APPENDIX 7

Ecology Assessment

Port Waratah Coal Services

Ecology Assessment

Kooragang Coal Terminal Stage 4 Project
Fourth Dump Station & Fourth Shiploader

November 2009

Umwelt
Environmental Consultants

Ecology Assessment
Kooragang Coal Terminal Stage 4 Project
Fourth Dump Station & Fourth Shiploader

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Port Waratah Coal Services

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1.0 Introduction

Port Waratah Coal Services (PWCS) Limited owns and operates the Carrington Coal Terminal (CCT) and Kooragang Coal Terminal (KCT) in the Port of Newcastle in New South Wales (NSW) (refer to **Figure 1.1**). The terminals receive, assemble, blend and load coal from the Hunter region onto ships for export around the world. To meet the increasing demand for Hunter region coal, PWCS has implemented a continuous expansion program that has seen total throughput capacity for the two terminals increase from 46 million tonnes per annum (Mtpa) in 1996 to the present approved 145 Mtpa capacity.

Expansion works at the KCT are being progressed in accordance with the Stage 3 Expansion development consent (DA No 35/96) issued by the Minister for Urban Affairs and Planning in November 1996. Since 1996, PWCS has established the third rail coal receival station; the K6 wharf and third shiploader; and the eastern half of the approved stockpiles Pad C and D, and the associated reclaimers, stackers and interconnecting conveyors. The Stage 3 development consent provides for the current approved footprint of KCT.

PWCS obtained a Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2007 to increase the approved capacity throughput to a nominal 120 Mtpa. The 2007 Project Approval provided for the increase to throughput capacity at KCT and did not alter the approved KCT footprint.

In response to the continued increase in demand for Hunter Valley coal, PWCS has investigated options to maximise the efficiency of KCT so as to achieve the approved throughput capacity while accommodating the constraints, both internal and external, to the terminals. This investigation has identified the benefit of constructing and operating a fourth dump station, a fourth shiploader, and associated coal handling infrastructure. PWCS is seeking approval for the construction and operation of the fourth coal handling stream at KCT (the Stage 4 Project).

1.1 The Stage 4 Project

PWCS proposes to construct and operate a fourth dump station for the receival of coal at KCT, a fourth shiploader, and associated coal handling infrastructure. The additional coal handling and loading infrastructure will allow PWCS to improve the efficiency of coal throughput at KCT. The project will include the construction and operation of additional infrastructure as shown on **Figure 1.2**, including:

- fourth dump station, associated rail facilities, sample plant and inbound conveyors;
- augmentation to the rail loop to include an additional inbound and outbound track to the fourth rail receival facility;
- feed out conveyor including the construction and operation of a conveyor bridge over Teal Street, on the approach to Stockton Bridge;
- transfer houses;
- surge bin;
- outbound sample plant;

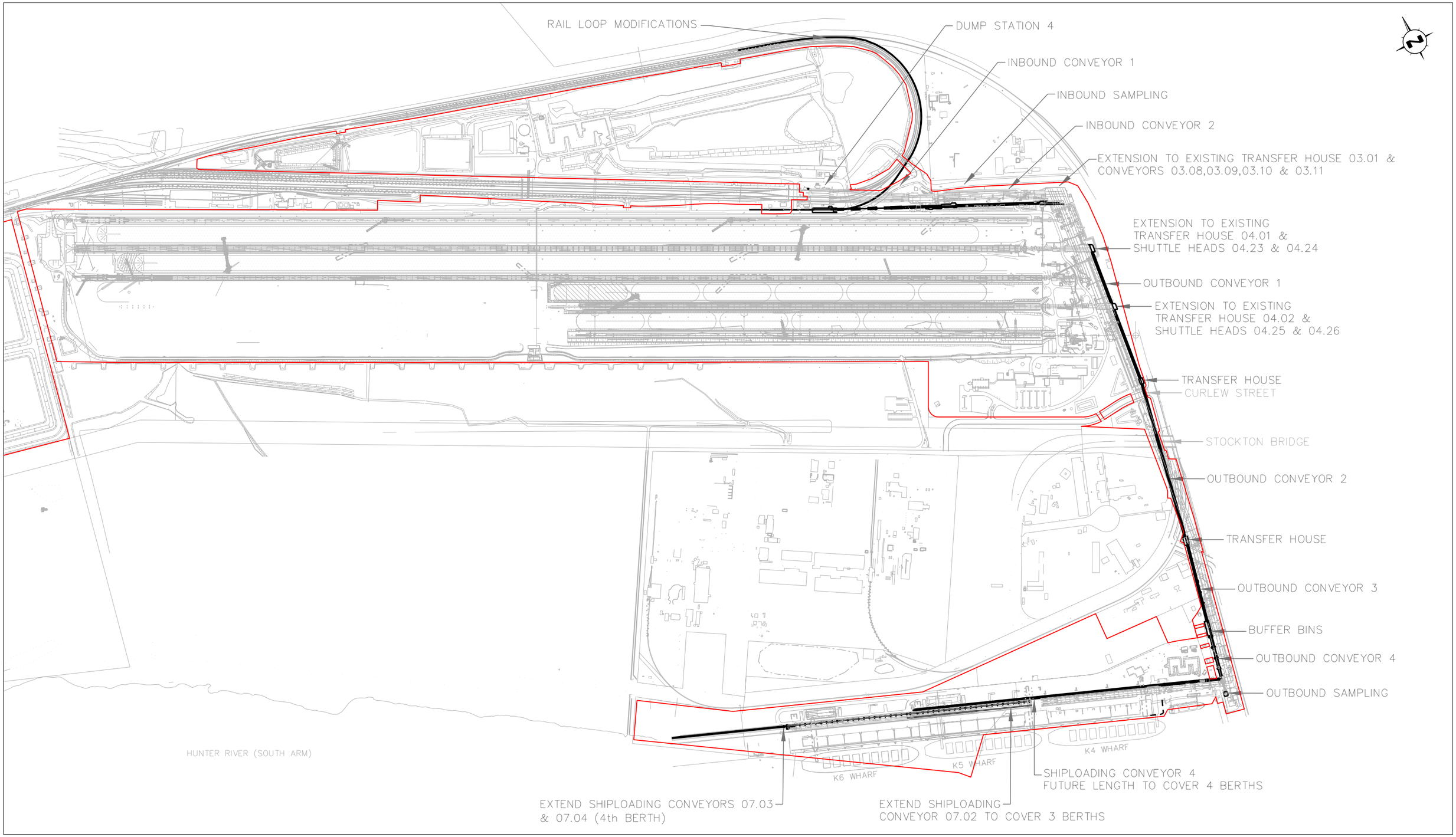
Source: Port Waratah Coal Services Limited (2008, 2009)

0 0.5 1.0 2.0km
1:35 000

Legend
Kooragang Coal Terminal

FIGURE 1.1

Location of Kooragang Coal Terminal



Source: Port Waratah Coal Services Limited (2008)

Legend

Kooragang Coal Terminal

Stage 4 Project

FIGURE 1.2

Layout of Stage 4 Project

- shiploader conveyor; and

- fourth shiploader to service the existing and approved berths.

The project will involve only minor changes to the approved footprint of KCT with additional infrastructure associated with the Project to be constructed on previously disturbed land. While the augmentation to the rail loop is proposed to be constructed outside the existing KCT footprint, the additional construction area will be contained within previously disturbed land. The remaining project features will be contained within the existing approved KCT disturbance footprint. The construction of the proposed outbound conveyor 1 along the eastern boundary of the site may require the removal of planted tree screens (*Eucalyptus spp*.) (refer to **Figure 1.2**). No additional ecological features will require removal as a result of the project.

In addition, the project will:

- be encompassed by the existing environmental management systems including the water management system, air quality and noise mitigation strategies;

- maintain current internal road traffic movements as all coal will be moved by conveyors;

- include installation of proven noise attenuation on new plant and equipment to reduce operational noise impacts;

- include installation of proven dust control measures on new plant and equipment to reduce the potential for dust generation;

- introduce soft flow chutes to eliminate coal boiling typical of traditional chutes and so reduce dust at transfer points;

- continue to enclose coal transfer chutes within transfer houses;

- continue to receive rail deliveries in enclosed buildings and minimise unloading dust by minimising drop heights into receival bins;

- continue to control the dust from the stockpiled coal by ensuring the surface of stockpiles are kept appropriately moist by the stockpile yard spray system, controlled automatically from an on-site weather station;

- continue to limit stacker drop heights to minimise the 'drop zone' of the coal, thereby controlling dust. Automated stackers are used which assists with minimising this 'drop zone' and also provides for greater operational efficiency; and

- shiploader infrastructure is designed to discharge coal within the hold of a ship, minimising the height of open free fall of coal and dust creation.

The project does not require any change to the operational workforce and the facility will continue to operate 24 hours a day, for the whole year.

1.2 Project Area

KCT operations are located on Kooragang Island, on the lower reaches of the Hunter River approximately 2 kilometres north of Newcastle (refer to **Figure 1.1**). Kooragang Island is essentially reclaimed land created by joining Dempsey, Moscheto and Walsh Islands. The area was originally developed in the early to mid 1900s as the industrial centre for Newcastle. Officially named in 1968, Kooragang Island is a total area of approximately 2600 hectares and is bounded by the south and north channels of the Hunter River. KCT is strategically located in the south-eastern portion of Kooragang Island, providing ready access to sea going vessels via the Hunter River and Newcastle Harbour.

