T4 PROJECT

RESPONSE TO SUBMISSIONS AND PREFERRED PROJECT REPORT

Prepared for Port Waratah Coal Services Limited | September 2013

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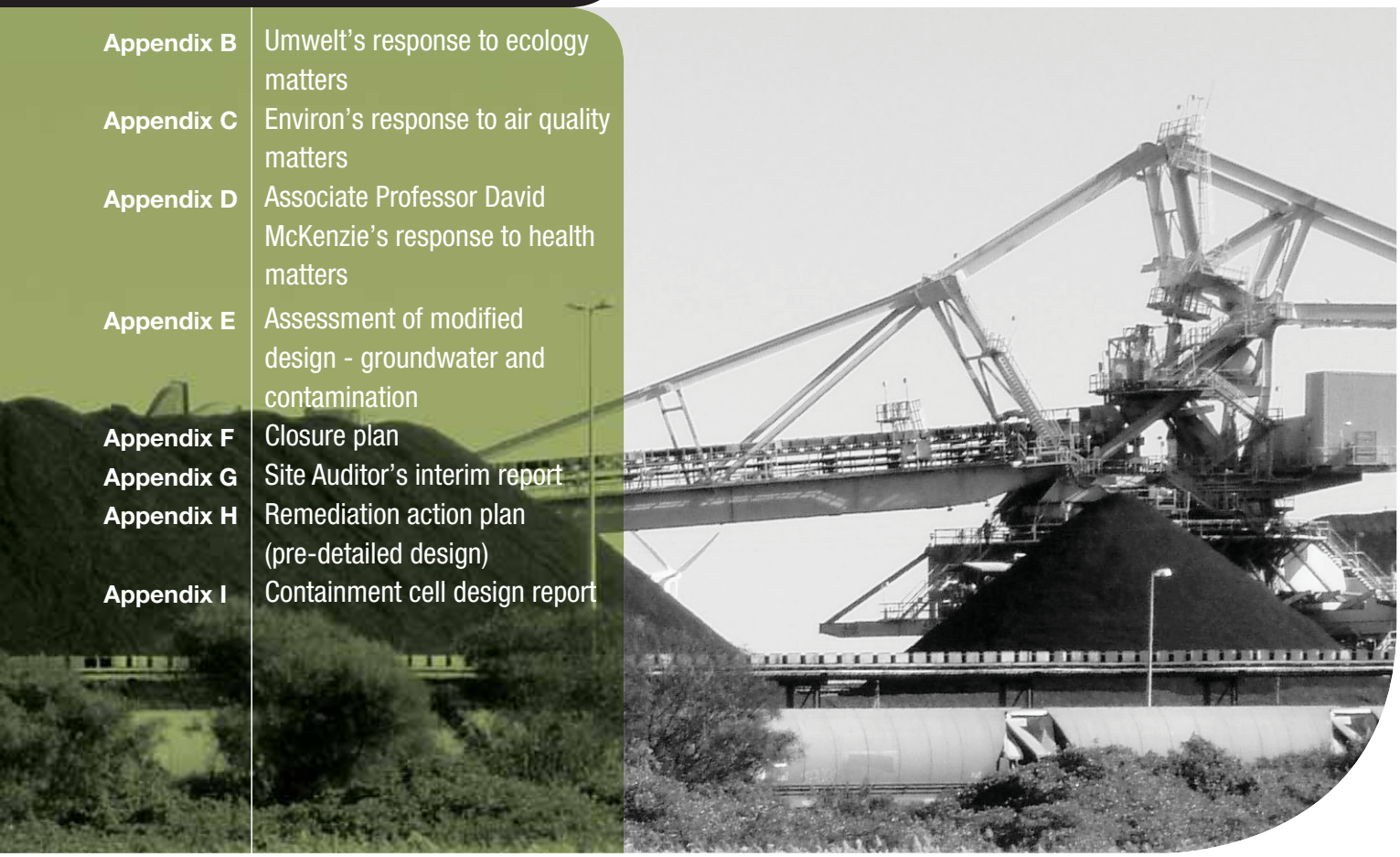

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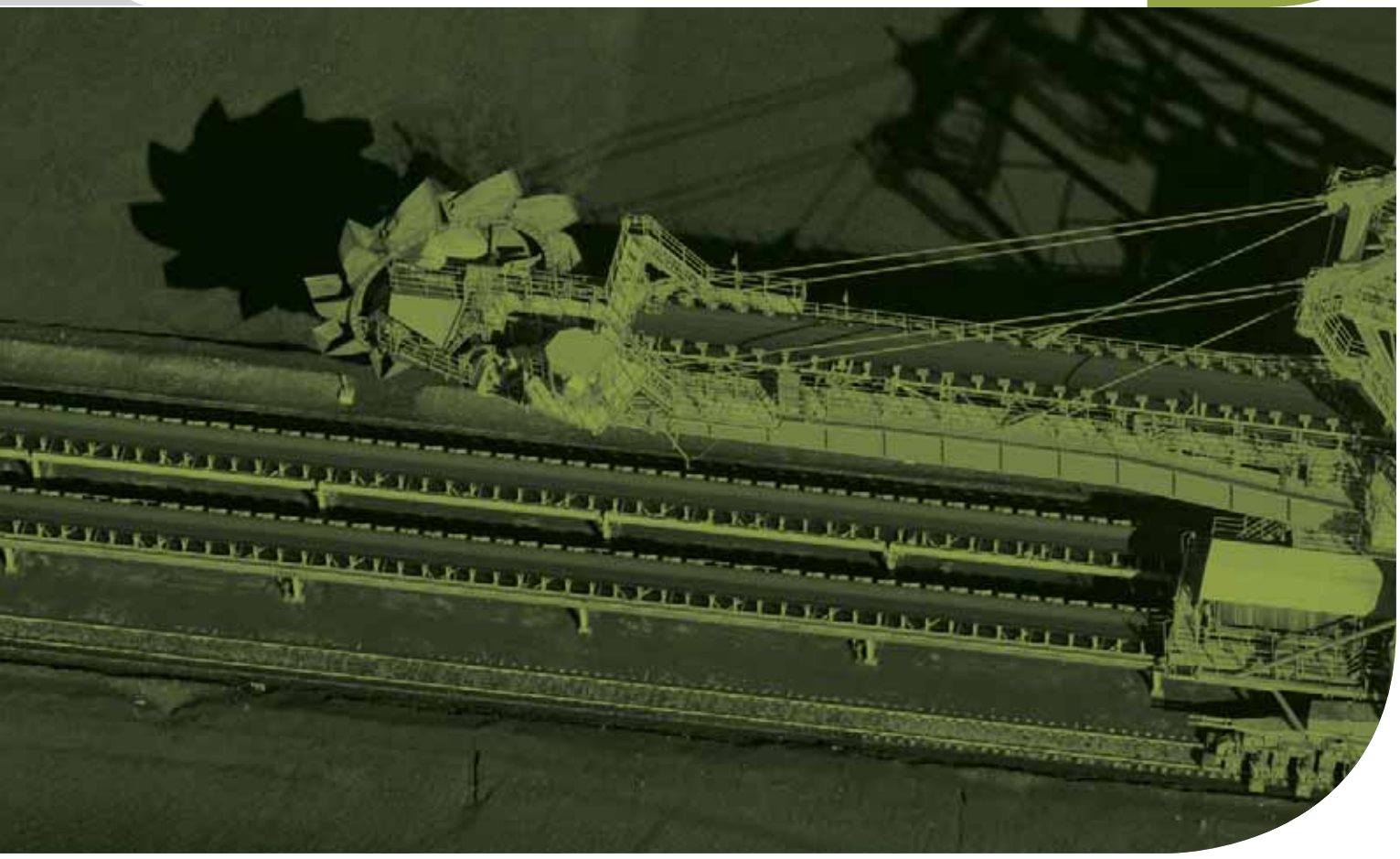
APPENDIX B

