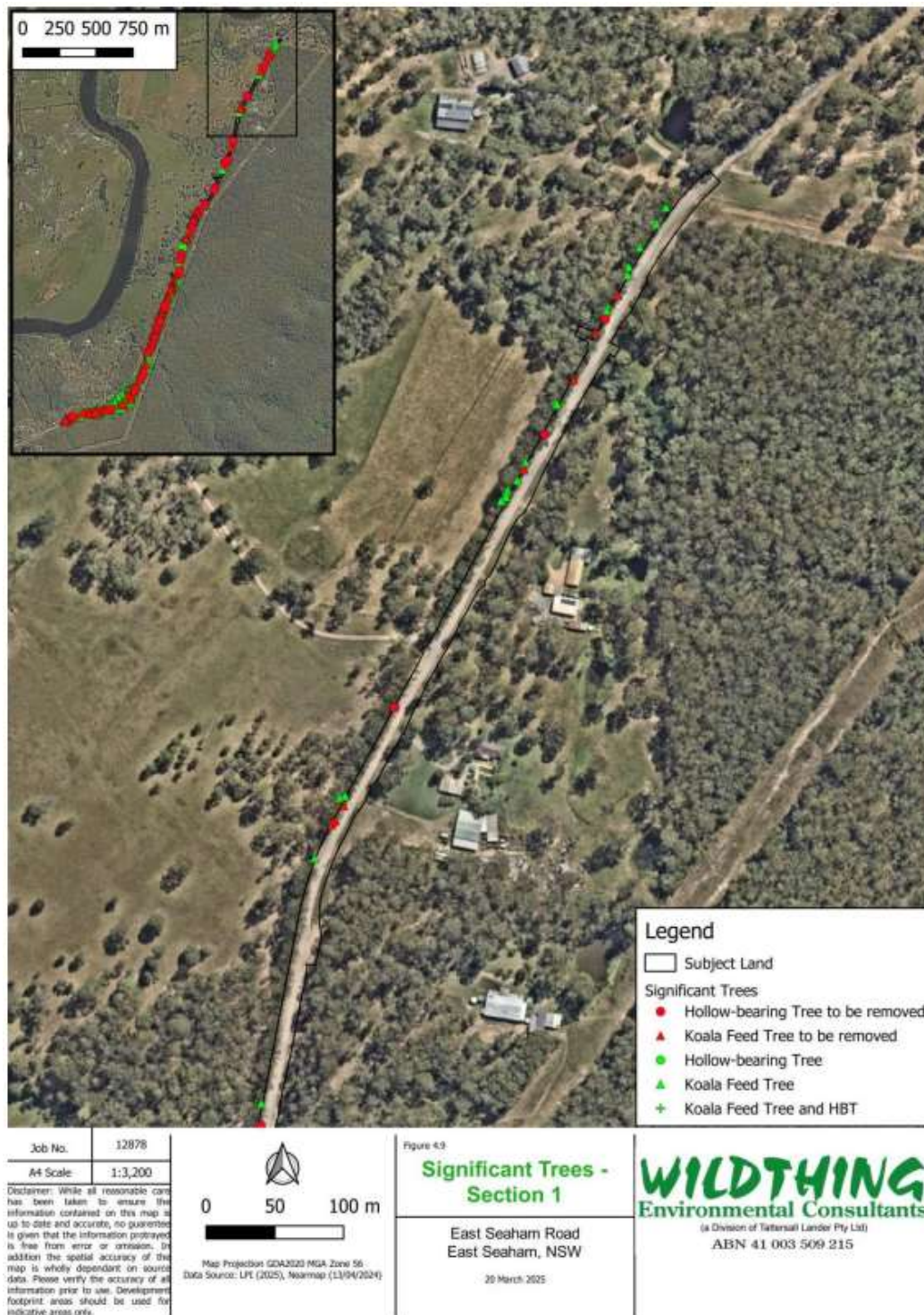


Figure 5-14 Habitat trees and koala feed trees





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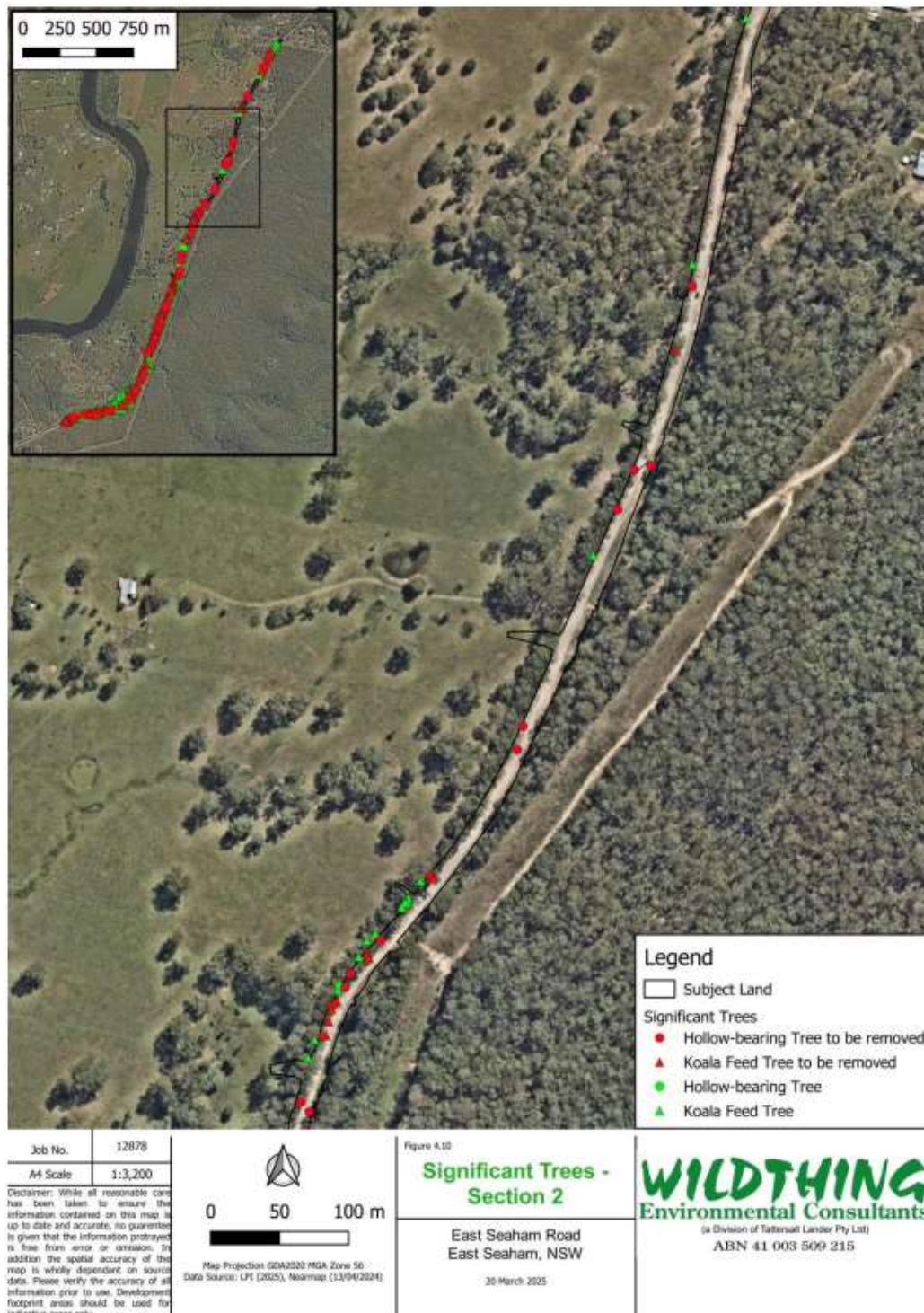


Figure 5-15 Habitat trees and koala feed trees





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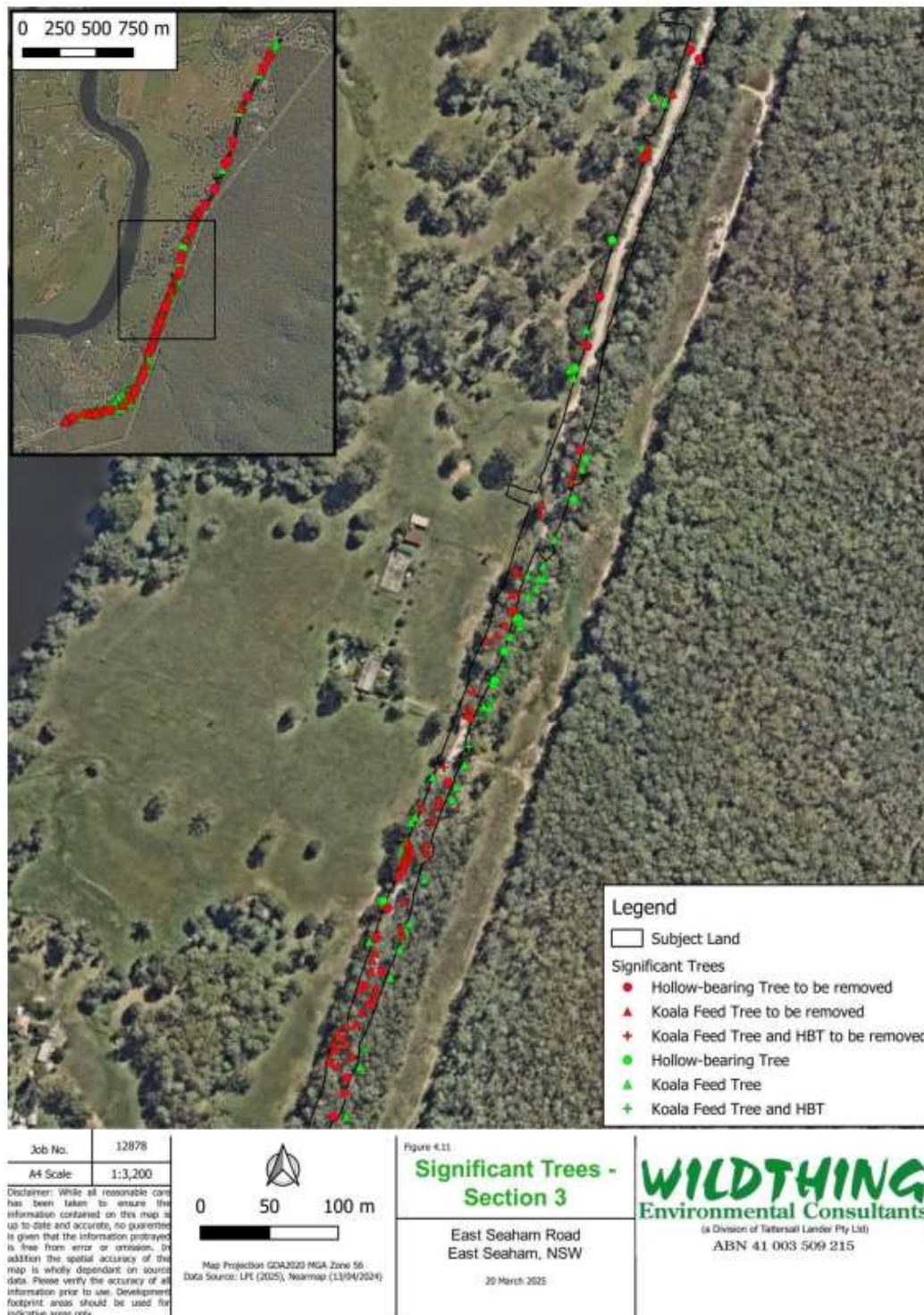


Figure 5-16 Habitat trees and koala feed trees





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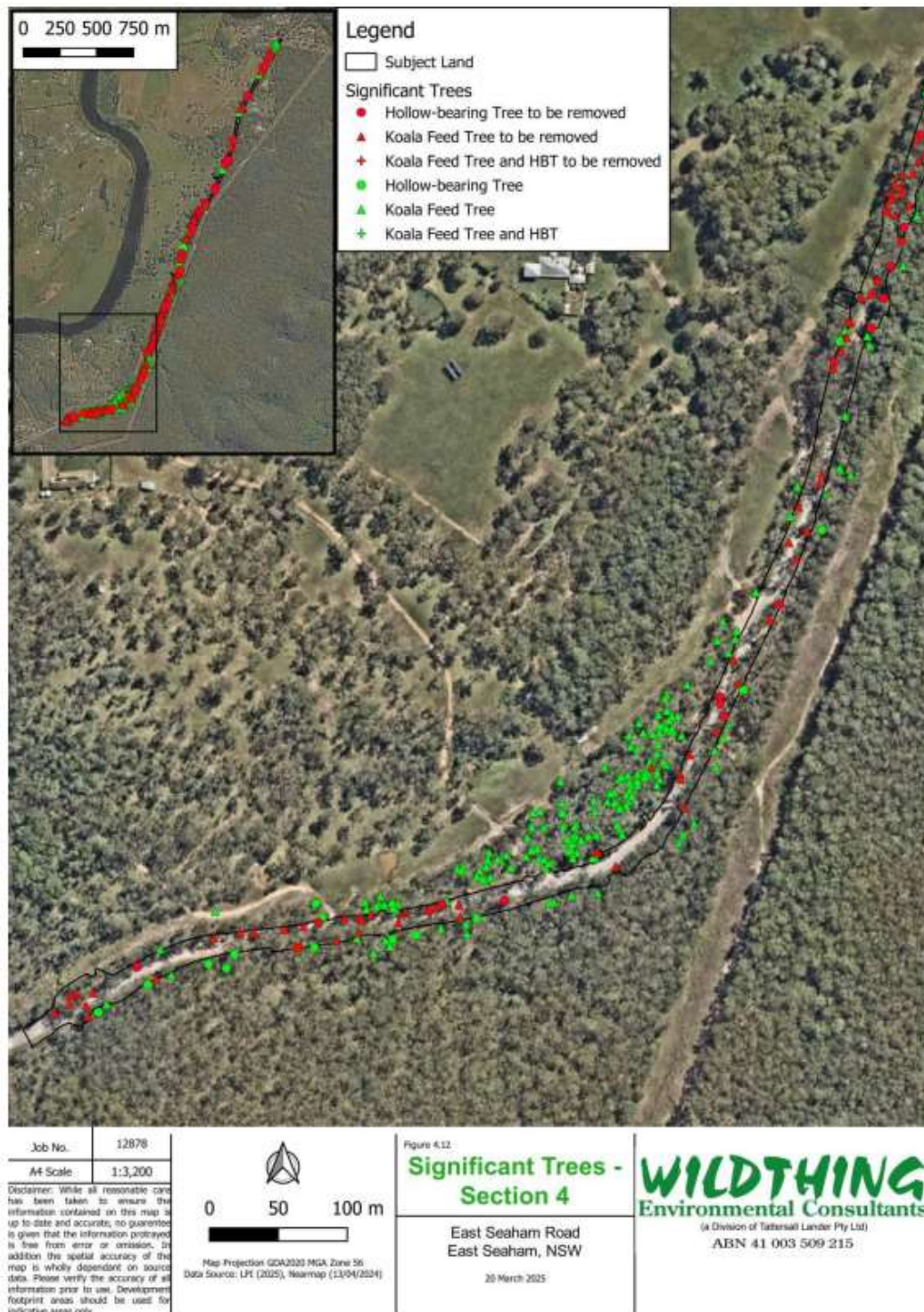


Figure 5-17 Habitat trees and koala feed trees



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#### Biodiversity corridors

According to the Fauna Key Habitats and Corridors for North East NSW (DPIE 2011 *cited in* Wildthing Environmental Consultants 2025), Key Fauna Habitat is mapped within the centre and north of the subject land whilst Fauna Corridors are mapped along the east of the subject land, in Wallaroo National Park (Wildthing Environmental Consultants 2025). Biodiversity corridors are illustrated in **Figure 5-18**.

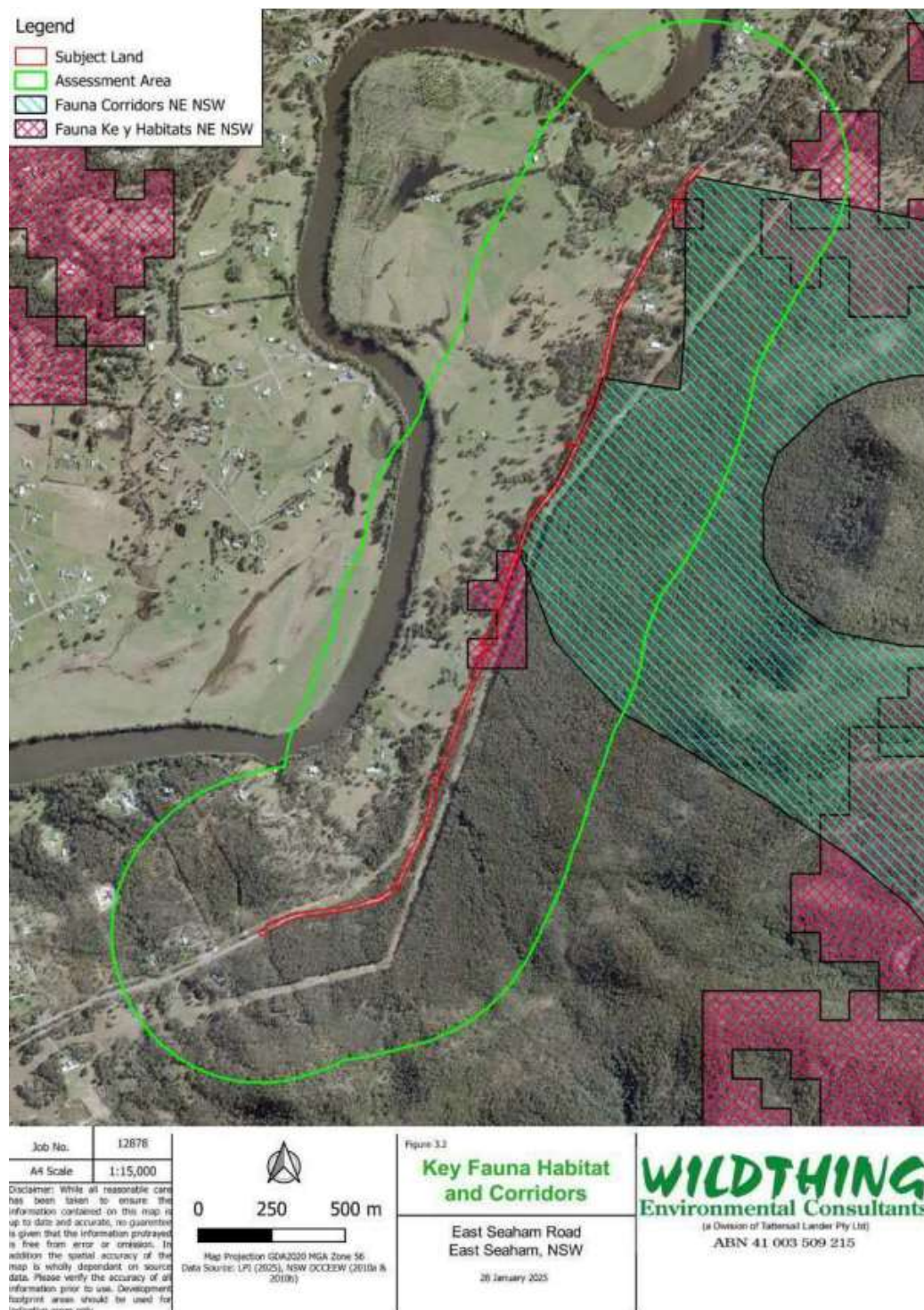
A north-south connection runs along either side of the East Seaham Road, however, it is somewhat fragmented by driveways into residential lots and more so in the north where a 30 m powerline easement runs alongside East Seaham Road (Wildthing Environmental Consultants 2025). The canopy along East Seaham Road is connected to a large, continuous, forested patch of habitat as part of Wallaroo National Park in the east, north and south (Wildthing Environmental Consultants 2025). To the west this habitat is connected to forested patches, scattered trees and open paddocks within residential lots (Wildthing Environmental Consultants 2025). The current connection between either sides of East Seaham Road is relatively strong in the centre and south of the study area with canopies almost overlapping in some spots over the two-lane road (Wildthing Environmental Consultants 2025). The project will result in a widening of this gap through the removal of trees either side of the road. This will also narrow the existing continuous habitat running along either side of East Seaham Road, particularly on the western side.





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**Figure 5-18 Key fauna habitat and corridors**



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### Non-native vegetation

Areas of non-native vegetation were present within sections of the road reserve. These areas were largely dominated by introduced grasses, *Cenchrus clandestinus* (Kikuyu), *Chloris gayana* (Rhodes Grass), *Axonopus fissifolius* (Narrow-leaved Carpet Grass), *Paspalum dilatatum* (Paspalum) and other introduced ground covers particularly *Plantago lanceolata* (Plantain) and *Senecio madagascariensis* (Fireweed) (Wildthing Environmental Consultants 2025). In total, 0.44ha of non-native vegetation was present within the subject land (Wildthing Environmental Consultants 2025). Priority weed species found within the subject land are included in **Table 5-2**.

**Table 5-2 Non-native vegetation**

Species name	Common name	Legal requirement	Additional significance
<i>Asparagus aethiopicus</i>	Ground Asparagus	General Biosecurity Duty Prohibition on dealings Regional Recommended Measure	
<i>Asparagus asparagoides</i>	Bridal Creeper	General Biosecurity Duty Prohibition on dealings Regional Recommended Measure (Hunter)	T
<i>Senecio madagascariensis</i>	Fireweed	General Biosecurity Duty Regional Recommended Measure	N
<i>Lantana camara</i>	Lantana	General Biosecurity Duty Prohibition on dealings Regional Recommended Measure (Hunter)	N, T
<i>Rubus fruticosus species aggregate</i>	Blackberry	General Biosecurity Duty Prohibition on dealings Regional Recommended Measure	

T – Listed as a Threatening Process under the NSW BC Act 2016

N – Weed of National Significance. \*Priorities under the *Biosecurity Act 2015*

General Biosecurity Duty - any person dealing with plant matter must take measures to prevent, minimise or eliminate the biosecurity risk (as far as is reasonably practicable)

Prohibition on dealings - Must not be imported into the State or sold

### Serious and irreversible impact (SAIL) species

One candidate SAIL entities *Miniopterus australis* (Little Bent-winged Bat) was recorded within the subject land, however no preferred breeding habitat was present on site (Wildthing Environmental Consultants 2025). The closest preferred roosting



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habitat is Thunderbolt Cave which is located approximately 1.8 km east of the subject land which could provide roosting habitat for *M. australis* and other SAI candidate species *Miniopterus orianae oceanensis* (Large Bent-wing Bat) and *Chalinolobus dwyeri* (Large-eared Pied Bat) (Wildthing Environmental Consultants 2025).

#### Matters of National Environmental Significance (MNES)

Considerations have been made under the EPBC Act & MNES. The nationally listed EEC Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions was found to occur in the subject land and three nationally listed species *Pteropus poliocephalus* (Grey-headed Flying-fox) (Vulnerable), *Phascolarctos cinereus* (Koala) (Endangered), *Calyptorhynchus lathamii* (South-eastern Glossy Black-Cockatoo) (Vulnerable) were found to occur on site due to targeted surveys (Wildthing Environmental Consultants 2025).

#### Areas of outstanding biodiversity values

No declared areas of outstanding biodiversity value were located within or in proximity to the subject land.

#### Karst, caves, crevices, cliffs, rocks or other geological features of significance

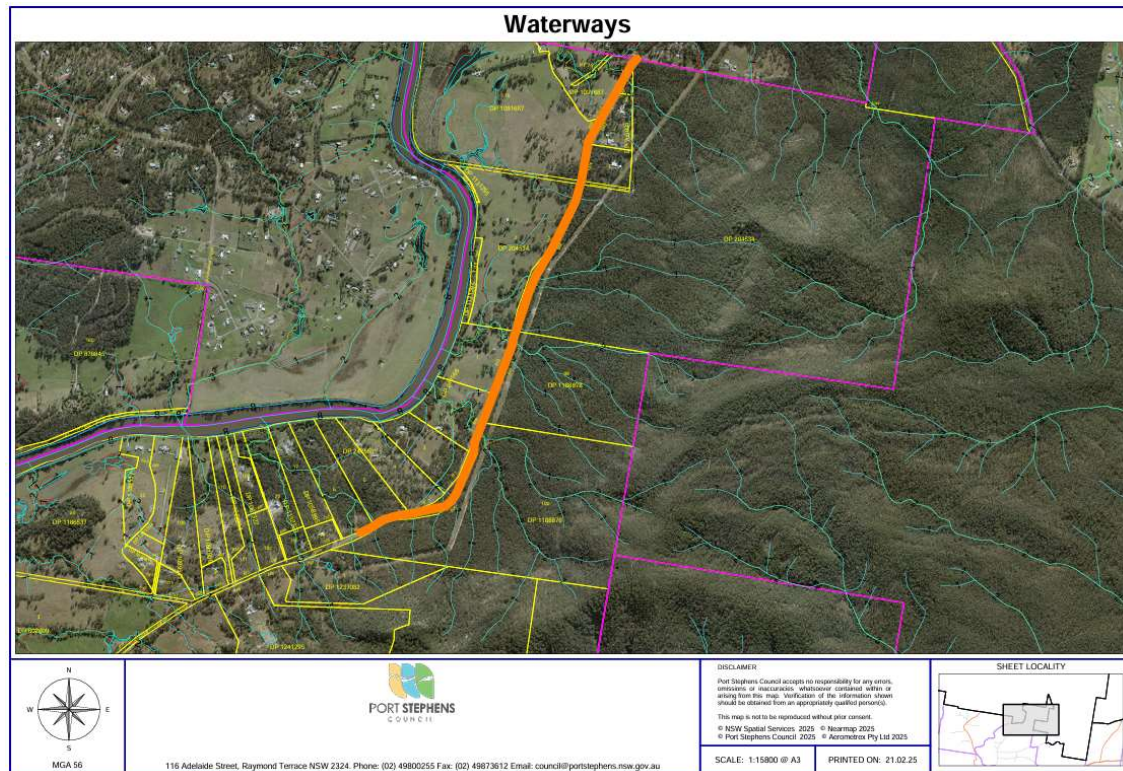
No significant geological features were present within the subject land.

#### Waterways and their catchments

The subject land occurs within the Williams River Catchment. A number of first and second order and 2 third order prescribed streams pass through culverts within the subject land. There were also a number of dams located within close proximity to the subject land. No wetlands are located within the project area or within 500 m of the project area. The project area does not drain to a wetland. See **Figure5-19**.



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**Figure 5-19 Waterways and stream order**

### Groundwater dependant ecosystems (GDEs)

Based on the PCTs identified in the construction footprint during field surveys and the GDE Atlas, it is likely that some of the PCTs present in the construction footprint would have a degree of groundwater dependence (Wildthing Environmental Consultants 2025). The vegetation communities' onsite, however, are unlikely to be entirely dependent on groundwater and are likely to be opportunistic GDEs that depend on the subsurface presence of groundwater during dry periods (Wildthing Environmental Consultants 2025).

During geotechnical surveys, groundwater was only encountered at the site in borehole N3 at 1 m from surface and was located adjacent to an existing creek line (Hunter Civilab 2024). PCT 4042 Lower North Riverflat Eucalypt-Paperbark Forest is present in the location of borehole N3. PCT 4042 is a vegetation community that is more common in the lower areas of the floodplain. Due to the locality, rainfall volumes and distribution, and ephemeral nature of the waterways onsite, PCT 4042 is unlikely to rely solely on groundwater and would likely be more dependent on rainfall, surface flows within the ephemeral waterways onsite and periodic flooding. See **Figure 5-20** and **Figure 5-21**.



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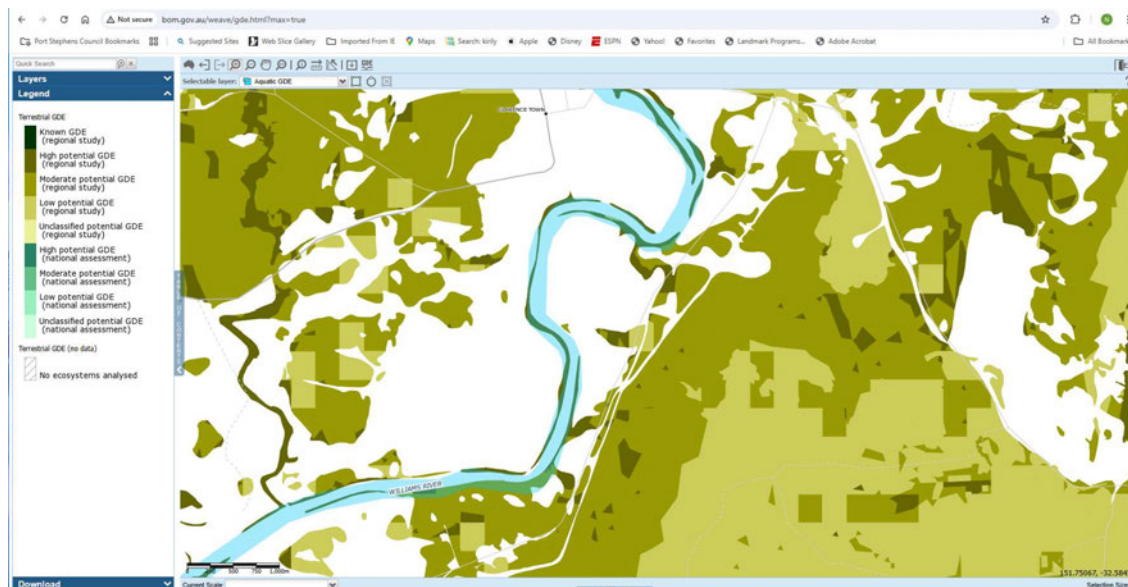


Figure 5-20 Groundwater dependant ecosystems



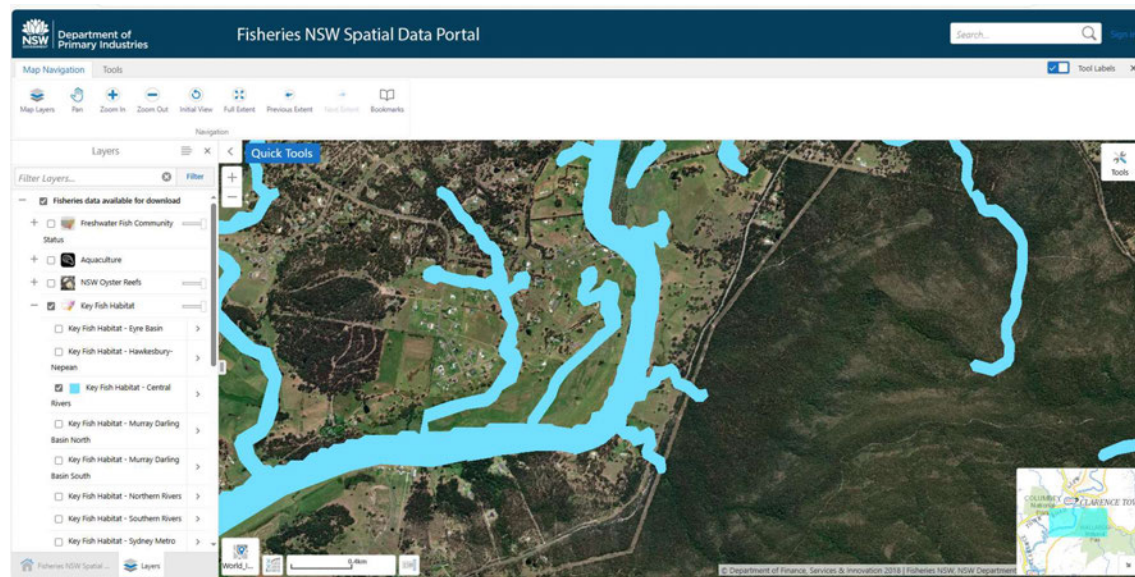
Figure 5-21 Location of borehole N3 adjacent 873 East Seaham Road



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### Key fish habitat (KFH)

KFH is mapped as occurring onsite and downstream from the site within the Williams River catchment. Two waterway crossings along East Seaham Road are identified as KFH are within the project area. See **Figure 5-22**.



**Figure 5-22 Key fish habitat within the project locality**

### 5.2.2. Site survey

#### Landscape features

Landscape features extents within the subject land were determined by undertaking searches of external resources such as NSW SEED Mapping, Land and Property Information, and NSW Planning Portal. Field reconnaissance was also undertaken by Wedgetail Project Consulting (2023 cited in Wildthing Environmental Consultants 2025) to determine the condition and extent of landscape features within the subject land and surrounding locality.

#### Native vegetation cover

The percent native vegetation cover was assessed by Wildthing Environmental Consultants (2025) by applying a 500 m buffer around the edge of the project area and digitising all the native vegetation within, using GIS editing tools and recent aerial photography. The total area of native vegetation was calculated across the assessment area by Wildthing Environmental Consultants, 2025 in accordance with



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the definition of Native vegetation Cover within the Biodiversity Assessment Method Operational Manual Stage 1 (DPIE 2020b).

#### Desktop searches

Searches were undertaken by Wildthing Environmental Consultants (2025) using the BioNet VIS Database and NSW SEED mapping. Based on the results of the review of existing information and the requirements of the BAM, Wildthing Environmental Consultants (2025) designed appropriate surveys for the subject land. Supplementary iterations and amendments were made to the base map throughout the fieldwork period, in accordance with Section 5.2 of the BAM, via hand-held GPS units and aerial photo interpretation. Iterations to the base map were based on observation of broad vegetation composition, landform, and physiography, and on quantitative data collection through identification of all plants encountered, to the species level, (Wildthing Environmental Consultants 2025). Vegetation types observed were compared to the base map and cross-referenced with the community profile descriptors (and diagnostic species tests) held within the BioNet VIS Database.

#### Plot based vegetation survey and vegetation integrity survey

Detailed floristic surveys were undertaken in January 2025 by Wildthing Environmental Consultants (2025). These surveys included the establishment of three plot-based vegetation and vegetation integrity plots with data collected in accordance with BAM by persons trained in the BAM and under the direction of persons accredited under the BAM. Survey plot location was selected such that it included all functional attributes relevant to the PCT and vegetation zone and the size of the plots were modified to fit within the narrow road reserve containing the vegetation (Wildthing Environmental Consultants 2025).