As outlined in **Section 1.0**, the Stage 3 development consent (DA 35/96) provides for the current approved footprint of KCT (refer to **Figure 1.2**). All relevant ecology considerations were taken into account during the EIS process and subsequent development consent requirements for the Stage 3 Expansion. Further details on this assessment and development consent requirements for the Stage 3 Expansion are provided in **Section 3.1.1**.

The project area for the Ecology Assessment comprises the areas located outside of the current approved KCT footprint associated with the Stage 4 Project. As outlined in **Section 1.1**, this includes areas associated with the proposed rail loop augmentation that are located outside of the current approved KCT footprint. The proposed rail line augmentation will provide for a dedicated inbound and outbound path to the proposed fourth dump station that will be integrated with operational interactions with the existing and approved dump stations at KCT. The proposed rail loop augmentations are located on previously disturbed land as shown on **Figures 1.3** and **1.4**.

In addition, the DGRs require the assessment of potential impacts on the ecological features of lands adjoining KCT. As shown on **Figure 1.1**, the northern extent of Kooragang Island includes Kooragang Nature Reserve (KNR), which forms part of the RAMSAR listed Hunter wetlands, and is located immediately north of KCT (refer to **Section 2.0**). The Stage 4 Project has the potential to impact on KNR through potential off site emissions of dust, noise and water, and the potential for groundwater interactions. These potential impacts have been assessed and determined to be negligible, as outlined in **Section 5.0**.

1.3 Objectives

This Ecology Assessment has been prepared by Umwelt (Australia) Pty Limited (Umwelt) to assess the potential impact of the project on native flora and fauna species, endangered populations, threatened ecological communities (TECs) and their habitats occurring in the project area and on adjoining lands that may contain groundwater dependant ecosystems (GDEs). Terrestrial vegetation communities, flora and fauna species and fauna habitat present in the project area have been identified and considered as part of the impact assessment. The assessment addresses potential impacts on any threatened species, endangered population, TECs, or their habitat (terrestrial or aquatic) that may occur in, or in the general vicinity of the project area.

The objectives of the ecological assessment were to:

- identify the flora and fauna species previously recorded within the project area from previous studies on the site, local studies or ecological database searches;
- identify any threatened flora and fauna species, endangered populations, TECs, or their habitats within the project area, particularly those listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act), NSW *Fisheries Management Act 1994*

Source: Port Waratah Coal Services Limited (2008, 2009)

Legend

- Kooragang Coal Terminal
- Stage 4 Project Infrastructure
- Approved Infrastructure (Yet to be constructed)
- Newcastle Coal Infrastructure Group

FIGURE 1.3

Proposed Stage 4 Project

Source: Port Waratah Coal Services Limited (2008, 2009)

0 100 200 300m
1:6 000

Legend

- Kooragang Coal Terminal
- Stage 4 Project Infrastructure
- Newcastle Coal Infrastructure Group

FIGURE 1.4

Proposed Rail Loop Augmentation and 4th Dump Station

File Name (A4): R05_V1/2551_057.dgn

(FM Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);

- assess the potential impact of the Stage 4 Project on any threatened flora and fauna, endangered populations, TECs, or their habitats recorded (or with potential to occur) in the project area;

- assess the potential impact of the Stage 4 Project on any threatened flora and fauna, endangered populations, TECs, or their habitats recorded (or with potential to occur) on lands adjoining the project area; and

- provide necessary management options to minimise ecological impacts associated with the project.

This ecological assessment accompanies the broader Environmental Assessment prepared for the Stage 4 Project.

2.0 Regional Context

The Hunter Estuary Wetlands comprise Kooragang Nature Reserve, Hexham Swamp Nature Reserve, Shortland Wetlands and the SEPP 14 listed wetlands associated with the lower Hunter River Estuary, north of Newcastle in NSW. The wetlands occur within the floodplain of the Hunter River, which drains one of the largest coastal basins in NSW and extends further inland than any other coastal catchment. Kooragang Nature Reserve and Shortland Wetlands are listed under the Ramsar Convention on Wetlands of International Importance. The Hunter Estuary Wetlands comprise the largest estuarine wetland reserve in NSW.

The Hunter River originates in the Barrington Tops Plateau, flowing for some 250 kilometres to the sea at Newcastle. River regulation has lead to the disruption of natural flow regimes and stream geomorphological impacts. In addition, land clearing over the past 200 years has lead to the degradation of riparian corridors, broad scale hydrological changes, biodiversity losses, stream bank erosion and sedimentation.

The Hunter River Inquiry (Healthy Rivers Commission 2002) provided evidence that ecological sustainability is not currently being achieved in the Hunter catchment. Across the catchment, only one third of streams are in good condition, with stable banks and a natural pool/riffle structure, and approximately 10% of streams are unstable. Water quality is extremely variable and the extraction of water has placed most streams under stress. Studies of macroinvertebrates show that between 40% and 70% of sites or subcatchments surveyed are in poor condition and approximately 30% of native fish species have been lost from the catchment.

KCT is situated in the south-east portion of Kooragang Island (refer to **Figure 1.2**) on the reclaimed industrial land above the now buried Dempsey and Moscheto Islands (ERM Mitchell McCotter 1996). Kooragang Island formerly consisted of seven small islands and channels with dredging and reclamation in the 1950s and 1960s converting the estuarine habitats into one island for industrial purposes.

2.1 Vegetation Communities and Flora Species

Kooragang Island is predominantly composed of estuarine and freshwater wetland communities with exotic pastures derived from the clearing of the woodlands and large areas of industrial land.

Five vegetation communities were mapped as occurring on or in proximity to Kooragang Island by the Hunter Estuary Processes Study vegetation mapping (McDonald 2001), comprising:

- mangrove complex;
- saltmarsh;
- Casuarina complex;
- freshwater wetlands; and
- Phragmites swamp.

All of these communities are now listed as TECs under the TSC Act, except for mangrove forests, which are protected under the FM Act (however are not listed as a threatened species, or community). The TECs that each of the vegetation communities recorded on Kooragang Island conform to, include:

- Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions;
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions; and
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (includes Phragmites swamp).

Over 150 flora species have been recorded within the Hunter Estuary Wetlands including the following significant species listed as vulnerable under the TSC Act:

- *Cynanchum elegans* (immediately adjacent to Hunter Estuary Wetlands boundary); and
- *Zannechellia palustris* (immediately adjacent to Hunter Estuary Wetlands boundary).

2.2 Fauna Habitats and Species

The lower Hunter contains some of the most significant wetlands in NSW. The wetland habitats of the Hunter River estuary is noted by the Lower Hunter Regional Conservation Strategy to be of exceptional conservation significance (DECC 2009a). The Hunter estuary wetlands are listed internationally under the Ramsar Convention due to their unique mix of wetland types, importance for maintaining biological diversity and conservation of migratory shorebirds (including regularly supporting between 2% and 5% of the East Asian–Australasian Flyway population of Eastern Curlew (Australian Wetlands Database 2009). The Hunter Estuary Wetlands support habitat for at least 42 of the 66 species listed under international migratory species conventions (DECC 2009b). The estuary supports a large number of species at a critical seasonal stage of their breeding cycle and provides a key refuge during inland drought for species such as freckled duck (*Stictonetta naevosa*), pink-

eared duck (*Malacorhynchus membranaceus*), Australian pelican (*Pelecanus conspicillatus*) and glossy ibis (*Plegadis falcinellus*) (DECC 2009b).

Aquatic and terrestrial fauna occur throughout the Hunter estuary. Major faunal groups include fish, crustaceans (such as prawns), benthic invertebrates, significant native amphibian, reptilian and mammalian populations and residential, seasonal and migratory avifaunal communities (MHL 2003). The estuary provides significant resources for a large variety of migratory and resident bird species, but shows a low diversity of native amphibians, reptiles and mammals. Much of the native fauna has been destroyed as a result of habitat destruction and predation by introduced species. Faunal habitats closely follow the floral habitat types of the estuary, with additional faunal habitat types including tidal flats and saline open water bodies, fresh open water bodies, artificial structures and bare sandy sites (MHL 2003).

The Hunter Estuary Wetlands provide habitat for numerous terrestrial threatened species listed under the NSW TSC Act and the Commonwealth EPBC Act. Kooragang Island provides habitat for a large population of the green and golden bell frog (*Litoria aurea*) which is listed as endangered under the TSC Act and as vulnerable nationally under the EPBC Act.

Other threatened species known to occur on Kooragang Island or in nearby habitats include the Australasian bittern (*Botaurus poiciloptilus*); the red goshawk (*Erythrotriorchis radiatus*); black-necked stork (*Ephippiorhynchus asiaticus*), comb-crested jacana (*Irediparra gallinacea*); and the magpie goose (*Anseranas semipalmata*).

2.3 Conservation Reserves

The Stage 4 Project Area is located adjacent to the Hunter Estuary National Park. This national park encompasses the former Kooragang Nature Reserve and Hexham Swamp Nature Reserve, Stockton Sandspit and part of Ash Island. This area is the largest single estuary reserve in NSW.