UMWELT'S RESPONSE TO ECOLOGY MATTERS



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UMWELT'S RESPONSE TO ECOLOGY MATTERS

Terminal Four (T4) Project

August 2013

UMWELT'S RESPONSE TO ECOLOGY MATTERS

Terminal Four (T4) Project

August 2013

Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Port Waratah Coal Services Limited

Project Director:	**Travis Peake**
Project Manager:	**Allison Riley**
Report No.	**2860/R09/FINAL**
Date:	**August 2013**

Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au

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APPENDIX

1.0 Introduction

This document has been prepared in response to a request from the Director-General in accordance with section 75H(6) of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) that Port Waratah Coal Services Limited (PWCS) prepare a response to the issues raised during the public exhibition period for the Terminal 4 Project (T4 Project).

1.1 Summary of Submissions

As part of the approval process for the T4 Project an environmental assessment (EA) of the project was prepared by EMGA Mitchell McLennan Pty Limited (EMM), with extensive input from other consulting companies. This included an ecology assessment by Umwelt (Australia) Pty Limited (Umwelt). The draft EA was lodged with the NSW Department of Planning and Infrastructure (DP&I) for adequacy review on 30 November 2011. Following government feedback it was modified and the DP&I then deemed that it adequately met the requirements for an EA and could proceed to public exhibition. The final EA was publicly exhibited from 8 March to 7 May 2012. In response, PWCS received 488 submissions on the project, including a large number of form letters and multiple submissions by some respondents.

1.2 Report Structure

This response to submissions report has been prepared by Umwelt on behalf of PWCS to address the key ecological issues raised through the submissions received on the EA through the public exhibition period. Matters raised by each submission are addressed individually for submissions received from government authorities and grouped by issue for those received from other groups and individuals, except for the more detailed submissions on ecological issues. For each issue, the theme of the issue raised is noted in bold, followed by a response in normal type.

2.0 Agency Submissions

2.1 Office of Environment and Heritage (OEH)

2.1.1 Threatened Species

OEH acknowledges that the exhibited EA has clarified sampling stratification units and has provided this information in a tabular format (Table 3.2, Appendix K) enabling an assessment of survey effort against each stratification unit. However the table omits the size/area of each stratification unit. This information would have been helpful to enable OEH to further assess survey effort against scale.

The vegetation survey of the T4 project area was stratified using the biophysical attributes shown in Table 3.2 of the Ecological Assessment (EA Appendix K), as indicated by Office of Environment and Heritage (OEH) above. Section 3.3.8 of the Ecological Assessment provides a summary of adequacy of the flora field surveys. As part of the summary, the area of each stratification unit is indicated in Table 3.6 of the Ecological Assessment. Table 3.6 (reproduced as **Table 2.1** below) identifies the adequacy of the quadrat survey with respect to OEH draft guidelines and indicates that the level of field survey undertaken for the T4 Project exceeds the suggested minimum sampling frequency and that the results of the flora assessment and vegetation mapping can be viewed with a high degree of certainty. The OEH draft guidelines state that a combination of transects and plots are recommended to be employed the selection and number of each depend on the characteristics and size of the site. **Table 2.1** shows the combination that was utilised during surveys of the T4 project area and shows that the effort employed in either transects or quadrats reached the recommended amount.

Table 2.1 – Adequacy of Vegetation Survey*

Stratification Unit	Area (ha) in T4 Project Area[#]	No. of Quadrats and Transects Sampled and No. of each required (x)
Saltmarsh/Samphire Shrublands on tidal flats/creeks in estuarine sediment with restricted tidal regime (**saltmarsh in proposed rail and utility corridor**)	19.4	Quadrats: 12 (2) Transects: 7 (2)
Saltmarsh/Samphire Shrublands on estuarine stream channel in estuarine sediment with unrestricted tidal regime (**saltmarsh on Hunter River south arm**)	2.3	Quadrats: 3 (1) Transects: 0 (1)[^]
Mangrove Closed Forest on tidal flats/creeks in estuarine sediment with restricted tidal regime (**mangrove forest in proposed rail and utility corridor**)	28.3	Quadrats: 5 (2) Transects: 2 (2)
Mangrove Closed Forest on estuarine stream channel in estuarine sediment with unrestricted tidal regime (**mangrove forest on Hunter River south arm**)	5.9	Quadrats: 1 (2)[^] Transects: 1 (2)[^]
Freshwater Wetland (aquatic plants) on tidal flats and creeks in estuarine sediment with restricted tidal regime (**freshwater wetlands in proposed rail and utility corridor in depressions with freshwater influence**)	6.8	Quadrats: 3 (2) Transects: 3 (2)

Table 2.1 – Adequacy of Vegetation Survey (cont.)

Stratification Unit	Area (ha) in T4 Project Area	No. of Quadrats and Transects Sampled and No. of each required (x)
Freshwater Wetland (aquatic plants) in pits on made land growing in fill (**freshwater wetlands in closed depressions on reclaimed/filled land**)	27.7	Quadrats: 8 (2) Transects: 4 (2)
Disturbed Land (grasslands, forblands, shrublands and tree clumps) on made land growing in fill	180.1	Quadrats: 1 (3)^ Transects: 2 (3)^
Tree planting on made land growing in fill on slopes.	3.2	Transect: 1 (2)^

* Note that additional survey work has been undertaken since the EA and Ecological Assessment (Umwelt 2012a) was exhibited.
# Note that vegetation areas have been updated as per the revised T4 Project design as outlined in the PPR/RTS document.
^ The OEH draft guidelines state that a combination of transects and plots are recommended to be employed and the selection and number of each depend on the characteristics and size of the site. Table 2.1 shows the combination that was utilised during surveys of the T4 project area and shows that, on the whole, the vegetation communities were more than adequately sampled with particular focus on those that are more threatened and likely to be impacted by the project.

The current EA states that targeted surveys were undertaken for these species (Maundia triglochinoides and Asperula asthenes) but omits specific details on timings with respect to what time of year they were undertaken. These details need to be provided so that OEH can ascertain whether or not appropriate surveys have been undertaken.