#### Targeted flora surveys

Targeted flora surveys were undertaken by Wildthing Environmental Consultants (2025) in accordance with the NSW Guide to Surveying threatened plants and their habitats (DPIE 2020e), Draft survey guidelines for Australia's threatened orchids (DoE, 2013a), and in correlation with local flowering reference populations for orchids. All vegetation communities were considered to be habitat for the target species by Wildthing Environmental Consultants (2025). A parallel field traverse (i.e. parallel transects) was undertaken within the subject land. Surveys were conducted along parallel line transects approximately 5 to 10 m apart for orchids, herbs and forbs, and 10 to 20 m for shrubs and trees. Transects were conducted along a straight path using the tracks on a GPS to guide the surveyors. Targeted surveys for *Pterostylis chaetophora*, *Asperula athenes*, *Rhizanthella slateri*, *Grevillea parviflora* subsp.



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*parviflora* and *Tetratheca juncea* were conducted within appropriate survey times (by Wildthing Environmental Consultants 2025).

#### Significant tree survey

Wildthing Environmental Consultants (2024) conducted a significant tree survey for hollow-bearing trees, trees containing large stick nests within and within close proximity to the impact area and Schedule 2 Koala Feed Trees under the Port Stephens CKPoM. The ground-based survey recorded the details of each significant tree including height, diameter at breast height (dbh), hand held GPS coordinates and fauna habitat attributes such as hollows with the presence of activity in the form of scratches, scats on the trunks of trees and scats around the base also noted.

#### Threatened fauna survey

Wildthing Environmental Consultants (2024) conducted a desktop assessment for the potential use of the subject land by threatened species. Field survey was conducted by Wildthing Environmental Consultants (2024) using the Department of Environment and Conservation's (NSW) Threatened Biodiversity Survey and Assessment Guidelines – Working Draft (DEC 2004) and included:

- Diurnal avifauna surveys at peak activity periods (i.e. dawn and dusk). Searches were also conducted within the subject land and in close proximity for large stick nests which may indicate breeding by the candidate species. Incidental observations of avifauna were also made during other surveys. Observations were also made of secondary indications (i.e. distinctive feathers and nests) of avifauna were also recorded.
- Stagwatching of hollow trees suitable for *Petaurus norfolcensis* (Squirrel Glider), *Calyptorhynchus lathami* (Glossy Black-cockatoo) (Breeding) and owl species such as *Tyto novaehollandiae* (Masked Owl) and *Ninox strenua* (Powerful Owl).
- Call playbacks which were played after quiet listening/ stagwatch or 10 minutes of listening and observing. Broadcasting and listening conducted for each owl species including Powerful Owl (*Ninox strenua*), Barking Owl (*Ninox connivens*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*).
- Arboreal mammal surveys targeting *Petaurus norfolcensis* (Squirrel Glider), *Phascogale tapoatafa* (Brush-tailed Phascogale) and *Phascolarctos cinereus* (Koala). Surveys included spotlighting and camera trapping. Target trees that the cameras were pointed at were chosen based on their location (not easy to see from road and not pointing at road), evidence of fauna use (scratches on trunk) and presence of hollows.
- Spotlighting which was undertaken on foot using 100watt hand-held spotlights and high-powered head torches. Targeted candidate species targeted included



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*Petaurus norfolcensis* (Squirrel Glider), *Petauroides volans* (Greater Glider), *Phascolarctos cinereus* (Koala) and *Turnix maculosus* (Red-backed Button-quail).

- Small terrestrial mammal trapping using 25 Elliott Type A traps (8 x 10 x 33 cm). The traps were left in place for four consecutive nights giving a total of 100 small terrestrial trap nights.
- Microchiropteran bat surveys using Anabat<sup>TM</sup> bat-call detectors (Chorus) to passively record the calls of passing Microchiroptera bats. Four Anabats<sup>TM</sup> were set up within suitable Microchiroptera bat habitat and along potential flyways and left to record for 4 consecutive nights. The calls were then analysed using Anabat Insight.
- Spot Assessment Technique (SAT) to determine localised levels of habitat use by Koalas. This included a radial assessment of Koala activity within the immediate area surrounding a tree of any species that is known to have been utilised by the species, or otherwise considered to be of some importance for Koala conservation and/or management purposes. Three assessments were undertaken within random sites of the subject land.

All incidental observations and secondary indications such as the presence of scats were also recorded.

#### Survey limitations

Limiting factors included:

- difficulty in detection of species with large home ranges
- climate variability which may affect the occurrence of some species
- dust presence within the roadside vegetation and pluming dust which was excessive when vehicles travelled the road
- excessive noise of heavy vehicles utilising the deteriorating gravel road which could be heard from a far distance, especially during nocturnal surveys.

Wildthing Environmental Consultants (2025) applied the precautionary principle in all cases where the survey methodology may have given a false negative result. The precautionary principle applied by recognising that most threatened species are rare and therefore unlikely to be encountered during a survey even if they may utilise the study area at other times. These species were assessed on the basis of the presence of suitable habitat and likely significance of that habitat to a viable local population.





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#### 5.2.4. *Impact assessment*

##### **SIS or BDAR**

During design development, PSC reviewed the proposed design options, conducted preliminary ecological survey work and used the test of significance in Section 7.3 of the BC Act to determine that the proposed activity was likely to significantly affect threatened species or ecological communities, or their habitats. In accordance with Section 7.8 of the BC Act as a Part 5 activity, PSC had the option of accompanying the EIS with a species impact statement or BDAR. PSC elected to prepare a BDAR due to the more time efficient planning pathway for offsetting and ensuring the ability to meet grant funding delivery dates.

The BDAR has been prepared by a BAM Accredited Assessor in accordance with the BAM to assess the biodiversity impact and offsetting obligation of the proposal under the BC Act and associated regulations.

##### **Avoidance and minimisation of impacts**

The project area has been positioned overtop of and along both sides of a pre-existing gravel portion of East Seaham Road. The project has been designed to largely follow the alignment of the pre-existing road and retain the majority of vegetation within the road reserve. The project area has been subject to continual disturbances such as road maintenance, dust incursion from the gravel road and noise pollution from the deteriorating gravel road. Due to the project area being generally consistent with the existing road, the impacts have largely been limited to native vegetation closest to the road edge. Vegetation closest to the existing road is considered most disturbed of all vegetation in the road reserve, due to edge effects such as dust pollution from traffic, compaction from vehicles pulling over and weed spraying as part of regular weed management by PSC. Direct and indirect impacts of the proposal have mainly been limited to the most disturbed vegetation and habitat while the majority of the better-quality potential habitat for the species will be avoided in the road reserve.

During the design process the following were undertaken:

- [REDACTED]



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- partial minor realignment to avoid impacts to biodiversity, improve road sight lines and reduce impacts on local heritage item (through removal of vegetation) at the start of Stage 6.
- road design in accordance with Austroads Standards with the following minor amendments:
  - Some crest curves along the alignment do not meet Austroads Standards. Appropriate signage has been proposed for where this occurs. If crest curves were compliant further cut would be required and design grades for driveways would not allow egress. Additional clearing, land acquisition and boundary adjustments would be required which would result in additional unacceptable impacts to biodiversity due to increased batter widths, and alternatively if retaining walls were installed there would be an impact on biodiversity (albeit less than increased batter widths), project costs and potentially delivery duration.
  - Hazards exist within the clear zone as defined by Austroads Standards in the final design including trees and culverts. The clear zone will be substantially improved compared to current existing conditions due to tree removal. To meet Austroads Standards clear zone requirements, further substantial tree removal would be required which would produce an unacceptable impact on biodiversity and further impacts on local heritage. Vegetation clearing is set at 3 m from edge line of travel lane or toe of batter whichever is greater. The Austroads Standard is approximately 7 m. Travel lane widths and shoulder widths are compliant with Austroads Standards. This is consistent with previous stages of East Seaham Road upgrade works.
  - The safety barrier has been introduced on curves and steep batters where required to reduce the extent of clearing and improve safety in these localities.

Once complete, the project will likely eliminate the dust spill onto vegetation within the road reserve that currently occurs and minimise road noise of heavy vehicles utilising the deteriorating gravel road. The project does not include the erection of any artificial lighting.

Overall, these considerations helped to balance impacts on land use, endangered ecological communities and threatened flora and fauna.

#### Direct impacts

Potential direct impacts arising from the project include removal of native vegetation and flora and fauna habitats and removal of known habitat for threatened fauna species.



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Direct impacts to native vegetation arising from the project includes the removal of: 2.13 ha of native vegetation comprising of:

- 1.34 ha of PCT 3433 Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
- 0.36 ha of 3431 Central Hunter Ironbark Grassy Woodland (no hollow bearing trees)
- 0.43 ha of 4042 Lower North Riverflat Eucalypt-Paperbark Forest (Wildthing Environmental Consulting 2025).

This vegetation removal will require offsetting in accordance with the BAM. Areas of retained native vegetation within the study area are known and predicted to support the same native vegetation and TECs as those being directly impacted by the project (Wildthing Environmental Consulting 2025). In the context of native vegetation retained impacts to areas of better quality habitat and vegetation have been avoided and direct impacts to native vegetation are considered minor (Wildthing Environmental Consulting 2025).

Direct impacts to threatened species relate to impacts to their habitat. The areas of retained native vegetation adjacent to the construction footprint are known and predicted to support the same native vegetation and TECs as those being directly impacted, direct impacts to threatened species are considered minor (Wildthing Environmental Consulting 2025).

**Table 5-3** and **Table 5.4** provide a summary of the ecosystem credits and species credits required to offset the impacts to ecological communities and threatened species. **Table 5-5** provides a summary of measures implemented to minimise direct impacts.

**Table 5-3 Ecosystem credits requiring offsetting**

PCT	Threatened ecological community	Impact area (ha)	Number of ecosystem credits required
3433 Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	1.34	27
3431 Central Hunter Ironbark Grassy Woodland (no hollow bearing trees)	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	0.36	3
4042 Lower North Riverflat Eucalypt-Paperbark Forest	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	0.43	14





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**Table 5-4 Species credits requiring offsetting**

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
Red Helmet Orchid	<i>Corybas dowlingii</i>	1.77 ha	2
Powerful Owl	<i>Ninox strenua</i>	1.09 ha	2
Squirrel Glider	<i>Petaurus norfolcensis</i>	1.77 ha	2
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	1.77 ha	2
Koala	<i>Phascolarctos cinereus</i>	1.77 ha	2
Tall Rustyhood	<i>Pterostylis chaetophora</i>	2.13 ha	2
Heath Wrinklewort	<i>Rutidosia heterogama</i>	1.70 ha	2

**Table 5-5 Minimisation measures direct impacts**

Impact	Objective	Mitigation measure (Wildthing 2025)	Standard wording for mitigation measure
Clearing of native vegetation	Retention of mature trees and hollow-bearing trees within the retained native vegetation within the study area will facilitate the movement of mobile threatened species and provide foraging, nesting and shelter/shade resources.	<p>Where possible, construction works should avoid any impact to mature trees and hollow-bearing trees. Where unavoidable, works should minimise impacts to mature trees as follows:</p> <ul style="list-style-type: none"> <li>clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development footprint. Tree clearing and disturbance will be limited to the development site</li> <li>where a tree must be disturbed the priority should be given to pruning rather than clearing</li> <li>the clearing of any trees should be undertaken in a manner that avoids damaging adjacent vegetation i.e., all trees should be felled into disturbed areas when feasible</li> <li>individual trees that are to be retained are to be protected during construction by a temporary fence around the dripline.</li> </ul>	<p>Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p> <p>Where a tree identified for retention must be disturbed, the tree should be preferentially retained and pruned rather than cleared.</p> <p>All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).</p> <p>Install exclusion fencing that includes temporary fencing to protect and avoid identified hollow bearing trees.</p> <p>Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.</p>



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#### Indirect impacts

Indirect impacts are summarised in **Table 5-6** and residual impacts in **Table 5-7**.



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**Table 5-6 Avoidance and minimisation measures indirect impacts**

Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
Connectivity (habitat fragmentation)	Eliminate the inadvertent removal vegetation to avoid further habitat fragmentation	Only what is required to be removed for safety purposes is proposed to be removed.	<p>Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p> <p>Install exclusion fencing that includes temporary fencing to:</p> <ul style="list-style-type: none"> <li>protect and avoid known populations of <i>Pterostylis chaetophora</i> onsite</li> <li>protect and avoid identified hollow bearing trees.</li> </ul> <p>Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.</p> <p>Clearly demarcate all trees to be removed in accordance with QF-ENV-001 Tree Tagging Standards and Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).</p>
Loss of BC Act 2016 listed TEC Lower Hunter spotted Gum – Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	Eliminate the inadvertent removal of this TEC to be retained within the scope of the proposal	The clearance zone is to be clearly marked to eliminate any inadvertent impact to adjoining habitat.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of BC Act 2016 listed TEC Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion	Eliminate the inadvertent removal of this TEC to be retained within the scope of the proposal	The clearance zone is to be clearly marked to eliminate any inadvertent impact to adjoining habitat.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks





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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
			and issues onsite and ensure they are available upon request.
Loss of threatened flora habitat	Eliminate the inadvertent removal of habitat to be retained	The clearance zone is to be clearly marked to eliminate any inadvertent impact to adjoining habitat.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of <i>Pterostylis chaetophora</i> (Tall Rustyhood) habitat	Eliminate the inadvertent removal of habitat to be retained.  Avoid impact to retained specimens of <i>Pterostylis chaetophora</i>	The clearance zone is to be clearly marked to eliminate any inadvertent impact to adjoining habitat.	Install exclusion fencing that includes temporary fencing to protect and avoid known populations of <i>Pterostylis chaetophora</i> onsite.  Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.  Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of <i>Corybas doweringii</i> (Red Helmet Orchid) habitat	Eliminate the inadvertent removal of habitat to be retained within the scope of the proposal	The clearance zone is to be clearly marked to eliminate any inadvertent impact to adjoining habitat.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of <i>Rutidosia heterogama</i> (Heath Wrinklewort) habitat	Eliminate the inadvertent removal of habitat to be retained within the scope of the proposal	The clearance zone is to be clearly marked to eliminate any inadvertent impact to adjoining habitat.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
Loss of <i>Phascolarctos cinereus</i> (Koala habitat)	Timing works to avoid critical life cycle events such as breeding for Koala	Timing works to avoid critical life cycle events such as breeding season (October to January) for the Koala.	Timing of vegetation clearance should occur outside the bird nesting season (late August to December) and avoid critical life cycle events such as breeding for avifauna species and outside the koala breeding season (October to January).
Loss of threatened <i>Petaurus norfolcensis</i> (Squirrel Glider) habitat	A net positive increase of Squirrel Glider nesting habitat within the locality, a retention of key connections	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval. Nest boxes should be installed prior to removal of vegetation.  Nest boxes are to be designed to specifications for Squirrel Glider, Brush-tailed Phascogale, Powerful Owl and Microchiropteran Bats. Nest boxes should not be installed within Koala Feed Trees where possible.	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).  Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.
Loss of threatened <i>Phascogale tapoatafa</i> (Brush-tailed Phascogale) breeding habitat	A net positive increase of Brush-tailed Phascogale nesting habitat within the locality, a retention of key connections	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval. Nest boxes should be installed prior to removal of vegetation.  Nest boxes are to be designed to specifications for Squirrel Glider, Brush-tailed Phascogale, Powerful Owl and Microchiropteran Bats. Nest boxes should not be installed within Koala Feed Trees where possible.	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).  Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.
Loss of <i>Ninox strenua</i> (Powerful Owl) breeding habitat	Retention where possible of Powerful Owl nesting habitat	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
		<p>Specification 2024. Documentary evidence of installation of the nest box must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval. Nest boxes should be installed prior to removal of vegetation.</p> <p>Nest boxes are to be designed to specifications for Squirrel Glider, Brush-tailed Phascogale, Powerful Owl and Microchiropteran Bats. Nest boxes should not be installed within Koala Feed Trees where possible.</p>	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.
Loss of <i>Pomatostomus temporalis temporalis</i> (Grey-crowned Babbler) habitat	Eliminate the inadvertent removal of vegetation to avoid further habitat fragmentation	Only what is required to be removed for safety purposes is proposed to be removed.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of <i>Pteropus poliocephalus</i> (Grey-headed Flying Fox) foraging habitat	Eliminate the inadvertent removal of vegetation to avoid further habitat fragmentation	Only what is required to be removed for safety purposes is proposed to be removed.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of <i>Daphoenositta chrysoptera</i> (Varied Sittella) habitat	Eliminate the inadvertent removal of vegetation to avoid further habitat fragmentation	Only what is required to be removed for safety purposes is proposed to be removed.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Loss of <i>Calyptorhynchus lathamii</i> (South-eastern Glossy Black-Cockatoo) transitory habitat	Eliminate the inadvertent removal of vegetation to avoid further habitat fragmentation	Only what is required to be removed for safety purposes is proposed to be removed.	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.





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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
Loss of <i>Micronomus norfolkensis</i> (Eastern Coastal Free-tailed Bat) habitat	A net positive increase of Brush-tailed Eastern Coastal Free-tailed Bat roosting habitat within the locality, a retention of key connections	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval. Nest boxes should be installed prior to removal of vegetation.  Nest boxes are to be designed to specifications for Squirrel Glider, Brush-tailed Phascogale, Powerful Owl and Microchiropteran Bats. Nest boxes should not be installed within Koala feed trees where possible.	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).  Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.
Loss of <i>Falsistrellus tasmaniensis</i> (Eastern False Pipistrelle) habitat	A net positive increase of Eastern False Pipistrelle roosting habitat within the locality, a retention of key connections	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval. Nest boxes should be installed prior to removal of vegetation.  Nest boxes are to be designed to specifications for Squirrel Glider, Brush-tailed Phascogale, Powerful Owl and Microchiropteran Bats. Nest boxes should not be installed within Koala Feed Trees where possible.	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).  Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.
Loss of <i>Miniopterus australis</i> (Little Bentwing Bat) hunting and roosting habitat in the form of tree hollows	A net positive increase of Little Bentwing Bat roosting habitat within the locality, a retention of key connections	Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest boxes must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval. Nest boxes should be installed prior to removal of vegetation.	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).  Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
		Nest boxes are to be designed to specifications for Squirrel Glider, Brush-tailed Phascogale, Powerful Owl and Microchiropteran Bats. Nest boxes should not be installed within Koala Feed Trees where possible.	box hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.
Impact on breeding populations	Timing works to avoid critical life cycle events such as breeding for avifauna species and koalas	Timing of vegetation clearance should occur outside the bird nesting season (late August to December) to avoid critical life cycle events for avifauna species and outside the koala breeding season (October to January).	Timing of vegetation clearance should occur outside the bird nesting season (late August to December) to avoid critical life cycle events for avifauna species and outside the koala breeding season (October to January).
Reduced viability of adjacent habitat due to noise, dust, light spill, edge effects and weed incursion	Reduce dust, noise pollution and avoid excessive light pollution affecting adjacent habitat	Reduce dust, noise pollution and avoid excessive light pollution affecting adjacent habitat.	See <b>Section 5.1.3</b> and <b>Section 5.7.3</b> .
Impact on waterbodies, water quality and hydrological processes	Minimise impacts on surface water quality and quantity	Silt fencing and controls on sediment and runoff must be implemented prior to any construction within the subject land particularly around prescribed streams within and in proximity to the subject land.	<p>Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004). The sediment and erosion controls must have the aim of achieving an outcome of no visible turbid plumes reaching the waterway for any rainfall event up to a 1 in 2 year average recurrence interval event.</p> <p>Install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p>
Increased risk of starvation, exposure and loss of shade or shelter	The retention of mature trees, hollow-bearing trees will provide food and shelter resources within the immediate locality	Where possible, construction works should avoid any impact to mature trees and hollow-bearing trees.	<p>Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p> <p>Install exclusion fencing that includes temporary fencing to:</p> <ul style="list-style-type: none"> <li>protect and avoid known populations of <i>Pterostylis</i></li> </ul>



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
			<p><i>chaetophora</i> onsite</p> <ul style="list-style-type: none"> <li>protect and avoid identified hollow bearing trees.</li> </ul> <p>Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.</p> <p>Clearly demarcate all trees to be removed in accordance with QF-ENV-001 Tree Tagging Standards and Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).</p>
Clearing of native vegetation	Retention of mature trees and hollow-bearing trees within the retained native vegetation in the study area will facilitate the movement of mobile threatened species and provide foraging, nesting and shelter/shade resources	<p>Where possible, construction works should avoid any impact to mature trees and hollow-bearing trees. Where unavoidable, works should minimise impacts to mature trees as follows:</p> <ul style="list-style-type: none"> <li>clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development footprint. Tree clearing and disturbance will be limited to the development site</li> <li>where a tree must be disturbed the priority should be given to pruning rather than clearing</li> <li>the clearing of any trees should be undertaken in a manner that avoids damaging adjacent vegetation i.e., all trees should be felled into disturbed areas when feasible</li> <li>individual trees that are to be retained are to be protected during construction by temporary fence around the dripline.</li> </ul>	<p>Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p> <p>Where a tree identified for retention must be disturbed, the tree should be preferentially retained and pruned rather than cleared.</p> <p>All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).</p> <p>Install exclusion fencing that includes temporary fencing to:</p> <ul style="list-style-type: none"> <li>protect and avoid known populations of <i>Pterostylis chaetophora</i> onsite</li> <li>protect and avoid identified hollow bearing trees.</li> </ul> <p>Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.</p> <p>Clearly demarcate all trees to be removed in accordance with QF-</p>





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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
			ENV-001 Tree Tagging Standards and Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).
Inadvertent impacts to biodiversity values	Avoid inadvertent impact to biodiversity values	<p>Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following:</p> <ul style="list-style-type: none"> <li>threatened species onsite and/ or adjacent to the site</li> <li>endangered ecological communities onsite and/ or adjacent to the site</li> <li>hollow bearing trees onsite and/ or adjacent to the site.</li> </ul> <p>Install exclusion fencing that includes temporary fencing to:</p> <ul style="list-style-type: none"> <li>protect and avoid known populations of <i>Pterostylis chaetophora</i> onsite</li> <li>protect and avoid identified hollow bearing trees.</li> </ul> <p>Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.</p> <p>Priority will be given during construction to avoid any inadvertent impact to significant biodiversity values within the subject land. Avoidance measures should include the following:</p> <ul style="list-style-type: none"> <li>all material stockpiles, vehicle parking and machinery storage will be located within open areas proposed for clearing, and not in areas of native vegetation that are to be retained</li> <li>implementation of temporary stormwater controls during construction and to ensure that discharges outside the</li> </ul>	<p>As per Wildthing Environmental Consultants (2025).</p> <p>Store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required and manage all stockpiles on site in accordance with the NSW Managing Urban Stormwater: Soils and construction – Volume 1 4th edition and the approved stockpile management plan prepared for the site. Place stockpiles at strategic locations to mitigate environmental impacts whilst facilitating material handling requirements. Establish access routes around material stockpiles that enable access from adjoining haulage routes and store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required.</p> <p>Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004). The sediment and erosion controls must have the aim of achieving an outcome of no visible turbid plumes reaching the waterway for any rainfall event up to a 1 in 2 year average recurrence interval event.</p> <p>Install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p>



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
		development footprint are consistent with existing conditions.	
Inadvertent impact to retained trees	Avoid inadvertent impact to trees	Clearly demarcate all trees to be removed in accordance with Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).	Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.  Clearly demarcate all trees to be removed in accordance with Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).
Clearing of Powerful Owl habitat	Avoid disturbing Powerful Owls during nesting period and avoid removing active nesting hollows	An inspection of all hollows greater than 200 mm (including those to be retained and removed) as documented in the tree schedule in the Biodiversity Development Assessment Report must be conducted by a suitably qualified and experienced ecologist with the assistance of an elevated work platform. Inspection must determine the suitability of the hollow for use by Powerful Owl. This activity must be completed prior to the nesting periods for Powerful Owl (May to October (OEH)). The consultant must provide a survey report to Council's project Manager within 7 days of completion of the hollow survey and prior to the removal of any vegetation on site. The report must clearly identify the tree ID, species name and common name, hollow characteristics e.g. depth, height above ground, aperture width and any other relevant details for each hollow and include an assessment of the suitability of the hollow for use by threatened arboreal species. If a nest tree with evidence of use is identified, the survey report must also include recommendations for suitable buffer zones during the breeding/ nesting period and advice on scheduling of construction activities within the buffer zones. Council's project Manager must have the report reviewed by Council's Environmental Risk or project Support Environmental Officer or appropriately nominated persons prior to works commencing.	As per Wildthing Environmental Consultants (2025).
Clearing of fauna habitat, resulting in	Avoid fauna injury and/or mortality during	Trees within the subject land are to undergo a preclearance survey (thorough inspection of the canopy) every morning prior to tree	All preclearance works must occur in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
arboreal fauna injury and/or mortality	clearing of vegetation	clearance operations by a suitably qualified ecologist, particularly for arboreal species just prior to removal/trimming. If a Koala is found clearing activities are to cease until the animal has left on its own accord. If a Powerful Owl is observed breeding within a tree to be removed, then clearance operations are to cease until the young have fledged the nest. Searches are also to be undertaken for bird nests that are currently being utilised for breeding. Any animals injured during construction should be taken immediately to a Vet for treatment. Any animals suspected to require rehabilitation would be delivered post-veterinary care to an appropriate animal rehabilitator.	Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024). The consultant must provide a preclearance survey report in accordance with the requirements of Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024) and submit the report to the Council's project Manager within 7 days of completion of clearing activities. Council's project Manager must have the report reviewed by Council's Environmental Risk or project Support Environmental Officer.  All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).
Clearing of fauna habitat, resulting in ground dwelling fauna injury and/or mortality	Avoid fauna injury and/or mortality during clearing of vegetation	Vegetation within the subject land is to undergo pre-clearance searches for ground dwelling species, to relocate captured specimens into neighbouring vegetation outside of the clearance zone.	All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).
Clearing of fauna habitat and displacement of resident fauna	Avoid fauna injury and/or mortality during clearing of vegetation	A suitably qualified and experienced ecologist should be engaged to supervise removal of all significant habitat features, including hollowbearing trees and maintain a vegetation clearance register which should include the location, type, size of felled habitat trees and any contact with resident fauna. The supervising ecologist will work co-operatively with the plant operator to develop an adaptive clearance methodology that should minimise impacts to potential resident fauna whilst being conducted according to safe work methods. The adaptive clearance methodology should include the following key aspects: <ul style="list-style-type: none"> <li>• seeking consultation with a suitably qualified ecologist to determine the best time to schedule clearance works to avoid nesting and breeding times for resident fauna</li> <li>• preclearance surveys completed on the morning of any clearance works to determine if any nesting birds or canopy dwelling mammals are within the clearance footprint</li> <li>• clearing utilising a 'soft felling' technique in which trees are 'nudged' by machinery, and fauna given time to leave</li> </ul>	All preclearance works must occur in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024). The consultant must provide a preclearance survey report in accordance with the requirements of Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024) and submit the report to the Council's project Manager within 7 days of completion of clearing activities. Council's project Manager must have the report reviewed by Council's Environmental Risk or project Support Environmental Officer.  All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).





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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
		<p>(overnight), before slowly felling the tree the following day</p> <ul style="list-style-type: none"> <li>if fauna are identified within the proposed clearing area prior to clearing, or after 'nudging' the tree, operations will cease until the fauna has moved to a safe location or has been relocated. If fauna flee into a habitat tree demarcated for removal this tree should be left to fell until the following day</li> <li>any captured displaced fauna relocated to the nearest area of appropriate habitat. If arboreal, the fauna to be placed inside an artificial nest box and relocated. If the displaced fauna is nocturnal relocation to occur during dusk</li> <li>all hollow logs and felled trees would be inspected by the ecologist before relocation into areas of similar adjacent habitat.</li> </ul> <p>All habitat tree felling activities and results to be summarised in a tree clearance report by the supervising ecologist, including fauna injuries. Any animals injured during construction should be taken immediately to the nearest Veterinary Hospital for treatment. Any animals suspected to require rehabilitation would be delivered post veterinary care to an appropriate animal rehabilitator associated with Wildlife In Need of Care (WINC) Rescue phone no. 1300 946 295. All fauna sightings/captures are to be recorded and uploaded to the NSW BioNet Atlas.</p>	
Inadvertent encounters and impacts to fauna	Minimise likelihood of unplanned interactions with fauna	Conduct daily fauna checks prior to works commencing. If fauna are encountered during the daily check or during works follow the procedures in Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).	As per Wildthing Environmental Consultants (2025).
Movement barrier for mobile ground dwelling species via fencing	Avoid cutting off connectivity for mobile ground dwelling species	Any new fencing required along the road reserve should use fauna friendly fencing that has a gap of at least 30cm between the ground and the first strand of fence so wildlife can go UNDER the fence rather than having to go OVER the fence.	As per Wildthing Environmental Consultants (2025).
Transport of weeds and pathogens from	Minimise weed infestations within	The following measures are to be implemented to prevent exotic plant material from entering/exiting the subject land:	All weed and pathogen management must be in accordance with Biodiversity Management Guideline: Protecting and managing



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Impact	Objective	Avoidance and minimisation measure (Wildthing 2025)	Equivalent wording for mitigation measure for the EIS and CEMP
the site to adjacent vegetation	adjoining vegetation	<ul style="list-style-type: none"> <li>no imported/exported material to be permitted unless it has been inspected and confirmed to be free of dirt and mud which may contain weed seeds and vegetative material such as bulbs, root fragment, tubers or rhizomes</li> <li>vehicles and machinery to be clean of soils, vegetation and seeds that have been brushed off or washed down prior to entering the study area. A clean down register to be maintained at the entry of the study area.</li> </ul>	biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).
Impact to adjoining native vegetation from dumping	Prevent degradation of retained vegetation by dumping and other human activities	Erection of signage discouraging dumping was observed within the road reserve. This signage is to be retained within the scope of the proposal.	Signage retained on design plans.
Vehicle strike	Reduce the likelihood and occurrence of vehicle strikes with fauna within the locality	Not increasing the speed limit above the pre-existing speed limit of 70km/h along the road. Widening areas and clearing vegetation to improve visibility along the road will assist in the avoidance of vehicle strike by allowing the driver opportunity to see the animal crossing the road.	70km/hr speed limit designated on design plans.

**Table 5-7 Residual indirect impacts**

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase	Likelihood and consequences	Mitigation measures
Sedimentation and contaminated and/or nutrient rich run-off	Adjacent vegetation, including 1st order, 2nd order and 3rd order prescribed streams	Surrounding vegetation outside the subject land boundary	During heavy rainfall or storm events	Long-term	Construction Operation	Potential sediment and contaminated runoff into adjacent and retained vegetation is likely to occur during high rainfall events	<p>Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004). The sediment and erosion controls must have the aim of achieving an outcome of no visible turbid plumes reaching the waterway for any rainfall event up to a 1 in 2 year average recurrence interval event.</p> <p>Install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans.</p>



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Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase	Likelihood and consequences	Mitigation measures
							Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.
Transport of weeds and pathogens	Adjacent vegetation and retained vegetation within the road reserve	Surrounding vegetation outside the subject land boundary	Daily during the construction phase and ongoing during the operation phase	Long-term	Construction Operation	Risk of the spread of weeds with the establishment of non-native grassed areas within the subject land	All weed and pathogen management must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).
Inadvertent impacts on adjacent habitat or vegetation	Adjacent vegetation and retained vegetation within the road reserve	Surrounding vegetation outside the subject land boundary	Daily during the construction phase and ongoing during the operation phase	Long-term	Construction Operation	Widening and tarring the road and removal of vegetation increases the risk of inadvertent impacts on adjacent habitat and vegetation	Demarcate the extent of works with the installation of stake rope and fluro tags or similar with fluro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.  If damage occurs to vegetation, fauna or their habitat other than that indicated on the approved plans notify the site Team Leader. The Team Leader shall notify the project Manager and contact Council's EMS Risk Officer or EMS Manager for advice. Any advice, corrective or preventative works must be implemented onsite in a timely and efficient manner  See also Section 5.1.3 and Section 5.1.7.
Reduced viability of adjacent habitat due to edge effects	Adjacent vegetation and retained vegetation within the road reserve	Surrounding vegetation outside the subject land boundary	During the life of the proposal	Long-term	Construction Operation	Increases the risk of edge effects occurring within retained vegetation	See also <b>Section 5.1.3</b> and <b>Section 5.1.7</b> .  Illegal dumping signage retained on design plans.  All weed and pathogen management must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).



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Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase	Likelihood and consequences	Mitigation measures
							Ongoing weed management operationally as part of PSC's roadside weed control programs.
Rubbish dumping	Adjacent vegetation and retained vegetation within the road reserve	Surrounding vegetation outside the subject land boundary	During the life of the proposal	Long-term	Construction Operation	The road is likely to become more utilised which has the potential to decrease rubbish dumping within the locality	Illegal dumping signage retained on design plans.
Fragmentation of movement corridor	Mammals and reptiles	Surrounding vegetation outside the subject land boundary	During the life of the proposal	Long-term	Construction Operation	The road will be widened and therefore create a larger distance of non-vegetated areas within the east-west corridor	Distances assessed in BDAR as widened but still within arboreal fauna capabilities to utilise roadside vegetation as part of east west movements.





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### Prescribed impacts

Prescribed impacts are the impacts on biodiversity values which are not related to, or are in addition to, native vegetation clearing and habitat loss. In general, these types of impacts identify habitat or features of the environment that are irreplaceable. **Table 5-8** describes the prescribed impacts as identified in the BAM Operational Manual – Stage 1 2018.