Part of the Hunter Estuary National Park includes the Hunter Estuary Wetlands Ramsar wetland of international importance. The Convention on Wetlands of International Importance, known as the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (Ramsar 2009). The Hunter Estuary Wetlands Ramsar site comprises two locations, approximately two kilometres apart, within the former Kooragang Nature Reserve and Wetland Centre Australia. The Hunter Estuary Wetlands Ramsar Site was included as a wetland of international importance in 1984.

3.0 Methodology

3.1 Literature Review

3.1.1 Kooragang Coal Terminal Stage 3 Expansion Environmental Impact Statement 1996 (ERM Mitchell McCotter)

A flora and fauna assessment was prepared for the Stage 3 expansion of the KCT with flora and fauna surveys undertaken within the current approved footprint of KCT. Flora surveys resulted in the delineation of five vegetation communities, including:

- sedgeland/rushland – community comprising rushes and sedges to two metres tall, dominated by common reed (*Phragmites australis*). The community occurs around the edges of artificial drainage depressions and ponds;

- open forest – comprising planted tree screens dominated by eucalypts (*Eucalytpus* spp.), wattles (*Acacia longifolia* var*. sophorae; Acacia saligna*), camphor laurel (*Cinnamomum camphora*) and swamp she-oak (*Casuarina glauca*);

- mangroves – grey mangrove (*Avicennia marina*) occurs along the edge of the water management channel inside the rail loop;

- saltmarsh – dominated by samphire (*Sarcocornia quinqueflora*) and *Sueda australis* and occurring adjacent to the mangrove forest; and

- disturbed areas dominated by weeds such as bitou bush (*Chrysanthemoides monolifera*).

No rare or threatened flora species were recorded during surveys.

Three broad fauna habitats were identified in the project area, including:

- sedgeland/rushland;

- open forest; and

- estuarine wetland.

A total of 34 fauna species were recorded during targeted surveys undertaken in the study area, comprising 23 bird species, seven mammal species, three amphibians and one unidentified reptile (snake). Surveys included the identification of the following threatened species:

- Australasian bittern (*Botaurus poiciloptilus*);

- eastern bentwing-bat (*Minopterus schreibersii oceanensis*); and

- green and golden bell frog (*Litoria aurea*).

The project was considered likely to significantly impact threatened species recorded in the study area and a Species Impact Statement (SIS) was prepared.

3.1.2 Kooragang Coal Terminal Stage 3 Expansion Species Impact Statement 1996 (ERM Mitchell McCotter)

Ecological assessments undertaken as part of the EIS considered the project likely to result in a significant impact on the following species and a Species Impact Statement (SIS) was prepared for the project:

- Australasian bittern (*Botaurus poiciloptilus*);

- eastern bentwing-bat (*Minopterus schreibersii oceanensis*); and

- green and golden bell frog (*Litoria aurea*).

Additional surveys were undertaken as part of the SIS to target the green and golden bell frog (*Litoria aurea*). This previous investigation determined that the habitat within the KCT operational area was not critical habitat for the green and golden bell frog (*Litoria aurea*) as

defined under the *NSW Threatened Species Conservation Act 1995*. The identified habitat for green and golden bell frog (*Litoria aurea*) within the KCT operational area has been removed as part of the approved Stage 3 expansion. The impacts of this disturbance have been effectively offset by PWCS by compensatory habitat and a detailed ecological monitoring program to offset the loss of known threatened species habitat from within the project area.

PWCS developed a research and wetlands development program for wetlands in close proximity to KCT to offset the impacts of the Stage 3 expansion on green and golden bell frog individuals found within the KCT operational area in 1996. The research program was developed through an agreement with the Hunter Catchment Management Trust (HCMT) (now Hunter Central Rivers Catchment Management Authority) in 1997, and under the supervision of the then NSW NPWS, to establish a framework for the program.

The program was known as the Conservation of the Green and Golden Bell Frog with Emphasis on Relocation and Habitat Creation Project. An integral aspect of the program was the contribution of $200,000 from PWCS to fund research specifically targeting the management of the green and golden bell frog. The research was undertaken by the University of Newcastle. This project was developed as a measure to offset the impacts of the Stage 3 expansion of KCT (approved in 1997) on the green and golden bell frog.

Regular reviews of the research project were undertaken throughout its implementation. This included an audit of the progress of the project in relation to the aims and objectives that were established by PWCS and HCMT and approved by the NSW Department of Planning (DoP) with concurrence of the then NSW NPWS. The review process determined that the project was achieving its aims and objectives and was:

> contributing substantially to knowledge of the ecology of the GGBF and the development of methods and approaches to improve its long term conservation viability (NPWS 2003:2)

In July 2003, the then NSW NPWS provided the written confirmation of the completion of the research project and the achievement of the aims and objectives of the green and golden bell frog program.

3.2 Ecological Database Searches

In order to identify threatened species, endangered populations and TECs with the potential to occur in the project area, an assessment of relevant ecological databases was completed. These database sources comprised:

- a 10 kilometre radius search from the centre of the project area of the DECCW Atlas of NSW Wildlife (July 2009);
- a 10 kilometre radius search from the centre of the project area of the DEWHA Protected Matters Database (July 2009).

Records from these database searches were combined with records derived through literature reviews and professional opinion to identify the range of potentially occurring threatened species. The identification of potentially occurring threatened species was then used to assist in the development of appropriate survey methods. The results of the database searches have been compiled in Tables 1 and 2 of **Appendix A**.

3.3 Site Inspection

An inspection of the KCT facility was undertaken by a Senior Ecologist from Umwelt on 21 July 2009. All components of the KCT facility with the potential to be impacted by the project were inspected to determine ecological values and the potential for native flora and fauna species to occur.

Flora and fauna species were recorded opportunistically during all aspects of the site inspection, and vegetation communities were assessed.

4.0 Results

The site inspection confirmed that the proposed components of the project are to be undertaken within the existing disturbance footprint of the KCT or in highly disturbed industrial land surrounding the existing rail loop. No areas of native vegetation were identified in the project area.

The site inspection also confirmed the presence of vegetation communities and associated fauna habitats previously described within the approved KCT footprint (refer to **Section 3.1**). Native vegetation communities currently remaining within the approved KCT footprint occur primarily within the existing rail loop and include:

- a strip of grey mangrove (*Avicennia marina*), approximately 500 metres long and 1 to 2 trees wide, occurring along the edge of the water management channel inside the rail loop; and

- a small area of saltmarsh (approximately 500 metres long and 2 to 3 metres wide), dominated by samphire (*Sarcocornia quinqueflora*) and *Sueda australis* and occurring adjacent to the mangrove forest.

The remainder of the approved KCT footprint is highly disturbed, or currently developed and includes areas of landscape plantings along the eastern boundary of the KCT site, adjacent to the ship loaders and coal stockpiles and surrounding the administration area. These landscape plantings include a range of eucalypts, acacias and casuarinas and provide only low quality habitat for native flora and fauna species.

Seven bird species were opportunistically recorded during the site inspection (all being considered to be commonly associated with disturbed habitats) and included:

- feral pigeon (*Columba livia*);

- common mynah (*Acridotheres tristis*);

- masked lapwing (*Vanellus miles*);

- superb blue wren (*Malurus cyaneus*);

- Australia magpie (*Gymnorhina tibicen*);

- magpie lark (*Grallina cyanoleuca*); and

- noisy miner (*Manorina melanocephala*).

Mangrove and saltmarsh habitats or other significant ecological features were not recorded within the Stage 4 Project Area, as described in **Section 1.1**. The inspection of the project area did not identify any of the significant ecological features that are known to occur in the local area. No threatened species or TECs were recorded and the adjacent RAMSAR wetland is not considered to occur within the project area boundary and is separated from the project area by an existing embankment, which forms a definable boundary to the KNR located immediately north of the project area.

5.0 Impact Assessment

All relevant ecological considerations were taken into account during the Environmental Impact Statement process (ERM Mitchell McCotter 1996), and subsequent development consent requirements for the Stage 3 Expansion (refer to **Section 3.1.1**). The Stage 4 Project includes the proposed augmentations to the existing rail loop servicing KCT, which are located outside of the current approved KCT footprint. The infrastructure associated with the proposed augmentations to the rail loop will be constructed on previously disturbed land and does not involve any disturbance to the minor areas of native vegetation (grey mangrove and saltmarsh) that occur inside the rail loop.

As shown on **Figure 1.1**, the northern extent of Kooragang Island includes Kooragang Nature Reserve (KNR), which forms part of the Ramsar listed Hunter Estuary Wetlands, and is located immediately north of KCT. The Stage 4 Project has the potential to impact on KNR through potential off site emissions of dust, noise and water, and the potential for groundwater interactions.

Predicted off-site impacts, including potential dust, noise and water quality impacts are not expected to increase above existing approved levels (refer to Section 6.0 of the EA). PWCS has designed and implemented a range of environmental management strategies and plans to effectively manage the impacts of KCT on the environment and local community. Central to the environmental management framework of KCT is an environmental management system (EMS) independently certified under the ISO14001 standard. The PWCS EMS provides the framework for environmental management of KCT operations and construction activities. The EMS incorporates a range of strategies and procedures that outline the specific processes implemented at KCT to manage, monitor and effectively minimise potential impacts of KCT operations on the surrounding environment.