Maundia triglochinoides

Harden (1993) and Botanic Gardens Trust (BGT) (2012) state that *Maundia triglochinoides* grows in swamps or shallow freshwater on heavy clay; and that it flowers during warmer months. Survey of freshwater wetlands in the T4 project area was carried out using quadrats and meandering transects in locations listed in **Table 2.2**. As shown in **Table 2.2**, surveys were carried out during the warmer months of November 2010, January 2011 and February 2012. Surveys of Freshwater Wetlands were also undertaken in April and May 2011. Targeted searches for *M. triglochinoides* were undertaken during these surveys. However, the species was not recorded at any locations. The similar species *Triglochin procera*, with which *M. triglochinoides* can be readily confused and which inhabits similar habitat, was also not recorded. Freshwater wetlands in the T4 project area were typically brackish due to the historic marine sediments underlying the wetlands and their proximity to tidal levels. As such, the freshwater habitat of the T4 project area is not ideal for *M. triglochinoides*. As a precautionary approach, an assessment of significance for this species has been carried out indicating that the T4 Project will not have a significant impact on *M. triglochinoides* (refer to **Appendix 1**).

Table 2.2 – Survey of Freshwater Wetlands in the T4 Project Area

Date of Survey	Location of Survey Sites	Type of Survey (number undertaken)
8/11/2010	Pond 10, Pond 12, Railway Pond, Easement Pond, Deep Pond	Quadrat (6) Meandering transect (1)
11/11/2010	Easement Pond South	Meandering Transect (1)

Table 2.2 – Survey of Freshwater Wetlands in the T4 Project Area (cont.)

Date of Survey	Location of Survey Sites	Type of Survey (number undertaken)
29/11/2011	Ponds north of rail	Quadrat (1)
17/1/2012	Ponds north of rail	Quadrat (1)
1/02/2012	Eastern Lagoon	Quadrat (1)
6/02/2012	Reedy Pond, next to Swan Pond	Meandering Transect (1) Quadrat (1)
9/05/2011	OEH Wetland 1	Meandering Transect (1)
10/05/2011	Railway Road Pond and other ponds north of rail	Meandering Transect (2)
16/05/2011	Eastern end of railway corridor, ponds north of rail	Meandering Transect (1) Quadrat (1)

Asperula asthenes

RBGDT (2012) and Harden (1992) state that *Asperula asthenes* grows in damp sites often along river banks; from Taree to Bulahdelah. It flowers in spring. The T4 project area is approximately 100 kilometres south of Bulahdelah, and as there are no known local records for the species it is assumed that the T4 project area is out of the natural range of this species.

Spring surveys were undertaken in 2010 and 2011 in various ponds and damp sites including the margins of Swan Pond, Easement Pond and Deep Pond. Numerous other surveys were also undertaken in damp sites during different seasons. **Table 2.3** summarises relevant survey sites; that is, those carried out in damp sites, not including saline sites such as true Saltmarsh and Mangrove Forest. Saline sites are not expected to support this species. *Asperula asthenes* was not recorded in any location. The only Rubiaceae recorded was *Asperula conferta* (common woodruff), which was recorded in two freshwater wetland sites.

Table 2.3 – Surveys in Damp Sites within the T4 Project Area

Date of Survey	Locations of Survey Sites	Type of Survey (number undertaken)
8/11/10	Railway ponds; Easement Pond; Ponds 10 & 12; Deep Pond	Quadrats (6); Meandering Transect (1)
9/5/10	Disturbed land (incl. areas on damp ground)	Meandering Transect (1)
11/11/10	Easement Pond South; Tree Planting on bank of Long Pond	Meandering Transects (2)
9/5/11	Swan Pond eastern margin (incl. areas with freshwater influence); OEH Wetland 1	Quadrats (2); Meandering Transects (2)
10/5/11	Railway Road Pond; various ponds north of rail	Meandering Transects (3)
16/5/11	Various ponds north of rail	Quadrats (1); Meandering Transects (2)
29/11/11	Swan Pond eastern margin; various ponds north of rail	Quadrats (2)
17/1/12	Various ponds north of rail	Quadrats (1)
6/2/12	Reedy Pond	Quadrats (1); Meandering Transects (1)
1/2/12	Ponds in Eastern Freshwater Wetland (north of rail, east of Mosquito Creek)	Quadrats (1); Meandering Transects (2)

2.1.2 Compensatory Habitat Area

A singular, over-arching 'compensatory offset package' for the entire proposal needs to be provided, that clearly demonstrates how each threatened species, ecological community and habitat which is impacted upon is actually offset.

The OEH submission provided a detailed discussion that has been considered during the development of the T4 Project Biodiversity Offset Strategy including advice regarding assessment methodologies, including BioBanking; land ownership and conservation mechanisms; threatened species offsetting requirements; and appropriate management plan development. Each of these factors has been considered in detail in the Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR.

The need for a Biodiversity Offset Strategy was identified early in the T4 Project planning as refinements to the proposed disturbance area and the implementation of a range of impact mitigation strategies were not considered likely to be sufficient to counterbalance the impacts of the T4 Project on all ecological values.

The T4 Project will result in the loss of habitat for a range of shorebirds, wetland-dependent birds, the green and golden bell frog, micro-bat species and *Zannichellia palustris*. In addition, the T4 Project will result in the loss of Coastal Saltmarsh EEC, Freshwater Wetlands EEC (other other non-listed freshwater wetland habitat), mangrove habitat and loss of an area of Deep Pond, which affects deep-diving ducks and other species.

At the time that the EA was placed on public exhibition (March 2012), the Biodiversity Offset Strategy was in the preliminary phase of development as many of the proposed land-based offset sites had not been secured and therefore could not be publicly reported due to commercial confidentiality arrangements. The Biodiversity Offset Strategy outlined in Section 7.0 of the Ecological Assessment (EA Appendix K) provided a comprehensive framework for the more detailed Updated Impact Mitigation and Biodiversity Offset Strategy (Umwelt 2012b).

Following the exhibition phase of the T4 Project, two substantial offset sites, the Tomago Offset Site and Brundee Offset Site, have been secured by PWCS to offset the impacts of the T4 Project on ecological values, should the T4 Project be approved and constructed. The Updated Impact Mitigation and Biodiversity Offset Strategy addressing how each threatened species, ecological communities and habitat impacted by the T4 Project will be offset has been prepared (refer to Appendix J of the PPR).

2.1.3 National Parks Estate

OEH strongly recommends infrastructure, utilities and associated services remain within the SEPP land to ensure there are no additional impacts on reserved land. Any realignment works need to be restricted to the SEPP areas and no works are to be conducted within the National Parks and Wildlife Services Reserve system.

The T4 Project does not extend into the NPWS reserve system; the T4 project area is zoned SP1 Special Activities under the *State Environmental Planning Policy (Major Projects) Amendment (Three Ports) 2009*. The boundary of the Hunter Wetlands National Park is shown on Figure 2.1 of the Ecological Assessment (EA Appendix K, Umwelt 2012a), along with project components, which demonstrates that no infrastructure, utilities or associated services will be in the National Park, nor will the proposed channel linking Mosquito Creek and Mosquito Creek Tributary.