**Table 5-8 Avoidance and minimisation measures for prescribed impacts**

Feature	Present	Description	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	No	N/A	N/A
Human-made structures	Yes	Culverts, road, driveways, fences, power poles.	Sheltering species, microchiropteran bats or mud nest avifauna species. All of the culverts were assessed as not providing suitable habitat for Microbats due to the small size of the culverts (small diameter and roof low to the ground), small span under East Seaham Road, obstructions over entrances and mud and debris partially filling culverts. The areas around the culverts within the study area also were unlikely to provide habitat for threatened wetland species due to the lack of standing water.
Non-native vegetation	Yes	The subject land contained 0.44 ha of non-native vegetation mostly comprised of pasture grasses and weeds.	Hunting avifauna species such as <i>Lophoictinia isura</i> (Square-tailed Kite) (Foraging) and <i>Hieraaetus morphnoides</i> (Little Eagle) (foraging).
Habitat connectivity	Yes	For the majority of the alignment the project area adjoins Wallaroo National Park which is located east of the project area.	Highly mobile threatened species such as woodland birds (e.g. <i>Glossopsitta pusilla</i> (Little Lorikeet), <i>Lathamus discolor</i> (Swift Parrot) and arboreal mammals like <i>Petaurus norfolcensis</i> (Squirrel Glider) and <i>Phascolarctos cinereus</i> (Koala).
Waterbodies, water quality and hydrological processes	Yes	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> order prescribed streams were present passing through culverts within East Seaham Road. These streams are ephemeral and surface water was only observed after rainfall events.	Amphibians, aquatic avifauna and hunting avifauna as well as microchiropteran bats (foraging). Streams are ephemeral and therefore unlikely to be permanent fish habitat.
Wind turbine strikes (wind	No	N/A	N/A



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farm development only)			
Vehicle strikes	Yes	Through the centre of the subject land is the gravel portion of East Seaham Road, East Seaham. The proposal will allow for the upgrade of this portion of road.	Mobile threatened species such as avifauna, microchiropteran bats, arboreal mammals like <i>Petaurus norfolcensis</i> (Squirrel Glider) and <i>Phascogale cinereus</i> (Koala).



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#### Serious and irreversible impacts

The BC Act imposes various obligations on determining authorities in relation to impacts on biodiversity values that are serious and irreversible.

One candidate SAI entities *Miniopterus australis* (Little Bent-winged Bat) was recorded within the subject land; however no preferred breeding habitat was present on site (Wildthing Environmental Consultants 2025). The closest preferred roosting habitat is Thunderbolt Cave which is located approximately 1.8 km east of the subject land which could provide roosting habitat for *M. australis* and other SAI candidate species *Miniopterus orianae oceanensis* (Large Bent-wing Bat) and *Chalinolobus dwyeri* (Large-eared Pied Bat) (Wildthing Environmental Consultants 2025). Further assessment by Wildthing Environmental Consultants (2025) was conducted for all three species and the project was not found to impact these SAI entities due to the absence of preferred roosting habitat in close proximity to the site (100 m) and considering mitigating measures to reduce indirect impacts to retained vegetation. No other candidate SAI entities were found to be present within the study area thus no obligation for proposal refusal would be applicable to this project from relevant regulatory bodies.

**Table 5-9** provides an overview of the entities at risk of an SAI and reasons why the SAI entity was excluded from further consideration/ assessment.



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**Table 5-9 SAIL species and consideration of impacts**

Common name	Scientific name	SAIL assessment completed	Reason for exclusion from further assessment if no further SAIL assessment is required (Wildthing Environmental Consultants 2025)
Regent Honeyeater	<i>Anthochaera phrygia</i>	No	The project area was not within the Important Areas Map for this species.
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Yes	This species was not recorded on site and no breeding habitat in the form of caves, tunnels, mines, culverts or other structures were present within the subject land or study area, however, Thunderbolt Cave is located less than 2 km from the subject land. Taking into consideration the relatively large amount of suitable hunting habitat in the local area, the absence of preferred roosting habitat within the site and mitigating measures to reduce impacts, the proposal is unlikely to disrupt the lifecycle of the species such that local extinction would occur, would not reduce the population size of the species, would not result in the loss of, or impact on roosting impact the species and would not result in direct impacts on the species' habitat. Indirect impacts would be negligible and minimised through the implementation of mitigation measures.
Red goshawk	<i>Erythroriarchis radiatus</i>	No	Despite targeted searches this species was not recorded within the study area.
Swift Parrot	<i>Lathamus discolor</i>	No	The development area was not within the Important Areas Map for this species.
Little Bent-winged-bat	<i>Miniopterus australis</i>	Yes	This species was not recorded on site and no breeding habitat in the form of caves, tunnels, mines, culverts or other structures were present within the subject land or study area, however, Thunderbolt Cave is located less than 2 km from the subject land. Taking into consideration the relatively large amount of suitable hunting habitat in the local area, the absence of preferred roosting habitat within the site and mitigating measures to reduce impacts, the proposal is unlikely to disrupt the lifecycle of the species such that local extinction would occur, would not reduce the population size of the species, would not result in the loss of, or impact on roosting impact the species and would not result in direct impacts on the species' habitat. Indirect impacts would be negligible and minimised through the implementation of mitigation measures.
Large Bentwinged-bat	<i>Miniopterus orianae oceanensis</i>	Yes	This species was not recorded on site and no breeding habitat in the form of caves, tunnels, mines, culverts or other structures were present within the subject land or study area, however, Thunderbolt Cave is located less than 2 km from the subject land. Taking into consideration the relatively large amount of suitable hunting habitat in the local area, the absence of preferred roosting habitat within the site and mitigating measures to reduce impacts, the proposal is unlikely to disrupt the lifecycle of the species such that local extinction would occur, would not reduce the population size of the species, would not result in the loss of, or impact on roosting impact the species and would not result in direct impacts on the species' habitat. Indirect impacts would be negligible and minimised through the implementation of mitigation measures.





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Common name	Scientific name	SAIL assessment completed	Reason for exclusion from further assessment if no further SAIL assessment is required (Wildthing Environmental Consultants 2025)
Scrub Turpentine	<i>Rhodamnia rubescens</i>	No	Despite targeted searches this species was not recorded within the study area.
Native Guava	<i>Rhodomyrtus psidioides</i>	No	Despite targeted searches this species was not recorded within the study area.
Sooty Owl	<i>Tyto tenebricosa</i>	No	Despite targeted searches this species was not recorded within the study area.

### Consideration of the CKPoM

Table 5-10 provides an overview of the potential compliance of the proposal with the CKPoM

**Table 5-10 CKPoM assessment**

Performance criteria	Response (Wildthing Environmental Consultants 2025)
Minimise the removal or degradation of native vegetation within Preferred Koala Habitat or Habitat Buffers	'Preferred Koala Habitat' occupies 2.13 ha of the subject land. Habitat buffers consisting of '50 m Buffer Over Cleared' occupied a total of 2.92 ha of the subject land. The project will allow the removal of all 2.13 ha of 'Preferred Koala Habitat'. The remaining vegetation within the road reserve will be retained. By applying a 100 m buffer around the project area, approximately 54.05 ha of 'Preferred Koala Habitat' will be retained. Surrounding vegetation of the subject land, including vegetation retained within the road reserve may be indirectly impacted by changes to road conditions.
Maximise retention and minimise degradation of native vegetation within 'Supplementary Koala Habitat' and 'Habitat Linking Areas'	No areas of 'Supplementary Koala Habitat' or 'Habitat Linking Areas' were identified within the site.
Minimise the removal of any individuals of preferred Koala food trees, wherever they occur on a development site. In the Port Stephens LGA these tree species are <i>Eucalyptus robusta</i> (Swamp Mahogany), <i>Eucalyptus parramattensis</i> (Parramatta Red Gum) and <i>Eucalyptus tereticornis</i> (Forest Red Gum)	One species of recognised Preferred Koala Food Tree, <i>Eucalyptus tereticornis</i> (Forest Red Gum) was found to be present in the study area. The road upgrade will result in the removal of 169 specimens of <i>E. tereticornis</i> . Due to the nature of the project area being a road reserve and due to the adjacent electrical easement there is little scope for the restoration of Koala habitat onsite. PSC has opted into the offset scheme under the BC Act 2016 for the proposed road upgrade, and therefore all native vegetation removed, including Koala habitat, will be offset.
Make provisions, where appropriate, for restoration or rehabilitation of areas identified as Koala Habitat including 'Habitat	Due to the nature of the subject land being a road reserve and due to the adjacent electrical easement there is little scope for the restoration of Koala habitat onsite. PSC has opted into the offset scheme under the BC Act 2016 for



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Performance criteria	Response (Wildthing Environmental Consultants 2025)
Buffers' and 'Habitat Linking Areas over Mainly Cleared Land'	the proposed road upgrade, and therefore all native vegetation removed, including Koala habitat, will be offset.
Make provisions for long term management and protection of Koala habitat including both existing and restored habitat	Vegetation within the road reserve will be subject to on-going maintenance, including weed management by PSC. PSC has opted into the offset scheme under the BC Act 2016 for the proposed road upgrade, and therefore all native vegetation removed, including Koala habitat, will be offset.
Not compromise the potential for safe movement of Koalas across the site. This should include maximising tree retention generally and minimising the likelihood that the proposal would result in the creation of barriers to Koala movement, such as would be imposed by certain types of fencing	To allow for the safe movement of Koalas, the project has retained the majority of native vegetation within the scope of the proposal. It is also recommended that the proposal contains the following: <ul style="list-style-type: none"> <li>• remain free of any barriers or impediments to Koala movement</li> <li>• on-going weed Control within the road reserve</li> <li>• retained speed limit of 70km/h</li> <li>• koala signage along the road to warn drivers of their potential presence.</li> </ul>
Be restricted to identified envelopes which contain all buildings and infrastructure and fire fuel reduction zone	During the construction phase of the project, the project area extents should be clearly marked to prevent disturbance to remaining habitat.
Include measures to effectively minimise the threat posed to Koalas by dogs, motor vehicles and swimming pools	A number of measures will be implemented within any future planning proposal to minimise the threat to Koalas. These measures will include: <ul style="list-style-type: none"> <li>• retain the current speed limit along the road</li> <li>• installation of Koala warning signage be placed along the road to reduce the chance of vehicle collision.</li> </ul>



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#### ***Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) & Matters of National Environmental Significance (MNES)***

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. Under the EPBC Act, any action which has, will have, or is likely to have a significant impact on a matter of MNES is defined as a controlled action, and requires approval from DCCEE, which is responsible for administering the EPBC Act.

The process includes conducting a Significant Impact Criteria assessment for listed threatened species and ecological communities that represent a matter of MNES that will be impacted as a result of the proposed action.

The likelihood of occurrence for EPBC listed threatened species is included in Appendix C of the BDAR (Wildthing 2025). The assessment has been undertaken in accordance with Significant impact guidelines 1.1 under the EPBC Act to address the significant impact criteria for following EPBC listed threatened TEC and species:

- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions
- *Phascolarctos cinereus* (Koala)
- *Pteropus poliocephalus* (Grey-headed Flying Fox)
- *Calyptorhynchus lathami* (South-eastern Glossy Black-Cockatoo).

The significant impact criteria found that there is not likely to be a significant impact for the nationally listed threatened biodiversity as a result of the project (Wildthing Environmental Consultants 2025).

#### **Impacts to Key Fish Habitat (KFH)**

The works are occurring in KFH and a permit will be required in accordance with Section 200 and Section 219 of the FM Act. There are two road crossings of areas identified as key fish habitat including:

- Stage 5 chainage 4046 adjacent to 829 East Seaham Road to the west and Wallaroo National Park to the east
- Stage 6 chainage 4550 adjacent to 873 East Seaham Road to the west and Wallaroo National Park to the east.

The vegetation present within the ephemeral watercourse is predominantly a mix of introduced and native pasture grasses. Wedgetail project Consulting (2024 cited in Wildthing Environmental Consulting 2025) identified that there were no areas of pooling water observed within the project area and that no waterbodies with emergent vegetation were present on site and that drainage lines occur through the project area, and some of these hold water after rain events, however, none of these drainage lines



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permanently hold water (observed to be dry during subsequent surveys). The culverts had obstructions over entrances and mud and debris partially filling culverts (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consulting 2025). These areas also did not provide habitat for threatened wetland species due to the lack of standing water.

Based on the site characteristics identified by (Wedgetail Project Consulting 2024 cited in Wildthing Environmental Consulting 2025) the watercourse would be defined as TYPE 3 Minimally sensitive key fish habitat, as the habitat onsite is ephemeral and does not support native aquatic or wetland vegetation and classified as CLASS 4 Unlikely key fish habitat as the waterway has:

- intermittent flow following rain events only
- little channel definition which has been highly modified and has sporadic remnant riparian vegetation
- only standing water following rain events in small pools that are heavily degraded and largely absent of native aquatic vegetation.

Design considerations included:

- replacement of the existing twin 1500 mm pipes with triple 1650 mm pipes at chainage 4046
- replacement of the existing with three 1800 mm x 1200 mm culverts at chainage 4550
- stabilisation of the inlet and outlet of the culvert with geomorphic protection.

General design layout is provided in **Figure 5-23** and **Figure 5-24**.

Further detail and rehabilitation of KFH and disturbed areas within the road corridor extents would be provided in the construction environmental management plan and be undertaken in accordance with the relevant NSW Fisheries guidelines and permit conditions.

General site characteristics, potential impacts to KFH and mitigation measures to be implemented are provided in **Table 5-11**.





# Environmental Assessment

## Level 4

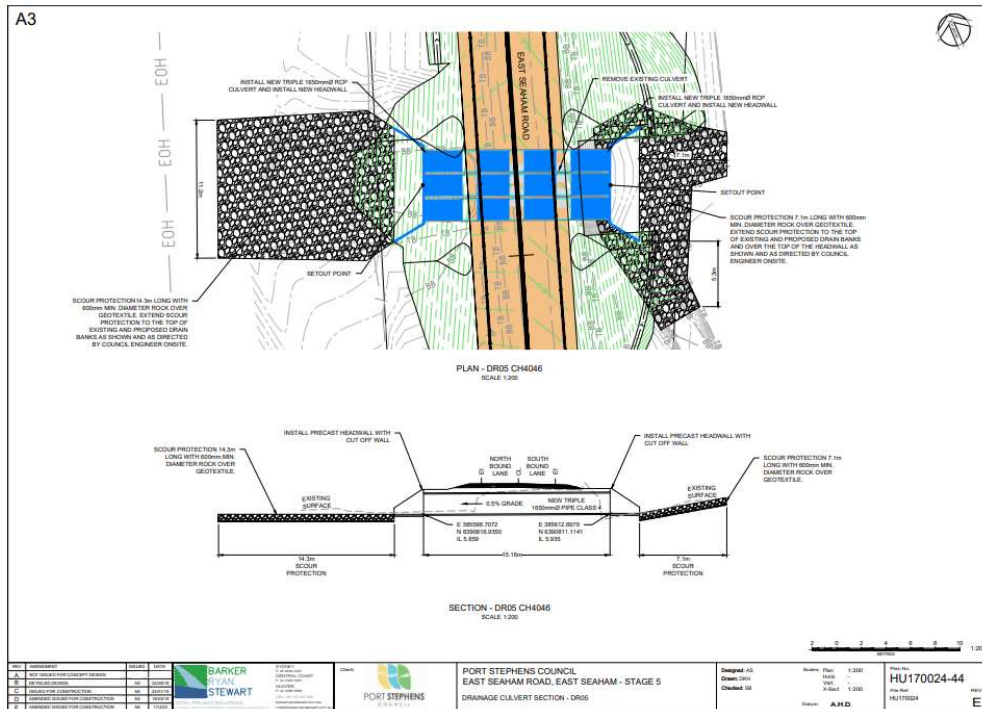


Figure 5-23 Key fish habitat culvert crossing at chainage 4046

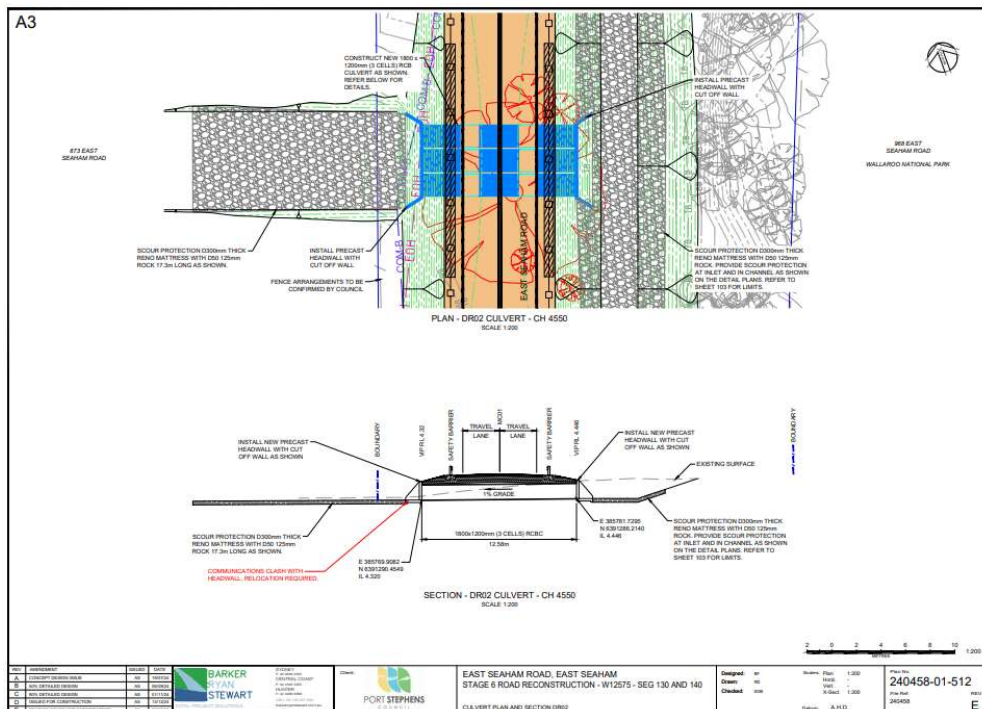


Figure 5-24 Key fish habitat culvert crossing at chainage 4550



## Environmental Assessment Level 4

**Table 5-11 Site characteristics, impacts and mitigation measures for Key Fish Habitat**

Site characteristic	Impacts	Mitigation measures
Geomorphic	<p>The majority of the catchment is upstream (east) of East Seaham Road. The upstream catchment is fully vegetated within Wallaroo National Park. The vegetation however, was originally logged and as such it is likely that the watercourse is highly modified from the original form. The crossings under East Seaham Road have been modified with the introduction of culverts which are under sized for the flows being experienced. Downstream the lands have been largely cleared for rural residential development. Downstream the watercourses meander for approximately 300 to 500 m until they discharge into the Williams River. Downstream of East Seaham Road the watercourses have some riparian vegetation intact, however, it is sparse and likely highly edge affected. This has resulted in altered stream geomorphology with increased channelization and bank erosion.</p> <p>During works there is an increased risk of erosion and sedimentation and on completion of the works East Seaham Road will be transformed from relatively pervious to impervious. This will result in a minor increase in flows from the roadway, however the size of the road catchment as a portion of the whole catchment is negligible. The majority of the geomorphic impacts would result from the amplification of the culvert. Geomorphic protection has been provided in the design to help improve geomorphic stability. With the majority of the upstream catchment being vegetated the amplification of the culvert would likely have a limited impact further downstream, with the existing channel capacity also being easily exceeded in larger events. The works would have a minor geomorphic impact downstream.</p>	<p>Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004). The sediment and erosion controls must have the aim of achieving an outcome of no visible turbid plumes reaching the waterway for any rainfall event up to a 1 in 2 year average recurrence interval event.</p> <p>Prepare a dewatering management plan in accordance with Transport for NSW technical guidelines for areas of the site requiring dewatering. The dewatering plan would include water monitoring locations to be monitored prior to, during and post completion of dewatering activities. A qualified hydrologist or environmental scientist or equivalently experienced professional will be engaged to undertake water quality monitoring activities, review collected data and advise on appropriate mitigation and management measures. The Plan must be reviewed and approved by the project Support Environment Officer or if developed by the project Support Environment Officer, reviewed and approved by the project Manager and Environmental Risk Officer.</p> <p>All documentation and notifications must be provided in accordance with the NSW Fisheries Permit requirements.</p> <p>Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.</p> <p>Induct all personnel working onsite including workers and contractors, to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks', and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following:</p> <ul style="list-style-type: none"> <li>• site sensitivities and their relevance to the proposal including:             <ul style="list-style-type: none"> <li>○ key fish habitat.</li> </ul> </li> </ul>
Flow regime	<p>Current flows from the upstream catchments are constrained by the culvert crossing at East Seaham Road, with overtopping of the road in larger rain events. In smaller events the constriction of flow through the culvert would increase stream velocity immediately downstream resulting in scour, bed and bank erosion and stream instability. The watercourses are ephemeral and have a mixture of native and pasture grasses immediately downstream of the culverts. There can be small areas downstream of the culverts which pool for</p>	



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Site characteristic	Impacts	Mitigation measures
	<p>short periods after rainfall.</p> <p>Although the amount of flows will not change as a result of the road upgrades, there is a risk that the culvert upgrades will result in more concentrated flows being discharged downstream of East Seaham Road (these flows would currently be crossing East Seaham Road via a combination of the existing smaller culverts and as overland flow). Scour protection has been designed for all culvert crossings to control the velocity of flows and reduce the likelihood of scour and erosion to downstream properties.</p>	<ul style="list-style-type: none"> <li>• QF-ENV-008 Unexpected finds procedures (CAP WKS)</li> <li>• erosion and sediment control requirements</li> <li>• exclusion fencing requirements</li> <li>• weed management</li> <li>• NSW Fisheries requirements including an emphasis on incident reporting.</li> </ul> <p>Plan and stage works and design the site where feasible and reasonable to:</p>
Water quality	<p>The hydrology and sediment input would have historically altered due to previous logging and development of the rural residential housing and agricultural lands and East Seaham Road including drainage, as well as installation of power supply. These impacts have resulted in increased runoff rates and sediment loads. With the majority of the upstream catchments being vegetated within Wallaroo National Park, the expected pollutant loads would be low. However pollutants may include heavy metals, chemicals, nutrients, and litter from East Seaham Road and surrounding rural residential development, which would have historically, and still be continuing to, result in a decline in stream health. The majority of the pollutant load received by the watercourses would be diffuse-source pollution generated from catchment runoff and erosion. This would cause elevated turbidity and nutrient levels in the receiving waters. Pesticides and herbicides used in roadside weed management activities and on rural lands would also contribute to poorer water quality. During construction activities surface runoff could also increase the amount of suspended material that enters watercourses due to soils being exposed, increasing the turbidity levels. Turbidity (siltation) has been found to irritate the gills of fish in extreme cases causing breathing problems and even mortality. Sediment levels can also indirectly affect fish by causing substantial changes to their habitat (e.g. reducing light penetration for macrophytes and seagrass growth, infilling of gravel beds and deep holes etc.).</p> <p>The larger 974 km<sup>2</sup> Williams River catchment (of which these watercourses are a tributary of) has approximately 80% of the lands being used for agriculture, 14% held within National Parks and a further 6% directly by Hunter Water. The Williams River catchment also includes the townships and various residential</p>	<ul style="list-style-type: none"> <li>• limit duration of works within defined watercourses to the minimum possible and where possible deliver the works during low flow / dry weather periods.</li> <li>• reduce open excavations.</li> </ul> <p>Install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p> <p>Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.</p> <p>Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).</p> <p>Works must be delivered in compliance with the Dewatering Management Plan prepared for the site.</p> <p>All works must be delivered in accordance with the NSW Fisheries Permit.</p> <p>Undertake daily checks of site drainage systems and undertake maintenance when</p>





# Environmental Assessment Level 4

Site characteristic	Impacts	Mitigation measures
	<p>areas of Dungog, Clarence Town, and Seaham. It is unlikely that due to the largely vegetated nature of the catchments and small percentage of land use in context of the wider catchment, the watercourses within the project area significantly contribute to poorer water quality within the Williams River. Provided the mitigation measures are implemented, any impacts on water quality would be negligible.</p>	<p>required to ensure site drainage systems are operating at capacity e.g. removal of debris and that there is no increase in turbidity (sediment laden water). Ensure there is no release of dirty water into drainage lines and/ or watercourse.</p> <p>When working within and adjacent to watercourses onsite and water is present, a visual inspection of the waterway for dead or distressed fish (downstream) or other fauna (indicated by fish gasping at the water surface, fish crowding in pools) is to be undertaken daily during the retaining wall works which have the potential to impact on the marine environment. Observation of dead and distressed fish or other fauna must be immediately reported to Council's Environmental Risk Officer and NSW Fisheries. All works must be ceased until the cause is rectified and NSW Fisheries and Council's Environmental Risk Officer approve works to recommence. Any rectification works directed by NSW Fisheries and Council's Environmental Risk Officer must be completed.</p> <p>Manage construction activities to minimise water and land pollution, using the following measures:</p> <ul style="list-style-type: none"> <li>storage of all plant, materials and equipment must not be outside the direct works area or outside the approved compound site location and all chemicals, fuels and oils must be stored in suitable bunded areas with the capacity of the bund at least 120 per cent of the volume of the largest container stored. Do not store or collect for disposal any chemicals, fuels and/or waste within or adjacent to watercourse, drainage lines or unsealed surfaces</li> <li>do not carry out works such as bitumen spraying, the spraying of paint or other materials during strong winds or adverse weather conditions</li> <li>keep an emergency spill response kit onsite at all times and monitor the kit for replenishment of contents. Make all staff aware of the location of the spill kit and ensure that they are trained in its use. If a spill occurs, follow the EMS Incidence Response Procedure and immediately notify the project Manager and/ or EMS Manager</li> <li>avoid refuelling of equipment or chemical handling activities outside the compound. Conduct the activities offsite where practical. If the activity</li> </ul>
Surrounding land use	<p>The majority of the catchment is upstream (east) of East Seaham Road. The upstream catchment is fully vegetated within Wallaroo National Park. The vegetation however, was originally logged and as such it is likely that the watercourse is highly modified from the original form. The crossings under East Seaham Road have been modified with the introduction of culverts which are under sized for the flows being experienced. Downstream the lands have been largely cleared for rural residential development. Downstream the watercourses meander for approximately 300 to 500 m until they discharge into the Williams River. Downstream of East Seaham Road the watercourses have some riparian vegetation intact, however, it is sparse and likely highly edge affected. This has resulted in altered stream geomorphology with increased channelization and bank erosion.</p> <p>The surrounding land use and catchment land use would remain relatively unchanged as a result of the works.</p>	
Condition of riparian vegetation	<p>The majority of the catchment is upstream (east) of East Seaham Road. The upstream catchment is fully vegetated within Wallaroo National Park. The vegetation however, was originally logged and as such it is likely that the watercourse is highly modified from the original form. The crossings under East Seaham Road have been modified with the introduction of culverts which are under sized for the flows being experienced. Downstream the lands have been largely cleared for rural residential development. Downstream the watercourses meander for approximately 300 to 500 m until they discharge into the Williams River. Downstream of East Seaham Road the watercourses have some riparian vegetation intact, however, it is sparse and likely highly edge affected. This has resulted in altered stream geomorphology with increased channelization and bank erosion.</p>	





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Site characteristic	Impacts	Mitigation measures
	<p>The recommended width of riparian buffer zones for Type 3, Class 4 KFH is 10 to 50 m (NSW Department of Primary Industries, 2013). Riparian buffer zones should be clearly delineated (e.g. fences or other markers) and well managed to avoid degradation (e.g. weed and public access management).</p> <p>The project is occurring within a road environment, where opportunity for restoration of riparian habitat is limited. The surrounding land use and catchment land use would remain relatively unchanged as a result of the works. Scour protection has been designed for all culvert crossings to control the velocity of flows and reduce the likelihood of scour and erosion to downstream properties and further degradation of downstream riparian habitat.</p>	<p>must occur onsite, conduct the activity on flat ground at least 50 m from any watercourse, drainage line or sensitive area with spill containment measures in place and within a bunded area</p> <ul style="list-style-type: none"> <li>• use and store all hazardous and dangerous goods in accordance with all relevant statutory standards and procedures and manufacturer's MSDS. Retain a copy of all relevant MSDS onsite and ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code</li> <li>• where possible wash equipment, machinery or works vehicles offsite at an approved facility. Where onsite wash down is required for weed control, use potable water and contain any excess debris from equipment with containment material. Dispose of any containment material and water in accordance with the Waste Management requirements for the works.</li> </ul>
Condition of freshwater aquatic vegetation	<p>The vegetation present within the ephemeral watercourse is predominantly a mix of introduced and native pasture grasses. There were no areas of pooling water observed within the project area and no waterbodies with emergent vegetation were present on site (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consultants 2025). Some of the drainage lines within project area, hold water after rain events, however, none of the drainage lines permanently hold water (observed to be dry during subsequent surveys) (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consultants 2025). The culverts had obstructions over entrances and mud and debris partially filling culverts and did not provide habitat for threatened species due to the lack of standing water (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consultants 2025).</p>	<p>Store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required and manage all stockpiles on site in accordance with the NSW Managing Urban Stormwater: Soils and construction – Volume 1 4<sup>th</sup> edition and the approved stockpile management plan prepared for the site. Place stockpiles at strategic locations to mitigate environmental impacts whilst facilitating material handling requirements. Establish access routes around material stockpiles that enable access from adjoining haulage routes.</p>
Presence of wetlands nearby	<p>There are no wetlands upstream or downstream of the watercourses.</p>	<p>Where possible avoid, reuse and recycle spoil and waste generated. Manage waste that cannot be avoided, reused or recycled in accordance with the <i>NSW Waste Avoidance and Recovery Act 2011</i>, and classify the waste in accordance with the NSW Waste Classification Guidelines. If being removed offsite classify waste in accordance with the NSW Waste Classification Guidelines and dispose of at a facility appropriately licenced to accept such waste. Any material reused onsite shall be compliant with <i>NSW Protection of the Environment Operations (Waste) Regulation 2014</i> and associated exemptions such as the <i>NSW EPRM Exemption 2014</i>.</p>
Substrate type	<p>The substrate type is a clayey, silty sand with traces of gravel and organic material with a fine to coarse grain size (Cardno 2017; Hunter Civilab 2024).</p>	
Presence of refuge areas	<p>There is a lack of refuge areas such as upstream pools that would likely sustain fish species due to the small size of the catchment and ephemeral nature of the watercourse.</p>	
Presence of	<p>The site has no spawning areas.</p>	<p>Provide a sufficient number of suitable and labelled receptacles for generated</p>



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Site characteristic	Impacts	Mitigation measures
spawning areas		waste and recyclable materials and clean/empty receptacles as required to avoid overflows.
Presence of natural or artificial barriers to fish passage upstream and downstream	The project culvert installation is occurring at existing culvert road crossings. A culvert, causeway or ford is the minimum recommended crossing type for Class 4 Unlikely key fish habitat, with culverts and fords preferred to causeways (in that order (Fairfull and Witheridge 2003) cited in NSW Department of Primary Industries 2013). The works would be replacing an existing culvert with a culvert of larger capacity.	Remove, transport and dispose of hazardous and dangerous goods in accordance with the NSW Waste Classification Guidelines and dispose of at a waste facility licenced to accept such waste. Any transport of dangerous goods must occur with a driver possessing a dangerous goods drivers licence and dangerous goods vehicle licence. All dangerous goods transport shall be in accordance with <i>NSW Dangerous Goods (Roads and Rail Transport Act 2008 and NSW Dangerous Goods (Road and Rail) Transport Regulation 2014</i> . Ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code.
Types of migratory fish or other aquatic species likely to inhabit the areas	There were no areas of pooling water observed within the project area, and no waterbodies with emergent vegetation were present on site (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consultants 2025). Some of the drainage lines within project area, hold water after rain events, however, none of the drainage lines permanently hold water (observed to be dry during subsequent surveys) (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consultants 2025). The culverts had obstructions over entrances and mud and debris partially filling culverts and would be unlikely to provide habitat for migratory fish or other aquatic species (Wedgetail project Consulting 2024 cited in Wildthing Environmental Consultants 2025).	The management of concrete washout must be in accordance with the Transport for NSW Concrete washout guideline dated June, 2023. Ensure the provision and regular service of portable self-contained toilets by contractors. All weed and pathogen management must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).
Timing of construction in relation to flow conditions relative to expected wet seasons	The works would be timed where possible to coincide with dry weather and periods of low flow periods to minimise potential environmental impacts and construction duration and cost.	All works within the riparian zone and associated waterways present must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024). Stabilise exposed areas as soon as practically possible using turf, hydromulch, hydro seed/ sterile cover crop. Only use a hydro mulch mix of local provenance seed or sterile cover crop that is certified by the supplier as free from weeds. Leave erosion and sediment controls in place until the site is fully stabilized.
Presence of any listed threatened or protected aquatic species or 'critical habitat' under the FM Act and EPBC Act	The site does not contain any critical habitat or habitat suitable for threatened protected aquatic species listed under the FM Act or EPBC Act.	Undertake weekly checks and conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available on request. Remove all physical construction elements from the site such as any physical controls, vehicles, plant and equipment, fencing such as tree protection fencing and exclusion fencing, and traffic controls, and leave the site clean and free of debris.



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### 5.2.5. Mitigation measures

For mitigation measures relating to air quality, hazardous substances management, noise and vibration and waste management see **Section 5.1**, **Section 5.5**, **Section 5.7** and **Section 5.8** respectively.