Given the proximity of KCT to Kooragang Nature Reserve the management of water is critical to prevent any impacts on the ecological character of the reserve. PWCS has established a totally closed water management system to meet the design requirement of a 1 in 100 year design storm event or equivalent (refer to Section 2.3.3 of the EA). The comprehensive water management system at KCT operates to collect water from operational activities and to harvest stormwater for recycling. All areas of the plant, including the wharf, capture water and channel it back to settling ponds for clarification prior to being held in storage ponds for re-use. The water management system is effectively designed to restrict runoff from within the KCT operational area into the adjacent Kooragang Nature Reserve.

The system only overflows in the event of extreme or prolonged wet weather. In the event of the exceedance of the capacity of the water management system overflows are discharged via an existing stormwater channel which provides a vegetated flow path to the North Arm of the Hunter River. The location of the rail loop embankment between the stormwater channel and the adjacent Kooragang Nature Reserve provides a barrier to protect the Kooragang Nature Reserve in the event that the capacity of the stormwater channel is exceeded.

There will be sediment and erosion controls during construction of the proposed augmentations to the rail loop within the project area.

There are a number of components of the Stage 4 Project that have the potential to interact with existing groundwater systems within the KCT site, including the construction activities associated with the proposed fourth dump station and associated conveyor systems. There are two known groundwater aquifers within the vicinity of the KCT site and the broader Kooragang Island area. A perched aquifer exists close to ground surface and is associated with the filling of land for the establishment of industrial land at Kooragang Island (refer to **Section 1.2**). This aquifer is referred to as the Fill aquifer. An additional aquifer occurs at depth and is associated with a naturally occurring aquifer system associated with the surrounding estuarine area. This aquifer is referred to as the Estuarine aquifer. Groundwater in the aquifer systems travels in a general northerly direction towards the tidal flats associated with the north arm of the Hunter River.

PWCS has designed the relevant components of the Stage 4 Project to minimise potential groundwater interactions as far as practicable. A comprehensive assessment of potential impacts of the Stage 4 Project on the known groundwater systems has been completed (refer to Appendix 6 of the EA). As outlined in this assessment, the potential impacts on the existing flow (in relation to potential drawdown effects) and quality of the existing groundwater systems will be minimal and localised within the KCT site. As such, the Stage 4 Project is not expected to impact on the existing groundwater resources within KCT and negligible impact outside KCT. Therefore there will be negligible risk of impact on any GDEs occurring in adjacent habitats.

5.1 Impacts on Threatened Species, Endangered Populations and TECs

5.1.1 Assessment under the Environmental Planning and Assessment Act 1979

Three threatened species have been previously recorded at KCT. These species include:

- Australasian bittern (*Botaurus poiciloptilus*);
- eastern bentwing-bat (*Minopterus schreibersii oceanensis*); and
- green and golden bell frog (*Litoria aurea*).

Since the preparation of the Stage 3 Expansion EIS (ERM Mitchell McCotter 1996), coastal saltmarsh has also been listed as an Endangered Ecological Community (EEC) under the TSC Act.

In addition, the habitats of the project area are expected to provide a small area of potential habitat for a further 17 threatened species (refer to **Appendix A**).

Tables 1 and 2 of **Appendix A** provide an assessment of the potential impact of the project on threatened species, endangered populations and TECs previously recorded or considered likely to occur within 10 kilometres of KCT. Tables 1 and 2 contain the relevant ecological details of each listing (including their habitat requirements, known range and reservation within conservation reserves within the region), as well as an assessment as to whether there may be an impact on any recorded or potentially occurring threatened species, population or TECs as a result of the project. The impacts of the project are considered for each species, endangered population and TEC identified in Tables 1 and 2 and provides an

assessment of significance based on the ecological features and habitats of the project area and the ecological requirements of each species, endangered population and TEC.

The proposed disturbance area does not include the habitats or known records of threatened species or TECs previously recorded in the project area. The assessment indicates that the project is not likely to impact threatened species, endangered population or TECs previously recorded or considered to potentially occur within the Stage 4 Project Area.

5.1.2 SEPP 44 Assessment

The Stage 4 Project Area is not considered to be core koala habitat as defined under SEPP 44 due to a lack of preferred koala food trees listed in Schedule 2 of the Policy. The preparation of a Koala Plan of Management is not required. SEPP 44 does not place any constraints on the project.

5.1.3 Assessment under the Fisheries Management Act 1994

No FM Act listed threatened aquatic flora or fauna species were recorded within the project area.

The Hunter River does not provide known habitat for any threatened species listed under the FM Act and the project will not impact threatened aquatic species, populations or EECs potentially occurring within the project area.

5.1.4 Assessment of Matters of National Environmental Significance under the Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth EPBC Act, the approval of the Commonwealth Minister for the Environment, Water, Heritage and the Arts is required for any action that may have a significant impact on matters of national environmental significance (NES). These matters are:

- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- Ramsar wetlands of international importance;
- the Commonwealth marine environment;
- World Heritage properties;
- National Heritage places; and
- nuclear actions.

The EPBC Act Policy Statement 1.1 – Significant Impact Guidelines outline significant impact criteria that determine whether an action has, will have, or is likely to have a significant impact on matters of NES. These criteria have been considered in the Assessment of Significance provided in **Appendix B**, for those matters of NES that have been recorded within the project area, or have potential habitat in the project area.

Threatened species and communities listed under the EPBC Act that have previously been recorded in the project area or local area are considered in Tables 1 and 2 of **Appendix A**.

One EPBC Act threatened fauna species, the vulnerable green and golden bell frog (*Litoria aurea*), was recorded in the Stage 3 Project Area in 1996 (ERM Mitchell McCotter 1996). The impacts of the Stage 3 Project disturbance have been effectively offset by PWCS. The Stage 4 Project Area does not contain potential habitat for this species. The Stage 4 Project Area is not considered to provide potential habitat for listed migratory waders and threatened species. KCT is adjacent to the Hunter Estuary Wetlands, listed as a Wetland of International Importance under the RAMSAR convention.

The Assessment of Significance provided in **Appendix A** and **Appendix B** indicates that the project will not have a significant impact on matters of NES.

6.0 Management Measures

A range of management strategies will be used by KCT to limit potential impacts on native flora and fauna in the project area and in adjacent habitats. The strategies will include:

- management of noise and dust to minimise impacts to adjoining vegetation communities and fauna (as addressed in the Sections 6.3.1 and 6.3.2 of the EA);
- feral animal and noxious weed control consistent with existing practice at KCT;
- management of erosion and sedimentation to ensure that adjoining vegetation communities and aquatic systems are not disturbed (as addressed in Section 6.3.3 of the EA);
- management of surface water to ensure that adjoining vegetation communities, aquatic systems and associated fauna are not disturbed (as addressed in Section 6.3.3 of the EA); and
- adaptive management, as required.

As outlined in **Section 5.0** PWCS has designed and implemented a range of environmental management strategies and plans to effectively manage the impacts of KCT on the surrounding environment.

As outlined previously, PWCS has designed and established a fully enclosed water management system designed to capture stormwater runoff up to a 1 in 100 year storm event from all areas of the KCT operational area to effectively mitigate impacts on the surrounding environment. The project proposes minor alterations to the comprehensive water management system to incorporate the construction and operation of the relevant components of the Stage 4 Project and as such the system will continue to mitigate potential impacts on the surrounding environment.

PWCS has implemented an Acoustical Design, Procurement, Construction and Commissioning Process throughout the Stage 3 Expansion approved in 1997. In many cases PWCS has gone well beyond the best available technology by promoting research and development of acoustical solutions not previously considered economically achievable. This process has been exceptionally successful in reducing noise emissions from KCT to below relevant government and community criteria. The initiatives undertaken as part of this noise mitigation process (refer to Table 6.2 of the EA) incorporate Best Available Technology to enable PWCS to achieve compliance in relation to consented noise limits.

In addition, PWCS has committed to continue to investigate and implement (where feasible) new technology and practices targeting noise reduction as part of the ongoing design,

procurement, construction and commissioning process. This will reduce the off-site impacts on the adjacent Hunter Estuary Wetlands and ensure they remain at levels that will not affect any listed threatened or migratory species.

PWCS has implemented a large array of dust controls and safeguards (refer to Section 6.3.2 of the attached EA) to ensure that air quality outside KCT is not adversely affected by emissions from the operation. The introduction of improved technology of coal handling associated with the project will further strengthen the dust controls, including the introduction of soft flow chutes at coal transfer points and improved belt cleaning systems. This will further mitigate off site impacts on the adjacent Hunter Estuary Wetlands and ensure they remain at levels that will not affect any listed threatened or migratory species.

7.0 References

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APPENDIX A

Threatened Species Assessment

Appendix A – Threatened Species Assessment of Significance

Threatened species, endangered populations, and threatened ecological communities (TECs) identified or considered likely to occur within 10 kilometres of the Stage 4 Project Area (project area) are listed in **Tables 1** and **2** below. These tables include the results of the searches of the DECCW Atlas of NSW Wildlife Database and DEWHA Protected Matters Database for a 10 kilometre radius of the project area.

Tables 1 and **2** contain the relevant ecological details of each listing (including their habitat requirements, known range and reservation within conservation reserves within the region), as well as an assessment as to whether there may be an impact on any recorded or potentially occurring threatened species, population or TECs as a result of the project.