The only work proposed in the Hunter Wetlands National Park is reinstatement of an estuarine channel through an existing levee in the park (the Eastern Watercourse Levee), to enable tidal exchange with the freshwater lagoon south of the levee. This will maintain this area's tidal regime and mitigate impacts of the proposed rail embankment, including on vegetation communities in the National Park and Ramsar site. Further details on these proposed works are provided in Appendix K of the RTS/PPR document. These works require separate approval under the *National Parks and Wildlife Act 1974* and Part 5 of the EP&A Act. PWCS has been consulting NPWS about these works. NPWS has stated that they support this approach in principle subject to appropriate assessment. The ecological assessment (refer to Section 6 of the PPR) concluded that removing or modifying the Eastern Watercourse levee will result in an ecological gain by restoring the area of disturbed wetland communities to an estuarine mangrove complex, characteristic of the surrounding naturally occurring vegetation and habitats. Therefore, subject to NPWS's approval, indirect impacts within the National Park will be mitigated by the proposed works at the Eastern Watercourse Levee.

The EA assessed potential indirect impacts off-site, including at the National Park, for example to flora and fauna habitat, water quality, flow regimes and noise levels. Mitigation measures were developed to minimise the potential for off-site impacts, including at the National Park, and are in Chapter 15 of the RTS/PPR. This includes the estuarine channel realignment and levee modification to prevent any significant impacts to the tidal regime of wetlands to the north, outside the T4 project area, within the National Park and Ramsar site. As described in the EA and RTS/PPR, modelling and assessment showed that, with the proposed mitigation measures, no significant adverse impacts are anticipated in the Hunter Wetlands National Park, including to water quality, levels or flow regimes. The T4 Project will improve management of existing contamination in the T4 project area, which will benefit receiving environments in the National Park.

The EA discusses the realignment of the Sydney-Newcastle Oil and Gas Pipeline and a proposed easement. Figure 1.2 (Appendix K) indicates the pipeline will run through the middle of OEH Wetland 2. The relocation of this pipeline may affect the ecological integrity of OEH wetland which has scant discussion in Section 9.2.6, Appendix J. The existing Oil and Gas Pipeline runs through the middle of Railway Road Pond and should not be removed from its current location and remain in situ as OEH Wetland 2 is a significant wetland for the Green and Golden Bell Frog.

The construction of infrastructure associated with the T4 Project and the relocation of utilities, specifically the gas and water pipelines, will not have any direct impacts on reserve land. No infrastructure or utilities will be provided outside the SP1 zone. The modified design of the T4 Project includes construction of the relocated water pipeline to be mainly located in the rail embankment fill, which will not directly impact OEH Wetland 2. The proposed location of the gas easement is as shown in the EA and includes a small area at the northern extent of OEH Wetland 2 that does not pass through the middle of the pond. The pipeline itself would be within this easement but would not take up the full 20 metre wide easement. Consideration is being given into whether the pipeline can be directionally drilled at this location, provided geotechnical conditions allow for drilling to occur and subject to agreement with relevant stakeholders. If the pipeline is directionally drilled, it is anticipated that it will not directly impact OEH Wetland 2.

In the event that directional drilling is not appropriate, alignment of the pipeline within the easement would take into account avoidance of OEH Wetland 2 where possible and mitigation measures in the CEMP such as erosion and sediment controls will be employed to minimise impacts on the wetland. Notwithstanding, the ecological assessment in the EA conservatively assumed that all vegetation would be cleared from the gas easement and this was taken into account in developing the Biodiversity Offset Strategy, which more than adequately offsets the potential impacts. As per OEH's recommendation, the section of

existing gas pipeline that is no longer required is proposed to be isolated, decommissioned and remain *in situ*.

It should be noted that there is no oil pipeline in the T4 project area.

2.1.4 Realignment of Existing Watercourses

The EA indicates the proponent intends to realign the existing watercourse off Mosquito Creek (Mosquito Creek Tributary, Appendix J, Section 8.2.2, and Figure 6). Appendix J currently states, 'A detailed investigation into the most appropriate construction and re-vegetation techniques will be conducted", indicating a thorough environmental assessment has yet to be conducted on the creek realignment proposal. The proponent needs to provide adequate environmental assessment of the proposal prior to determination of the project.

Mosquito Creek is a substantial tributary of the Hunter River north arm that was historically blocked on its southern entrance with the construction of the railway on Kooragang Island and during the infilling of the island. It is proposed that a channel be constructed to ensure that water flows to the unnamed tributary that feed estuarine wetland habitat to the north is replicated such that there is negligible change to the ecology of this area. The constructed channel would continue to deliver tidal water to the wetlands of Hunter Wetlands National Park and the Hunter Estuary Wetlands Ramsar Site.

As discussed in the ecological assessment of the modified T4 Project (refer to Section 6 of the PPR), the construction of the diversion channel is expected to assist in maintaining flow into the unnamed tributary of Mosquito Creek. It will also result in the loss of approximately 0.2 hectares of mangrove forest in the proposed rail and utility corridor within the T4 project area. The EA assumed that this area would be cleared and the offset package included components that adequately offset the impacts of vegetation and habitat removal from this area. Since the exhibition of the EA, SMEC has modelled and assessed potential impacts to Mosquito Creek and the Mosquito Creek Tributary in detail, including a conceptual design for the proposed diversion channel and modelling of its effectiveness (Appendix L of the RTS/PPR). The modelling indicates that the constructed channel will be effective in maintaining the existing tidal regime in the Mosquito Creek Tributary and adjacent wetlands. Based on the analyses undertaken by SMEC (Section L of the PPR and Appendix J of the EA), any ecological change resulting from indirect impacts to the Hunter Wetlands National Park and the Hunter Estuary Wetlands Ramsar Site is expected to be negligible.

2.1.5 Compensatory Habitat Package

A singular, over-arching 'compensatory offset package' for the entire proposal needs to be provided, that clearly demonstrates how each threatened species, ecological community and habitat which is impacted upon is actually offset, OEH acknowledges that the EA provides the framework of such a package but it is lacking the detailed information, finality and certainty for OEH to assess what measures are being implemented.

PWCS has finalised the Biodiversity Offset Strategy that was outlined in the T4 Project EA. The Updated Impact Mitigation and Biodiversity Offset Strategy (Umwelt 2012b) in Appendix J of the PPR details the land-based and non-land based strategies that have been developed to compensate for the residual impacts of the T4 Project that could not be adequately avoided or mitigated.

2.1.6 Loss of Migratory Shorebird Habitat in Swan Pond

The proponent needs to review the proposal to ensure impacts on the Swan pond are eliminated or at least are minimised.