**Table 5-12 Mitigation measures biodiversity**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Prepare a dewatering management plan in accordance with Transport for NSW technical guidelines for areas of the site requiring dewatering. The dewatering plan would include water monitoring locations to be monitored prior to, during and post completion of dewatering activities. A qualified hydrologist or environmental scientist or equivalently experienced professional will be engaged to undertake water quality monitoring activities, review collected data and advise on appropriate mitigation and management measures. The Plan must be reviewed and approved by the project Support Environment Officer or if developed by the project Support Environment Officer reviewed and approved by the project Manager and Environmental Risk Officer.	Pre-construction
Prepare a plan for the management of material and stockpiling and include the plan in the CEMP. The requirements of the template QF-ENV-009 Stockpile Mgmt Plan (CAP WKS) are the minimum to be provided in the plan. The Stockpile and Material Management Plan must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.	Pre-construction
Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and include the plan in the CEMP. The sediment and erosion controls must have the aim of achieving an outcome of no visible turbid plumes reaching the waterway for any rainfall event up to a 1 in 2 year average recurrence interval event.	Pre-construction
All documentation and notifications must be provided in accordance with the NSW Fisheries Permit requirements.	Pre-construction Construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Induct all personnel working onsite including workers and contractors, to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>permissible hours of work (including for deliveries)</li> </ul>	Pre-construction



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Mitigation measure	Timing
<ul style="list-style-type: none"> <li>site sensitivities and their relevance to the proposal including: <ul style="list-style-type: none"> <li>any significant waterways</li> <li>key fish habitat</li> <li>possibility of threatened species onsite and/ or adjacent to the site</li> <li>possibility of endangered ecological communities onsite and/ or adjacent to the site</li> <li>hollow bearing trees onsite and/ or adjacent to the site.</li> </ul> </li> <li>QF-ENV-008 Unexpected finds procedures (CAP WKS)</li> <li>erosion and sediment control requirements</li> <li>noise and vibration management requirements including any site specific and relevant mitigation measures, any limitations on high noise generation activities, and the location of the nearest sensitive receivers</li> <li>exclusion fencing requirements</li> <li>weed management</li> <li>NSW Fisheries requirements including an emphasis on incident reporting</li> <li>site compound areas and construction employee parking areas and designated loading/unloading areas and procedures.</li> </ul>	
<b>General</b>	
Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.	Pre-construction Construction Operation
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
Conduct all activities between the daylight hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays. No work on Sundays, public holidays or night works are permitted.	Construction Operation
Plan and stage works and design the site where feasible and reasonable to: <ul style="list-style-type: none"> <li>limit duration of works within defined watercourses to the minimum possible and where possible deliver the works during low flow / dry weather periods</li> <li>reduce open excavations.</li> </ul>	Pre-construction Construction
<b>Biodiversity and offsetting</b>	
An inspection of all hollows greater than 200 mm (including those to be retained and removed) as documented in the tree schedule in the Biodiversity Development Assessment Report (Wildthing 2025) must be conducted by a suitably qualified and experienced ecologist with the assistance of an elevated work platform. Inspection must determine the suitability of the hollow for use by Powerful Owl. This activity must be completed prior to the nesting periods for Powerful Owl (May-October (OEH)). The consultant must provide a survey report to Council's project Manager within 7 days of completion of the hollow survey and prior to the removal of any vegetation on site. The report	Pre-construction





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Mitigation measure	Timing
must clearly identify the tree ID, species name and common name, hollow characteristics e.g. depth, height above ground, aperture width and any other relevant details for each hollow and include an assessment of the suitability of the hollow for use by threatened arboreal species. If a nest tree with evidence of use is identified, the survey report must also include recommendations for suitable buffer zones during the breeding/ nesting period and advice on scheduling of construction activities within the buffer zones. Council's project Manager must have the report reviewed by Council's Environmental Risk or project Support Environmental Officer or appropriately nominated persons prior to works commencing.	
The class and number of ecosystem credits and species credits as detailed in Biodiversity Development Assessment Report for Stages 5 and 6 of a proposed road upgrade at East Seaham Road (Wildthing 2025) must be retired to offset the residual biodiversity impacts of the development prior to works commencing on site. The requirement to retire credits may be satisfied by payment to the Biodiversity Conservation Fund of an amount equivalent to the class and number of ecosystem credits, as calculated by the Biodiversity Offsets Payment Calculator. Evidence of the retirement of credits or payment to the Biodiversity Conservation Fund as detailed in Biodiversity Development Assessment Report for Stages 5 and 6 of a proposed road upgrade at East Seaham Road (Wildthing 2025) must be provided to the Environmental Risk Manager, Environmental Risk Officer or appropriately nominated persons prior to works commencing.	Pre-construction
Compensatory fauna habitat in the form of nest boxes mounted in alternate trees will be provided with 2 nest boxes for every hollow lost. The nest boxes shall be offset, constructed and installed in accordance with the Port Stephens Council Biodiversity Technical Specification 2024. Documentary evidence of installation of the nest box/ augmented hollow/ salvaged hollow must be provided in accordance with the Bushland Schedule of Rates Tender and to the Environmental Operations Team Leader or nominated representative for approval.	Pre-construction
All preclearance works must occur in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024). The consultant must provide a preclearance survey report in accordance with the requirements of Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024) and submit the report to the Council's project Manager within 7 days of completion of clearing activities. Council's project Manager must have the report reviewed by Council's Environmental Risk or project Support Environmental Officer.	Construction
Install exclusion fencing that includes temporary fencing to: <ul style="list-style-type: none"> <li>protect and avoid known populations of <i>Pterostylis chaetophora</i> onsite</li> <li>protect and avoid identified hollow bearing trees.</li> </ul> Exclusion zone fencing must be installed in accordance with the requirements of Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024). Exclusion zones must be identified on site map within the Construction Environmental Management Plan prepared for the site.	Pre-construction Construction
Clearly demarcate all trees to be removed in accordance with QF-ENV-001 Tree Tagging Standards and Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).	Pre-construction
All clearing of vegetation and removal of bushrock and re-use of woody debris and bushrock, must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).	Construction



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Mitigation measure	Timing
Where a tree identified for retention must be disturbed, the tree should be preferentially retained and pruned rather than cleared.	Construction
If damage occurs to vegetation, fauna or their habitat other than that indicated on the approved plans notify the site Team Leader. The Team Leader shall notify the project Manager and contact Council's EMS Risk Officer or EMS Manager for advice. Any advice, corrective or preventative works must be implemented onsite in a timely and efficient manner.	Construction Operation
All weed and pathogen management must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).	Construction Operation
All works within the riparian zone and associated waterways present must be in accordance with Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects EMF-BD-GF-0039 (TfNSW March 2024).	Construction Operation
All works must be delivered in accordance with the NSW Fisheries Permit.	Construction
Existing signage in relation to discouraging illegal dumping must be maintained, or if removed, replaced prior to the completion of works.	Construction
Timing of vegetation clearance should occur outside the bird nesting season (late August to December) and to avoid critical life cycle events such as breeding for avifauna species and outside the koala breeding season (October to January).	Construction
Any new fencing required along the road reserve should use fauna friendly fencing that allows kangaroos and wallabies to safely travel through the land. Fauna friendly fencing includes elements such as a gap of at least 30cm between the ground and the first strand of fence so wildlife can go under the fence rather than having to go over the fence.	Construction
Locate compounds and anything within the compound away from sensitive receivers and outside of the drip line or tree protection fencing of any trees.	Construction
<b>Monitoring and unexpected finds</b>	
Undertake daily checks of site drainage systems and undertake maintenance when required to ensure site drainage systems are operating at capacity e.g. removal of debris and that there is no increase in turbidity (sediment laden water). Ensure there is no release of dirty water into drainage lines and/ or watercourse.	Construction Operation
Conduct daily fauna checks prior to works commencing. If fauna are encountered during the daily check or during works follow the procedures in Biodiversity Management Guideline Protecting and managing biodiversity on Transport for NSW projects (TfNSW March 2024).	Construction Operation
When working within and adjacent to watercourses onsite and water is present, a visual inspection of the waterway for dead or distressed fish (downstream) or other fauna (indicated by fish gasping at the water surface, fish crowding in pools) is to be undertaken daily during the retaining wall works which have the potential to impact on the marine environment. Observation of dead and distressed fish or other fauna must be immediately reported to Council's Environmental Risk Officer and NSW Fisheries. All works must be ceased until the cause is rectified and NSW Fisheries and Council's Environmental Risk Officer approve works to recommence. Any rectification works directed by NSW Fisheries and Council's Environmental Risk Officer must be completed.	Construction Operation



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Mitigation measure	Timing
<p>Visually monitor for any of the signs of the following:</p> <ul style="list-style-type: none"> <li>acid sulfate soils</li> <li>contamination such as odour, seepage of unusual liquids from soil or rock, unusual metal objects, discolouration or staining of the rock, unusual colours, odours or sheens on groundwater, presence of underground storage tanks, potential asbestos containing material, presence of waste or rubbish or unusual colour of the soil</li> <li>asbestos</li> <li>coal tar.</li> </ul> <p>If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).</p>	<p>Construction Operation</p>
Pollution prevention	
<p>Manage construction activities to minimise water and land pollution, using the following measures:</p> <ul style="list-style-type: none"> <li>storage of all plant, materials and equipment must not be outside the direct works area or outside the approved compound site location and all chemicals, fuels and oils must be stored in suitable bunded areas, with the capacity of the bund at least 120 per cent of the volume of the largest container stored. Do not store or collect for disposal any chemicals, fuels and/or waste within or adjacent to watercourse, drainage lines or unsealed surfaces</li> <li>do not carry out works such as bitumen spraying, the spraying of paint or other materials during strong winds or adverse weather conditions</li> <li>keep an emergency spill response kit onsite at all times and monitor the kit for replenishment of contents. Make all staff aware of the location of the spill kit and ensure that they are trained in its use. If a spill occurs, follow the EMS Incidence Response Procedure and immediately notify the project Manager and/ or EMS Manager</li> <li>avoid refuelling of equipment or chemical handling activities outside the compound. Conduct the activities offsite where practical. If the activity must occur onsite, conduct the activity on flat ground at least 50 m from any watercourse, drainage line or sensitive area with spill containment measures in place and within a bunded area</li> <li>use and store all hazardous and dangerous goods in accordance with all relevant statutory standards and procedures and manufacturer's MSDS. Retain a copy of all relevant MSDS onsite and ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code</li> <li>where possible wash equipment, machinery or works vehicles offsite at an approved facility. Where onsite wash down is required for weed control, use potable water and contain any excess debris from equipment with containment material. Dispose of any containment material and water in accordance with the Waste Management requirements for the works</li> <li>stabilise exposed areas as soon as practically possible using turf, hydromulch, hydro seed/ sterile cover crop. Only use a hydro mulch mix of local provenance seed or sterile cover crop that is certified by the supplier as free from weeds</li> <li>the management of concrete washout must be in accordance with the Transport for NSW Concrete washout guideline dated June, 2023</li> <li>monitor weather conditions for adverse weather that may increase impacts and where possible schedule works to avoid these periods. Do not undertake works during inclement weather to minimise the risk of damage to assets and ensure there is no compromise of site safety. Where severe weather is forecast, undertake all reasonable precautions to</li> </ul>	<p>Construction Operation</p>



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Mitigation measure	Timing
<p>prepare and secure the site for a storm event and help minimise the potential for damage. If heavy rain is forecast in the next 24 hours delay commencement or cease works until such time a suitable dry period of weather is forecast</p> <ul style="list-style-type: none"> <li>drive to conditions on unsealed roads and/ or onsite and signpost designated access points, routes, vehicle manoeuvring areas, parking areas and ensure site personnel, contractors and delivery trucks are aware of the requirements to help reduce site disturbance. Restrict vehicles and personnel to designated tracks, trails and parking areas. Where possible park and turn-around on hard, well drained surfaces</li> <li>maintain a clean site that is free of litter and unnecessary debris with all wastes stored securely to avoid/ minimise the risk of pollutants escaping</li> <li>inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions</li> <li>install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans. Leave controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request. Leave erosion and sediment controls in place until the site is fully stabilized</li> <li>works must be delivered in accordance with the NSW Fisheries Permit</li> <li>works must be delivered in compliance with the Dewatering Management Plan prepared for the site</li> <li>limit duration of works within defined watercourses to the minimum possible and where possible deliver the works during low flow / dry weather periods</li> <li>reduce open excavations.</li> </ul>	
<b>Stockpile, spoil and waste management</b>	
Store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required and manage all stockpiles on site in accordance with the NSW Managing Urban Stormwater: Soils and construction – Volume 1 4 <sup>th</sup> edition and the approved stockpile management plan prepared for the site. Place stockpiles at strategic locations to mitigate environmental impacts whilst facilitating material handling requirements. Establish access routes around material stockpiles that enable access from adjoining haulage routes and store all stockpiled material in a location consistent with the approved plans with a separate area designated for storage of contaminated spoil where required.	Construction
Stockpile and store excavated topsoil separately for reuse in rehabilitation works once works are complete. Incorporate non-woody vegetation (typically grasses and groundcover species) into the stripping of topsoil to retain any organic materials and nutrients within the topsoil layer. Carry topsoil removal with care to ensure that topsoil is not mixed with subsoils, particularly where topsoil is thin.	Construction
Remove all physical construction elements from the site such as any physical controls, vehicles, plant and equipment, fencing such as tree protection fencing and exclusion fencing, and traffic controls, and leave the site clean and free of debris.	Construction Operation
Maintain a clean site that is free of litter and unnecessary debris with all wastes stored securely to avoid/ minimise the risk of pollutants escaping.	Pre-construction Construction Operation





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#### 5.3. Contamination & chemical/ hazardous substances management

This chapter describes the risks and potential impacts from contamination and chemical/ hazardous substance management that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

Key issues to be addressed from the SEARS are:

*An assessment of the extent and nature of any potential soil (terrestrial and aquatic) and groundwater contamination at the site and demonstrate that the site is suitable (or will be after remediation) for the proposal.*

##### 5.3.1. Existing environment

A desktop review was carried out to characterise the existing environment with respect to soils and contamination and identify areas of potential contamination risk. Relevant databases and literature reviewed included:

Publicly-available information, including:

- PSC website
- geographical and soil mapping
- NSW EPA Contaminated Sites Record of Notices (records checked 11 February 2025)
- list of contaminated sites notified to the NSW EPA (register checked 11 February 2025)
- NSW EPA current PFAS investigation sites
- Environmental Protection Licenses and non-compliances related to Environmental Protection Licenses requirements under the *Protection of the Environment Operations Act 1997*.

There are no contaminated sites recorded or that have been notified to the NSW EPA within or immediately adjacent to the construction footprint.

Per- and polyfluoroalkyl substances (PFAS) are identified as being persistent both in the environment and the human body and there is potential for significant accumulation with prolonged exposure. Current NSW EPA investigations are focused on sites where it is likely that large quantities of PFAS have previously been used. A search of NSW EPA current PFAS investigation sites indicates there are no areas within the construction footprint. The site is also not mapped as lands that are or may be contaminated with PFAS.

Based on historical aerial photography, the construction footprint was largely vegetated then cleared and used for agricultural and rural/ residential purposes along



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East Seaham Road. Potential contaminants as a result of historical land use may include diffuse pesticide and herbicide use (pesticides/herbicides), isolated waste disposal (hydrocarbons, metals, biological hazards, nitrates, pesticides/ herbicides, asbestos) and chemical/fuel use and storage (hydrocarbons, pesticides, herbicides, phenols).

Site inspections were also carried out within the construction footprint, however, no areas of suspected contamination such as old stockpiles, asbestos, dumped items such as tyres, abandoned vehicles, illegally dumped demolition and construction debris or any other indicators were identified.

A preliminary material classification of soils was conducted to provide the likely classification of spoil generated as part of the redevelopment works. Material was assessed against the chemical criteria within the Recovered Aggregate & Excavated Natural Material (ENM) Orders (NSW EPA 2014) and to visually assess subgrade against Virgin Excavated Natural Material (VENM) definitions as referenced by the *Protection of the Environment Operations Act 1997*.

Fifteen primary soil samples were collected from the road corridor, comprising of one discrete sample per location. Visual assessment was performed of underlying subgrade materials, and laboratory analysis of samples for chemical properties specified in the ENM Order were conducted.

Results of the chemical analysis identified that heavy metals, polyaromatic hydrocarbons, total recoverable hydrocarbons and BTEX (aromatic hydrocarbons benzene, toluene, ethylbenzene and xylene), electrical conductivity and pH were all within acceptable limits identified within ENM Order / Recovered Aggregate Order 2014 assessment criteria.

Pavement materials within the road corridor were reported acceptable against ENM Order and Recovered Aggregate Order 2014 assessment criteria. Additional testing in accordance with the specified sampling densities and testing attributes will be necessary to satisfy the respective recovery order requirements. These materials were also found to be acceptable within threshold criteria for General Solid Waste as specified in the NSW Waste Classification Guidelines 2014. Subgrade materials within the road corridor were deemed acceptable for classification as VENM and are therefore suitable for offsite reuse or disposal under this classification.

Overall it is considered that the site has a low contamination risk potential.



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#### 5.3.2. *Impact assessment*

During construction and operation and maintenance activities there is the potential for:

- poor storage, use and management of hazardous materials leading to leakages of substances
- spills of contaminating materials such as oils, fuels or chemicals from road users that could potentially contaminate soil near project roads and adjacent areas outside the project
- importation of contaminated material from external sites/ suppliers
- unexpected finds of contaminated material (low risk).

These impacts could result in:

- human health risks (to construction workers), with construction workers being most at risk from contaminated land impacts due to the potentially complete exposure pathways including dermal contact (contaminated soil and water) and inhalation/ingestion (impacted dusts/soils)
- risks to the receiving environment (waters and soils): Construction work may create exposure pathways through (for example) disturbance, removal of vegetation and topsoil and dewatering. This could result in soil contamination, groundwater contamination and contamination of stormwater and waterbodies.

During construction and operation, if contaminated lands or materials are encountered or suspected unexpected finds procedures would be implemented. All waste and hazardous materials would be handled, disposed of and transported in accordance with the relevant statutory requirements and pollution prevention controls would help minimise potential impacts. Pollution prevention controls would include:

- storage of chemicals, fuels and oils within bunded areas
- preventing activities such as bitumen spraying during high winds
- ensuring spill management protocols and resources are stored onsite and in a known location
- minimising activities such as washing of plant, equipment and machinery within 50 m of any watercourse
- using and storing hazardous and dangerous goods in accordance with all relevant statutory standards and procedures and manufacturer's MSDS.



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#### 5.3.3. Mitigation measures

**Table 5-13 Mitigation measures for the management of contamination and chemical/ hazardous substances**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>QF-ENV-008 Unexpected finds procedures (CAP WKS)</li> <li>chemical and hazardous substance management.</li> </ul>	Pre-construction
<b>General</b>	
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
<b>Monitoring and unexpected finds</b>	
Visually monitor for any of the signs of the following: <ul style="list-style-type: none"> <li>acid sulfate soils</li> <li>contamination such as odour, seepage of unusual liquids from soil or rock, unusual metal objects, discolouration or staining of the rock, unusual colours, odours or sheens on groundwater, presence of underground storage tanks, potential asbestos containing material, presence of waste or rubbish or unusual colour of the soil</li> <li>asbestos</li> <li>coal tar.</li> </ul> If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).	Construction Operation
<b>Pollution prevention</b>	
Manage construction activities to minimise water and land pollution, using the following measures: <ul style="list-style-type: none"> <li>storage of all plant, materials and equipment must not be outside the direct works area or outside the approved compound site location and all chemicals, fuels and oils must be stored in suitable bunded areas with the capacity of the bund at least 120 per cent of the volume of the largest container stored. Do not store or collect for disposal any chemicals, fuels and/or waste within or adjacent to watercourse, drainage lines or unsealed surfaces</li> </ul>	Construction Operation





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Mitigation measure	Timing
<ul style="list-style-type: none"> <li>do not carry out works such as bitumen spraying, the spraying of paint or other materials during strong winds or adverse weather conditions</li> <li>keep an emergency spill response kit onsite at all times and monitor the kit for replenishment of contents. Make all staff aware of the location of the spill kit and ensure that they are trained in its use. If a spill occurs, follow the EMS Incidence Response Procedure and immediately notify the project Manager and/ or EMS Manager</li> <li>avoid refuelling of equipment or chemical handling activities outside the compound. Conduct the activities offsite where practical. If the activity must occur onsite, conduct the activity on flat ground at least 50 m from any watercourse, drainage line or sensitive area with spill containment measures in place and within a bunded area</li> <li>use and store all hazardous and dangerous goods in accordance with all relevant statutory standards and procedures and manufacturer's MSDS. Retain a copy of all relevant MSDS onsite and ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code</li> <li>the management of concrete washout must be in accordance with the Transport for NSW Concrete washout guideline dated June, 2023.</li> </ul>	
<b>Stockpile, spoil and waste management</b>	
Where possible avoid, reuse and recycle spoil and waste generated. Manage waste that cannot be avoided, reused or recycled in accordance with the <i>NSW Waste Avoidance and Recovery Act 2011</i> , and classify the waste in accordance with the NSW Waste Classification Guidelines. If being removed offsite classify waste in accordance with the NSW Waste Classification Guidelines and dispose of at a facility appropriately licenced to accept such waste. Any material reused onsite shall be compliant with <i>NSW Protection of the Environment Operations (Waste) Regulation 2014</i> and associated exemptions such as the <i>NSW EPRM Exemption 2014</i> .	Construction Operation
Remove, transport and dispose of hazardous and dangerous goods in accordance with the NSW Waste Classification Guidelines and dispose of at a waste facility licenced to accept such waste. Any transport of dangerous goods must occur with a driver possessing a dangerous goods drivers licence and dangerous goods vehicle licence. All dangerous goods transport shall be in accordance with <i>NSW Dangerous Goods (Roads and Rail Transport Act 2008 and NSW Dangerous Goods (Road and Rail) Transport Regulation 2014</i> . Ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code.	Construction Operation
Ensure truck drivers are undertaking material tracking recording the source location, destination and volumes and ensure that for any material brought onto site this information is provided to the Team Leader	Construction Operation



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### 5.4. Flooding

This chapter describes the risks and potential impacts from flooding and presents the approach to the management of these impacts. Flooding reports are included in **Attachment 14** and **Attachment 15**.

Key issues to be addressed from the SEARS are:

- *Any flood risk having regard to adopted flood studies, the potential effects of climate change and relevant provisions of the NSW Floodplain Development Manual;*
- *Impacts of the proposed development, including any changes to flood risks onsite and off-site and details of design and/or other mitigation measures to mitigate flood risks; and*
- *Details of potential impacts to existing community flood emergency management and evacuation arrangements.*

For human health risks (to construction workers) and risks to the receiving environment during construction as a result of flooding caused by weather events, see **Section 5.5**.

#### 5.4.1. Existing environment

East Seaham Road generally runs east of and parallel to the Williams River. The works area is rural in nature with rural riverfront properties to the west of the road and a large area of National Park to the east. The landform generally slopes from east to west. The land to the east of East Seaham Road is mountainous with steep slopes at the upper reaches of the catchment. There are multiple valleys along the extent of East Seaham Road.

A total catchment of approximately 220 ha was determined to contribute to various locations along the stage 6 works extent and a total catchment of approximately 139 ha was determined to contribute to various locations along the stage 5 works extent. Sub-catchment areas were delineated based on the landform contributing to runoff at each existing culvert crossing as illustrated in **Figure 5-25** and **Figure 5-26**.



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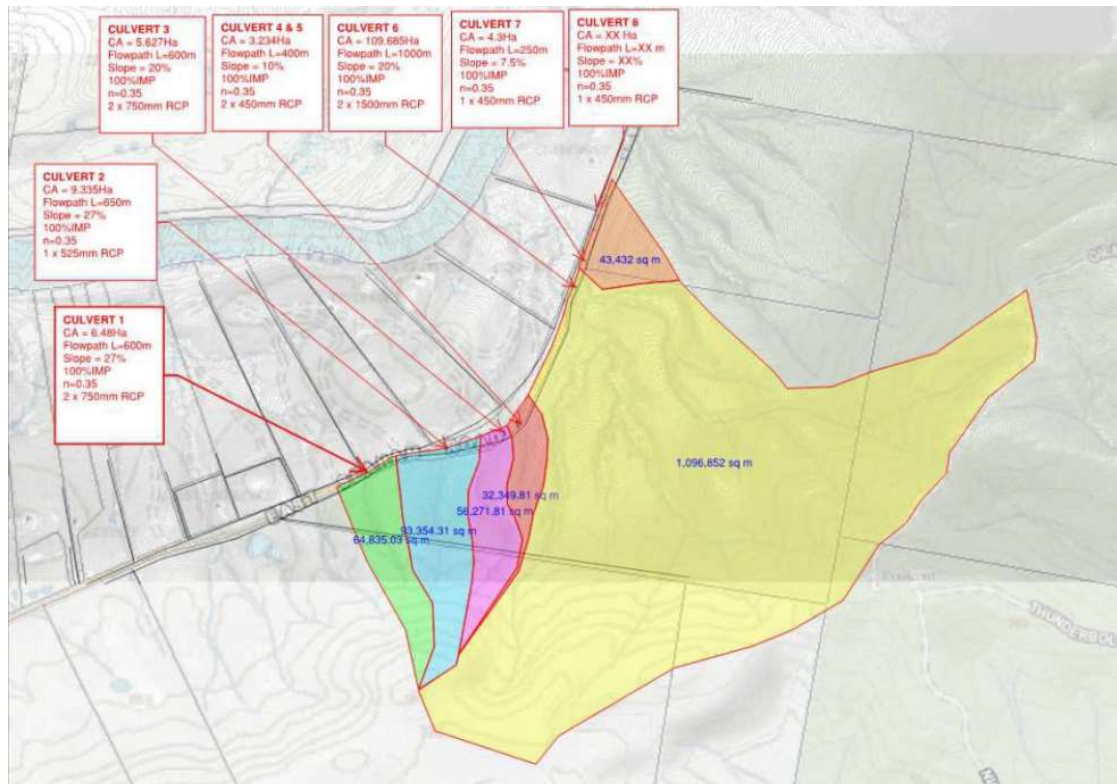


Figure 5-25 Stage 5 catchments



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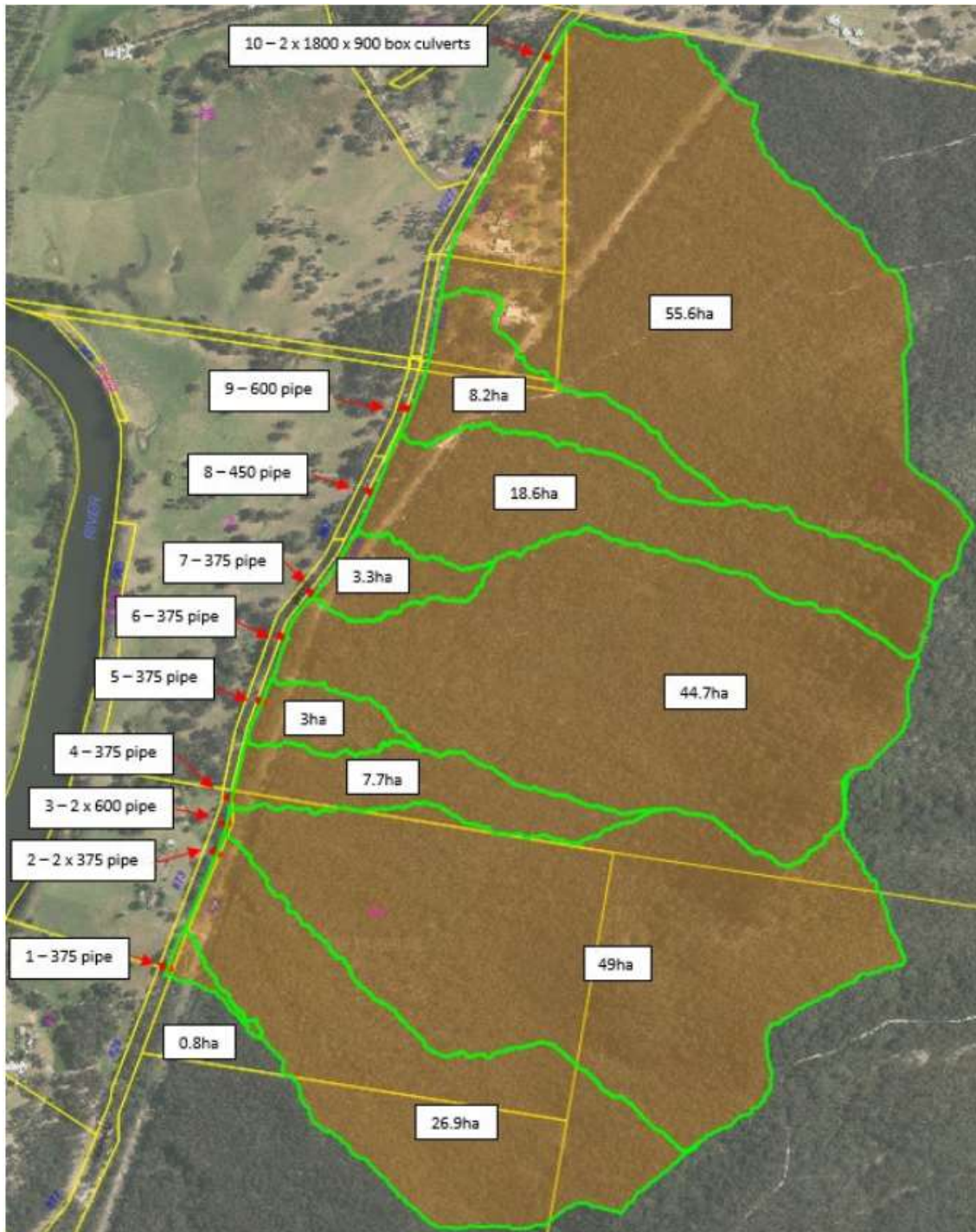


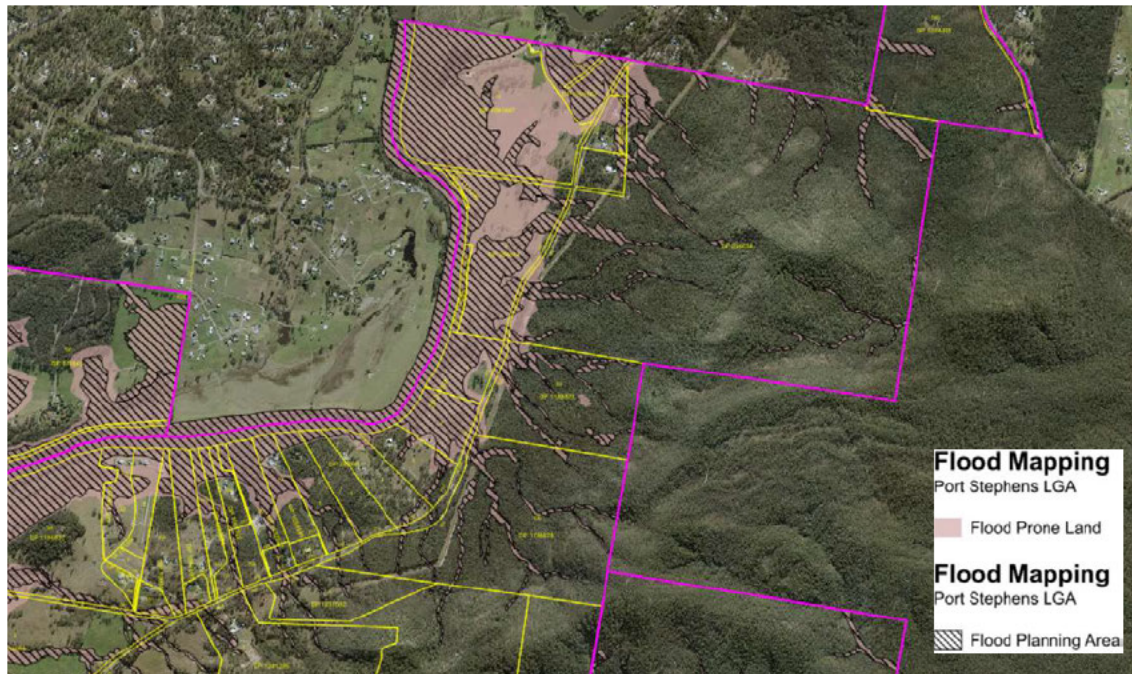
Figure 5-26 Stage 6 catchments and flow paths





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Flooding of the Williams River impacts East Seaham Road at a number of locations. **Figure 5-27** illustrates the Flood Planning Area (FPA) and Probable Maximum Flood (PMF) that impacts the project area.



**Figure 5-27 Flood planning area and probable maximum flood**

The modelled flow for the current scenarios can be viewed in the drainage reports in **Attachment 14** and **Attachment 15**.

### **5.4.2. Impact assessment**

The East Seaham Road and drainage upgrades reduce the overall flood risk along the section of the road. The design includes substantial upgrades of existing cross drainage structures (culverts) that will convey local catchment flows beneath the road and reduce the likelihood of surface flow over the road.

For local catchment flooding the design criteria for the roads cross drainage was:

- to convey the 5% AEP local flood event without overtopping
- for 1% AEP surface water flow over East Seaham Road to be considered safe (VD < 0.4 and depth below 200mm).

The design achieves these objectives and has resulted in a significant reduction in drainage/ flooding risk when compared to the existing road conditions. Under existing



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conditions the culverts were unable to convey the 5% AEP local catchment flows without road overtopping. See **Attachment 14** and **Attachment 15**.

Specifically, during flood modelling for the design, Regional Catchment flooding for Williams River Flood levels from the Williams River Flood Study (BMT WBM 2009; updated 2016) were interrogated to understand when regional flooding inundates parts of the existing road. The lowest section of the road is inundated during a 5% AEP event by a depth of over 0.5 m. The road surface has been lifted at this low point to ensure the road surface is not inundated during a 5% AEP event. This increases the flood immunity and trafficability of the road during flooding of the Williams River.

Given the significant improvements to both the road design and cross drainage capacity, the design presents a significant improvement that increases the resilience of the road into the future as climate change impacts are realised. The design of the road reduces flood risk and has considered the principles of the NSW Floodplain Risk Management Manual (2023).

Once complete the works will allow more water to flow through the drainage culverts beneath the road and reduce the likelihood of surface flows crossing the road. Although the amount of flows will not change as a result of the road upgrades, there is a risk that the culvert upgrades will result in more concentrated flows being discharged downstream of the road (these flows would currently be crossing the road via a combination of the existing smaller culverts and as overland flow). Scour protection has been designed downstream of all culvert crossings to control the velocity of flows and reduce the likelihood of scour and erosion to downstream properties.

Road and drainage upgrades would ultimately have a positive outcome on emergency management and evacuation arrangements for the area. The flood immunity of the road will be increased for the following scenarios:

- when considering flooding of the local catchment, the section of the road will remain safe and trafficable up to a 1% AEP design event
- when considering flooding of the Williams River, the road will now be traversable during all events up to a 5% AEP flood.

The modelled flow for the constructed design scenarios can be viewed in the drainage reports in **Attachment 14** and **Attachment 15**.

Notification of the works commencing should be provided to local residents and the community. For impacts and mitigation measures relating to flooding risks and safety impacts see **Section 5.5.2** and **Section 5.5.3**.