The potential impact of the project on migratory species and Ramsar wetlands listed under the Commonwealth EPBC Act is provided in **Appendix B**. Threatened species listed under the EPBC Act have been assessed below in **Tables 1** and **2** and further assessment under the EPBC Act is not required for these species.

Table 1 - Threatened Flora Assessment

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED FLORA SPECIES						
rough double tail *Diuris praecox*	V (TSC) V (EPBC)	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey.	Occurs between Ourimbah and Nelson Bay.	Glenrock SCA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
leafless tongue orchid *Cryptostylis hunteriana*	V (TSC) V (EPBC)	This species appears to favour moist soils on the flat coastal plains. Occupies swamp heath, but also in sclerophyll forest and woodland, often on sandy soils. Typically found in communities containing hard-leaved scribbly gum (*Eucalyptus haemastoma*), brown stringybark (*E. capitellata*) and red bloodwood (*Corymbia gummifera*).	This species is known to occur in the Karuah Manning and Wyong CMA sub-regions in the Hunter Central Rivers region.	Tomaree NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
heart-leaved stringybark *Eucalyptus camfieldii*	V (TSC) V (EPBC)	Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone and coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal NP.	Tilligery SCA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
		include stunted species of *E. oblonga* (narrow-leaved stringybark), *E. capitellata* (brown stringybark) and *E. haemastoma* (scribbly gum).				
Parramatta Red Gum *Eucalyptus parramattensis* subsp. *decadens*	V (TSC) V (EPBC)	Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant.	There are two separate meta-populations of *E. parramattensis* subsp. decadens. The Kurri Kurri meta-population is bordered by Cessnock—Kurri Kurri in the north and Mulbring—Aberdare in the south. Large aggregations of the sub-species are located in the Tomalpin area. The Tomago Sandbeds meta-population is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south.	Tilligery SCA Medowie SF Schnapper Island NR Joe Redman Reserve	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
tall knotweed *Persicaria elatior*	V (TSC) V (EPBC)	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
biconvex paperbark *Melaleuca*	V (TSC)	Biconvex paperbark generally grows in damp places, often near streams or low-lying	Scattered and dispersed populations of this species are known to occur in the Karuah	Tilligery SCA	The project area does not provide suitable habitat for this species and it has not	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
biconvexa		areas on alluvial soils of low slopes or sheltered aspects.	Manning and Wyong sub-regions of the Hunter/Central Rivers Catchment		been recorded at the site. There is no potential for a significant impact on this species.	
dwarf kerrawang *Rulingia prostrata*	E (TSC) E (EPBC)	Occurs on sandy, sometimes peaty soils in a wide variety of habitats.	This species is known to occur in the Karuah Manning sub-region of the Hunter/Central Rivers Catchment.	Tilligery SCA Medowie SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
heath wrinklewort *Rutidosis heterogama*	V (TSC)	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Scattered coastal locations between Wyong and Evans Head, and on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes.	Glenrock SCA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
magenta lilly pilly *Syzygium paniculatum*	V (TSC)	This species grows in subtropical and littoral rainforests on sandy soils or stabilised dunes near the sea.	Occurs in widely separated localities between Bulahdelah and Jervis Bay.	This species is not known to occur in reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
black-eyed Susan *Tetratheca juncea*	V (TSC) V (EPBC) 3VCa (ROTAP)	Usually found in low open forest or woodland with a shrub understorey and grass groundcover on low nutrient soils, however it and has also been found in heathland and moist forest. This species generally prefers well-drained sites and ridges, although it also found on upper and mid-	This species is confined to the Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock LGAs.	Glenrock SCA Karuah NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
		slopes and occasionally in gullies. There appears to be a preference for southerly aspects, although the species will occur on slopes with a variety of aspects.				
Zannichellia palustris	E (TSC)	Grows in fresh or slightly saline stationary or slowly flowing water.	Known to occur in the Hunter, Karuah Manning and Wyong sub-regions of the Hunter/Central Rivers Catchment	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
THREATENED ECOLOGICAL COMMUNITIES						
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Species restricted to coastal saltmarshes include Distichlis distichophylla (endangered), Halosarcia pergranulata subsp. pergranulata, Wilsonia backhousei (vulnerable) and Wilsonia rotundifolia (endangered).	This community occurs in the intertidal zone along the NSW coast.	Hunter Estuary NP	A small area of saltmarsh is known to occur in the Stage 3 Project Area, contained within the existing, approved rail loop. The Stage 4 Project will not result in the removal of saltmarsh communities and will not result in alterations to the water management system in which the community occurs. There is no potential for a significant impact on this community.	No
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney	EEC (TSC)	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines,	Known from parts of the LGAs of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes,	Pambalong NR	The project area does not contain any examples of this community. There is no potential for a significant impact on this community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Basin and South East Corner Bioregions		lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation	Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Hawkesbury, Baulkham Hills, Hornsby, Lane Cove, Blacktown, Auburn, Parramatta, Canada Bay, Rockdale, Kogarah, Sutherland, Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Major examples once occurred on the floodplains of the Clarence, Macleay, Hastings, Manning, Hunter, Hawkesbury, Shoalhaven and Moruya Rivers.			
Freshwater Wetlands on Coastal Floodplains	EEC (TSC)	Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur	Known from along the majority of the NSW coast. There is less than 150 ha remaining on the Tweed lowlands (estimate in 1985); about 10,600 ha on the lower Clarence floodplain (in 1982); about 11,200 ha on the lower Macleay floodplain (in 1983); about 3,500 ha in the lower Hunter – Central Hunter region (in 1990s); less than 2,700 ha on the NSW south coast from Sydney to Moruya (in the mid 1990s), including about	Hunter Estuary NP	The project area does not contain any examples of this community. There is no potential for a significant impact on this community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
		below 20 m elevation on level areas.	660 ha on the Cumberland Plain (in 1998) and about 100 ha on the Illawarra Plain (in 2001); and less than 1000 ha in the Eden region (in 1990).			

Key: CE = Critically endangered species
CEEC = Critically Endangered Ecological Community
E = Endangered
EEC = Endangered Ecological Community
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*
NP = National Park
NR = Nature Reserve
P = Preliminary Determination
SCA = State Conservation Area
SRA = State Recreation Area
TSC = *Threatened Species Conservation Act* 1995
V = Vulnerable