As discussed in Section 5.3.7.1 of the Ecological Assessment (Umwelt 2012a) and reiterated in the PPR, there are no feasible options for avoidance of Saltmarsh impacts in this area. The rail embankment and other project infrastructure are fully contained within the SP1 zone which permits port development with consent. The impacts of the modified T4 Project on 3.3 hectares of Swan Pond are discussed in Section 6 of the PPR and have been taken into account in developing the mitigation measures and Biodiversity Offset Strategy. The impact assessment and offset strategy in fact conservatively assume that the entire rail and utility corridor will be cleared, other than an area to be retained around OEH Wetland 1. The offset package includes components that adequately offset the impacts of vegetation and habitat removal from all of this area, including the portion of Swan Pond which is within the SP1 zone (and the T4 project area).

The modified design takes into consideration the needs of all Kooragang Island's rail users, particularly the NCIG proposed rail flyover. Notably, all impacts will remain within the SP1 zone. Overall project boundary impacts to saltmarsh communities have not substantially changed as a result of the modified T4 Project design.

Swan Pond is approximately 13 hectares in size, although this is variable depending on tidal and rainfall conditions. Saltmarsh associated with Swan Pond is recognised as an 'important bird habitat' in the Hunter Estuary (Herbert 2007) and partly extends into the SP1 zone (and T4 project area), as identified in the EA. The Ecological Assessment (refer to Section 5.3.8.1 of the EA Appendix K) also identifies Swan Pond as the third most important wetland for shorebirds in the Hunter Estuary according to the number of significant species recorded by HBOC (Herbert 2007). Depending on the fluctuating water levels in Swan Pond, large numbers of migratory shorebirds have been recorded including marsh sandpiper (*Tringa stagnatilis*), red-necked stint (*Calidris ruficollis*) and sharp-tailed sandpiper (*Calidris acuminata*) (Herbert 2007).

Under the modified design for the T4 Project, the loss of 18.9 hectares under the EP&A Act (21.2 hectares under the EPBC Act) of saltmarsh habitat, of which 3.3 hectares occurs in and around Swan Pond, is expected to impact native fauna species assemblages, in particular the white-fronted chat (*Epthianura albifrons*), and a range of threatened and migratory shorebird species recorded and considered likely to occur in the T4 project area due to the loss of foraging habitat and potential roosting habitat for these species.

The Updated Impact Mitigation and Biodiversity Offset Strategy, provided in Appendix J of the PPR, includes substantial commitments regarding saltmarsh conservation, restoration and creation initiatives designed to offset the loss of Saltmarsh habitat from the T4 project area. The T4 project area offers no opportunities for Saltmarsh creation initiatives on-site, and therefore off-site opportunities have been extensively investigated and are a key project commitment. The migratory shorebird and saltmarsh offsets include the construction and remediation of up to approximately 140 hectares of land in the Tomago Wetlands that previously provided the largest nocturnal roost for shorebirds in the Hunter Estuary (Herbert 2007; OEH 2011).

Until the 1970s, saltmarsh in the Tomago Offset Site provided the primary nocturnal roosting site for most of the shorebirds in the Hunter Estuary (Herbert 2007; OEH 2011). Migratory shorebird and wetland expert Phil Straw from Avifauna Research Pty Limited has been integral in determining the location and appropriateness of shorebird habitat restoration works proposed for the Tomago Offset site. It is proposed to construct a series of shorebird habitats on the Tomago Offset site providing several shallow lagoons to enable different

management strategies to be applied. Although all lagoons would be constructed to provide shorebird habitat, it is important to have several options available for water levels and frequency of flooding.

A conceptual design of migratory shorebird and saltmarsh habitat restoration works has been prepared by Phil Straw, and is centred on the creation of shallow tidal lagoons, mudflats and saltmarsh habitat. The concept design for these lagoons includes areas flooded by the tide controlled by the use of adjustable tidal channels. At low tide, relatively small areas of permanent water that are predominantly mudflats would be present. The shorelines of the ponds would be graded appropriately to allow saltmarsh colonisation, with the regeneration of the community likely to occur naturally with the ingress of seed stock with tidal water as part of the habitat restoration works. The need for assisted rehabilitation will be investigated as part of further works during the detailed design of the habitat restoration program, in consultation with the relevant government agencies. Islands would provide potential diurnal roost sites that would be either bare ground or covered with low growing vegetation such as samphire (*Sarcocornia quinqueflora* subsp. *quinqueflora*), but not species such as seablite (*Suaeda australis*) or sea rush (*Juncus kraussii* subsp. *australiensis*) as they are likely to inhibit the use of the islands as diurnal roost sites. Nocturnal roost sites would be constructed in very shallow water on the leeward side of islands or shores. It is important that the whole system is clear of tall vegetation.

Constructing the migratory shorebird habitat will be undertaken in conjunction with the creation of saltmarsh community as detailed in the Tomago Offset Site Restoration Project Environmental Impact Assessment (Appendix K of the PPR) and the Updated Impact Mitigation and Biodiversity Offset Strategy (Appendix J of the PPR).

PWCS is committed to the successful implementation of strategies designed to offset the loss of important habitat from the T4 project area. PWCS is also committed to a detailed management and monitoring program for the site to measure the success of the restoration project.

2.1.7 Dredging and Changes in the Tidal Prism

Changes in the tidal prism may affect the ecological function of the wetlands within the Hunter Wetlands National Park, as the major tributaries that feed the wetlands on the western side of the park; Fish Fry Creek, Wader Creek, Dead Mangrove Creek, Cobbins Creek and Crabhole Creek all occur within 6km of the dredging location.

Dredging was not specifically addressed in the EA as it is being dealt with through a separate approval process. As noted in Section 1.1.1 of the Ecological Assessment (Umwelt 2012a), the majority of dredging in the Hunter River south arm required for the T4 Project currently has development consent from 2005, under the EP&A Act (DA-134-3-2003-i). Impacts of dredging were assessed by GHD (2003) and mitigation measures developed to minimise potential impacts. Details are in the GHD (2003) report. The potential impacts and proposed management and monitoring measures were deemed acceptable by government and approved in 2005 under DA-134-3-2003-i; dredging in accordance with this consent has proceeded as far upstream as NCIG's site. Modifications have also been assessed and approved since this time.

As the T4 Project's engineering has progressed, changes to the proposed dredge plan have been identified, including to the orientation of berth pockets, area and depth of dredging and swing basin location. As has occurred for past changes to the approved dredge design, approval for the changes will be sought by modifying the existing consent and impacts of the proposed changes will be assessed in detail as part of the modification application. These modifications will require approval under the EP&A Act and EPBC Act to proceed.

Notwithstanding the above, the impacts of the modified dredge plan on hydrodynamics have already been assessed by WorleyParsons and while this assessment is currently being updated to re-submit with the modification application's EA, the results were submitted in Appendix I of the EA. WorleyParsons' work included numerical modelling and assessment of potential alterations to tidal hydrodynamics, flooding and water quality in the Hunter Estuary using a hydrodynamic model of the Lower Hunter River. This was done under a range of flooding and sea level rise scenarios. The results of the assessment indicate negligible difference to the impacts presented in the EIS prepared in 2003 (that is, negligible difference between approved and proposed impacts) for all aspects of the hydrodynamic modelling such as water levels, tidal planes, current velocities, flow rates and flooding.