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### 5.4.3. Mitigation measures

**Table 5-14 Mitigation measures related to flooding**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Community notification must occur in accordance with the project specific engagement plan prepared for the works. Notification of works should occur to provide advance warning of the works and potential disruptions for all sensitive land uses. Notification may consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact.	Pre-construction
Handle enquiries and complaints in accordance with Council's complaints handling procedures and eliminate or minimise the issue where practical.	Construction Operation
<b>General</b>	
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)



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### 5.5. Hazards and Risks

This chapter describes the risks and potential impacts from hazards that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

Key issues to be addressed from the SEARS are:

*The effects of coastal processes and coastal hazards including the effects of sea level rise and climate change on the, and arising from, the proposed development*

For impacts associated with construction traffic management and access, see **Section 5.9**, dust generation, see **Section 5.1** and noise and air pollution, see **Section 5.7** and **Section 5.1**. For potential environmental impacts associated with excavations, groundwater, see **Section 5.8**.

#### 5.5.1. Existing environment

See **Section 5.3** for contamination risks and **Section 5.8** for acid sulfate soil risks.

### Climate change and sea level rise

The geography of the Hunter region affects local weather conditions, which together have led to a range of unique and important ecosystems (Hunter Climate Change Snapshot 2024). The climate of the Hunter region is subtropical to temperate, creating a convergence zone for ecosystems that are characteristic of the North Coast, Western Slopes and Sydney Basin (Hunter Climate Change Snapshot 2024).

The Hunter Climate Change Snapshot (2024) identifies that:

- **Average temperatures.** Across the Hunter region, average temperatures will increase throughout this century. Under a low-emissions scenario, the average temperature increase across the region is projected to be less than 0.1°C between 2050 and 2090. However, a temperature increase of 1.6°C is projected during the same period under a high-emissions scenario. Notably, the temperature projections for 2050 under a high-emissions scenario are expected to exceed the projections for 2090 under a low-emissions scenario. Temperature increases are expected in all parts of the region and across all seasons.
- **Prolonged hot days.** Prolonged hot days are where the maximum temperatures are equal to or above 35°C. This is likely to increase the incidence of illness and death particularly amongst vulnerable people. Seasonal changes in hot days could also have significant impacts on bushfire danger, infrastructure and native species. The number of hot days will increase for the Hunter region by 2050 for both a low-emissions and a high-emissions scenario, with an even





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greater increase by 2090 under a high-emissions scenario. The number of hot days is projected to increase across spring, summer and autumn, with the largest increase in summer. Under a low-emissions scenario, there is a minimal increase in the number of hot days between 2050 and 2090, with less than 1 additional day projected across the region. However, a substantial increase of 13.1 additional hot days per year is projected under a high-emissions scenario during the same period.

- *Rainfall patterns and flooding.* Climate change will influence rainfall patterns and the total amount of rainfall that we receive. These changes may have widespread impacts on water security, agricultural productivity and native species' reproductive cycles. Annual average rainfall in the region is projected to remain variable throughout this century. By 2090, on average, annual rainfall is projected to decrease by 8% under a low emissions scenario and by 9% under a high emissions scenario. Changes to average rainfall will occur in all seasons, with the largest changes expected in winter. By 2090, on average, winter rainfall is projected to decrease by 12% under a low-emissions scenario and by 26% under a high-emissions scenario. On average, summer, autumn and spring rainfall is projected to change by less than 12% across the region by 2090 under both a low-emissions scenario and a high-emissions scenario. The changes in rainfall will also impact flooding with variable changes to the flood planning levels throughout the region.
- *The Forest Fire Danger Index (FFDI).* The FFDI represents an estimate of fire weather risk. The FFDI is calculated from temperature, relative humidity and wind speed, as well as a number representing fuel dryness. The number of severe fire weather days will increase for the Hunter region by 2050 for both a low-emissions and a high-emissions scenario, with an even greater increase projected by 2090 under a high-emissions scenario. The number of severe fire weather days is projected to increase during spring and summer, with the largest increase in spring. Increases to severe fire weather days are projected to occur across most of the region.

The NSW Government has adopted a Sea Level Rise Policy Statement (NSW Government 2009) to support consistent adaptation to projected sea level rise impacts. The Policy Statement includes sea level rise planning benchmarks for use in assessing the potential impacts of projected sea level rise in coastal areas, including flood risk and coastal hazard assessments, development assessment, coastal infrastructure design processes and land use planning exercises. These benchmarks are a projected rise in sea level (relative to the 1990 mean sea level) of 0.4 m by 2050 and 0.9 m by 2100 (NSW Department of Environment, Climate Change and Water 2009).

The site is located approximately 20 km inland from the coast and at its lowest point approximately 5 m AHD. The Williams River is located at its closest point



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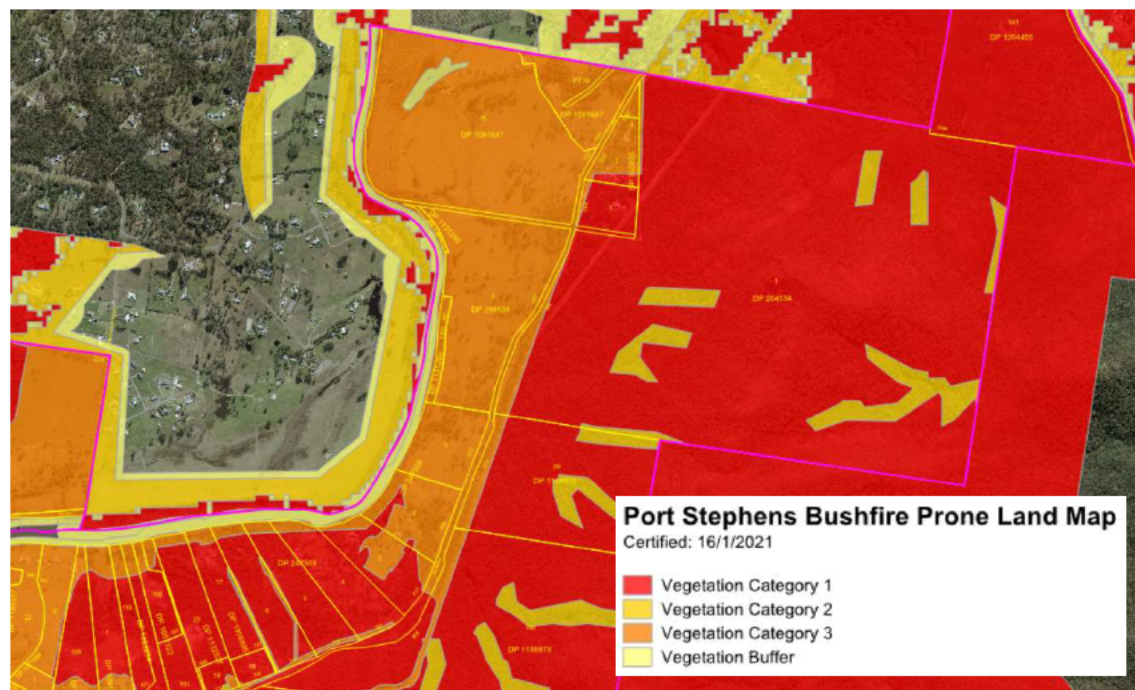
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approximately 200 to 300 m west of East Seaham Road and is not tidal at this location. The site is unlikely to be subject to sea level rise or tidal surges.

#### Bushfire prone lands

The NSW Bushfire Prone Land Map Tool (NSW Rural Fire Service 2016; accessed 11 February 2025) was used to identify where the construction footprint intersects bushfire prone land. Existing land uses, based on spatial data and aerial photography, were also assessed to determine the potential bushfire risk on properties.

Bushfire season for the lower Hunter region is typically from October to March, with most fires a result of illegal burning off, lightning strikes and car dumping (Newcastle Bush Fire Management Committee 2018). The project is located within and near bushfire prone land, as shown in **Figure 5-28**.



**Figure 5-28 Bushfire prone lands**

#### Floodprone land

The PSC Flood Prone Land Map was reviewed to identify where the construction footprint intersects floodprone land.

Clarence Town, Seaham, and East Seaham, located on the Williams River and Jackass Creek, are at risk of flooding. The Williams River, fed by the steep-sloped



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Chichester River, contributes to the flood risk in this area. The Seaham Weir helps limit tidal influence and backflow from the Hunter River, but the sector can still be isolated for up to five days during major floods, depending on their scale (NSW SES 2025). The project is located within and near floodprone prone land, as shown in **Figure 5-27** in **Section 5.4.1**.

#### **5.5.2. Impact assessment**

##### **Climate change**

During the construction period there is the potential for greenhouse gas emissions due to:

- vehicle, plant and equipment releasing emissions (gases, liquid droplets or solid particles)
- chemical usage
- generation of carbon dioxide from vehicle emissions associated with driving to and from the site and operation of plant and machinery on the site.

The greenhouse gas emissions from these activities would be released into the atmosphere. Greenhouse gas emissions worldwide are contributing to global warming.

The activity is small scale, relatively short in duration and has a limited extent and is unlikely to significantly increase greenhouse gas emissions. The mitigation measures in **Section 5.5.3** would be implemented to help minimise emissions as a result of the works.

It is unlikely that during the short duration of the works, climate change would significantly alter expected weather norms or impact the works.

During operation and maintenance there is the potential for greenhouse gas emissions similar to those within the construction period. It is likely that operation and maintenance activities over time may be altered in frequency and/ or duration and type to adapt to the potential impacts of climate change.

During operation and maintenance, mitigation measures will be implemented, such as operating, inspecting and maintaining equipment to ensure it is in good working order, and operated in accordance with the manufacturer's instructions, to help limit impacts.

##### **Bushfire**

As the project would be located within and near bushfire prone land, the project has the potential to increase bushfire risk from accidental ignition. Potential bushfire risks



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could result from activities and materials used with increased fuel loads, the use of mobile equipment, fuels and chemicals, and work on days that are classified as high fire risk. Construction ancillary facilities and construction infrastructure are temporary in nature and, where required, would be cleared of vegetation.

During construction, there would be impacts on roads in and next to the construction footprint including reduced speed limits and modified arrangements. This may delay response times and/or access for emergency services including fire crews, in the event of a bushfire. Construction personnel would be made aware of the potential for bushfires before working on the project.

There would be human health risks (with construction workers being most at risk) and risk of environmental harm from bushfires.

The operational infrastructure of the project is largely not vulnerable to bushfire due to its incombustible nature (road surface materials, retaining walls, road barriers). Bushfires may occur as a result of car accidents or littering (e.g. cigarette butts). Access for emergency services would be improved by the operation of the project. In the instance that sections of the project are closed for safety reasons during a bushfire, the existing emergency access routes would provide an alternate route for emergency and evacuation traffic.

Bushfire risks would be included in Safe Work Method Statements for construction and operational activities and notification of the works to emergency services would be provided prior to works commencing.

### Flooding

For flooding changes see **Section 5.4**. The design of the road reduces flood risk and has considered the principles of the NSW Floodplain Risk Management Manual (2023).

There is a risk of severe weather and flooding during construction and operation and maintenance of the road that may cause impacts to human health (to construction workers and local residents), local properties and the local receiving environment. Risks may include:

- loss of life or serious harm to people and wildlife
- loss of livelihoods or economic impacts
- loss or damage to property and/ or construction items such as plant, materials, vehicles, equipment, fencing etc
- increased spread of water borne diseases and mosquitos
- increased risk of physical, biological and chemical hazards.





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During operation and maintenance, access for emergency services and residents would be improved by the operation of the project, as the works would have an improvement when compared to the existing flood conditions.

Flooding risks would be included in Safe Work Method Statements for construction and operational activities and notification of the works to emergency services would be provided prior to works commencing.

### 5.5.3. Mitigation measures

**Table 5-15 Mitigation measures for hazards and risks**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Include emergency management for bushfire, flooding and severe weather events in the Safe Work Method Statement(s) relevant to/ prepared for the proposed works.	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Community notification must occur in accordance with the project specific engagement plan prepared for the works. Notification of works should occur to provide advance warning of the works and potential disruptions for all sensitive land uses. Notification may consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact.	Pre-construction Construction
Notify landholders, the local community, emergency services, waste services, bus companies, NSW NPWs, relevant service providers and any other relevant stakeholders via letter, phone call or email or as otherwise appropriate, of the intention to carry out works. Notification should detail the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification should include the likely traffic impacts and any other relevant impacts of the work without understating its effect. Notification should be provided a minimum of 10 working days prior to the start of works.	Pre-construction Construction
Handle enquiries and complaints in accordance with Council's complaints handling procedures and eliminate or minimise the issue where practical.	Construction Operation
Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference	Pre-construction



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Mitigation measure	Timing
(such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>permissible hours of work (including for deliveries)               <ul style="list-style-type: none"> <li>surrounding rural residential development.</li> </ul> </li> <li>emergency management procedures</li> <li>traffic management.</li> </ul>	
<b>General</b>	
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
<b>Monitoring and unexpected finds</b>	
Visually monitor traffic for excessive delays or que lengths. Notify the Team Leader and appropriate Manager (if required) and amend the TMP (if required).	Construction Operation
<b>Pollution prevention</b>	
Operate, inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions. Requirements include: <ul style="list-style-type: none"> <li>ensuring air lines on pneumatic equipment do not leak and plant silencers are well maintained</li> <li>ensuring plant and equipment are fitted with approved exhaust systems (to maintain exhaust emissions within acceptable standards)</li> <li>personnel onsite are to be trained and proficient in the operation of plant, equipment and vehicular procedures for the required tasks and ways to reduce impacts</li> <li>inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions.</li> </ul>	Construction Operation
<b>Stockpile, spoil and waste management</b>	
Opportunities to reduce resource use and water consumption and to reuse and recycle water must be considered during implementation and operation, where reasonable and feasible.	Construction Operation



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### 5.6. Heritage

This chapter describes potential impacts that may be generated by the construction and operation of the project on Aboriginal and non-indigenous heritage and presents the approach to the management of these impacts. For the Aboriginal Due Diligence Assessment see, **Attachment 9** and for the Statement of Heritage Impact see, **Attachment 10**.

Key issues to be addressed from the SEARS are:

*The preparation of an Aboriginal Cultural Heritage Assessment Report (ACHAR), prepared in accordance with relevant policy and guidelines, identifying, describing and assessing any impacts to Aboriginal cultural heritage sites or values associated with the project. The ACHAR must be prepared in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) and the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010), including results of thorough archaeological survey and test excavations (where required). The ACHAR must include evidence of adequate and continuous consultation with Aboriginal stakeholders in determining and assessing impacts, developing and selecting options for avoidance of Aboriginal cultural heritage and mitigation measures (including the final proposed measures), having regard to the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010).*

*An assessment of direct and indirect impacts on environmental heritage (within the project site and in the vicinity of the project site) and archaeological significance prepared in accordance with the relevant guidelines, which assesses any impacts and outlines measures to ensure they are minimised and mitigated.*

#### 5.6.1. Existing environment

##### Aboriginal heritage

###### *Landscape context*

The project area is located within the North Coast Bioregion. The bioregion spans from Tweed Heads in the north, to Nelson Bay in the south and is bound by the coastline. The eastern extent of the North Coast Bioregion is characterised by a coastal sand barrier, which transitions to low foothills and ranges, ending with steep slopes and gorges associated with the Great Escarpment in the west (NSW Department of Planning and Environment 2016 cited in Biosis 2025).

The project area is located at the base of the foot slopes, west of Wallaroo National Park and east of the Williams River. The landforms have, however, been modified by the creation of East Seaham Road and continual regrading.



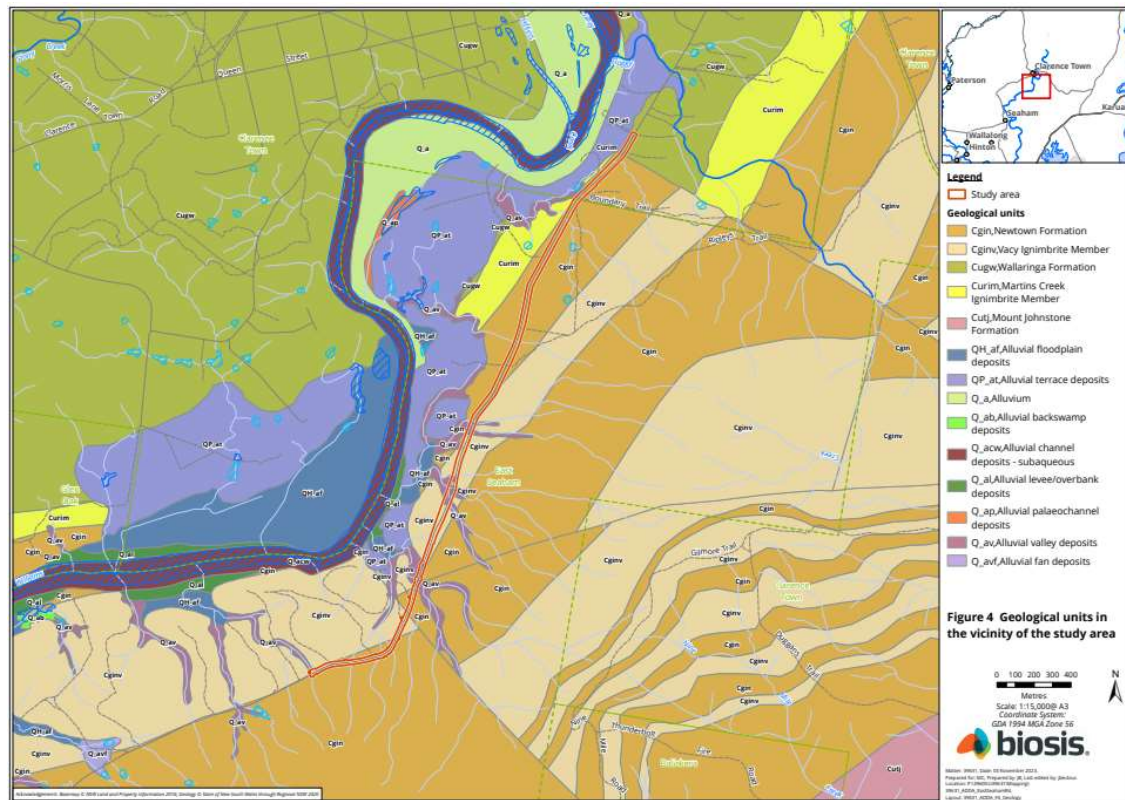
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The geological formations include the:

- Wallaringa Formation which is located in the northern most 150 m of the project area
- Newtown Formation which is located from the extent of the Wallaringa Formation to 200 m further south. There is also a small portion of this formation located within the southern 200 m of the project area
- Vacy Ignimbrite Member which is located between the extents of the Newtown Formation in the southern extent of the project area.

The project area overlaps several geological units made complex due to the association with a dense network of hydrological structures stemming from the Williams River. **Figure 5-29** illustrates the location of alluvial valley deposits in the southern portion of the project area where watercourses are located.



**Figure 5-29 Geological formations**

Raw materials suitable for artefact manufacture may have been acquired from gravels and cobbles transported within alluvial deposits and quarries from tuff deposits located within the Newtown Formations and where appropriately sized outcroppings are available, sandstone associated with the Wallaringa formation also has the potential to be associated with grinding grooves due to the availability of free-flowing water throughout the project area (Biosis 2025). However, the project area is highly disturbed and it is therefore unlikely that these features are present or intact. The Vacy Ignimbrite Member, is typically associated with very coarse-





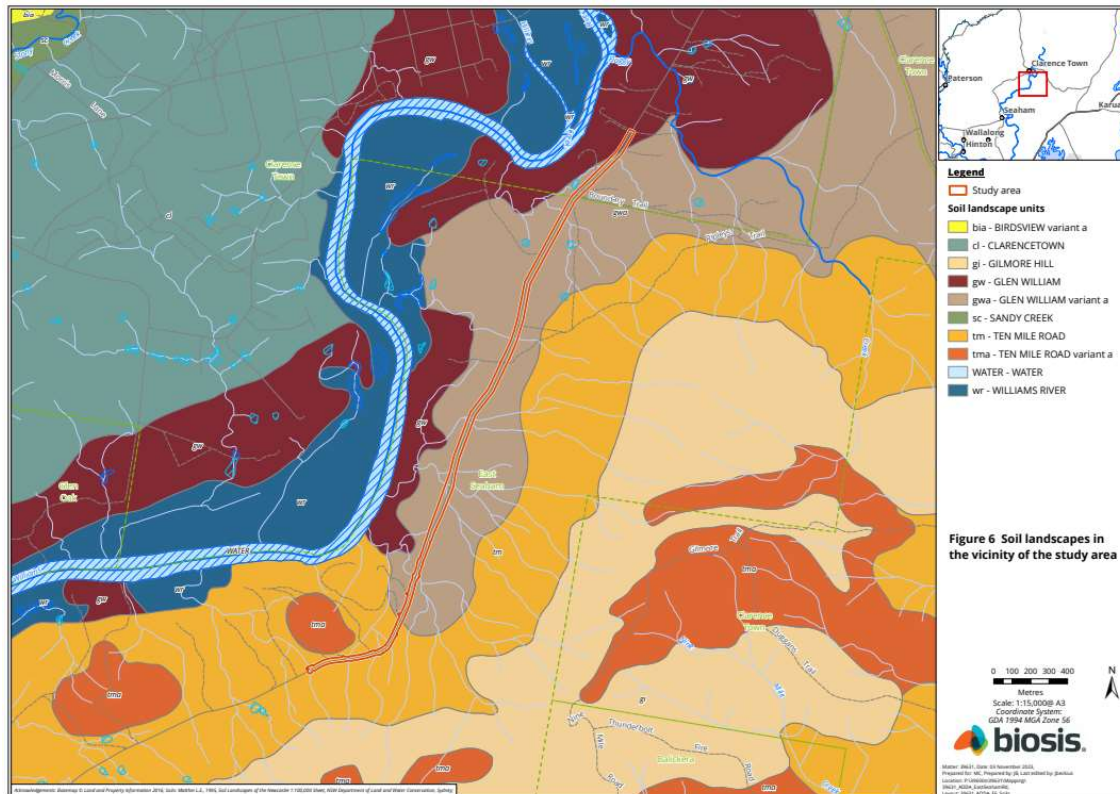
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grained materials and therefore is not associated with the Aboriginal heritage site types commonly associated with the Port Stephens regions.

The project area and surrounding lands are populated by a dense network of streams associated with the Williams River, a 7th order waterway which runs mostly parallel to the project area (approximately 200 to 300 m to the west at its closest point). A variety of 1<sup>st</sup>, 2<sup>nd</sup> and two 3<sup>rd</sup> order prescribed watercourses bisect the project area. With such a large water resource located in proximity to the project area and a high-density network of lower order streams, the area would have represented a favourable location for long term occupation (Biosis 2025).

Soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure (Biosis 2025). The Glen William Variant A and Ten Mile Road soil landscapes are present within the project area. The Glen William Variant A soil landscape occupies the majority of the project area. The depths of the soils associated with foot slopes within this soil landscape may be indicative of intact archaeological deposits where soils are relatively undisturbed (Biosis 2025). The Ten Mile Road soil landscape includes multiple watercourses within the project area and it is likely that any archaeological deposits located within the Ten Mile Road soil landscape would have been subject to movement and redeposition from their original contexts (Biosis 2025). Soil landscapes present in the project area are illustrated in **Figure 5-30**.



**Figure 5-30 Soil landscapes**



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Due to the level of clearing that has been undertaken historically, mature vegetation which may hold evidence for resource gathering is unlikely to be present within the project area. Several animal species commonly hunted and utilised by indigenous people are likely to be present within the project area and locality. It is likely that fauna was present and a useful resource for local indigenous people (Biosis 2025).

#### *Land use history*

The project area is located within the traditional lands of the Worimi people. According to Sokoloffnov (1977, p.16 cited in Biosis 2025), the territories of the Worimi were established to include a variety of habitats rich in raw materials and food resources. Trade, intermarriage, and the sharing of ceremonial places were central to the Worimi nation's interaction with neighbouring tribal groups, such as the Awabakal, Kamilaroi, Guringai, Wanaruah, and other tribes within the region (Biosis 2025).

Little is known about the size of the population of the Worimi tribe within Port Stephens before European settlement; however, numbers declined rapidly after contact (Dean-Jones 1990, p.68 cited in Biosis 2025). Exposure to diseases introduced by European settlers, the destruction of food resources, and instances of hostile relations between Europeans and the Worimi and Awabakal people would have contributed significantly to this decline (Biosis 2025).

#### *Aboriginal archaeological sites*

There are numerous studies within the region and locality that were used by Biosis (2025) to determine the likelihood of different Aboriginal archaeological sites. Biosis (2025) reported ■■■ Aboriginal archaeological sites within a ■■■ search area which was centred on the project area. Biosis (2025) also reported that the dominant site type is "artefacts site", representing 45.65% (n=42), followed by PAD representing 21.73% (n=20), modified trees at 9.78% (n=9) and grinding grooves at 7.60% (n=7). This was followed by burial at 4.34% (n=4), ceremonial ring at 3.26% (n=3) and stone arrangement and stone quarry at 2.17% (n=2). One shell, art and Aboriginal ceremony and dreaming site were each detected in the search once (representing 1.08%) (Biosis 2025).

Based on this information Biosis (2025) concluded that there was a moderate potential for flaked stone artefact scatters and isolated artefacts and low potential for PADS, modified trees, grinding grooves, ceremonial ring (stone or earth), stone arrangements, shell middens, quarries, burials, rock shelters with art and/ or deposit, Aboriginal ceremony and dreaming sites, post-contact sites and Aboriginal places.

#### *Archaeological survey*

An archaeological survey was conducted to undertake a systematic survey of the project area targeting areas with the potential for Aboriginal heritage, identify Aboriginal archaeological sites visible on the ground surface where present and identify and record any areas of Aboriginal archaeological sensitivity.



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Constraints to the survey included visibility with some areas obscured from view by ground disturbances and presence of dense vegetation and exposure with the project area displaying limited areas of exposure on the road corridors (Biosis 2025). The central section of the project area had the highest levels of exposure, due to ground disturbances from the pre-existing exposed gravel road (Biosis 2025). In the shoulders on the boundary of the road, exposure was minimal (0–5%) and was limited by areas that were densely vegetated (Biosis 2025).

Disturbance levels within the project area were assessed during the visual inspection (Biosis 2025). Levels of disturbance were categorised through an inspection of the ground surface, landforms, and aerial imagery. The project area has experienced varying levels of disturbance over time. The majority of the project area has been subjected to extensive native vegetation clearance for the construction of East Seaham Road. East Seaham Road consists of a highly modified gravel road with 0.2 to 0.5 m wide shoulders with modified and disturbed ground vegetation, and beyond the shoulder extent, these areas of vegetation vary throughout the road alignment (approximately 6 m wide, but of varying width) (Biosis 2025). There are cleared and regenerating vegetation areas associated with the development of culverts, powerlines and other infrastructure such as services and residential development (Biosis 2025). Disturbance throughout the project area would have impacted both surface and subsurface deposits (Biosis 2025). Soils at locations of vegetation clearing experienced higher levels of displacements and re-deposition in shallow layers (Biosis 2025). The development of East Seaham Road involved the modification of the landform for provision of electricity supply, and disturbance of this nature is characterised as high (Biosis 2025). The excavation undertaken to construct the road would have displaced the soils and thus completely disturbed that region resulting in high disturbance levels. Disturbances of this nature would likely result in the limited preservation of intact archaeological deposits in subsurface layers (Biosis 2025).

Biosis (2025) identified that the project area is situated within an ideal location for the procurement of resources that would have allowed for long term occupation. Biosis (2025) also identified that past archaeological investigations have demonstrated that occupation zones tend to be within 100 m of watercourses. The project area is located parallel to the Williams River, a 7th order waterway. At its closest point, the Williams River is located approximately 200 to 300 m west of the project area. The project area is also bisected by 13 water courses including 2 third order prescribed watercourses which feed into the Williams River. The highest population of these water courses are identified within the southern portion of the project area which is located within an undulating landscape. However, Biosis (2025) identified that with such a large water resource located in proximity to the project area, there is a higher likelihood for Aboriginal sites to exist within 100 m of the Williams River.

Field investigations by Biosis (2025) supported the background research findings with the majority of the East Seaham Road corridor showing evidence of continuous and intensive disturbance. The field investigation indicated that the disturbances ranged between less than 1 m and up to 4 m laterally and up to 1 m vertically due to the installation of drainage systems, electrical poles, fence lines and road construction and grading (Biosis 2025). During the archaeological survey, no Aboriginal sites or objects were identified (Biosis 2025).



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### Non-indigenous heritage

A heritage impact assessment was prepared by Biosis (2025a) in accordance with current heritage guidelines including Assessing Heritage Significance, Assessing Significance for Historical Archaeological Sites and 'Relics' and the Burra Charter. The assessment identifies and assesses the heritage values associated with the project area and surrounds, assesses the impact of the project on the cultural heritage significance of the project area, and identifies sites and features within the project area which are already recognised for their heritage value through statutory and non-statutory heritage listings. The assessment also provides recommended mitigation measures to avoid or mitigate any negative impacts on the heritage significance of the project area. The following information is extracted from this impact assessment.

#### *Heritage items within the locality*

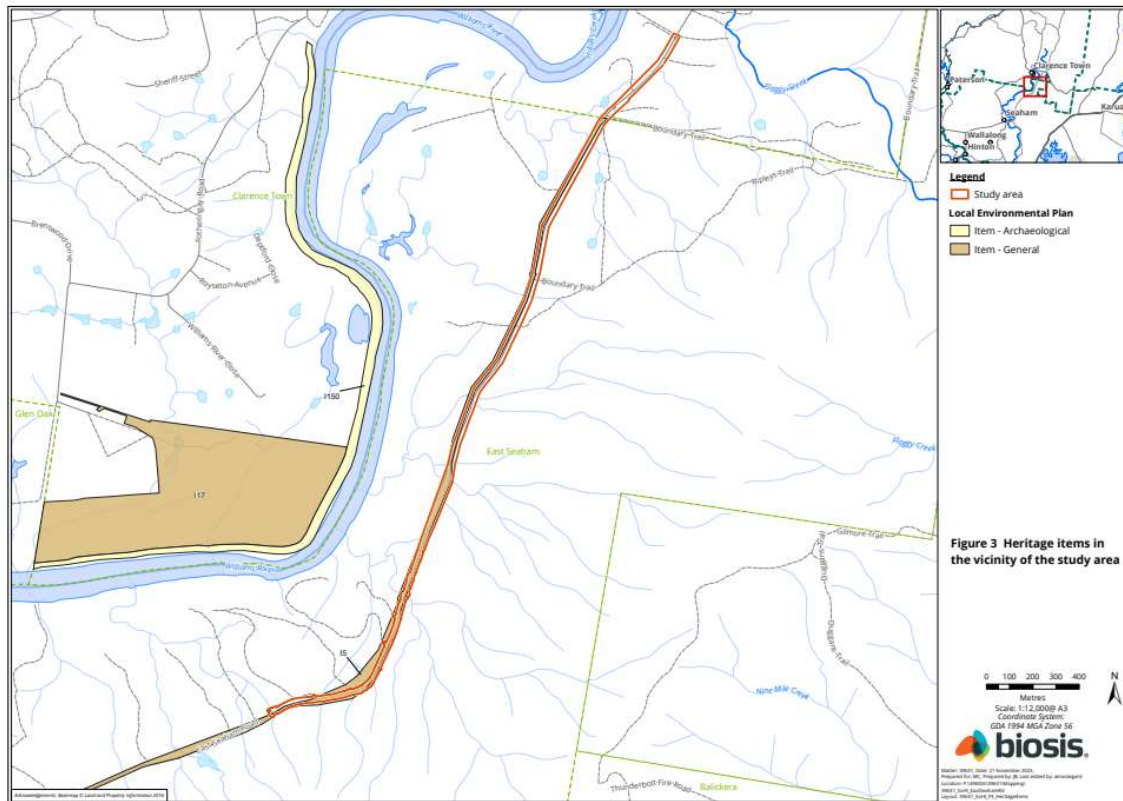
A summary of heritage listings within and in the vicinity of the project area is presented in **Table 5-16** and **Figure 5-31**.

**Table 5-16 Heritage listings within the locality of the project**

Instrument	Site Number	Site name	Address/ property description	Type of listing	Significance
<i>Port Stephens Local Environment Plan 2013</i>	15	Road reserve	East Seaham Road and road reserve, East Seaham	General heritage item	Local
<i>Dungog Local Environment Plan 2014</i>	117	Homestead "Fotheringay"	Lot 3 DP 1221980, 221 Fotheringay Road, Fotheringay	General heritage item	Local
<i>Dungog Local Environment Plan 2014</i>	1150	Marshall & Lowe "Deptford" shipyard site, Fotheringay	Crown Reserve (no street frontage), Lot 7303 DP 1132982, Clarence Town	Archaeological site	Local



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**Figure 5-31 Location of heritage items in relation to the project area (Biosis 2025a)**

### *History of the region and East Seaham Road*

Biosis (2025a) provides an overview of history within the region:

- The first instance of European contact with Port Stephens took place in 1770, when Captain James Cook and the Endeavour passed the harbour on 11 May, naming it for Sir Phillip Stephens, Secretary to the Admiralty.
- Approximately 2 years after the arrival of the First Fleet in 1788, a group of escaped convicts are believed to have entered the region.
- The convict ship Salamander entered the Port Stephens estuary in late 1791.
- In February 1795, Surveyor-General Charles Grimes visited Port Stephens on the orders of Lieutenant-Governor Paterson. Grimes reported that the land was low and sandy, and did not recommend further visits. In August, HMAS Providence took shelter in the harbour, where the captain, W.R. Broughton, encountered four surviving convicts who had escaped from Parramatta and were living with the Worimi people.
- Further visits were made to the Port Stephens area in the first few decades of the 19th century and in December 1811 and January 1812, Governor Lachlan Macquarie and his wife inspected Port Stephens as part of a plan to establish



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a settlement north of Newcastle. Macquarie noted that while the port was 'Good, safe, and capacious', the land was not inviting to settlement and farming. As a result, no government settlement was made.