Table 2 - Threatened Fauna Assessment

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
AMPHIBIANS						
wallum froglet *Crinia tinnula*	V (TSC)	Wallum Froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country.	This species is known to occur in the Hunter, Karuah Manning, Wyong and Macleay Hastings sub-regions of the Hunter/Central Rivers Catchment.	Tomaree NP Tilligery NR Joe Redman R Moffats Swamp NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
green and golden bell frog *Litoria aurea*	E (TSC) V (EPBC)	Occurs amongst emergent aquatic or riparian vegetation and amongst vegetation, fallen timber, including grassland, cropland and modified pastures. Breeds in still or slow flowing waterbodies with some vegetation such as *Typha* spp. and *Eleocharis* spp.	NSW North Coast near Brunswick Heads, southwards along the NSW Coast to Victoria where it extends into east Gippsland.	Hunter Estuary NP	Three green and golden bell frogs were recorded in the Stage 3 Project Area in 1996. Known habitat for the species was removed as part of the Stage 3 Expansion (ERM Mitchell McCotter 1996) and compensatory habitat and a research project was included in the project consent conditions. The Stage 4 Project Area does not contain potential habitat for this species. The Stage 4 Project will not result in the disturbance of potential habitats and there will be no changes to the KCT water management system. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
littlejohns treefrog *Litoria littlejohni*	V (TSC)	Occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	Distribution includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria.	Olney SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
REPTILES						
green turtle *Chelonia mydas*	V (TSC) V (EPBC)	Ocean-dwelling species spending most of its life at sea. Eggs laid in holes dug in beaches throughout their range. Scattered nesting records along the NSW coast.	Widely distributed in tropical and sub-tropical seas. Usually found in tropical waters around Australia but also occurs in coastal waters of NSW, where it is generally seen on the north or central coast, with occasional records from the south coast.	Glenrock SRA Tomaree NP Tilligerry NR Worimi NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
leathery turtle *Dermochelys coriacea*	V (TSC) V (EPBC) MAR (EPBC) MIG (EPBC)	This turtle is a marine species that can be identified both in and offshore in tropical and temperate waters.	This species can be found in all Australian coastal waters, in particular between the south of Queensland and the NSW central coast.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
broad-headed snake *Hoplocephalus bungaroides*	E (TSC)	This species shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
BIRDS						
magpie goose *Anseranas semipalmata*	V (TSC)	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land.	Rare in south-eastern Australia, with an increasing number of records in central and northern NSW. Vagrants can follow food sources to south-eastern NSW.	Pambalong NR	The project area does not provide suitable habitat for this species, although it has not been recorded at the site. There is no potential for a significant impact on this species.	No
blue-billed duck *Oxyura australis*	V (TSC)	This species prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	Widespread in NSW, but most common in the southern Murray-Darling Basin area.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
freckled duck *Stictonetta naevosa*	V (TSC)	This species prefers permanent freshwater swamps and creeks with heavy growth of cumbungi, lignum or tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. This species generally rests in dense cover during the day, usually in deep water. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. The nests are usually located in dense vegetation at or near water level.	The freckled duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. This species may also occur as far as coastal NSW and Victoria during such times.	Hunter Estuary NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
wandering albatross *Diomedea exulans*	E (TSC) V (EPBC)	This species feed in pelagic, offshore and inshore waters, and breed on a number of islands just north of the Antarctic Circle: South Georgia Island (belonging to the UK), Prince Edward and Marion Islands (South Africa), Crozet and Kerguelen Islands (French Southern Territories) and Macquarie Island (Australia).	The wandering albatross visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. It has been recorded along the length of the NSW coast.	Glenrock SCA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Antipodean albatross *Diomedea antipodensis*	V (TSC) V (EPBC) MAR & MIG (EPBC)	This albatross is marine, pelagic and aerial. And is found in waters with a temperature between -2 and 24 degrees Celsius. It is typically found in areas of open waters.	This species breeds on Macquarie and Heard Island. And feeds in areas of the Australian southern ocean.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Tristan albatross *Diomedea exulans exulans*	E (EPBC) MAR (EPBC) MIG (EPBC)	This species is known to breed biennially although there is little else known about their breeding biology.	The sea distribution of this species is not yet understood, but it is known to move from sub-Antarctic breeding island to the south Atlantic ocean to latitudes of 35° S. This species is rarely observed in the Pacific and Indian Oceans, although patchy records do exist. This species has been identified at Wollongong.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Gibsons albatross *Diomedea gibsoni*	V (TSC) V (EPBC) MAR (EPBC) MIG (EPBC)	The Gibsons albatross only breeds in New Zealand. This species only feeds pelagically on crustaceans, squid and fish.	This species is typically only found in the Auckland Islands of New Zealand. However it regularly occurs of the NSW coast between Newcastle and Green Cape.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
shy albatross *Thalassarche cauta*	V (TSC) V (EPBC) MAR (EPBC) MIG (EPBC)	The shy albatross is a pelagic species found in both sub-Antarctic and sub-tropical marine waters. These birds are usually observed resting on the ocean when it is calm or soaring in the air when seas are rough with strong winds present. When on land they are typically found on cliffs and ledges on the sheltered sides of islands. Nests are mounds usually constructed from a combination of mud, bones, plant matter and rocks.	This bird is widely distributed throughout the southern oceans. The breeding grounds of this bird are typically the islands off the coast of Australia and New Zealand. Between July and November this species is commonly identified off the NSW south-east coast.	Tomaree NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Salvins albatross *Thalassarche salvini*	V (EPBC) MAR (EPBC) MIG (EPBC)	The Salvins albatross is a pelagic species found in both sub-Antarctic and sub-tropical marine waters. These birds are usually observed resting on the ocean when it is calm or soaring in the air when seas are rough with strong winds present. When on land they are typically found on cliffs and ledges on the sheltered sides of islands. Nests are mounds usually constructed from a combination of mud, bones, plant matter and rocks.	This bird is widely distributed throughout the southern oceans. The breeding grounds of this bird are typically the islands off the coast of Australia and New Zealand. Between July and November this species is commonly identified off the NSW south east coast.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
white-capped albatross *Thalassarche steadi*	V (EPBC) MAR (EPBC) MIG (EPBC)	The shy albatross is a pelagic species found in both sub-Antarctic and sub-tropical marine waters. These birds are usually observed resting on the ocean when it is calm or soaring in the air when seas are rough with strong winds present. When on land they are typically found on cliffs and ledges on the sheltered sides of islands. Nests are mounds usually constructed from a combination of mud, bones, plant matter and rocks.	This bird is widely distributed throughout the southern oceans. The breeding grounds of this bird are typically the islands off the coast of Australia and New Zealand. Between July and November this species is commonly identified off the NSW south-east coast.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
black-browed albatross *Thalassarche melanophris*	V (TSC) V (EPBC)	Inhabits Antarctic, sub-Antarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. This species nests annually on a mound of soil and vegetation, on the cliffs or steep slopes of vegetated Antarctic and sub-Antarctic islands.	The black-browed albatross has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Campbells albatross *Thalassarche impavida*	V (EPBC) MAR (EPBC) MIG (EPBC)	Campbells albatross is a marine species that occurs in Antarctic, sub-Antarctic and temperate waters (although it has occasionally been recorded in tropical areas). It can tolerate temperatures between 0 and 24 degrees celsius. This species forages at the edges of continental and island shelves.	During breeding season, this species is mostly confined to Antarctic and sub-Antarctic waters. Although, at other times of the year it is known as an uncommon visitor to the continental shelf-break to SA, known to the off-shore areas of SA, NSW, Tasmania and NSW.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
southern giant petrel *Macronectes giganteus*	E (TSC) E (EPBC)	Over summer, the species nests in small colonies amongst open vegetation on Antarctic and sub-Antarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	This species has a circumpolar pelagic range and is a common visitor off the coast of NSW.	Glenrock SRA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
northern giant petrel *Macronectes halli*	V (EPBC) MAR (EPBC) MIG (EPBC)	This bird is a marine species that is typically identified in sub-Antarctic to sub-tropical waters depending on the time of year. This species tends to be attracted to sewerage outfalls and can be typically seen scavenging around penguin and seal colonies.	During winter months this bird is typically distributed in areas around the Australian mainland. During summer months it breeds in the areas of the sub-Antarctic.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Goulds petrel *Pterodroma leucoptera leucoptera*	E (TSC E (EPBC)	This species can be found on Cabbage Tree Island from mid to late September. On this island they nest between two steep and rocky gullies forested with cabbage tree palms.	During breeding season this bird is distributed on Cabbage Tree Island and Boondelbah Island of the coast of Port Stephens.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
providence petrel *Pterodroma solandri*	V (TSC)	The providence petrel is a marine bird species that builds a nest of grass in a chamber at the end of a burrow up to 2 metres in length. These nests are built on the lower slopes of mountains.	This bird is distributed across the eastern waters of the Pacific Ocean. Australian breeding sites are located at Lord Howe Island and Phillip Island.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
flesh-footed shearwater *Puffinus carneipes*	V (TSC)	The flesh-footed shearwater is a marine bird species that nests on Lord Howe Island, it lays its eggs at the end of a burrow that can reach up to 2 metres in length.	This species is distributed across the Indian and Pacific Ocean. Around the NSW coastline, this species nests on Lord Howe Island. It is also known to nest on the coastline of WA.	Munmorah SCA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Australasian bittern *Botaurus poiciloptilus*	V (TSC)	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleoacharis* spp.).	This species may be found over most of the state except for the far north-west.	Hunter Estuary NP	One Australasian bittern was recorded in the Stage 3 project area in 1996. Known habitat in the KCT area for the species was removed as part of the Stage 3 Expansion (ERM Mitchell McCotter 1996). The Stage 4 Project Area does not contain potential habitat for this species The Stage 4 Project will not result in the disturbance of potential habitats and there will be no changes to the water management system. There is no potential for a significant impact on this species.	No
black bittern *Ixobrychus flavicollis*	V (TSC)	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland.	Hunter Estuary NP Moffats Swamp NR	The project area does not provide suitable habitat for this species, and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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black-necked stork *Ephippiorhynchus asiaticus*	E (TSC)	Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.	This species is widespread across coastal northern and eastern Australia, becoming uncommon further south into NSW, and rarely found south of Sydney.	Hunter Estuary NP Pambalong NR Worimi NR	The project area does not provide suitable habitat for this species, and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Eastern osprey *Pandion cristatus*	V (TSC)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes.la	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas.	Tomaree NP Hunter Estuary NP Worimi NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
square-tailed kite *Lophoictinia isura*	V (TSC)	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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broad-billed sandpiper *Limicola falcinellus*	V (TSC)	Favours sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	Most records from Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary.	Hunter Estuary NP	The project area does not provide suitable habitat for this species, and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Terek sandpiper *Xenus strenua*	V (TSC)	This species has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Australian painted snipe *Rostratula australis*	E (TSC)	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin.	Pambalong NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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black-tailed godwit *Limosa limosa*	V (TSC)	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have been recorded in wet fields and sewerage treatment works.	This species is migratory, flying to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. This species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	Hunter Estuary NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
great knot *Calidris tenuirostris*	V (TSC)	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sand flats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.	This species has been recorded at scattered sites along the coast to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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comb-crested jacana *Irediparra gallinacea*	V (TSC)	Inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies.	Occurs throughout coastal Australia and well inland in the north from the Kimberley to Sydney. Vagrants occasionally appear further south, possibly in response to unfavourable conditions further north in NSW.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
bush stone-curlew *Burhinus grallarius*	E (TSC)	This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. The bush stone curlew is largely nocturnal, being especially active on moonlit nights. It nests on the ground in a scrape or small bare patch laying two eggs in spring and early summer.	The bush stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however, and in the south-east it is either rare or extinct throughout its former range.	Hunter Estuary NR Wallaroo NP Tilligery NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Australian pied oystercatcher *Haematopus longirostris*	V (TSC)	Favours inter-tidal flats of inlets and bays, open beaches and sandbanks.	This species is thinly scattered along the entire coast of NSW.	Hunter Estuary NR Worimi NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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sooty oystercatcher *Haematopus fuliginosus*	V (TSC)	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Small numbers of the species are evenly distributed along the NSW coast.	Tomaree NP Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
greater sand-plover *Charadrius leschenaultii*	V (TSC)	Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	This species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries.	Hunter Estuary NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
lesser sand-plover *Charadrius mongolus*	V (TSC)	Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	Most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records.	Hunter Estuary NP Worimi NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
little tern *Sterna albifrons*	E (TSC)	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records).	Occurs on the coast, mainly north of Sydney.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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wompoo fruit dove *Ptilinopus magnificus*	V (TSC)	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests.	Occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. It is rare south of Coffs Harbour.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
rose-crowned fruit dove *Ptilinopus regina*	V (TSC)	Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
superb fruit dove *Ptilinopus superbus*	V (TSC)	Inhabits rainforest and similar closed forests where it forages high in the canopy. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	This species occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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glossy black-cockatoo *Calyptorhynchus lathami*	V (TSC)	Habitat for this species includes forests on low-nutrient soils, specifically those containing key *Allocasuarina* feed species. They will also eat seeds from eucalypts, angophoras, acacias, cypress pine and hakeas, as well as eating insect larvae. Breeding occurs in autumn and winter, with large hollows required.	The glossy black-cockatoo has a sparse distribution along the east coast and adjacent inland areas from western Victoria to Rockhampton in Queensland. In NSW, it has been recorded as far inland as Cobar and Griffith.	Medowie SCA Tomaree NP Moffats Swamp NR Worimi NR Wallaroo NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
regent honeyeater *Anthochaera phrygia*	E (TSC) E (EPBC)	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine casuarina woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland.	Glenrock SRA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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swift parrot *Lathamus discolor*	E (TSC) E (EPBC)	This species often visits box-ironbark forests, feeding on nectar and lerps. In NSW, typical tree species in which it forages include mugga ironbark, grey box, swamp mahogany, spotted gum, red bloodwood, narrow-leaved red ironbark, forest red gum and yellow box. This bird is a migratory species that breeds in Tasmania during the spring and summer, and migrates to the mainland during the cooler months of the year.	In NSW this species has been recorded from the western slopes region along the inland slopes of the Great Dividing Range, as well as forests along the coastal plains from southern to northern NSW.	Tomaree NP Worimi NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
turquoise parrot *Neophema pulchella*	V (TSC)	This species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It nests in tree hollows, logs or posts, from August to December.	The turquoise parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.	Glenrock SRA Wallaroo NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
Eastern grass owl *Tyto longimembris*	V (TSC)	Found in areas of tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on flood plains.	Most likely to be found in the north-east of the state.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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masked owl *Tyto novaehollandiae*	V (TSC)	This species is generally recorded from open forest habitat with sparse mid-storey but patches of dense, low ground cover. It is also recorded from ecotones between wet and dry eucalypt forest, along minor drainage lines and near boundaries between forest and cleared land.	The masked owl occurs sparsely throughout the continent and nearby islands, including Tasmania and New Guinea.	Medowie SCA Tomaree NP Tilligery NR Medowie SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
barking owl *Ninox connivens*	V (TSC)	Habitat for this species includes dry forests and woodlands, often in association with hydrological features such as rivers and swamps.	The barking owl is distributed sparsely throughout temperate and semi-arid areas of mainland Australia; however it is most abundant in the tropical north. Most records for this species occur west of the Great Dividing Range.	Tilligery NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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powerful owl *Ninox strenua*	V (TSC)	The powerful owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It generally requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation.	The powerful owl occurs in eastern Australia, mostly on the coastal side of the Great Dividing Range, from south western Victoria to Bowen in Queensland.	Medowie SCA Moffats Swamp NR Tomaree NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
diamond firetail *Stagonopleura guttata*	V (TSC)	Habitat includes a range of eucalypt dominated communities with a grassy understorey, including woodland, forest and mallee. It appears that populations are unable to persist in areas where there are no vegetated remnants larger than 200 hectares.	The diamond firetail occurs through central and eastern NSW, north into southern and central Queensland and south through Victoria to South Australia. In NSW it mainly occurs west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain and the Hunter, Clarence, Richmond and Snowy River valleys.	Hunter Estuary NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
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spotted-tailed quoll *Dasyurus maculatus*	V (TSC) E (EPBC)	Habitat for this species is highly varied, ranging from sclerophyll forest, woodlands, coastal heathlands and rainforests. Records exist from open country, grazing lands and rocky outcrops. Suitable den sites including hollow logs, tree hollows, rocky outcrops or caves.	In NSW the spotted-tailed quoll occurs on both sides of the Great Dividing Range, with the highest densities occurring in the north east of the state. It occurs from the coast to the snowline and inland to the Murray River.	Tomaree NP Tilligery NP Wallaroo SF Wallaroo NP Uffington SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
brush-tailed phascogale (eastern subspecies) *Phascogale tapoatafa tapoatafa*	V (TSC)	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	This species has a patchy distribution around the coast of Australia. In NSW it is more frequently found in forest on the Great Dividing Range in the north-east and south-east of the State. There are also a few records from central NSW.	Uffington SF Tilligery NR Tomaree NP Wallaroo NP Wallaroo SF Joe Redman R	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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koala *Phascolarctos cinereus*	V (TSC)	This species inhabits eucalypt forest and woodland, with suitability influenced by tree species and age, soil fertility, climate, rainfall and fragmentation patterns. The species is known to feed on a large number of eucalypt and non-eucalypt species, however it tends to specialise on a small number in different areas. *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis, E. microcorys, E. robusta, E. albens, E. camaldulensis* and *E populnea* are some preferred species.	The koala has a fragmented distribution throughout eastern Australia, with the majority of records from NSW occurring on the central and north coasts, as well as some areas further west. It is known to occur along inland rivers on the western side of the Great Dividing Range.	Medowie SCA Moffats Swamp NR Tomaree NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
squirrel glider *Petaurus norfolcensis*	V (TSC)	Inhabits a variety of mature or old growth habitats, including box, box-ironbark woodlands, river red gum forest, and blackbutt-bloodwood forest with heath understorey. It prefers mixed species stands with a shrub or acacia mid-storey, and requires abundant tree hollows for refuge and nest sites.	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Medowie SCA Tomaree NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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long-nosed potoroo (south east mainland) *Potorous tridactylus tridactylus*	V (TSC) V (EPBC)	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	This species is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
grey-headed flying-fox *Pteropus poliocephalus*	V (TSC) V (EPBC)	This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Grey-headed flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria.	Glenrock SCA Snapper Island NR Hunter Estuary NP Wallaroo NP Wallaroo NR Tilligery NR Worimi NR	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