2.2 Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)

2.2.1 Biodiversity Offset Measures

DSEWPC requests further information regarding offset sites and notes that offset sites are not intended to make proposals with unacceptable impacts acceptable. Avoidance and mitigation should be primary strategies.

As outlined in Section 5.2.1 in the Ecological Assessment (EA Appendix K), PWCS has modified the T4 Project to avoid ecological impacts, particularly on the green and golden bell frog (*Litoria aurea*). By minimising/reducing the impact on protected species on-site through reducing the severity or timing or nature of impacts, the overall residual impacts have been reduced. Strategies included the realignment of the rail corridor to avoid important green and golden bell frog habitat in OEH Wetland 1 and Railway Road Pond and the retention of the southern portion of Deep Pond.

Additionally, following the exhibition stage of the T4 Project some minor changes were made to further avoid and minimise impacts including the installation of a traffic light system rather than a roundabout at the corner of Cormorant Road and Pacific National Access Road which will result in the reduction of impacts to known green and golden bell frog habitat at Long Pond now not expected to be directly or indirectly impacted as a result of the T4 Project.

Umwelt has updated the Biodiversity Offset Strategy that was outlined in the T4 Project EA, considering progression of project design, refinement of mitigation measures, and securing of offsets since the EA was exhibited. The Updated Impact Mitigation and Biodiversity Offset Strategy (refer to Appendix J of the PPR) details the land-based and non-land based strategies that have been developed to compensate for the residual impacts of the T4 Project that could not be adequately avoided or mitigated. These measures include:

- Establishment and long-term protection of the 238 hectare Tomago Offset Site that allows for the conservation of estuarine vegetation and habitats, the creation of migratory shorebird habitat; and the retention of Australasian bittern (*Botaurus poiciloptilus*) habitat in proximity to both the T4 project area and an existing estuarine habitat restoration program (refer to Section 4.1 of the Updated Impact Mitigation and Biodiversity Offset Strategy).

- Establishment and long-term protection of the 409 hectare Ellalong Lagoon Offset Site that allows for the conservation of a drought refuge for water bird species; conservation of known habitat for threatened micro-bat species recorded in the T4 project area; and the conservation of Lower Hunter Spotted Gum Ironbark Forest EEC and Swamp Oak Floodplain Forest EEC; conservation of significant woodland and forest habitat that includes the threatened known regent honeyeater (*Anthochaera phrygia*), swift parrot (*Lathamus discolor*), little lorikeet (*Glossopsitta pusilla*), grey-crowned babbler (*Pomatostomus temporalis temporalis*), varied sittela (*Daphoenositta chrysoptera*), black-chinned honeyeater (*Melithreptus gularis gularis*), brown treecreeper (*Climacteris picumnus victoriae*), squirrel glider (*Petaurus norfolcensis*) and grey-headed flying-fox (*Pteropus poliocephalus*). Additionally, the Ellalong Lagoon Offset Site has a historical record of green and golden bell frog (refer to Section 4.3 of the Updated Impact Mitigation and Biodiversity Offset Strategy).

- Establishment and long-term protection of the 204 hectare Brundee Offset Site that has a substantial breeding population of the green and golden bell frog and known habitat for the threatened Australasian bittern (*Botaurus poiciloptilus*) and the Australian painted snipe (*Rostratula australis*) located adjacent to a current reserve (refer to Section 4.2 of the Updated Impact Mitigation and Biodiversity Offset Strategy).

- Funding the University of Newcastle to facilitate the development of a green and golden bell frog captive breeding program (refer to Section 5.0 of the Updated Impact Mitigation and Biodiversity Offset Strategy) in association with NCIG to be used in approved translocation projects to supplement the wild population and also to trial the effectiveness of created habitat. Research is also proposed to examine population dynamics for the Kooragang Island green and golden bell frog population

2.2.2 Migratory Species – Shorebirds

Further detail on the land proposed for acquisition and the timeframe for establishment of shorebird populations is required.

Section 2.1.6 provides detailed discussion regarding the proposed offset for migratory shorebirds at the Tomago Offset Site.

PWCS remains committed to the successful implementation of strategies designed to offset the loss of important habitat from the T4 project area. PWCS is also committed to a detailed management and monitoring program for the site to measure the success of the restoration project. Subject to approval of the T4 Project, the construction works at the Tomago Offset Site will start during the T4 Project's detailed design phase.

2.2.3 Threatened Species – Green and Golden Bell Frog

The EA suggests that 900 GGBFs occur within the T4 Project Area of which an unknown proportion will be affected. It is highly likely that a significant proportion of the 900 GGBF found at the site will be adversely impacted by the development and biodiversity offset measures are proposed as residual impacts to the species are likely to occur.

As discussed in Section 5.4.1.1 of the T4 Project Ecological Assessment, it is considered that the T4 Project would be likely to result in a significant impact on the green and golden bell frog. The T4 project area includes 5.8 hectares of breeding habitat, based on the presence of tadpoles or metamorphs in ponds during recent and past surveys (refer to Figure 4.3), and approximately 45.9 hectares of other wetland habitat. The remaining habitats within the T4 project area are considered to provide potential terrestrial and dispersal habitat. The species is known to disperse across all habitats in the T4 project area,

most of which are highly disturbed exotic grasslands, between areas of breeding habitat within the T4 project area and from adjacent habitats on Ash Island (Leu 2011). The terrestrial habitat in the T4 project area is extensive and this is partly due to the isolation of several of the important breeding ponds (M. Mahony pers. comm.). The terrestrial habitat includes foraging habitat as well as shelter and dispersal habitat.

When determining the impact of the T4 Project on this species reference was made to the Green and Golden Bell Frog Impact Assessment Guidelines (NPWS 2003), the NSW Draft Recovery Plan (DEC 2005) for the species and the EPBC Act Policy Statement 3.19 Significant Impact Guidelines for the Vulnerable Green and Golden Bell Frog (*Litoria aurea*) (DEWHA 2009). As discussed in Section 4.2.4.1 of the Ecological Assessment (EA Appendix K), the green and golden bell frog population of Kooragang and Ash Islands is estimated to be approximately 900 individuals of which a portion occurs within the T4 project area. It is not considered that 900 individuals would be impacted as a result of the T4 Project. The T4 Project will remove approximately 5.8 hectares of breeding habitat and associated terrestrial habitat and without mitigation may also potentially contribute to the fragmentation of remaining habitat areas on Kooragang Island as the breeding sites generally occur on the periphery of the T4 project area.

Based on the information provided in the T4 Project Ecological Assessment, a significant impact (without consideration of mitigation and offsetting steps) cannot be ruled out based on current knowledge and, therefore, following the application of the precautionary principle, it is concluded that the loss of habitat is likely to result in a significant impact on the green and golden bell frog (*Litoria aurea*) as a result of the T4 Project.