- John Oxley and a team including Surgeon John Morris and Surveyor Evans surveyed the coastline from Port Macquarie to Newcastle as part of his 1818 expedition to western and northern NSW.
- The Williams River flows through the Hunter Region and provided fertile banks upon which many small agricultural communities were established in the early 1800s. The river also offered a prolific route of transport for trade and thoroughfare. Timber was the region's main economy.
- By 1823 a successful cedar getting industry had developed within the region, but the area became over-exploited and resources dwindled within several years. However, once the Australian Agricultural Company were offered a land grant at Port Stephens in 1825, the area began to be more fully explored.
- The Australian Agricultural Company had been established in 1824 as part of a collective whose purpose was to improve waste lands for agriculture and farming, but mainly for the production of wool.
- By 1828, 23 pastoral stations had been established in Port Stephens, all connected by roadways, with multiple farms and gardens to provide food for a population of almost 600. In 1833, half of the Port Stephens grant was exchanged for land on the Peel River and at Warrah. While the agricultural endeavours of the Company failed at Port Stephens, settlers were encouraged to settle on the Port Stephens Estate.
- The County of Gloucester was officially marked off in 1829. Three more prominent towns had emerged to significance along the Williams River by the 1820s and 1830s, largely driven by the timber industry: Clarence Town; Raymond Terrace; and Seaham. The local region, which was being progressively cleared, proved to be increasingly prolific as grounds for dairy farming, grazing, and agriculture. Infrastructure in the region developed, namely post offices, roads, and boating yards. Grants of land in the region were allocated to new and existing settlers.

The history of the development of East Seaham Road and local infrastructure in general was found not to be well-documented (Biosis 2025a). Biosis (2025a) identified that East Seaham Road was officially named in 1990, previously known as New Line Road (which retains a southern portion named as such). The local orientation of the road relevant to the study area appears to have changed several times over the course of its history as illustrated in **Table 5-17** and **Figures 5-32 to Figure 5-37**.



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**Table 5-17 Chronological summary of the development of the locality (Biosis 2025a)**

Date	Development
1801-1820s	East Seaham Road within project area and adjacent lands likely constructed.
1825-1833	Land within project area likely granted to the Church and Schools Corporation.
1839	First documentation of East Seaham Road within the project area and adjacent lands.
Mid to late 1800s	Historic map of the Williams River area shows the variation of the curtilages of East Seaham Road in early historical documents.
1857 (approximate)	Historic map shows further possible variation in the early curtilages of East Seaham Road.
1879	Old ford crossing to Clarence Town replaced by new Bridge off Limeburners Creek Road, likely impacting the use and curtilages of East Seaham Road.
1904	The curtilages of East Seaham Road appear to have changed to suit the new access route to Clarence Town. Land throughout the project area and adjacent lands have been packaged in various grants, but the road is not consistently considered public.
1909	Historic photograph shows that the landscape around the project area and adjacent lands is largely rural agricultural.
1914	The northern portion of the project area and adjacent lands have been divided into smaller properties. The non-public stretches of East Seaham Road within the project area and adjacent lands are limited to those within H.G. Douglas's properties. The alignment of the road does not yet match its modern appearance.
1910s-1970s	Various roadworks carried out within the project area including culvert construction, gravelling, and rolling.
1958	Historical aerial imagery shows the alignment of East Seaham Road and surrounding vegetation within the project area and adjacent lands. Vegetation is thickest in the southern portion of the study area.
1974	Historical aerial imagery shows changes to the vegetation within the project area and adjacent lands.
1984	Historical aerial imagery shows changes to the vegetation within the project area and adjacent lands.
2001	Historical aerial imagery shows changes to the vegetation within the project area and adjacent lands.
2006	Homestead, "Fotheringay" listed as an item of local heritage significance.
2013	East Seaham Road listed as an item of local heritage significance.
2014	Marshall & Lowe "Deptford" shipyard site, Fotheringaye listed as an item of local heritage significance.





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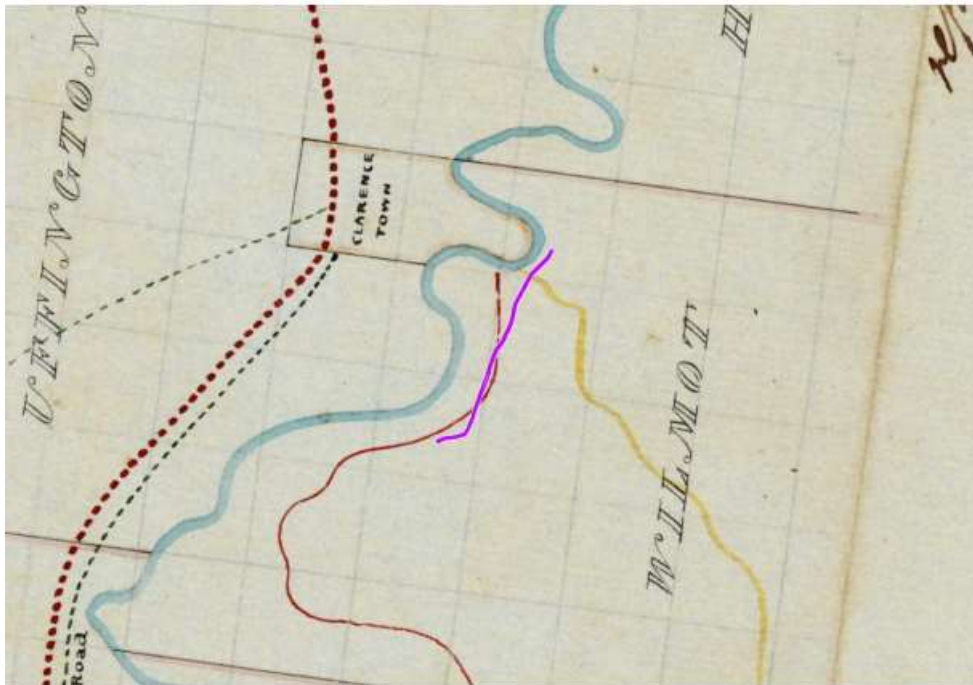


Figure 5-32 Georeferenced map of the proposed roads between Dungog and Maitland from 1839 with the subject site illustrated in purple and the original alignment of East Seaham Road in red (Biosis 2025a)

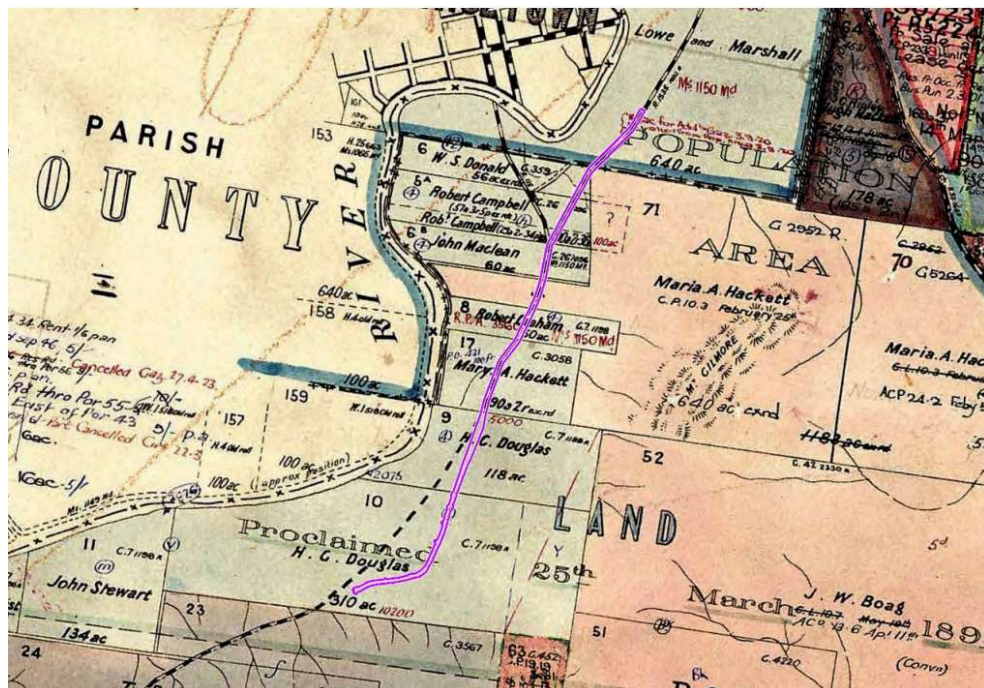


Figure 5-33 Georeferenced map from 1914 showing East Seaham Road with the subject site illustrated in purple (Biosis 2025a)





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**Figure 5-34** Georeferenced aerial photograph from 1958 with the study area outlined in purple (Biosis 2025a)



**Figure 5-35** Georeferenced aerial photograph from 1974 with the study area outlined in purple (Biosis 2025a)



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**Figure 5-36** Georeferenced aerial photograph from 1984 with the study area outlined in purple (Biosis 2025a)



**Figure 5-37** Georeferenced aerial photograph from 2001 with the study area outlined in purple (Biosis 2025a)





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#### *Current site setting*

The landscape character assessment within Biosis (2025a) identifies that East Seaham Road within the project area is adjacent to Wallaroo National Park to the east and private properties, Williams River and “Fotheringay” (Item No. I17) to the west. In the most northern portion of the project area where Wallaroo National Park ceases, private properties border East Seaham Road to the east (Biosis 2025a). The entirety of the project area and surrounding lands are comprised of roadways and associated infrastructure and the road generally runs adjacent to the Williams River which is located approximately 200 to 300 m west of the project area at its closest point and 1.1 kilometres east at its furthest point (Biosis 2025a). Biosis (2025a) identify that the majority of the project area falls within a footslope landform which slopes westerly from Wallaroo National Park towards Williams River and “Fotheringay” (Item No. I17), with a small southern portion located in a valley landform and a small northern portion located partially within a slope landform which descends easterly towards the valley.

The majority of the built fabric within the project area is comprised of the infrastructure associated with the alignment of East Seaham Road which includes large portions of gravel road, various signs related to the road and LGAs (Biosis 2025a).

Stone culverts are noted in the heritage inventory sheet for the East Seaham Road heritage item listing, however, during a site inspection by Biosis (2025a) only 3 concrete culverts were observed. Biosis (2025a) concluded that the stone culverts as referred to in the listing, if they remain, may be in the southernmost portion of East Seaham Road outside the project area or if within project area would be obscured by vegetation, sediment or similar. Eco Logical (cited in Biosis 2025a) conducted a constraints assessment for East Seaham Road which identified 8 culverts, all of which were concrete, suggesting that some modification, loss, replacement, or obscuration/concealment of the earlier reported stone culverts.

It is likely that due to historical works along East Seaham Road including clearing for road re-construction, upgrading of the culverts, installation of services and maintenance grading activities that the deposits around the culverts were possibly disturbed and removed (Biosis 2025a).

#### *Local significance*

The following statement of significance is taken directly from the heritage inventory sheet for the heritage item Road Alignment (Port Stephens LEP 2013), Item I5:

*East Seaham Road is valued not only for its relationship to early transport but because its alignment, vegetation and construction are qualities that represent early access roads throughout the Local Government Area. The alignment of East Seaham Road*



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*follows closely the original alignment of New Line Road in relation to the lie of adjacent properties, the proximity to the Williams River and Wallaroo Nature Reserve. A fine example of a richly tree-lined rural road with high conservation and aesthetic values.*

The following statement of significance is taken directly from the heritage inventory sheet for the heritage item Homestead "Fotheringay" (Dungog LEP 2014, Item 17).

*The study site contains the potential for archaeological remains pertaining to the domestic occupation and use of Fotheringay House for a period of more than 150 years. At present, from preliminary information obtained, the study site is considered to be of potential local archaeological significance. However as the exact construction period and year of the house itself is yet to be determined, without further research and assessment, the site must also be considered as holding potential for archaeological features and remains of state significance. Fotheringay house can be considered to be one of the earliest and most prominent homesteads constructed in Clarence Town during the mid-19th century. The fact that the main road leading to the property is named Fotheringay Road is a direct example of its value to the local community. The size and scale of the main cottage dwelling and its position directly adjacent to the Williams River made Fotheringay house a desirable location. The two long term owners of the property, Charles Felix Holmes and William J. Crocker, both raised their families in Fotheringay House while engaging in the dairy industry as a means of income. The site is an excellent demonstration of the development of rural living in the greater Dungog region, having been continuously occupied for a period of more than 150 years. This in turns offers an extensive archaeological data set which may represent the development and change of domestic practices in Clarence Town during the 19th and 20th centuries.*

The heritage inventory sheet for heritage item Marshall & Lowe "Deptford" shipyard site, Fotheringaye (Dungog LEP 2014 Item I150) does not contain any details regarding the item's history, an evaluation of significance nor a statement of significance (Biosis 2025a). It is presumed there was a shipyard adjacent / on the Williams River. This assessment does not include an archaeological assessment of the heritage item. However, as there are no works proposed within or in the vicinity of this item, there would be no impacts to the item.

#### **5.6.2. Impact assessment**

##### **Aboriginal heritage**

Biosis (2025) conducted an assessment in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010a) for the study area in order to inform responsibilities with regards to Aboriginal cultural heritage. In addition to the basic tasks required for a due diligence assessment, an





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extended background review, as well as an archaeological survey in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010b) was conducted, in order to adequately map areas of high, moderate and low archaeological potential (Biosis 2025).

Biosis (2025) concluded that whilst the environmental context of the project area is reflective of an area that may have been intensively occupied, the continuous and extensive disturbance associated with the construction and maintenance of East Seaham Road has likely destroyed any material evidence relating to site use and therefore the project area is considered to hold low archaeological potential.

The following management recommendations have been developed relevant to the project area and have been influenced by:

- predicted impacts to Aboriginal cultural heritage
- the planning approvals framework
- current best conservation practise, widely considered to include:
  - Ethos of The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance, 2013
  - Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010b).

Prior to any impacts occurring within the project area, the following is recommended (Biosis 2025):

- *Recommendation 1:* No further archaeological assessment is required. No further archaeological work is required in the study area due to the entire study area already being assessed as having low archaeological potential.
- *Recommendation 2:* Discovery of unanticipated Aboriginal objects. All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by Heritage NSW. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object, the archaeologist will provide further recommendations. These may include notifying Heritage NSW and Aboriginal stakeholders.
- *Recommendation 3:* Discovery of Aboriginal ancestral remains. Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity, you must:
  1. immediately cease all work at that location and not further move or disturb the remains



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2. notify the NSW Police and Heritage NSW' Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location
3. not recommence work at that location unless authorised in writing by Heritage NSW.

#### Non-indigenous heritage

Biosis (2025a) assessed the potential heritage impacts of the works in accordance with the Heritage Manual guideline *Statement of Heritage Impacts* and identified that the project area contains part of a local heritage item, Road Alignment, and is in the vicinity of two other heritage items, Homestead "Fotheringay" and Marshall & Lowe "Deptford" shipyard site, Fotheringaye.

Based on the assessment of impacts, overall the proposed works would have a minor but acceptable impact to heritage values to two of the heritage items, including Homestead "Fotheringay" and Marshall & Lowe "Deptford" shipyard site, Fotheringaye.

The works would have a significantly adverse impact on local heritage item, Road Alignment due to the degree of tree removal required. PSC in designing the road minimised these impacts by:

- compromising on the recommended Austroad standards clearzone extents as much as practically possible to reduce tree removal and potential impacts to heritage and biodiversity values of the site, whilst ensuring that the safety of road users was improved
- realigning East Seaham Road at the start of Stage 6 to provide for additional tree retention and minimise impacts to the heritage and biodiversity values of the site.

Whilst Biosis (2025a) assessed the project area as holding low archaeological potential for archaeological resources of heritage significance, should any of the stone culverts noted in the heritage inventory sheet for the heritage item Road Alignment be present within the project area, further assessment would be required as to their heritage significance.

These impacts would remain permanent and enduring.

Maintenance and operation of East Seaham Road would not include any activities likely to impact the local heritage item greater than those impacts during the construction phase.

To minimise impacts Biosis (2025a) made the following recommendations.



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- Recommendation 1:** Treatment of stone culverts. No instances of stone culverts, which are noted in the heritage inventory sheet for the heritage item Road Alignment, were identified within the project area as part of this assessment. However, this does not preclude their presence, as they may have been modified or may not be visible due to overgrown vegetation or sediment build up. Should any stone culverts be identified within the project area and areas of proposed work as the design develops and/or during the course of construction, heritage advice should be sought regarding their condition and assessment of heritage significance. During construction, this might take place in the form of having a heritage representative on site during works, or on standby to undertake site visits to inspect any finds. Ascertaining the presence and significance of possible stone culverts by detailed survey prior to the finalisation of the design of the works would mitigate the design risk of their discovery once the works have commenced. However, such a survey could not be properly carried out without the clearing of low vegetation at the edge of the road so that the ground and drainage can be seen.
- Recommendation 2:** Unexpected finds protocol. Relics are protected under Section 139 of the Heritage Act. The project area has been assessed as holding low archaeological potential for archaeological resources of heritage significance. However, it is recommended that an unexpected finds protocol be implemented as part of the construction management plan for the project to ensure that any unexpected archaeological finds are assessed and managed appropriately and in accordance with the Heritage Act.
- Recommendation 3:** Heritage induction. Due to the presence of part of a heritage item, Road Alignment, within the project area, it is recommended that all staff, contractors and subcontractors working on site undertake a heritage induction. This is recommended so that all staff, contractors and subcontractors are made aware of the heritage item, its elements and significance, as well as their responsibilities under and penalties for breaching of the Heritage Act or carrying out unapproved works that impact the heritage values of the site.

#### 5.6.3. Mitigation measures

Table 5-18 Mitigation measures for heritage

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction



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Mitigation measure	Timing
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>site sensitivities and their relevance to the proposal including: <ul style="list-style-type: none"> <li>heritage values of the site.</li> </ul> </li> <li>QF-ENV-008 Unexpected finds procedures (CAP WKS)</li> <li>exclusion fencing requirements.</li> </ul>	Pre-construction
<b>General</b>	
Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.	Pre-construction Construction Operation
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
<b>Monitoring and unexpected finds</b>	
Visually monitor for any signs of the following: <ul style="list-style-type: none"> <li>Aboriginal objects such as stone artefacts or shell middens. All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by Heritage NSW. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object, the archaeologist will provide further recommendations. These may include notifying Heritage NSW and Aboriginal stakeholders. If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).</li> <li>Discovery of Aboriginal ancestral remains. Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity, you must: <ul style="list-style-type: none"> <li>immediately cease all work at that location and not further move or disturb the remains</li> <li>notify the NSW Police and Heritage NSW' Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location</li> <li>not recommence work at that location unless authorised in writing by Heritage NSW.</li> </ul> </li> </ul> <p>If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).</p>	Construction Operation





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Mitigation measure	Timing
<ul style="list-style-type: none"> <li>Cultural heritage item(s) including specifically stone culverts. Should any stone culverts be identified within the project area and areas of proposed work, heritage advice should be sought regarding their condition and assessment of heritage significance. If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).</li> <li>Relics protected under Section 139 of the <i>NSW Heritage Act 1977</i>. The project area has been assessed as holding low archaeological potential for archaeological resources of heritage significance. However, it is recommended that an unexpected finds protocol be implemented as part of the construction management plan for the project to ensure that any unexpected archaeological finds are assessed and managed appropriately and in accordance with the Heritage Act.</li> </ul>	



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### 5.7. Noise & Vibration

This section describes the potential noise and vibration impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

Key issues to be addressed from the SEARS are:

*An assessment of construction noise and vibration impacts on nearby sensitive receivers and structures, and outline the proposed management and mitigation measures that would be implemented.*

#### 5.7.1. Existing environment

The existing noise environment surrounding the project area is dominated by rural residential land uses and vehicles using East Seaham Road.

Sensitive receivers within the locality include rural residential receivers and ecological receivers. Overall there are 16 rural residential receivers within 1 km of the site. There are 3 rural residential receivers within 100 m of the works, 1 within 200 m, 2 within 300 m, 2 within 400 m, 1 within 500 m and a further 7 within 1km of the works. There are no residential receivers within 50 m. Ecological receivers include Wallaroo National Park which is located to the east of, and adjacent to East Seaham Road, surrounding bushland and waterways on surrounding private lands and the Williams River located approximately 200 to 300 m west of the site at its closest point (to which the site drains).

Existing noise levels would be generally higher in the daytime due to land management activities being carried out on surrounding lands and higher traffic volumes during daylight hours. The existing noise setting is characteristic of a quiet rural setting.

Based on recent traffic counts on average there is 400 vehicle movements on East Seaham Road per day with approximately 9% comprising of heavy vehicles.

#### 5.7.2. Impact assessment

The primary impact would be increased noise levels with standard daylight construction hours during the construction period for sensitive receivers. No receivers would be noise affected outside of standard construction hours.

Works have the potential to impact native fauna. For impacts to native fauna see **Section 5.2.3.**



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No noise receivers are likely to be highly affected by noise. Noise levels however, would be moderately intrusive for some residential receivers along the roadway, all of which are within 200 m of the works and potentially highly intrusive for 3 residential receivers where works are within 50 to 100 m of the dwelling.

Residential receivers would potentially be most affected where culvert works are occurring, due to culvert works likely extending the duration of works within the vicinity of these properties.

The project includes outdoor activities with minimal isolation or containments from sensitive receivers and limited opportunities available to control noise at the source and in the path.

The project is linear in nature and would be carried out progressively such that the duration of noise impacts experienced at any individual receiver would be substantially smaller than the total construction duration.

No receivers would be noise affected outside of standard construction hours.

Noise generating plant, equipment and machinery would include:

- backhoe
- bulldozer
- chainsaw
- concrete pump
- concrete saw
- concrete truck
- concrete vibrator
- dump trucks
- delivery trucks
- diamond grinding
- front end loader
- generator
- grader
- hydraulic hammers
- light vehicles
- mobile crane for lifting precast pipes, headwalls and culverts
- road profiler
- pneumatic jackhammer
- pneumatic tyre roller
- power generator
- roller
- small hand tools
- steel drumroller
- tracked excavator
- site trucks
- tub and grinder mulcher
- vacuum truck
- vibroplates
- water cart
- vibratory roller.

Construction road traffic noise would be generated by vehicles associated with the construction of the project, including heavy vehicles transporting spoil and light vehicle movements generated by construction workers. The estimated average daily vehicle movements required for construction would be 60 truck movements per day (45 minute load/ haul and tip time over an 8 hour day with 6 trucks on rotation).



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This may increase once Dungog Council commence works on the new Clarence Town bridge. The new bridge will be built adjacent to the heritage-listed Brig O'Johnston Bridge on Limeburners Creek Road. Bridge construction is due to commence mid-2025, which will coincide with the works on East Seaham Road. Due to load limits on the Brig O-Johnston Bridge heavy vehicles over 15 tonnes would likely be diverted through East Seaham Road when requiring access to and from the northern side of the new Clarence Town Bridge for the period of the 18 month construction period estimated to commence mid-2025. PSC has been liaising with Dungog Council to ensure the impacts for both projects are adequately considered in the traffic management plans for the respective projects.

These additional works will result in increased truck movements and resultant noise along East Seaham Road. A Traffic Management Plan would be prepared for the works, and where possible should include the impacts of the works by Dungog Council. Once the details of the extent of increased vehicle movements is known, this would be communicated to the community. PSC has assumed all vehicle movements associated with the new bridge construction by Dungog Council would be during standard construction hours. Dungog Council would be responsible for ensuring any increased impacts on sensitive receivers as a result of the new bridge works would be communicated to those impacted and considered, as part of any environmental assessment prepared for the works.

Vibration impacts have been considered for properties along the East Seaham Road alignment within the project area. The number of receivers where human comfort and structural damage is unlikely to occur.

Individual consultation with each landholder adjacent to the project area has been conducted in the preceding 12 months. A community workshop was also held on 5 February 2025 to help provide the local community with an additional opportunity to voice concerns. Noise was not identified as a major community concern.

Community notification would occur in accordance with the project specific engagement plan prepared for the works. Notification of works would occur to provide advance warning of the works and potential disruptions for local residents. Notification would consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification would include the likely noise impact of the work without understating its effect and any work activities or equipment that will be particularly noisy or noticeable. Notification would be provided a minimum of 10 working days prior to the start of works. Consultation with affected landowners would be continual throughout the construction period of the project.





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Operational noise would be dominated by grading machine for future shoulder grading or heavy patch plant for heavy patching works. The same noise receivers would be impacted, however, likely to a lesser extent than during construction works. No long term onsite operational facilities would be required as part of the works.

An increase in traffic volumes may occur over time as the road has improved condition and as areas grow. Dungog and East Seaham are suburbs which continue to see families in particular moving into the area. The areas however, are not NSW State Government Growth areas and maintain a relatively small population with small growth rates (ABS accessed 25/02/2025). Road volumes would be unlikely to increase to an extent where traffic noise becomes a neighbourhood concern.

### 5.7.3. Mitigation measures

This section identifies the relevant mitigation measures to be implemented to manage potential noise and vibration associated with the project.

The below measures are expected to control the potential impacts from the project as far as practicable. Residual impacts are, however, expected to remain, particularly when noise intensive activities are being carried out near sensitive receivers. Increased consultation with those receivers would be conducted to minimise any potential impacts.

**Table 5-19 Mitigation measures for noise and vibration**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Community notification must occur in accordance with the project specific engagement plan prepared for the works. Notification of works should occur to provide advance warning of the works and potential disruptions for all sensitive land uses. Notification may consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification should include the likely noise impact of the work without understating its effect and any work activities or equipment that will be particularly noisy or noticeable. Notification should be provided a minimum of 10 working	Pre-construction



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Mitigation measure	Timing
days prior to the start of works.	
Handle enquiries and complaints in accordance with Council's complaints handling procedures and eliminate or minimise the issue where practical.	Construction Operation
Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>permissible hours of work (including for deliveries)</li> <li>site sensitivities and their relevance to the proposal including: <ul style="list-style-type: none"> <li>surrounding rural residential development.</li> </ul> </li> <li>noise and vibration management requirements including any site specific and relevant mitigation measures, any limitations on high noise generation activities, and the location of the nearest sensitive receivers</li> <li>site compound areas and construction employee parking areas and designated loading/unloading areas and procedures.</li> </ul>	Pre-construction
<b>General</b>	
Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.	Pre-construction Construction Operation
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
Conduct all activities between the daylight hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays. No work on Sundays, public holidays or night works are permitted.	Construction Operation
<b>Monitoring and unexpected finds</b>	
Periodically check the site, nearby residences and other sensitive land users to proactively identify noise issues and feasible and reasonable mitigation.	Construction Operation
<b>Pollution prevention</b>	
Operate, inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions. Requirements include: <ul style="list-style-type: none"> <li>ensuring air lines on pneumatic equipment do not leak and plant silencers are well maintained</li> <li>ensuring plant and equipment are fitted with approved exhaust systems (to maintain exhaust emissions within acceptable standards)</li> <li>personnel onsite are to be trained and proficient in the operation of plant, equipment and vehicular procedures for the required tasks and ways to reduce impacts</li> </ul>	Construction Operation



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Mitigation measure	Timing
<ul style="list-style-type: none"> <li>inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions.</li> </ul>	
<p>To reduce operational noise and vibration onsite:</p> <ul style="list-style-type: none"> <li>avoid the use of equipment that generates impulsive, tonal or irregular noise. Where feasible and reasonable, adopt less-annoying alternatives to 'beeper' alarms, such as smart alarms that adjust their volume to the ambient level of noise and 'broadband' alarms</li> <li>only use the necessary size and power equipment and identify and use equipment with the lowest noise emissions in its class to complete specific tasks e.g. prioritise the use of super-silenced compressors, silenced jackhammers and damped bits and select the most effective mufflers, enclosures and low-noise tool bits and blades. Always seek the manufacturer's advice before modifying plant, equipment or vehicles to reduce noise</li> <li>use portable plant, machinery or equipment with the potential to create high levels of noise that incorporates effective noise control. Where possible locate the plant, machinery or equipment onsite to provide a natural ground barrier between the plant, machinery or equipment and any sensitive receiving environments</li> <li>where feasible and reasonable, implement quiet work methods for diesel and petrol engines and pneumatic units (such as hydraulic or electric-controlled units) and where there is no electricity supply, consider an electrical generator away from residences or within an acoustic enclosure</li> <li>avoid placing noise-producing equipment where surfaces will reflect noise or reduce the effectiveness of mitigation</li> <li>maximise the offset distance between noisy plant and adjacent receivers where feasible and only have necessary equipment on site and working. Where possible, avoid mobile plant and equipment clustering near residences and other sensitive land uses</li> <li>use quieter work methods with minimal vibration where feasible and reasonable</li> <li>monitor weather conditions for adverse weather that may increase impacts such as noise and vibration, emissions and odours and where possible schedule works to avoid these periods. Do not undertake works during inclement weather to minimise the risk of damage to assets and ensure there is no compromise of site safety. Where severe weather is forecast, undertake all reasonable precautions to prepare and secure the site for a storm event and help minimise the potential for damage. If heavy rain is forecast in the next 24 hours delay commencement or cease works until such time a suitable dry period of weather is forecast</li> <li>do not alter designated access and egress. Inform truck drivers of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices, such as minimising use of engine brakes and avoiding engine idling</li> <li>optimise the number of vehicle trips to and from the site. For example to minimise noise and congestion, where possible, organise amalgamated loads rather than using several vehicles with smaller loads and minimise the number arriving at any one time</li> <li>ensure personnel onsite are to be trained and proficient in the operation of plant, equipment and vehicular procedures for the required tasks, and ways to reduce impacts</li> <li>inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions</li> <li>restrict and schedule deliveries to standard daytime working hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays. Where deliveries must be made during the evening or night-time (or on weekends or public holidays), schedule vehicle movements</li> </ul>	<p>Construction Operation</p>



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Mitigation measure	Timing
<p>to avoid residential streets where possible and ensure requirements are clearly communicated. Identify a parking area away from noise sensitive receivers for deliveries that arrive prior to the site being open and ensure the loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers</p> <ul style="list-style-type: none"><li>• locate compounds and anything within the compound away from sensitive receivers</li><li>• monitoring for atypically high noise levels and/or annoying characteristics and removing the equipment from operation until repaired or replaced.</li></ul>	





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### 5.8. Soil and Water

This chapter describes the potential soil and water impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts. For modelling of water quality impacts and drainage see, **Attachment 14**, **Attachment 15** and **Attachment 16**.

Key issues to be addressed from the SEARS are:

*An assessment of potential impacts on soil resources and riparian lands on and near the site, including soil erosion, salinity and acid sulfate soils; and a surface and groundwater impact assessment, including surface water resources (quality and quantity), including related infrastructure, hydrology, dependent ecosystems, drainage lines, downstream assets and watercourses, and groundwater resources in accordance with the relevant groundwater guidelines.*

#### 5.8.1. Existing environment

For a description of riparian lands and groundwater dependant ecosystems and key fish habitat see **Section 5.2 Biodiversity**.

### Geology

Reference to the 1:250,000 Newcastle Geological Map indicates that the site is underlain by Quaternary deposits consisting of gravel, sand, silt, clay, waterloo rock, as well as marine and freshwater deposits (Hunter Civilab 2024).

### Soils

Reference to the 1:100,000 Newcastle Soil Landscape Sheet indicates that the site is underlain by the Glen William Landscape which is characterized by:

- undulating low hills to gently undulating rises on Carboniferous volcanics and sediments
- level plain to gently undulating rises on alluvial terrace deposits of undetermined age in the Clarencetown Hills region
- slopes 1 to 15%, local relief up to 50 m and elevation to 60 m
- shallow to moderately deep (70 →130 cm), well to imperfectly drained Yellow Podzolic Soils (Dy3.41, Dy2.41) on footslopes, shallow (50 cm), well drained Bleached Loams (Um2.12) on volcanics and sediments, shallow to deep (50–>250 cm), moderately well-drained Brown Podzolic Soils (Db1.11, Db2.21) and some imperfectly drained Yellow Podzolic Soils (Dy3.21, Dy2.11) on alluvial terraces (Hunter Civilab 2024).

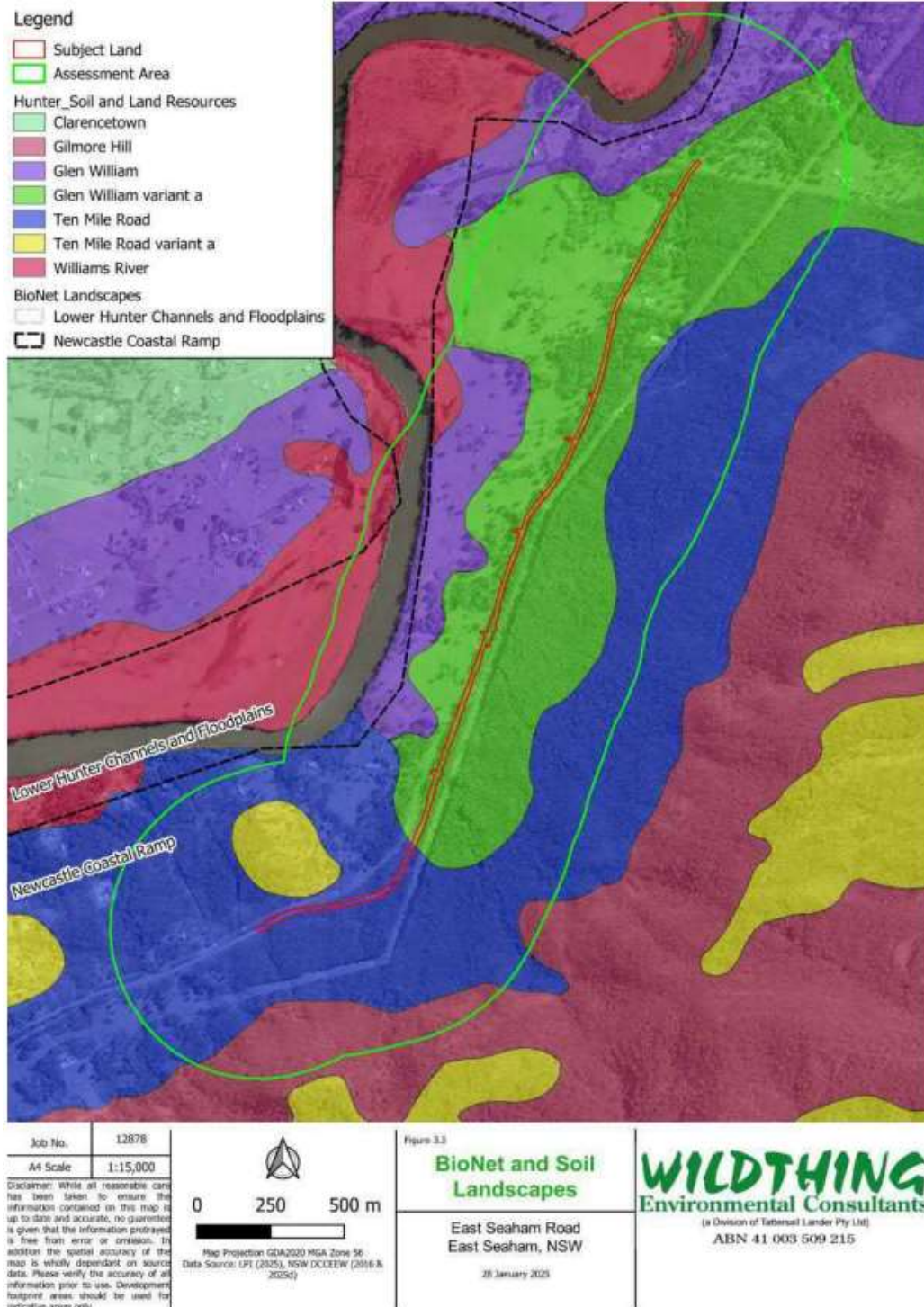


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See **Figure 3-38** which shows the soils landscapes within the locality of the project.