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yellow-bellied sheathtail bat *Saccolaimus flaviventris*	V (TSC)	This species forages for insects, flies high and fast over the forest canopy, but lower in more open country. It forages in most habitats across its very wide range, with and without trees; and appears to defend an aerial territory. It roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to use mammal burrows.	The yellow-bellied sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
eastern freetail-bat *Mormopterus norfolkensis*	V (TSC)	This species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.	The eastern freetail-bat is found along the east coast from south Queensland to southern NSW.	Tomaree NP Medowie SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
little bentwing bat *Miniopterus australis*	V (TSC)	Prefers moist eucalypt forest, rainforest or dense coastal banksia scrub. This species roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Occurs in coastal north-eastern NSW and eastern Queensland.	Medowie SCA Wallaroo NP Wallaroo SF Tomaree NP	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
eastern bentwing-bat *Miniopterus schreibersii oceanensis*	V (TSC)	This species hunts in forested areas and uses caves as the primary roosting habitat, but also uses derelict mines, storm-water tunnels, buildings and other man-made structures. It forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Eastern bent-wing bats occur along the east and north-west coasts of Australia.	Hunter Estuary NP Wallaroo NP Wallaroo SF Uffington SF	The eastern bentwing-bat was recorded in the Stage 3 Project Area in 1996. The Stage 4 Project Area does not contain potential habitat for this species. The Stage 4 Project will not result in the disturbance of potential habitats. There is no potential for a significant impact on this species.	No
large-eared pied bat *Chalinolobus dwyeri*	V (TSC) V (EPBC)	The large-eared pied bat is generally found in a variety of drier habitats, including dry sclerophyll forests and woodlands, however, it probably tolerates a wide range of habitats. It tends to roost in the twilight zones of mines and caves, generally in colonies or common groups.	This species has a distribution from south western Queensland to NSW from the coast to the western slopes of the Great Dividing Range.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
eastern false pipistrelle *Falsistrellus tasmaniensis*	V (TSC)	Habitat for this species includes sclerophyll forest. It prefers wet habitats, with trees over 20 metres high, and generally roosts in tree hollows or trunks.	This species has a range from south eastern Queensland, through NSW, Victoria and into Tasmania, and occurs from the Great Dividing Range to the coast.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
large-footed myotis *Myotis adversus*	V (TSC)	This species generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. It forages over streams and pools catching insects and small fish by raking its feet across the water surface.	The large-footed myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	Wallaroo SF Worimi NR Uffington SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
greater broad-nosed bat *Scoteanax rueppellii*	V (TSC)	The greater broad-nosed bat appears to prefer moist environments such as moist gullies in coastal forests, or rainforest. They have also been found in gullies associated with wet and dry sclerophyll forests and open woodland. It roosts in hollows in tree trunks and branches and has also been found to roost in the roofs of old buildings.	The greater broad-nosed bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however it does not occur at altitudes above 500 m.	Moffats Swamp NR Wallaroo NP Wallaroo SF	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No
New Zealand fur seal *Arctocephalus forsteri*	V (TSC)	Prefers rocky parts of islands with jumbled terrain and boulders.	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney.	This species is not known to occur in any reserves in the region.	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (NSW Government 2009)	Occurrence in Survey Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED POPULATIONS						
emu population in the NSW North Coast Bioregion and Port Stephens LGA (*Dromaius novaehollandiae*)	EP (TSC)	Occur in open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	Previously widespread on the NSW north coast, but now largely restricted to coastal and near coastal areas between Evans Head and Red Rock and west to the Bungawalbin area. There have also been some recent records from the Port Stephens area.	Medowie SCA	The project area does not provide suitable habitat for this species and it has not been recorded at the site. There is no potential for a significant impact on this species.	No