Substantial impact mitigation and offset strategies have been formulated to minimise and mitigate the impact of the T4 Project on the green and golden bell frog. Impact mitigation measures are detailed in Section 6.0 of the T4 Project Ecological Assessment (Umwelt 2012a) and the Updated Impact Mitigation and Biodiversity Offset Strategy (Appendix J of the PPR). Strategies include:

- mitigation measures including the retention and creation of habitats within the T4 project area to develop the Green and Golden Bell Frog Habitat Corridor;
- direct land-based offsets of a large breeding population of the species at the 204 hectare Brundee Offset Site adjacent an existing nature reserve;
- funding of captive breeding program at the University of Newcastle; and
- funding of population research on Kooragang Island.

2.2.3.1 Staging and Project Design

Consideration should be given to the alternative of staging the project in a south to north order to retain GGBF habitat in the cell ponds for as long as possible or perhaps avoided entirely.

Furthermore, it is not evident that alternative project designs that may better protect the green and golden bell frog breeding habitat were investigated.

Further consideration of the design of the project is required, especially the northern location of the new railway lines and coal stockyards to avoid impacting important green and golden bell frog populations; the potential exclusion of known breeding habitat; and the inclusion of a raised railway line.

Following the exhibition of the Environmental Assessment, PWCS commissioned Aurecon Hatch to undertake a detailed design review. The review considered whether the T4 Project could be redesigned to protect green and golden bell frog habitat at the northern extent of the proposed stockyard area during the initial stages of the development and potentially reduce the short term impacts on the green and golden bell frog, especially during construction and establishment of the Green and Golden Bell Frog Habitat Corridor. A possible alternative design solution was evaluated. This was the construction of the stockpile pads in the southern portion of the stockyard first, and the installation of in-ground barrier walls around the frog habitat to be protected, which aim to prevent salt water from entering these ponds during dredge material emplacement. The alternative construction design included the retention of important green and golden bell frog habitat ponds including Ponds 9, 10, 11 and 12 and Railway Pond during the initial stages of the T4 Project's construction and operation.

The design review was undertaken at substantial cost and delay to PWCS and the T4 Project. This potential alternative option was determined to be a prohibitive cost solution (i.e. an additional $120M) with a materially longer engineering and construction period (12 months) than the current preferred layout. This cost and schedule impact will be incurred without any certainty (greater than that provided by the existing proposed onsite mitigation measures) that the green and golden bell frog will be protected and successfully breed to maintain a stable population within the T4 project area. Factors beyond the control of the T4 Project such as rainfall, stochastic events (e.g. drought or flooding), breeding behaviour and chytrid fungus may result the green and golden bell frog population within the T4 project area declining despite the proposed protective measures.

PWCS has considered the outcome of the design review and advised that the proposed redesign and staging change is not a feasible option for the T4 Project. This is reported further in Appendix T of the RTS/PPR document.

2.2.3.2 Mitigation

GGBF monitoring should commence before construction takes place and should have regard to relevant State and Commonwealth guidelines.

The major objectives of the Green and Golden Bell Frog Habitat Corridor are to link existing bell frog breeding habitat with a terrestrial habitat corridor such that the bell frog can disperse among wetlands, the various breeding sites are not isolated, and to increase the amount of breeding habitat that is available for the frog on the island. The proposed habitat corridor provides for a linkage among known bell frog breeding sites that are already partially isolated, and equally importantly to enhance breeding opportunities by adding wetland clusters into the corridor that are designed specifically to meet the habitat requirements of the green and golden bell frog.

Investigations into the approach to be used in enhancing the habitat corridor were commenced in early 2012 with a trial monitoring program of wetland cluster pond construction. The objectives of this trial were to test for the capacity to attract green and golden bell frogs to constructed wetland clusters from nearby areas where the species have been observed, and to show that breeding can occur in these clusters. The constructed wetland clusters consist of a total of 12 ponds that are placed in two groups of six ponds located at each end of the proposed corridor. The trial program is being led by Professor Mike Mahony and green and golden bell frog researchers from the University of Newcastle.

The success of these constructed habitats will be monitored to guide the process of developing the Green and Golden Bell Frog Habitat Corridor within the T4 project area. Extensive surveys of the green and golden bell frog population at Kooragang Island have been undertaken across the T4 project area over many years and data and information from this will provide extensive baseline data. Continued monitoring of the green and golden bell

frog population on Kooragang Island and their dispersal capabilities into constructed habitats is integral to determining the success of the proposed Green and Golden Bell Frog Habitat Corridor and is being undertaken prior to disturbance of the site for the T4 Project. These surveys are undertaken with reference to the OEH *Draft Survey Guidelines* (DEC 2004), the *Survey Guidelines for Threatened Frogs* (DEWHA 2010) and the *Hygiene Protocol for the Control of Disease in Frogs* (DECC 2008).

Monitoring of the trial ponds is already showing signs that they will be successful, with green and golden bell frogs, as well as other frog species recorded in them during the 2012/13 monitoring period (S. Clulow pers. comm.).

The location of the proposed habitat corridor should be reconsidered to ensure it is accessible to the viable breeding populations in the northern section of the T4 project.

As discussed in Section 6.3.3 of the T4 Project Ecological Assessment (Umwelt 2012a), the proposed Green and Golden Bell Frog Habitat Corridor will include a cluster of ponds in the north-west of the T4 project area. This area was chosen because of its proximity to known green and golden bell frog habitat in the isolated ponds at the southern end of Deep Pond and because it provides a link to OEH Wetland 1 to the north-west.

The cluster of ponds proposed to the north-west of Deep Pond will enhance the number of ponds near OEH Wetland 1 and provide for a corridor from the T4 project area to the adjacent National Parks estate on Ash Island. This area would necessarily be constructed after the filling of the area and site works have been completed. A culvert will be constructed to allow for frog movement between the constructed habitat west of Deep Pond and the existing habitat in OEH Wetland 1. Preliminary results of recent surveys into the likelihood of the species traversing long, constructed culverts indicates juvenile green and golden bell frogs traversing 30 metre long culverts (M. Mahony pers. comm.) indicating that movement between the Green and Golden Bell Frog Corridor within the T4 project area and known habitats in OEH Wetland 1 and Ash Island is likely to be achievable.

Additionally, the current habitats primarily used by the green and golden bell frog on Kooragang Island are in sites that have been subject to significant human modification and disturbance. In particular, known important habitat ponds for the species, including Pond 11, Railway Pond and OEH Wetland 1, are wetlands created by the impounding of local freshwater runoff caused by the construction of the railway and waste emplacement. It follows that with careful design and management, wetlands can be created in the landscape to enhance the population's distribution and abundance.

The Corridor should incorporate buffers around GGBF habitat zones in the GGBF corridor of at least 200 metres from ponds and 100 metres from terrestrial movement areas or justification provided of why the Significant Impact Guidelines for the GGBF have not been applied.

PWCS engaged the expertise of Professor Mike Mahony to provide advice and peer review of the Ecological Assessment and to facilitate the development of impact mitigation and offset strategies for the green and golden bell frog. Professor Mahony provides substantial expertise in relation to the Lower Hunter Green and Golden Bell Frog Population and has been involved in much of the research into the population, including the development of impact mitigation and offset strategies for adjacent developments that impacted the population. Additionally, the expertise of Associate Professor Ross Goldingay of Southern Cross University was utilised to provide input and peer review of the preliminary development a detailed design pathway for the Green and Golden Bell Frog Habitat Corridor.