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*Figure 5-38 Soil landscapes*

#### Salinity

Salinity refers to the salt content of soil or water and is caused by the build-up of salt in surface soil or water. The risk of salinity impacts can be increased by clearing vegetation, irrigation or other activities that can lead to a temporary rise in the groundwater table, which then leaves salt behind as it recedes. Based on searches of the National Assessment Dryland Salinity data, there are no areas of soil salinity recorded near the project. The overall salinity hazard alignment is identified as 'very low' by the Hydrogeological Landscapes of New South Wales and the Australian Capital Territory (Department of Planning and Environment 2016b).

#### Acid sulfate soils

Acid sulfate soils are naturally occurring soils containing iron sulfides, which upon exposure to air, oxidise and create sulfuric acid. Disturbance of acid sulfate soils and/or potential acid sulfate soils can result in adverse impacts on surface and groundwater quality, flora and fauna, and degradation of habitats. Reference to the NSW Office of Environment and Heritage's online database 'ESPADE' indicates that the site lies in an area of no known occurrences of acid sulfate soils (Hunter Civilab 2024).

#### Mine subsidence

Reference to Subsidence Advisory NSW Mine District Maps indicates that the site does not lie within a Mine Subsidence District (Hunter Civilab 2024).

#### Catchments and waterways

The Williams River Catchment encompasses an area of 974 km<sup>2</sup> with land uses estimated to be around 80% agriculture, 14% National Parks and 6% owned directly by Hunter Water (Hunter Water 2022). Main townships and various residential areas are within the catchment namely Dungog, Clarence Town, and Seaham.

Runoff from the project would ultimately drain from the site via unnamed tributaries to the Williams River and Hunter River. **Figure 5-39** illustrates the waterways bisecting the project area. **Figure 5-25** and **Figure 5-26** in **Section 5.4.1** illustrate the catchments and their watercourses. All of the watercourses that bisect the project area are ephemeral streams.





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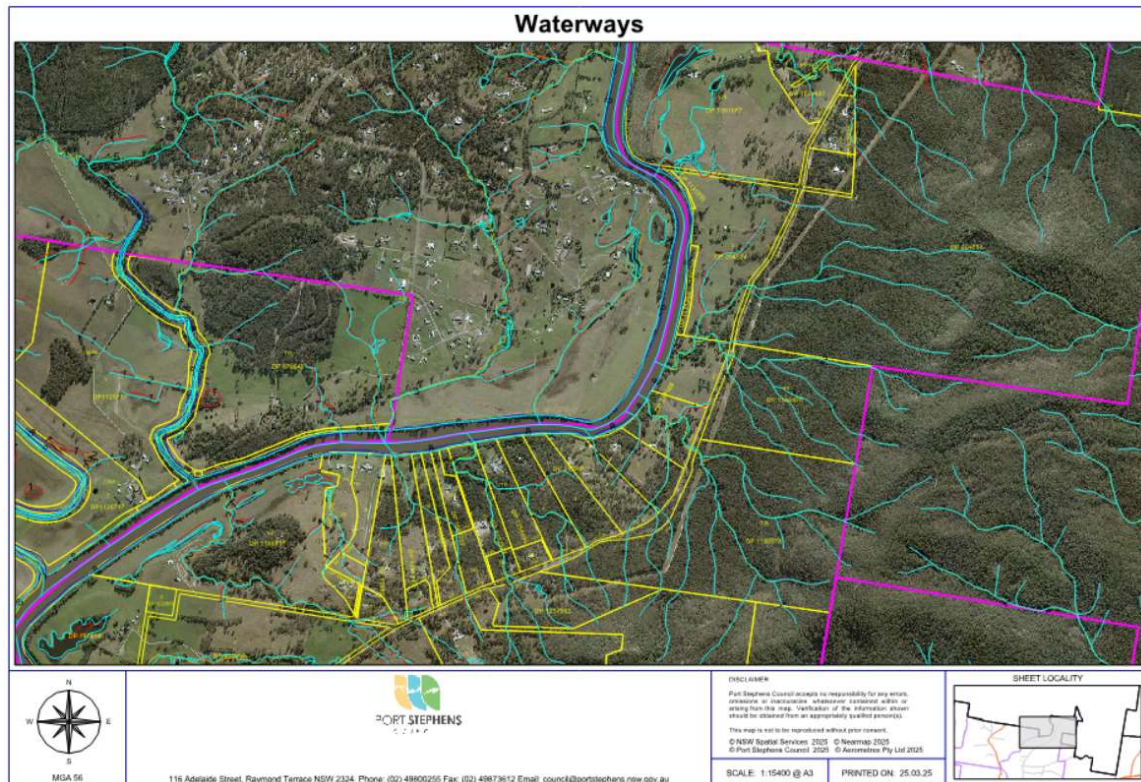


Figure 5-39 Waterways

### Surface water (quality) and Hunter Water supply

The Williams River is the primary drinking water source for the population of the Lower Hunter region, contributing about 50% of the water supplied (Hunter Water 2022). Hunter Water harvests raw water from the river at Seaham Weir and pumps it into Grahamstown Dam. Water is then pumped from the dam to the water treatment plant for treatment to meet public health standards before being supplied to customers (Hunter Water 2022).

Hunter Water manages the drinking water supply system in line with the Australian Drinking Water Guidelines 2011 (updated 2024). Monitoring of the water in the Williams River during the past 30 years has shown that water quality is declining (Hunter Water 2022). Land use activities including clearing, and run-off from agricultural and developed areas have also contributed to the declining water quality. One nutrient in particular, phosphate, has shown to be elevated in areas impacted by erosion (Hunter Water 2022).

Natural processes that affect water quality within the catchment would also include flood, fire and drought.





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Key threats to water quality in the river catchments include runoff from agricultural lands, which can include chemicals (such as pesticides, herbicides and fertilisers) as well as contamination from livestock faeces and urine, which contain pathogens and nutrients (particularly nitrogen and phosphorus) (Hunter Water 2017). Onsite sewage treatment and disposal systems (such as septic tanks and infiltration trenches) on unsewered properties are also a major potential source of pathogens and nutrients in river catchments (Hunter Water 2017). Excess nutrients in waterways can cause problematic algal blooms in rivers and dams, and can make the water more difficult and costly to treat (Hunter Water 2017). Both human and animal wastes can contain pharmaceutical compounds, which are often persistent in the environment for long periods of time and can be difficult to remove from water (Hunter Water 2017).

Erosion of riverbanks has long been recognised as a key factor contributing to poor water quality in waterways. Increased amounts of soil particles in the water from erosion and run-off results in high turbidity, which also results in elevated concentrations of nutrients in the water that can cause algal blooms, and an increased number of micro-organisms that can present a risk to public health (Hunter Water 2022). High turbidity results in higher water temperature and reduced light penetration that impacts on the ability of aquatic plants and animals to survive. In these ways erosion results in impacts on the ecology of the river (Hunter Water 2022).

Hunter Water has conducted routine water quality monitoring in the Seaham weir pool (and other parts of the river) and this monitoring has been undertaken continuously for approximately 30 years. Water quality monitoring results are typically complex due to the high variability in rainfall and, consequently, river flows (Hunter Water 2022). Following is a summary of main water quality attributes based on the results of this monitoring:

- **Total Suspended Solids** is a measure of suspended particulate matter, mainly soil, in the water that is a direct consequence of erosion and contributes to turbidity. The results of long-term water quality monitoring show that suspended solids concentrations have been steadily increasing over time, with the trend in suspended solids showing an increase of approximately 40% over the monitoring period.
- **Phosphorus** is one of the primary essential nutrients for growth and is closely associated with soil particles due to its chemistry. As the concentration of soil particles in the water increases, the concentration of phosphorus also increases. The trend in total phosphorus concentration reflects that of suspended solids and shows an increase in phosphorus levels of approximately 50% over the monitoring period.
- **Nitrogen** is also one of the primary essential nutrients for growth but is not closely linked to soil particles like phosphorus is. Nitrogen has a greater tendency to be dissolved in the water due to its chemistry. Water quality



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results show a slight increasing trend in total nitrogen over the monitoring period, although this is not conclusive.

Deterioration in the water quality impacts on drinking water quality, elevated concentrations of these factors lead to an increased risk of algal blooms in the river, which affects all water users (Hunter Water 2022).

#### Water related infrastructure

Water related infrastructure within the project area includes culverts. **Figure 5-25** and **Figure 5-26** in **Section 5.4.1** identify the culvert locations and sizes. Water related infrastructure on surrounding lands includes open drainage channels/ watercourses.

#### Groundwater

Hydrogeological investigations in the Hunter subregion have been undertaken for decades with earlier publications available to the project dating back to 1958, with some references from the early 1890s (Australian Government 2019). These studies indicate that the hydrogeological systems in the subregion are largely influenced by bedrock origin and tectonic activities during the post-Carboniferous period (Australian Government 2019). These systems are broadly grouped in three hydrogeological units including alluvial aquifers along major rivers and creek lines, coastal aquifers in the coastal area, and Triassic-Permian fractured rock aquifers of the Hunter subregion. These aquifer types are spatially variable and mostly localised.

Groundwater investigations were conducted as part of the geotechnical investigation for the project. Groundwater was only encountered at the site in borehole N3 at 1 m from surface and was located adjacent to existing creek line (Hunter Civilab 2024). Surface water was encountered at the site within draining line / creek bed (Hunter Civilab 2024). **Figure 5-40** illustrates the location of borehole N3

PCT 4042 is a vegetation community that is more common in the lower areas of the floodplain. Due to the locality, rainfall volumes and distribution, and ephemeral nature of the waterways onsite, PCT 4042 is unlikely to rely solely on groundwater and would likely be more dependent on rainfall, surface flows within the ephemeral waterways onsite and periodic flooding (Wildthing Environmental Consultants 2025).

Based on the PCTs identified in the construction footprint during field surveys and the GDE Atlas, it is likely that some of the PCTs present in the construction footprint would have a degree of groundwater dependence, however, they are unlikely to be entirely dependent on groundwater and are likely to be opportunistic GDEs that depend on the subsurface presence of groundwater during dry periods (Wildthing Environmental Consultants 2025).



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**Figure 5-40 Location of Borehole N3**

#### 5.8.2. Impact assessment

For impacts to riparian lands and groundwater dependant ecosystems and key fish habitat see **Section 5.2 Biodiversity**.

#### *Soil resources (impacts to soil erosion, salinity, acid sulfate soils)*

Construction of the project would temporarily expose the natural ground surface and subsurface through the removal of vegetation and excavation and compaction of topsoil. The temporary exposure and stockpiling of soil will expose it to water runoff and wind, which could increase soil erosion potential. There is the potential that exposed soils and other unconsolidated materials (such as spoil, sand and other aggregates) could be transported from the construction footprint into surrounding waterways via stormwater runoff. Erosion controls would be implemented to manage this risk.

It is unlikely that saline or acid sulfate soils would be encountered during construction. Unexpected saline or acid sulfate soils encountered during construction would be managed in accordance with the relevant unexpected finds procedures for the project.



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Construction activities may result in potential soil, surface water or groundwater contamination from the following activities (if unmitigated) due to:

- spills of oils, fuels or chemicals from plant and equipment in the construction footprint
- importing or backfilling of excavations with potentially contaminated spoil
- stockpiling of potentially contaminated spoil.

In addition, there is a risk of disturbing existing contaminated soil, which could result in:

- exposure of project workers and surrounding human receptors to contamination
- generation of contaminated surface water runoff from contaminated soils which could discharge to waterways or surrounding land
- generation of solid or liquid waste requiring disposal to landfill or a liquid waste facility.

No high or medium risk areas for contamination were identified within the project area (Hunter Environmental Consulting 2024), and areas identified as low risk would be managed through standard mitigation measures. Unexpected areas of contamination encountered during construction would be managed in accordance with the relevant unexpected finds procedures for the project

During operation, potential impacts from saline or acid sulfate soils or erosion and sedimentation impacts would be negligible as soils would generally not be disturbed during operation of the project. The project area is located within land mapped as low to extremely low acid sulfate soil probability, the overall salinity hazard is also low and exposed soil would be rehabilitated with vegetation cover to minimise future erosion and sedimentation.

*Surface water (quality and quantity including related infrastructure, hydrology, drainage lines, downstream assets and watercourses)*

The construction of the project has the potential to temporarily impact the water quality of waterways within the project area and areas downstream of the project due to:

- clearing of vegetation and exposure of soils which could result in mobilisation and release of sediment laden runoff from construction areas or stockpiles of soil
- direct disturbance of waterway bed and/or banks as a result of earthworks and culvert installation which could result in soil and bank erosion and mobilisation of sediments into receiving waterways
- loading and transporting of materials, stockpiling, earthworks, and demolition of structures which could result in dust, litter and other pollutants being mobilised by wind and stormwater runoff into waterways





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- vehicle movement across construction footprints which may loosen soils and transport sediment onto public roads and into the waterways.

This could cause sediments to smother receiving waterways, impacting aquatic ecosystems due to increased turbidity, lower dissolved oxygen levels, and increased toxicant concentrations, which could impact aquatic ecosystems and increased nutrients loads, which could lead to algal blooms and aquatic weed growth. This could potentially impact the health of aquatic ecosystems, irrigation and livestock. Visual amenity could also be reduced due to the presence of turbid water and visible gross pollutants.

The leakage or spillage of oils, fuel and/or chemicals from machinery or equipment, during refuelling or by accidental spill, could also potentially result in pollutants being conveyed to downstream waterways. This could lead to oil sheens on the water surface downstream of the project area which could impact amenity, and increased toxicant concentrations could lead to fish kills and other impacts to aquatic ecosystems and livestock.

Concreting activities could result in accidental runoff of concrete washout water into waterways through spills of excess or waste concrete being discharged near a watercourse. This has the potential to result in increased alkalinity and toxicant concentrations in waterways, which could lead to impacts to aquatic ecosystems such as fish kills and undesirable impacts to livestock.

Earthworks and changes to the site would result in concentrated flows that have potential to disrupt existing surface water flow paths, scour the earth and increase sediment loads carried by surface waters. This could increase turbidity, lower dissolved oxygen levels and increase nutrient transport and levels which could lead to algal blooms and aquatic weed growth. It may also reduce visual amenity due to increased turbidity and cause erosion affecting channel geomorphology and bank stability.

To help minimise potential impacts, erosion and sedimentation management measures would be further detailed in the CEMP. These measures would be implemented in accordance with Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (DECC 2008), commonly referred to as the 'Blue Book'. A dewatering management plan would also be required to be prepared in accordance with Transport for NSW technical guidelines. Access to the project area would also be limited and with the implementation of the mitigation measures, potential construction impacts would be appropriately managed and would be negligible.



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If dewatering activities are required, the open excavations following periods of rainfall may contain sediments and other pollutants that would be mobilised by the rainfall and potentially increase alkalinity and toxicant concentrations, which could lead to fish kills and other undesirable impacts to aquatic ecosystems and livestock downstream. Increased turbidity and lower dissolved oxygen levels and nutrients could also lead to algal blooms and aquatic weed growth, which could impact aquatic ecosystems, amenity, and livestock. A dewatering plan would be developed that includes water monitoring locations to be monitored prior to, during and post completion of dewatering activities. A qualified hydrologist or environmental scientist or equivalently experienced professional will be engaged to undertake water quality monitoring activities, review collected data and advise on appropriate mitigation and management measures.

During operation of the project, there is potential for the following impacts, if not managed appropriately:

- increased sedimentation which could affect receiving waterways impacting aquatic ecosystems
- increased turbidity, lower dissolved oxygen levels, and increases in toxicant concentrations could impact aquatic ecosystems and livestock
- nutrients in runoff could lead to algal blooms and aquatic weed growth, which could impact aquatic ecosystems and livestock
- reduced visual amenity from turbid water and visible gross pollutants, impacting visual amenity
- increase in scour and erosion potential due to increase in impervious surface, mitigated by the roadside drainage channels
- structural changes in creek lines due to flow induced changes in geomorphology, or hydrological changes.

MUSIC rainwater runoff modelling was completed to assess the change in pollutant load associated with the upgrade of East Seaham Road. East Seaham Road is located within the Hunter Water Drinking Catchment and NorBE (Neutral or Beneficial Effect) water quality criteria apply. To model the road upgrade, the areas of the existing unsealed road and final sealed road were extracted from the plans. There is 1.75 ha of existing unsealed road which will change to 2.63 ha of sealed road.

Water quality treatment measures modelled included swales and buffer strips to mimic the drainage swales and vegetated verges designed as part of the final design (PSC, 2025a). To model the water quality impacts of the grassed drainage swales, the total length of roadside swales was determined from the design plans and a typical cross section of a swale from the design plans was used to reflect the average swale dimension (PSC, 2025a).



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The MUSIC modelling demonstrated changes in pollution load when considering the existing unsealed road compared to the ultimate road design. Pollution loads for TSS (Total Suspended Solids) and TP (Total Phosphorous) were reduced and met NorBE criteria (PSC, 2025a). The pollutant loads for TN (Total Nitrogen) and gross pollutants increased by 44% for TN and 7% for GP.

There are substantial buffer areas between East Seaham Road and the ultimate discharge locations at various points along the Williams River with runoff from all areas of East Seaham Road generally flowing overland for at least 300 m via existing overland flow paths in private properties before discharging to the Williams River (2025a). It is likely that the designed rock scour protection at culvert crossings and the grassed overland flow areas to the river will provide additional water quality treatment that has not been included in the current MUSIC model and would further reduce both GP and TN loads (PSC, 2025a). It is also likely that the designed rock scour protection at culvert crossings and the grassed overland flow areas to the river would provide geomorphic protection.

The MUSIC model also determines pollutants loads based solely on a defined surface type and for roads, the main source of pollution is generated from traffic volume (PSC, 2025a). The upgrading of the existing unsealed road to a sealed road may attract additional traffic volume, however the usage of East Seaham Road being a single lane road each way remains largely unchanged and it is possible that the projected change in pollution generation could be slightly inflated (PSC 2025a).

Due to the likely small scope of maintenance and operational activities, the project would not be expected to significantly impact the environmental values and water quality objectives of the receiving environment and any impacts would be minor. Geomorphic protection is also provided, as detailed on the designs prepared for the project, to help minimise geomorphic changes in local watercourses.

*Groundwater (groundwater resources in accordance with the relevant groundwater guidelines)*

Groundwater is unlikely to be encountered for the majority of the works due to the shallow excavation depths proposed.

Potential for groundwater interaction exists during dewatering activities for construction of the culvert at Stage 6 chainage 4550 adjacent to 873 East Seaham Road to the west and Wallaroo National Park to the east.

Groundwater investigations were conducted as part of the geotechnical investigation for the project. Groundwater was only encountered at the site in borehole N3 at 1 m

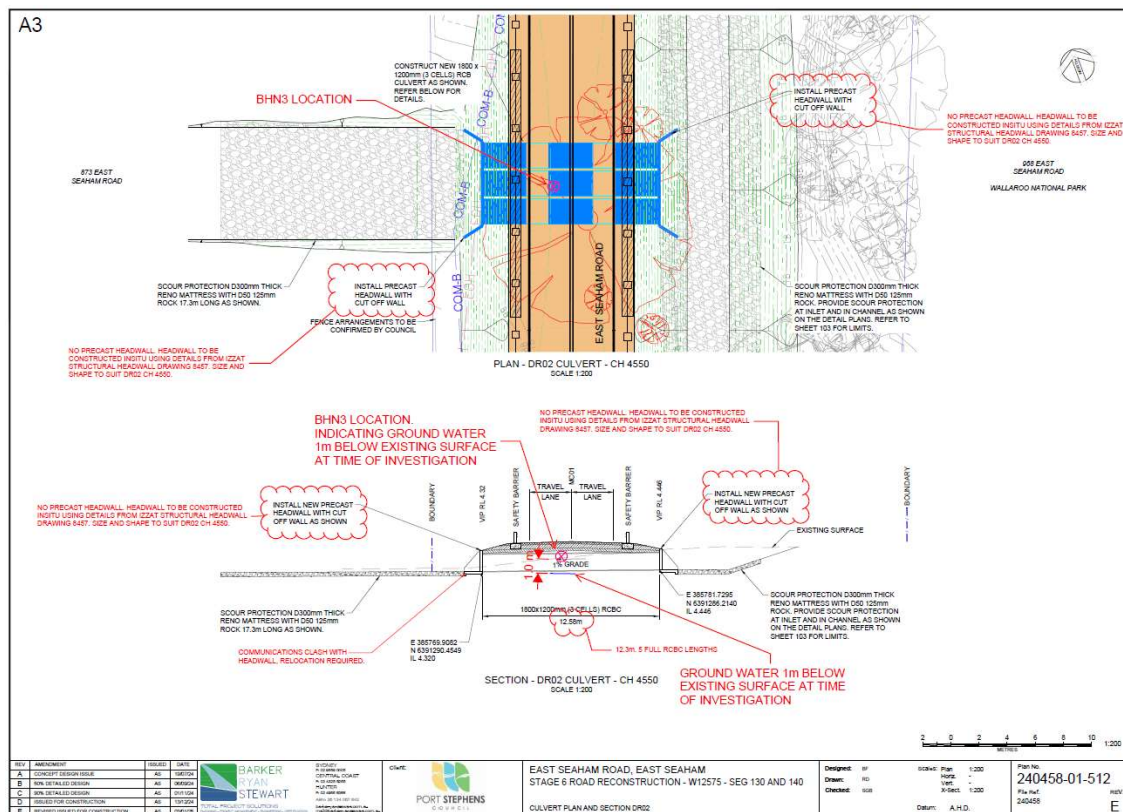


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from surface (adjacent to 873 East Seaham Road) and was located adjacent to existing 3<sup>rd</sup> order prescribed watercourse (Hunter Civilab 2024).

Excavation depths at chainage 4550 are proposed at approximately 1 m below existing surface levels. Depending on conditions at the time of excavation there is the potential for interception of groundwater. **Figure 5-41** illustrates the change in road alignment, location of the borehole, existing surface level and proposed depth of excavation.



**Figure 5-41 Culvert installation at CH4550 and proposed excavation depths**

If groundwater is encountered, groundwater has the potential to build up on the construction site (and potentially adjoining land) or require extraction from the water table. The groundwater will need to be removed by pumping. Sump pump is the most likely methodology should dewatering be required. Dewatering for the culvert installation has the potential to result in a minor localised lowering of the water table as a consequence of the interception of groundwater.

Works for the culvert installation are expected to take a period of 2 weeks. Dewatering if required would only be required for approximately 5 to 7 days during the 2 week





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period. Works would include additional boreholes prior to works to determine potential groundwater levels for the culvert construction. Where possible the culvert construction would be scheduled for a period of dry weather prior to and during the works to potentially eliminate or minimise the need for dewatering and groundwater interaction and possible associated impacts.

The Aquifer Interference Assessment Framework (NSW DPI Office of Water 2013) was used to assess impacts (see **Table 5-20**). The activity would be defined as a minimal impact aquifer interference activity. All volumes and water quality testing results would be recorded.

**Table 5-20 Aquifer interference impact assessment**

Consideration	Response
Is the activity defined as an aquifer interference activity?	Potentially
Is the activity a defined minimal impact aquifer interference activity according to section 3.3 of the AIP?	Yes
Identify all water sources that will be impacted, referring to the water sources defined in the relevant water sharing plan(s). Assessment against the minimal impact considerations of the AIP should be undertaken for each ground water source.	Hunter unregulated and alluvial water sources – Williams River water source
Determine if each water source is defined as 'highly productive' or 'less productive'. If the water source is named then it is defined as highly productive, all other water sources are defined as less productive.	Less productive
With reference to pages 13-14 of the Aquifer Interference Policy, determine the sub-grouping of each water source (eg. alluvial, porous rock, fractured rock, coastal sands).	Alluvial/ fractured rock
Determine whether the predicted impacts fall within Level 1 or Level 2 of the minimal impact considerations defined in Table 1 of the AIP, for each water source, for each of water table, water pressure, and water quality attributes.	Level 1, see <b>Table 5-21</b>
If unable to determine any of these impacts, identify what further information will be required to make this assessment.	N/A
Where the assessment determines that the impacts fall within the Level 1 impacts, the assessment should be 'Level 1 – Acceptable'.	Impacts fall within Level 1 – Acceptable
Where the assessment falls outside the Level 1 impacts, the assessment should be 'Level 2'. The assessment should further note the reasons the assessment is Level 2, and any additional requirements that are triggered by falling into Level 2.	Impacts fall within Level 1 – Acceptable
If water table or water pressure assessment is not applicable due to the nature of the water source, the assessment should be recorded as 'N/A – reason for N/A'.	N/A



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**Table 5-21 Minimal impact considerations for aquifer interference**

<b>Aquifer</b>	Hunter unregulated and alluvial water sources – Williams River water source	
<b>Category</b>	Alluvial	
<b>Level 1 Minimal impact consideration</b>		<b>Assessment</b>
<b>Water table</b> Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic 'post-water sharing plan' variations, 40 m from any: <ul style="list-style-type: none"> <li>high priority groundwater dependent ecosystem or</li> <li>high priority culturally significant site listed in the schedule of the relevant water sharing plan.</li> </ul>		The project would not be located within 40 m of any high priority groundwater dependent ecosystems or high priority culturally significant site. The project may potentially result in a negligible decline of the water table at existing bores in the vicinity of the project, however the impacts are considered to be limited.
<b>Water pressure</b> A cumulative pressure head decline of not more than 40% of the 'post-water sharing plan' pressure head above the base of the water source to a maximum of a 2 m decline, at any water supply work.		There are no existing bores in the vicinity of the project.
<b>Water quality</b> Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity.  No mining activity to be below the natural ground surface within 200 m laterally from the top of high bank or 100 m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a 'reliable water supply'.		The project is not anticipated to result in impacts to groundwater quality.  The dewatering plan would include water monitoring locations to be monitored prior to, during and post completion of dewatering activities. A qualified hydrologist or environmental scientist or equivalently experienced professional will be engaged to undertake water quality monitoring activities, review collected data and advise on appropriate mitigation and management measures.

Clause 21(1) and Clause 2 of Schedule 4 of the WM Act provides an exemption for water access licence for road construction and maintenance by roads authorities. PSC fulfils the definition of a road authority within the meaning of the Roads Act. In accordance with Clause 7(2) of Schedule 4 of the WM Act groundwater volumes would not exceed 3 megalitres.

Dewatering during excavations would be limited to a short period during installation of a culvert within Stage 6 at Chainage 4550. No other dewatering would likely be required as part of the project. Dewatering volumes would be dependent on groundwater levels and consolidation rates. Dewatering would be managed via a dewatering management plan.

A preliminary material classification of soils was conducted (Hunter Environmental Consulting 2024) which concluded that the site has a low contamination risk potential. For further information on contamination see **Section 5.3** and **Attachment 13**.



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Reference to the NSW Office of Environment and Heritage's online database 'ESPADE' indicates that the site lies in an area of no known occurrences of acid sulfate soils (Hunter Civilab 2024). It is unlikely that saline or acid sulfate soils would be encountered during construction.

Unexpected saline or acid sulfate soils encountered during construction would be managed in accordance with the relevant unexpected finds procedures for the project.

### 5.8.3. Mitigation measures

For mitigation measures relating to hazardous substances management and waste management see **Section 5.5** and **Section 5.8** respectively.

The below measures are expected to control the potential impacts from the project as far as practicable.

**Table 5-22 Mitigation measures for soil and water**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Prepare a dewatering management plan in accordance with Transport for NSW technical guidelines for areas of the site requiring dewatering. The dewatering plan would include provisions for water monitoring prior to, during and post completion of dewatering activities. A qualified hydrologist or environmental scientist or equivalently experienced professional will be engaged to undertake water quality monitoring activities, review collected data and advise on appropriate mitigation and management measures. The Plan must be reviewed and approved by the project Support Environment Officer or if developed by the project Support Environment Officer reviewed and approved by the project Manager and Environmental Risk Officer.	Pre-construction
Prepare a plan for the management of material and stockpiling and include the plan in the CEMP. The requirements of the template QF-ENV-009 Stockpile Mgmt Plan (CAP WKS) are the minimum to be provided in the plan. The Stockpile and Material Management Plan must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.	Pre-construction
Prepare an erosion and sediment control plan in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and include the plan in the CEMP. The sediment and erosion controls must have the aim of achieving an outcome of no visible turbid plumes reaching the waterway for any rainfall event up to a 1 in 2 year average recurrence interval event.	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the	Pre-construction Construction



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Mitigation measure	Timing
Environmental Safeguards and directions from the site manager.	
<b>Notification of activities &amp; consultation</b>	
<p>Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following:</p> <ul style="list-style-type: none"> <li>site sensitivities and their relevance to the proposal including: <ul style="list-style-type: none"> <li>any significant waterways.</li> </ul> </li> <li>QF-ENV-008 Unexpected finds procedures (CAP WKS)</li> <li>chemical and hazardous substance management</li> <li>erosion and sediment control requirements</li> <li>site compound areas and construction employee parking areas and designated loading/unloading areas and procedures</li> <li>emergency management procedures.</li> </ul>	Pre-construction
<b>General</b>	
Demarcate the extent of works with the installation of stake rope and fluoro tags or similar with fluoro tape attached to the stakes and rope between the stakes. Leave all controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.	Pre-construction Construction Operation
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
Conduct works in accordance with the recommendations of the final geotechnical report titled Report on Pavement Investigation East Seaham Road, Stage 5 East Seaham (Cardno, 4 October 2017) and Pavement and Investigation and Design East Seaham Road East Seaham Report Ref: G0558-R-001-REV0 (Hunter Civilab, 25 June 2024), except where varied by the approved plans.	Construction
<b>Monitoring and unexpected finds</b>	
Undertake daily checks of site drainage systems and undertake maintenance when required to ensure site drainage systems are operating at capacity e.g. removal of debris and that there is no increase in turbidity (sediment laden water). Ensure there is no release of dirty water into drainage lines and/ or watercourse.	Construction Operation
Visually monitor work sites, general work areas and stockpiles for dust generation, and water down with clean water or cover with tarpaulins in the event of dry and/ or windy conditions.	Construction Operation
When working within and adjacent to watercourses onsite and water is present, a visual inspection of the waterway for dead or distressed fish (downstream) or other fauna (indicated by fish gasping at the water surface, fish crowding in pools) which have the potential to impact on the aquatic environment. Observation of dead and distressed fish or other fauna must be immediately reported to Council's Environmental Risk Officer and NSW Fisheries. All works must be ceased until the cause is rectified and NSW Fisheries and Council's Environmental Risk Officer approve works to	Construction Operation





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Mitigation measure	Timing
recommence. Any rectification works directed by NSW Fisheries and Council's Environmental Risk Officer must be completed.	
<p>Visually monitor for any of the signs of the following:</p> <ul style="list-style-type: none"> <li>acid sulfate soils</li> <li>contamination such as odour, seepage of unusual liquids from soil or rock, unusual metal objects, discolouration or staining of the rock, unusual colours, odours or sheens on groundwater, presence of underground storage tanks, potential asbestos containing material, presence of waste or rubbish or unusual colour of the soil</li> </ul> <p>If suspected, intercepted, identified or located, stop work, cordon off the areas and follow QF-ENV-008 Unexpected Finds Procedure (CAP WKS).</p>	<p>Construction Operation</p>
Pollution prevention	
<p>Manage construction activities to minimise water and land pollution, using the following measures:</p> <ul style="list-style-type: none"> <li>storage of all plant, materials and equipment must not be outside the direct works area or outside the approved compound site location and all chemicals, fuels and oils must be stored in suitable bunded areas with the capacity of the bund at least 120 per cent of the volume of the largest container stored. Do not store or collect for disposal any chemicals, fuels and/or waste within or adjacent to watercourse, drainage lines or unsealed surfaces</li> <li>do not carry out works such as bitumen spraying, the spraying of paint or other materials during strong winds or adverse weather conditions</li> <li>keep an emergency spill response kit onsite at all times and monitor the kit for replenishment of contents. Make all staff aware of the location of the spill kit and ensure that they are trained in its use. If a spill occurs, follow the EMS Incidence Response Procedure and immediately notify the project Manager and/ or EMS Manager</li> <li>avoid refuelling of equipment or chemical handling activities outside the compound. Conduct the activities offsite where practical. If the activity must occur onsite, conduct the activity on flat ground at least 50 m from any watercourse, drainage line or sensitive area with spill containment measures in place and within a bunded area</li> <li>use and store all hazardous and dangerous goods in accordance with all relevant statutory standards and procedures and manufacturer's MSDS. Retain a copy of all relevant MSDS onsite and ensure hazardous goods are be labelled in accordance with the requirements of the Australian Dangerous Goods Code</li> <li>where possible wash equipment, machinery or works vehicles offsite at an approved facility. Where onsite wash down is required for weed control, use potable water and contain any excess debris from equipment with containment material. Dispose of any containment material and water in accordance with the Waste Management requirements for the works</li> <li>stabilise exposed areas as soon as practically possible using turf, hydromulch, hydro seed/ sterile cover crop. Only use a hydro mulch mix of local provenance seed or sterile cover crop that is certified by the supplier as free from weeds</li> <li>the management of concrete washout must be in accordance with the Transport for NSW Concrete washout guideline dated June, 2023</li> <li>monitor weather conditions for adverse weather that may increase impacts and where possible schedule works to avoid these periods. Do not undertake works during inclement weather to minimise the risk of damage to assets and ensure there is no compromise of site safety. Where severe weather is forecast, undertake all reasonable precautions to</li> </ul>	<p>Construction Operation</p>