Key E = endangered
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*
NP = National Park
NR = Nature Reserve
SCA = State Conservation Area
TSC = *Threatened Species Conservation Act 1995*
V = vulnerable

APPENDIX B

EPBC Act Assessment of Significance

Appendix B - Assessment of Significance under Environment Protection and Biodiversity Conservation Act 1999

Assessment of Significance under *Environment Protection and Biodiversity Conservation Act 1999*

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), approval from the Commonwealth Minister for the Environment, Heritage, Water and the Arts is required for any action that may have a significant impact on matters of national environmental significance (NES). These matters are:

- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- Ramsar wetlands of international importance;
- the Commonwealth marine environment;
- World Heritage properties;
- National Heritage places; and
- nuclear actions.

Migratory Species

A total of 42 migratory species listed under the EPBC Act have been recorded in the Hunter Estuary Wetlands which occur adjacent to the Stage 4 Project Area. The recorded migratory species include:

- white-bellied sea-eagle (*Haliaeetus leucogaster*);
- great egret (*Ardea alba*);
- cattle egret (*Ardea ibis*);
- double-banded plover (*Charadrius bicinctus*);
- greater sand-plover (*Charadrius leschenaultia*);
- lesser sand-plover (*Charadrius mongolus*);
- lesser golden plover (*Pluvialis dominica*);
- Pacific golden plover (*Pluvialis fulva*);
- grey plover (*Pluvialis squatarola*);
- Oriental cuckoo (*Cuculus optatus*);
- peregrine falcon (*Falco peregrinus*);
- white-winged black tern (*Chlidonias leucopterus*);
- little tern (*Sterna albifrons*);
- Caspian tern (*Hydroprogne caspia*);
- common tern (*Sterna hirundo*);
- buff-banded rail (*Gallirallus philippensis*);
- Lewins rail (*Lewinia pectoralis*);
- common sandpiper (*Actitis hypoleucos*);
- ruddy turnstone (*Arenaria interpres*);
- sharp-tailed sandpiper (*Calidris acuminate*);
- red knot (*Calidris canutus*);
- curlew sandpiper (*Calidris ferruginea*);

- pectoral sandpiper (*Calidris melanotos*);
- little stint (*Calidris minuta*);
- red-necked stint (*Calidris ruficollis*);
- great knot (*Calidris tenuirostris*);
- Lathams snipe (*Gallinago hardwickii*);
- grey-tailed tattler (*Tringa brevipes*);
- wandering tattler (*Tringa incanus*);
- broad-billed sandpiper (*Limicola falcinellus*);
- bar-tailed godwit (*Limosa lapponica*);
- black-tailed godwit (*Limosa limosa*);
- eastern curlew (*Numenius madagascariensis*);
- little curlew (*Numenius minutus*);
- whimbrel (*Numenius phaeopus*);
- ruff (*Philomachus pugnax*);
- wood sandpiper (*Tringa glareola*);
- common greenshank (*Tringa nebularia*);
- marsh sandpiper (*Tringa stagnatilis*);
- buff-breasted sandpiper (*Tryngites subruficollis*);
- Terek sandpiper (*Xenus cinereus*); and
- glossy ibis (*Plegadis falcinellus*).

An area of *important habitat* is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; or
- habitat that is of critical importance to the species at particular life-cycle stages; or
- habitat utilised by a migratory species which is at the limit of the species range; or
- habitat within an area where the species is declining.

The Stage 4 Project Area does not provide suitable potential habitat for migratory species. Mangrove and saltmarsh habitats occurring at KCT will not be impacted by the project. The Stage 4 Project Area does not provide habitat to support an important population of any listed migratory species and migratory species will not be significantly impacted by the project.

Ramsar Wetlands of International Importance

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

- **areas of the wetland being destroyed or substantially modified;**

The Stage 4 Project does not propose to significantly alter the approved footprint of KCT. The infrastructure associated with the project will be constructed on previously disturbed land.

Predicted off-site impacts, including potential dust, noise and water quality impacts are not expected to increase above existing approved levels (refer to Section 6.0 of the EA). There are a number of components of the Stage 4 Project that have the potential to interact with existing groundwater systems within the KCT site, including the construction activities associated with the proposed Fourth Dump station and associated conveyor systems. There are two known groundwater aquifers within the vicinity of the KCT site and the broader Kooragang Island area. A perched aquifer exists close to ground surface and is associated with the filling of land for the establishment of industrial land at Kooragang Island (refer to **Section 1.2**). This aquifer is referred to as the fill aquifer. An additional aquifer occurs at depth and is associated with a naturally occurring aquifer system associated with the surrounding estuarine area. This aquifer is referred to as the estuarine aquifer. Groundwater in the aquifer systems travels in a general northerly direction towards the tidal flats associated with the north arm of the Hunter River.

PWCS has designed the relevant components of the Stage 4 Project to minimise potential groundwater interactions as far as practicable. A comprehensive assessment of potential impacts of the Stage 4 Project on the known groundwater systems has been completed (refer to Appendix 6 of the EA). As outlined in this assessment, the potential impacts on the existing flow (in relation to potential drawdown effects) and quality of the existing groundwater systems will be minimal and localised within the KCT site. As such, the Stage 4 Project is not expected to have a significant impact on the existing groundwater resources within and surrounding KCT and therefore minimal impact on any GDEs occurring in adjacent habitats.

The Hunter Estuary Wetlands Ramsar site will not be destroyed or substantially modified as a result of the Stage 4 Project.

- **a substantial and measurable change in the hydrological regime of the wetland, for example a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland;**

The Stage 4 Project does not propose to significantly alter the approved footprint of KCT. The infrastructure associated with the Project will be constructed on previously disturbed land.

Surface water at KCT is managed within a closed water management system and therefore will not impact adjacent wetland ecosystems.

A comprehensive assessment of potential impacts of the Stage 4 Project on the known groundwater systems has been completed (refer to Appendix 6 of the EA). As outlined in this assessment, the potential impacts on the existing flow (in relation to potential drawdown effects) and quality of the existing groundwater systems will be minimal and localised within the KCT site. As such, the Stage 4 Project is not expected to have a significant impact on the existing groundwater resources within and surrounding KCT and therefore minimal impact on any GDEs occurring in adjacent habitats.

As such, the Stage 4 Project is not likely to impact the hydrological regime of the wetland.

- **the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected;**

The Stage 4 Project does not propose to significantly alter the approved footprint of KCT. The infrastructure associated with the Project will be constructed on previously disturbed land.

Offsite impacts are expected to be minimal and therefore there will not be measurable changes to the ecological functions of the adjacent Ramsar wetland. Therefore, the habitat and lifecycle of native species is not expected to be adversely affected.

As such, the Stage 4 Project is not likely to impact on the ecological values of adjacent areas of wetland, including terrestrial and aquatic vertebrate and invertebrate species.

- **a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health; or**

The Stage 4 Project does not propose to significantly alter the approved footprint of KCT. The infrastructure associated with the Project will be constructed on previously disturbed land.

Surface water at KCT is managed within a closed water management system and therefore will not impact adjacent wetland ecosystems.

A comprehensive assessment of potential impacts of the Stage 4 Project on the known groundwater systems has been completed (refer to Appendix 6 of the EA). As outlined in this assessment, the potential impacts on the existing flow (in relation to potential drawdown effects) and quality of the existing groundwater systems will be minimal and localised within the KCT site. As such, the Stage 4 Project is not expected to have a significant impact on the existing groundwater resources within and surrounding KCT and therefore minimal impact on any GDEs occurring in adjacent habitats.

As such, the Stage 4 Project is not likely to impact on the water quality of adjacent areas of wetland.

- **an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.**

The Stage 4 Project does not propose to significantly alter the approved footprint of KCT. The infrastructure associated with the Project will be constructed on previously disturbed land. Relevant off-site impacts, including potential dust, noise and water quality impacts, are not expected to increase above existing levels (refer to Main Text). There will be no measurable changes associated with the surface water management system or groundwater interactions.

As such, the Stage 4 Project is not likely to result in a species that is harmful to the ecological character of the wetland being established or the spread of an existing invasive species in the wetland.

Conclusion

The project will not have a significant impact on the Hunter Estuary Wetlands Ramsar Wetland of International Importance, as the project will be contained within existing disturbed infrastructure areas and there will be no offsite impacts.