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Mitigation measure	Timing
<p>prepare and secure the site for a storm event and help minimise the potential for damage. If heavy rain is forecast in the next 24 hours delay commencement or cease works until such time a suitable dry period of weather is forecast</p> <ul style="list-style-type: none"> <li>• drive to conditions on unsealed roads and/ or onsite and signpost designated access points, routes, vehicle manoeuvring areas, parking areas and ensure site personnel, contractors and delivery trucks are aware of the requirements to help reduce site disturbance. Restrict vehicles and personnel to designated tracks, trails and parking areas. Where possible park and turn-around on hard, well drained surfaces</li> <li>• maintain a clean site that is free of litter and unnecessary debris with all wastes stored securely to avoid/ minimise the risk of pollutants escaping</li> <li>• inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions</li> <li>• install erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom Vol 1 4th Ed 2004) and the approved plans. Leave controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request. Leave erosion and sediment controls in place until the site is fully stabilized</li> <li>• works must be delivered in accordance with the NSW Fisheries Permit.</li> <li>• works must be delivered in compliance with the Dewatering Management Plan prepared for the site</li> <li>• limit duration of works within defined watercourses to the minimum possible and where possible deliver the works during low flow / dry weather periods.</li> <li>• reduce open excavations</li> </ul>	
<p>Manage construction activities to minimise the emission of visible dust beyond the construction footprint. Dust mitigation measures for each location/ activity may include one or more of the following:</p> <ul style="list-style-type: none"> <li>• visual inspection of construction sites to identify sources of dust emissions, taking into account weather conditions (particularly dry and windy conditions) and the scale, nature and intensity of construction activities</li> <li>• scheduling of dust generating activities to minimise potential for elevated cumulative dust generation</li> <li>• locating and managing dust generating stockpiles to be located away from sensitive human and ecological receptors</li> <li>• application of measures to minimise dust generation from surfaces and stockpiles such as application of water sprays, spray seeding, and dust covers or similar</li> <li>• progressive site rehabilitation or stabilisation to minimise the potential for and duration of dust generation from disturbed areas</li> <li>• implementation of speed limits on unsealed roads and other trafficked surfaces</li> <li>• cover all loads of material, soil, fill or other erodible matter being transported to or from the work site at all times. Coverage must be maintained for the duration of transportation and until unloaded</li> <li>• providing stabilised site access and clean roads and access points as required. Implementing a wheel washing system at relevant construction site access points (with rumble grids to dislodge accumulated dust and mud prior to leaving the site) where</li> </ul>	Construction Operation



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Mitigation measure	Timing
<p>practicable</p> <ul style="list-style-type: none"> <li>minimising the number of stockpiles onsite, avoiding stockpiling in exposed areas and ensuring long-term stockpiles are covered or stabilised</li> <li>where excessive dust occurs, water down with clean water(e.g. water cart) or cover with tarpaulins in the event of dry and/ or windy conditions</li> <li>stabilise exposed areas as soon as practically possible using turf, hydromulch, hydro seed/ sterile cover crop. Only use a hydro mulch mix of local provenance seed or sterile cover crop that is certified by the supplier as free from weeds</li> <li>monitor weather conditions for adverse weather that may increase impacts such as dust and where possible schedule works to avoid these periods. Do not undertake works during inclement weather to minimise the risk of damage to assets and ensure there is no compromise of site safety. Where severe weather is forecast, undertake all reasonable precautions to prepare and secure the site for a storm event and help minimise the potential for damage. If heavy rain is forecast in the next 24 hours delay commencement or cease works until such time a suitable dry period of weather is forecast</li> <li>drive to conditions on unsealed roads and/ or onsite and signpost designated access points, routes, vehicle manoeuvring areas, parking areas and ensure site personnel, contractors and delivery trucks are aware of the requirements to help reduce site disturbance. Restrict vehicles and personnel to designated tracks, trails and parking areas. Where possible park and turn-around on hard, well drained surfaces</li> <li>reduce open excavations.</li> </ul>	
<p>Operate, inspect and maintain equipment to ensure it is in good working order and operated in accordance with the manufacturer's instructions. Requirements include:</p> <ul style="list-style-type: none"> <li>personnel onsite are to be trained and proficient in the operation of plant, equipment and vehicular procedures for the required tasks and ways to reduce impacts</li> </ul>	Construction Operation
<b>Stockpile, spoil and waste management</b>	
<p>Store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required and manage all stockpiles on site in accordance with the NSW Managing Urban Stormwater: Soils and construction – Volume 1 4<sup>th</sup> edition and the approved stockpile management plan prepared for the site. Place stockpiles at strategic locations to mitigate environmental impacts whilst facilitating material handling requirements. Establish access routes around material stockpiles that enable access from adjoining haulage routes.</p>	Construction Operation



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### 5.9. Traffic and transport

This chapter describes the potential traffic and transport impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

Key issues to be addressed from the SEARS are:

*A description of pedestrian and vehicular access arrangements during the construction of the proposal and a description of any construction compounds and how the site will be accessed.*

#### 5.9.1. Existing environment

East Seaham Road is a narrow two-lane, single carriageway, unsealed rural road that is approximately 12.4 km in length that traverses between Seaham and east of Clarence Town along the east side of the Williams River in a south-west to north-west direction (Cardno 2017).

East Seaham Road is a rural road which on average has 400 vehicle movements per day with 9% of those movements being heavy vehicles. East Seaham Road is a local road under the NSW Road Network Classifications. The primary regional road in the region is Clarence Town Road.

East Seaham Road is surrounded by rural residential properties, Wallaroo National Park and the Williams River.

#### 5.9.2. Impact assessment

There are concurrent works occurring within the locality that have the potential to result in cumulative traffic impacts. **Table 5-23** summarises the works and potential overlapping project delivery timeframes. The location of the concurrent works are illustrated in **Figure 5-42**.

**Table 5-23 Concurrent capital works within the locality**

Project	Timing and duration	Traffic management arrangement	Overlap with the project
Buckets Way, Twelve Mile	Current works due for completion at the end of June	Single lane managed by traffic lights during construction hours only	1 month only for June 2025
4 road sections along Clarence Town Road in the suburbs of Seaham and	July to December 2025	Single lane managed by traffic lights during construction hours only	6 month period from July to December 2025





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Glen Oak			
Italia Road, East Seaham	July to October 2025	Single lane managed by traffic lights during construction hours only	4 month period from July to October 2025
New Clarence Town bridge, Clarence Town (within Dungog Shire Council)	Mid 2025 with expected 18 month timeframe	New bridge construction N/A	Overlap of entire East Seaham Road construction timeframe of June 2025 for a period of 11 to 13 months



**Figure 5-42 Location of concurrent capital works within the locality**

Construction road traffic would be generated by vehicles associated with the construction of the project, including heavy vehicles transporting spoil and light vehicle movements generated by construction workers. The estimated average daily vehicle movements required for construction would be 60 truck movements per day (45 minute load/ haul and tip time over an 8 hour day with 6 trucks on rotation).

Options considered for traffic management include:

- full road closure
- one lane closure allowing for one lane, two way traffic.

Full road closure would include no through traffic and resident access only. East Seaham Road would be closed at the PSC and Dungog LGA boundary to no through traffic and only allow resident and construction vehicle construction access from the



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south. This option is expected to provide efficiencies in time and cost in construction as well as providing a safer environment for both workers and road users.

The option for one lane closure would permit one lane, two-way traffic to pass through the construction site and may be implemented during construction hours only or permanently throughout the project depending on the nature of the work being undertaken. Wait times would be expected for motorists due to the stop and go nature of the traffic control. The option for one lane closure with one lane, two-way traffic has the potential to increase project costs due to increased traffic control costs and to increase project duration. This option also poses a higher risk to the safety of personnel working onsite and motorists.

Both options are included in the EIS, due to the works by Dungog Council for construction of the new Clarence Town Bridge. The new bridge will be built adjacent to the heritage-listed Brig O'Johnston Bridge on Limeburners Creek Road. Bridge construction is due to commence in mid-2025, which will coincide with the works on East Seaham Road. Due to load limits on the Brig O-Johnston Bridge heavy vehicles over 15 tonnes will likely be diverted through East Seaham Road when requiring access to and from the northern side of the new Clarence Town Bridge for the period of the 18 month construction period estimated to commence mid-2025. PSC has been liaising with Dungog Council to ensure traffic impacts for both projects are adequately considered in the traffic management plans for the respective projects.

These additional works will result in increased truck movements along East Seaham Road. Once the details of the extent of increased vehicle movements is known, this would be communicated to the community. PSC has assumed all vehicle movements associated with the new bridge construction by Dungog Council would be during standard construction hours. Dungog Council would be responsible for ensuring any increased impacts on sensitive receivers as a result of the new bridge works would be communicated to those impacted.

In addition to traffic control, temporary closure of driveways, access to the electrical easement and NSW NPWS lands would be required to install table drains and/ or tie in driveways to the new road pavement. Where works are likely to affect driveway entrances/ access; specific notification by letterbox drop, phone call or email (or equivalent) would be provided to the affected stakeholder no later than 5 working days ahead of the construction activities affecting access. The specific notification would provide additional information specific to the period access may be restricted. Notification must be provided to residences that are likely to have persons present at the time works are occurring.

Individual consultation with each landholder adjacent to the project area has been conducted in the preceding 12 months. A community workshop was also held on 5



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February 2025 to help provide the local community with an additional opportunity to voice concerns. Traffic was identified as a minor community concern with the acknowledgement that the works could not occur without some impacts.

Community notification would occur in accordance with the project specific engagement plan prepared for the works. Notification of works would occur to provide advance warning of the works and potential disruptions for local residents. Notification would consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification would include the likely noise impact of the work without understating its effect and any work activities or equipment that will be particularly noisy or noticeable. Notification would be provided a minimum of 10 working days prior to the start of works. Consultation with affected landowners would be continual throughout the construction period of the project.

To ensure safety and to minimise traffic impacts, traffic management and control would be performed by suitably qualified and experienced personnel and would include the installation of temporary traffic barriers, and temporary road closure and diversions.

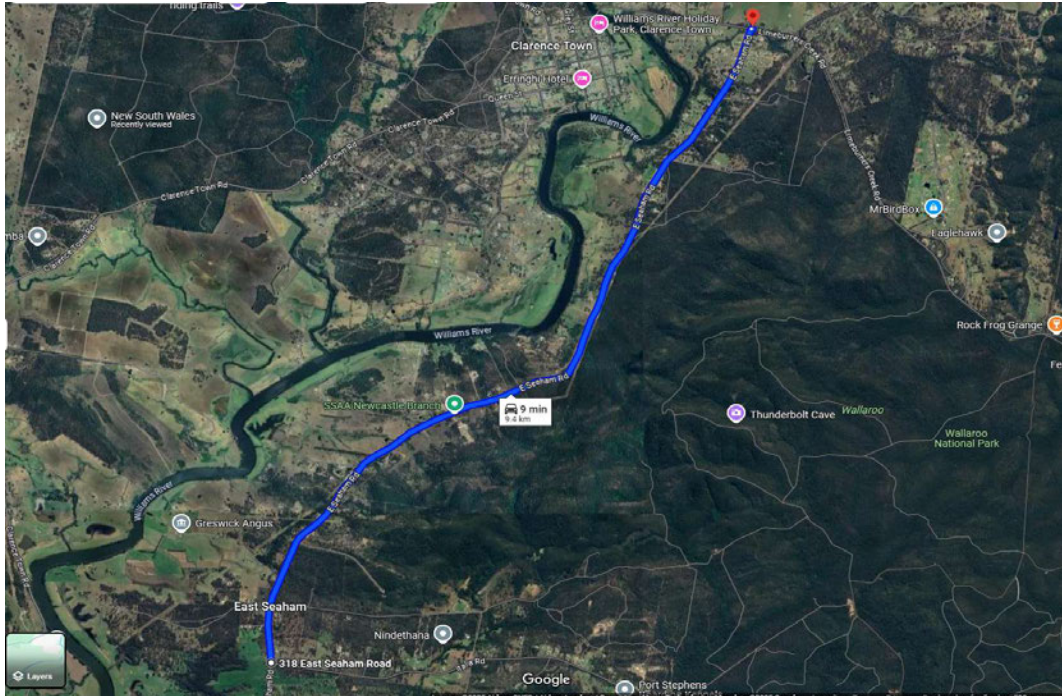
Detour maps for the road closure are illustrated in **Figure 5-43**, **Figure 5-44** and **Figure 5-44**. **Table 5-24** details the variance in kilometres and **Table 5-25** the variance in time (minutes) for the detour options resulting from the full road closure. The variance in time (minutes) resulting from the one lane closure allowing for one lane, two way traffic would be approximately 15 minutes.



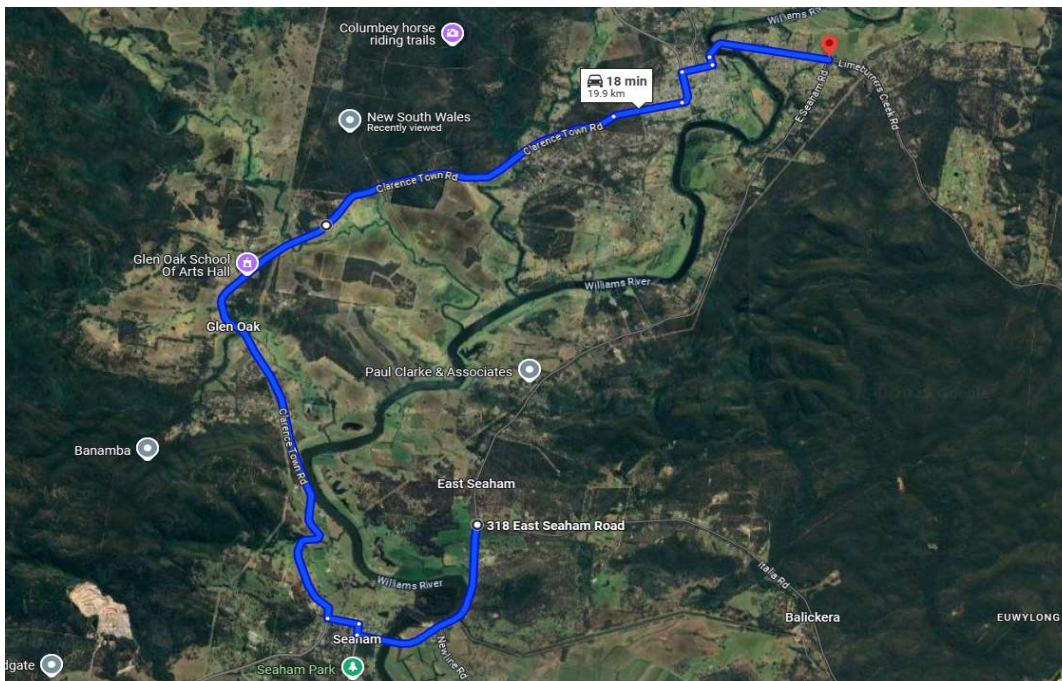


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**Figure 5-43 Travel through the project site as normal along East Seaham Road**



**Figure 5-44 Detour around East Seaham Road via Clarence Town Road**

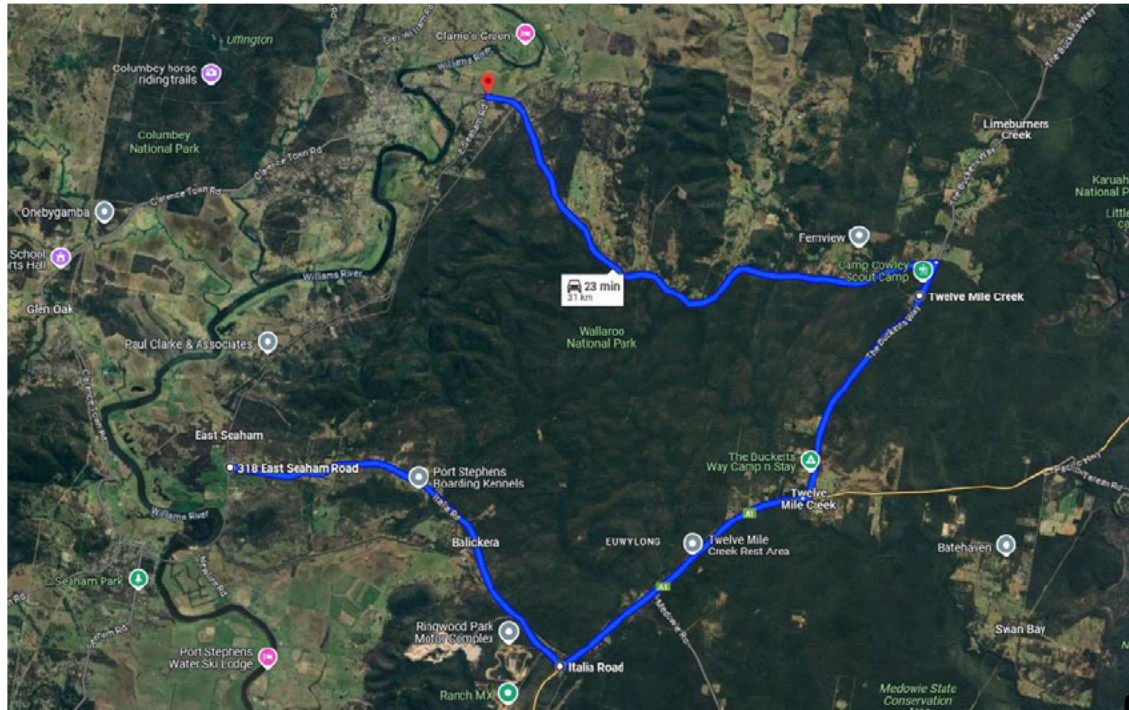




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**Figure 5-45 Detour around East Seaham Road via Italia Road, Pacific Highway, Bucketts Way and Limeburners Creek Road**

**Table 5-24 Road closure variance (km)**

Location	ESR Closure (North)	Clarence Town	Italia Road	Glen William	Glen Martin	Limeburners Creek Road (midpoint or around number 508)	Brookfield
Seaham	8.1				4.3	4.4	
Maitland	6.9				3.5	3.5	
Medowie	3.6						0.1
Raymond Terrace	9.1	0.8		1.2	5.7		0.8
Newcastle	4.3			5.6	3.7		
Clarence Town			5.6				
ESR closure (South)	22.6	14.2		12.7	19.1	17.8	14.3



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**Table 5-25 Road closure variance (minutes)**

Location	ESR Closure (North)	Clarence Town	Italia Road	Glen William	Glen Martin	Limeburners Creek Road (midpoint or around number 508)	Brookfield
Seaham	7				3	3	
Maitland	5				2	2	
Medowie	7						5
Raymond Terrace	8			1	9		
Newcastle	8			2	1		
Clarence Town			3				
ESR closure (South)	19	10		10	16	15	10

During operation, due to improvements in the road surface, traffic safety would be increased and overall driver experience enhanced. Bus access would be safer and more accessible due to the improved road surface and road shoulders being created. Emergency services would have improved accessibility and access for utility providers and NPWS would be maintained or improved. The need for road grading activities and associated resources to undertake the activities would be reduced. Speed limits would remain unchanged.

### 5.9.3. Mitigation measures

The below measures are expected to control the potential impacts from the project as far as practicable.

**Table 5-26 Mitigation measures for traffic**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction



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Mitigation measure	Timing
<p>Prepare a traffic management plan in consultation with Dungog Council and emergency services, waste services and any other relevant service providers and NSW NPWS and include the plan in the CEMP. The traffic management plan must include:</p> <ul style="list-style-type: none"> <li>measures to minimise and manage construction traffic and road safety impacts on other road users, including buses</li> <li>planning to minimise the movement of construction heavy vehicles during the AM and PM peak hours, weekends and public holidays, where practicable</li> <li>measures to provide safe and adequate access to residential premises and businesses during construction, particularly where construction activities affect existing property access arrangements</li> <li>details of the types of temporary traffic management measures that would be required during construction, such as posted speed limit reductions, detours and full or partial road closures, and how these measures would be managed to minimise impacts on other road users</li> <li>measures to periodically update landholders, the local community, emergency services, waste services, bus companies, NSW NPWs, relevant service providers and any other relevant stakeholders on the staging and progress of construction works, and to maintain safe adequate access during the construction period</li> <li>a framework for coordinating construction planning and traffic management with Dungog Council to minimise potential cumulative construction traffic impacts</li> <li>traffic controls that are fauna friendly. Barrier devices such as concrete jersey kerbs or water filled barriers must have provision for fauna escape with a 2-300mm gap for every 2 barriers or climbable fauna structures secured to the barrier devices.</li> </ul>	Pre-construction
<b>Notification of activities &amp; consultation</b>	
<p>Community notification must occur in accordance with the project specific engagement plan prepared for the works. Notification of works should occur to provide advance warning of the works and potential disruptions for all sensitive land uses. Notification may consist of or use variable message signage, letterbox drop (or equivalent) for residents within 1 km of the works, website/ social media or a combination to distribute information detailing the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification should be provided a minimum of 10 working days prior to the start of works.</p> <p>Where works are likely to affect driveway entrances; specific notification by letterbox drop, phone call or email (or equivalent) shall be provided no later than 5 working days ahead of construction activities. The specific notification must provide additional information specific to the period the driveway may be restricted. Notification must be provided to residences that are likely to have persons present at the time works are occurring.</p>	Pre-construction Construction
<p>Notify landholders, the local community, emergency services, waste services, bus companies, NSW NPWs, relevant service providers and any other relevant stakeholders via letter, phone call or email or as otherwise appropriate of the intention to carry out works. Notification should detail the work activities, dates and hours, impacts and mitigation measures and complaints handling contact. Notification should include the likely traffic impact and any other relevant impacts of the work without understating its effect. Notification should be provided a minimum of 10 working days prior to the start of works.</p>	Pre-construction Construction
Continue to liaise with and notify Dungog Council of the commencement of works and ensure Traffic	Pre-construction



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Mitigation measure	Timing
Management Plans for each project consider the impacted works and communicate any impacts to the community throughout the Construction period as required.	Construction
Handle enquiries and complaints in accordance with Council's complaints handling procedures and eliminate or minimise the issue where practical.	Construction Operation
Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>permissible hours of work (including for deliveries)</li> <li>site sensitivities and their relevance to the proposal including: <ul style="list-style-type: none"> <li>surrounding rural residential development.</li> </ul> </li> <li>traffic management.</li> </ul>	Pre-construction
<b>General</b>	
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
Conduct all activities between the daylight hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturdays. No work on Sundays, public holidays or night works are permitted.	Construction Operation
<b>Transport &amp; traffic</b>	
Install traffic controls and leave all traffic controls in place during works, undertake weekly checks and also conduct checks before and after rainfall and promptly correct any issues. Keep records of any checks and issues onsite and ensure they are available upon request.	Construction Operation
Sufficient car parking spaces will be provided within the project construction sites to accommodate anticipated construction worker parking requirements.	Construction
<b>Monitoring and unexpected finds</b>	
Visually monitor traffic for excessive delays or queue lengths. Notify the Team Leader and appropriate Manager (if required) and amend the TMP (if required).	Construction Operation





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#### 5.10. Waste management

This chapter describes the potential waste impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

Key issues to be addressed from the SEARS are:

*Details of the quantity and type of wastes generated; of details of waste management practices including handling and transport; and of identification, classification, disposal, receipt, stockpiling, reuse and quality control.*

##### 5.10.1. Existing environment

The existing environment is a rural roadside environment. Likely waste impacts would be limited to littering and incidents of illegal dumping and waste impacts from operation and maintenance activities. Waste generated from operation and maintenance activities would include resource usage, operational materials, water and electricity and generation and management of general waste.

##### 5.10.2. Impact assessment

Potential impacts during construction of the project relate to construction resource use, including construction materials, water and fuels and generation and management of wastes including non-spoil and spoil.

##### *Resource use during construction*

Indicative resources required for construction would include materials such as timber, road base materials and seal (bitumen and aggregate) material materials and landscaping supplies such as hydromulch would also be required. Resource requirements for the works would be unlikely to impact resource availability within the locality or wider region.

The design of the project has considered the construction methodology and ensured that all materials proposed for use are fit for purpose. PSC would minimise resource consumption and promote resource reuse and recycling in accordance with the waste management hierarchy of the *Waste Avoidance and Resource Recovery Act 2001*.

Small volumes of water would be required for dust suppression, concreting, equipment wash down and onsite amenities. Water carts would be used to transport water to the site. Water use for the project is expected to be minimal due to the relatively small scope of the works. Opportunities for water reuse would be investigated and pursued



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where feasible and reasonable, subject to meeting water quality requirements for reuse. Options for water reuse may include on-site reuse for construction purposes, such as dust suppression. Water would be preferentially sourced from treated construction water (e.g. extracted during dewatering activities, harvested stormwater and rainwater) and where required mains potable water supply. Sewage generated onsite would be trucked off-site to an appropriate disposal facility.

Power requirements for the site would be minimal. Generators would be used as required. Energy efficient equipment would be used where practical including the use of solar powered lighting and signage where reasonable and feasible.

#### *Waste generation during construction*

Wastes generated during construction would include:

- demolition wastes such as concrete, metals etc. which would be classified as general solid waste (non-putrescible)
- vegetation wastes which would be classified as (putrescible), the majority of which would be mulched and where possible reused onsite
- general construction waste such as timber formwork, scrap metal, packaging materials etc. which would be classified as general solid waste (non-putrescible)
- waste from operation and maintenance of construction vehicles and equipment including oils, types, batteries etc. which would be classified as hazardous waste
- general wastes such as food waste, paper, cardboard plastics, glass etc. which would be classified as general solid waste (non-putrescible and putrescible).

All waste transported offsite would be sent to an appropriately licenced waste facility for recycling or disposal. **Table 5-27** provides a summary of the main waste materials likely to be exported from the site and the amount.

Other wastes generated onsite would include aggregates such as crushed rock and concrete and excess material from the site which would be classified as excavated public road material or excavated natural material or virgin excavated natural material as per Hunter Environmental Consultants (2024). This waste would be temporarily transported and stored for reuse in one of Council's temporary EPRM roadside stockpile sites in accordance with the requirements of the *Excavated Public Road Materials Order 2014* and *Excavated Public Road Materials Exemption 2014* or Greater Newcastle Aerotropolis (GNAPL) in accordance with the signed Memorandum of Understanding (MoU). The approved locations to stockpile offsite would be a stockpile site which has an Environmental Assessment prepared for the site and be located within 60 km of the site from which the material is being removed.



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**Table 5-27 Exported materials from the project**

Type (EPRM, general waste, green waste, concrete etc)	Export destination	Amount
Removed existing concrete drainage lines	Appropriately licenced waste facility for recycling	236 lineal metres
Excess cut removed from the site	Council temporary EPRM stockpile or GNAPL under signed MoU	5,719m <sup>3</sup>
Mulch	Appropriately licenced waste facility for reuse	Unknown
Stumps	Waste management facility	Approximately 600
Signage	Waste management facility	1

Appropriate waste storage facilities, such as bins, would be provided for general waste storage during construction. Waste would be classified in accordance with the *Waste Avoidance and Resource Recovery Act 2001* and associated regulations and segregated appropriately. Waste collection would be carried out by an authorised contractor for off-site recycling or disposal at a licensed waste facility.

Waste transportation off-site for disposal would occur during standard construction hours. There is potential for environmental impacts as a result of the transport of waste including dust, mud-tracking and accidental spills. Mitigation measures would be outlined in the CEMP including adequate covering of truck loads and washing of heavy vehicle tyres to minimise tracking mud onto the road network

### *Resource use and waste generation during operation and maintenance*

During operation and maintenance resource use including operational materials and water would occur and also the generation and management of general waste. Any water use for operation and maintenance would be from a water cart and would be preferentially sourced from harvested stormwater and rainwater and where required mains potable water supply. Operation and maintenance activities are also likely to generate minor volumes of EPRM and general waste such as plastic and food waste.

Waste would be classified in accordance with the *Waste Avoidance and Resource Recovery Act 2001* and associated regulations and segregated appropriately. EPRM would be temporarily transported and stored for reuse in one of Council's temporary EPRM roadside stockpile sites in accordance with the requirements of the EPRM Order and Exemption and all other wastes transported offsite for recycling or disposal at appropriately licenced waste facilities. The approved locations to stockpile offsite would be a stockpile site which has an Environmental Assessment prepared for the site and be located within 60 km of the site from which the material is being removed.



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### 5.10.3. Mitigation measures

The below measures are expected to control the potential impacts from the project as far as practicable.

**Table 5-28 Mitigation measures for waste management**

Mitigation measure	Timing
<b>Documentation</b>	
Prepare a CEMP that includes all the mitigation measures identified in the Environmental Assessment and any relevant permits or approvals. <b>The CEMP must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.</b>	Pre-construction
Prepare a plan for the management of material and stockpiling and include the plan in the CEMP. The requirements of the template QF-ENV-009 Stockpile Mgmt Plan (CAP WKS) are the minimum to be provided in the plan. The Stockpile and Material Management Plan must be approved by Council's Environmental Risk Officer or project Support Environmental Officer or Team Leader Environmental Planning.	Pre-construction
Prepare a waste management plan and include the plan in the CEMP. The plan must specify measures to manage waste such as: <ul style="list-style-type: none"> <li>• expected waste types and volumes</li> <li>• procedures for managing waste materials</li> <li>• waste reporting requirements</li> <li>• disposal requirements.</li> </ul>	Pre-construction
Include appropriate clauses and conditions within tenders, employment contracts, subcontractor agreements and work method statements that require all workers and contractors to observe the Environmental Safeguards and directions from the site manager.	Pre-construction Construction
<b>Notification of activities &amp; consultation</b>	
Induct all personnel working onsite including workers and contractors to ensure they are aware of the mitigation measures and environmental safeguards, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference (such as a noticeboard). Emphasize the following: <ul style="list-style-type: none"> <li>• waste management procedures and requirements.</li> </ul>	Pre-construction
<b>General</b>	
Complete all works in accordance with the Environmental Assessment, approved plans, Construction Environmental Management Plan, approvals or permits and relevant Safe Work Method Statement(s).	Construction Operation (excluding CEMP)
<b>Stockpile, spoil and waste management</b>	
Store all stockpiled material in a location consistent with the approved plans, with a separate area designated for storage of contaminated spoil where required and manage all stockpiles on site in accordance with the NSW Managing Urban Stormwater: Soils and construction – Volume 1 4 <sup>th</sup> edition	Construction





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Mitigation measure	Timing
and the approved stockpile management plan prepared for the site. Place stockpiles at strategic locations to mitigate environmental impacts whilst facilitating material handling requirements. Establish access routes around material stockpiles that enable access from adjoining haulage routes.	
Where possible avoid, reuse and recycle spoil and waste generated. Manage waste that cannot be avoided, reused or recycled in accordance with the <i>NSW Waste Avoidance and Recovery Act 2011</i> , and classify the waste in accordance with the NSW Waste Classification Guidelines. If being removed offsite classify waste in accordance with the NSW Waste Classification Guidelines and dispose of at a facility appropriately licenced to accept such waste and/ or at GNAPL in accordance with the signed MoU. Any material reused onsite shall be compliant with <i>NSW Protection of the Environment Operations (Waste) Regulation 2014</i> and associated exemptions such as the <i>NSW EPRM Exemption 2014</i> .	Construction Operation
Provide a sufficient number of suitable and labelled receptacles for generated waste and recyclable materials and clean receptacles as required to avoid overflows.	Construction
Remove, transport and dispose of hazardous and dangerous goods in accordance with the NSW Waste Classification Guidelines and dispose of at a waste facility licenced to accept such waste. Any transport of dangerous goods must occur with a driver possessing a dangerous goods drivers licence and dangerous goods vehicle licence. All dangerous goods transport shall be in accordance with <i>NSW Dangerous Goods (Roads and Rail Transport Act 2008 and NSW Dangerous Goods (Road and Rail) Transport Regulation 2014</i> . Ensure hazardous goods are labelled in accordance with the requirements of the Australian Dangerous Goods Code.	Construction Operation
Ensure truck drivers are undertaking material tracking, recording the source location, destination and volumes and ensure that for any material brought onto site this information is provided to the Team Leader.	Construction Operation
Any imported fill, whether VENM, ENM or other imported material such as EPRM, must be accompanied by relevant documentation. Where documentation is not provided the source site of the material will be inspected and material sampled at a rate of one sample per 100 m <sup>3</sup> , with a minimum of 10 samples taken from each product imported.	Construction Operation
Ensure the provision and regular service of portable self-contained toilets by contractors.	Construction
Stockpile and store excavated topsoil separately for reuse in rehabilitation works once works are complete. Incorporate non-woody vegetation (typically grasses and groundcover species) into the stripping of topsoil to retain any organic materials and nutrients within the topsoil layer. Carry topsoil removal with care to ensure that topsoil is not mixed with subsoils, particularly where topsoil is thin.	Construction
Remove all physical construction elements from the site such as any physical controls, vehicles, plant and equipment, fencing such as tree protection fencing and exclusion fencing and traffic controls and leave the site clean and free of debris.	Construction Operation
Maintain a clean site that is free of litter and unnecessary debris with all wastes stored securely to avoid/ minimise the risk of pollutants escaping.	Pre-construction Construction Operation
Opportunities to reduce resource use and water consumption and to reuse and recycle water must be considered during implementation and operation, where reasonable and feasible.	Construction Operation