The Corridor has been designed with respect to the outcomes of specific research into the Kooragang Island Green and Golden Bell Frog Population, and considers learning's gained from other habitat creation/compensation projects. While the exact measurements of 200 metres and 100 metres may not have been incorporated in all instances, the key objectives of the Significant Impact Guidelines have been included such as the maintenance of corridors for movement and dispersal (DEWHA 2009).

2.2.3.3 Biodiversity Offset Measures

Notes that the proposed GGBF offset site is within the Sydney Basin Bioregion, but outside the Hunter Region.

The green and golden bell frog was formerly distributed from the NSW North Coast near Brunswick Heads southwards along the NSW coast to Victoria where it extended into East Gippsland, west to Bathurst, Tumut and the ACT. Declines were noticed in the late 1970s and became severe in the 1980s such that today the species exists as a series of isolated coastal populations within its former known range. In addition, there are two known extant inland (non-coastal) populations of this species; one at Ravensworth in the central Hunter Valley; and the other in the Southern Tablelands, known as the Molonglo population east of Queanbeyan (Osborne 2008).

In the Hunter region, the green and golden bell frog is known from three populations: the Upper Hunter Population; the Mid Hunter Population; and the Lower Hunter Population.

In the Upper Hunter region the green and golden bell frog is known from only eight sites that are geographically centred on the Lake Liddell/Ravensworth area (DECC 2007). Field surveys at these locations generally report sightings of small and isolated populations. For example, long term studies at Mt Owen Mine have resulted in the detection of green and golden bell frogs on only two occasions in the past decade despite the large number of ponds, swamps and waterways in the survey area that are considered to provide suitable physical and biotic habitat for the species (Forest Fauna Surveys 2010). The species was also recently recorded at Ravensworth North Mine near Ravensworth (Umwelt 2010), and its habitat at that location is to be secured within the Ravensworth North Biodiversity Offset Area (Umwelt 2011).

The mid Hunter populations are centred on wetlands to the south of Maitland in the vicinity of Wentworth Swamp (Gillieston and Ravensfield sites) and at Ellalong Lagoon (DECC 2007). These populations are considered to be small and isolated. Field surveys undertaken by Umwelt in 2011 and 2012 at the Gillieston site did not detect any green and golden bell frogs. The site was altered in 2004, and subsequent to this time there have been no systematic surveys at the site to determine the status of the population. Similarly there has been no systematic survey of the Ravensfield population in the past decade and the last known record of the species in the proximity to Ellalong Lagoon is from 1993.

In the lower Hunter region green and golden bell frogs are known from Kooragang and Ash Islands in the estuary; from locations within Hexham Swamp; from near Medowie to the north of the estuary (coastal floodplains of the Hunter River); and to the south near Catherine Hill Bay (recent observation in 2011, and not included in DECC Lower Hunter Management Plan M. Mahony pers. comm.). Systematic surveys are conducted only on Kooragang and Ash Islands and the status of the other three populations is not known, but it is considered that the populations are small and isolated (M Mahony pers. comm.). The Hexham Swamp population is considered to have been large in recent historic times, and there are numerous anecdotal records of the frog occurring in urban areas adjacent to the swamp prior to the 1990s (Markwell 1984). Recent studies in the Hexham area by Mahony (1996) and Stockwell *et al.* (2008) support this observation. A population occurred on the periphery of the former Hexham Swamp Nature Reserve on land owned by the radio station 2HD up until about

2007. This site is directly adjacent to the Kooragang/Ash Island population (across the Hunter River south arm). This population was monitored by scientists from the Australian Museum in the period 2004 to 2007 and was known to have up to 100 adult individuals, but the population disappeared. Recent surveys by Umwelt during 2011 and 2012 have not detected any individuals. The cause of the disappearance from these areas is unknown but the site is on the periphery of a large coastal floodplain wetland that had green and golden bell frog records associated with it from its northern, eastern and southern boundaries (DECC 2007). Mahony (1996) considers that the most likely explanation for the decline of the bell frog from such large natural swamp areas is the role of the amphibian disease chytridiomycosis.

The upper Hunter and mid Hunter populations of the species are considered to be very small and as a result opportunities for land-based conservation and offsetting initiatives are limited. These populations are not considered to be representative of the Lower Hunter Population centred on Kooragang Island in terms of population size and the Upper Hunter and Mid Hunter populations are likely to be substantially threatened by development pressure due to mining and residential development. As a result, PWCS sought to secure a site that provided habitat for a large extant population of the green and golden bell frog commensurate with the population being impacted by the T4 Project; that is a large breeding population, proximate to conservation areas.

While not situated in the Hunter Region, the Brundee Offset Site conserves habitat for a substantial, breeding population of the green and golden bell frog. As the site is situated within the Sydney Basin Bioregion it is considered to be located appropriately and provide the best opportunity for the ongoing protection of the species. In addition, Ellalong Lagoon Offset Site was secured as part of the Biodiversity Offset Strategy, resulting in the in-perpetuity conservation of a historically (at least) known population in the Hunter region. Further detail regarding the appropriateness of the land-based offsets for the green and golden bell frog is provided in the Updated Impact Mitigation and Biodiversity Offset Strategy (refer to Appendix J of the PPR).

Not clear if a GGBF reintroduction program at Ellalong Lagoon is proposed.

Surveys undertaken to date have not revealed the presence of the green and golden bell frog at the Ellalong Lagoon Offset Site. A green and golden bell frog (*Litoria aurea*) reintroduction program is not proposed as part of the Biodiversity Offset Strategy. Management plan development will consider appropriate ecological monitoring.

2.2.4 Threatened Species – Australasian Bittern

Any proposed Australasian bittern offset site should be surveyed to determine if the species is on site. Only sites where the species are known to occur and not protected can be classified as a direct offset measure for the species.

The Australasian bittern is expected to be significantly impacted as a result of the T4 Project and the species was one of the key drivers in the development of the T4 Project Biodiversity Offset Strategy. Targeted surveys were undertaken for the species at all proposed land-based offset sties and the species was positively identified at Brundee Swamp, near Nowra NSW and at the Tomago Offset Site (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR for locations). The Brundee land based offset site provides approximately 160 hectares of known habitat for the Australasian bittern and the Tomago Offset Site provides approximately 11 hectares of freshwater wetland that provides known habitat for the species and will be conserved as part of the T4 Project Biodiversity Offset Strategy. A total of 27.0 hectares of habitat will be removed for the species as a result of the T4 Project.

The Brundee Offset Site is considered to provide a high quality conservation outcome for the Australasian bittern on land that is currently subjected to farming pressures. The site is located adjacent to Brundee Swamp Nature Reserve; providing an appropriately located offset for the nationally endangered species.

Refer to the Updated Impact Mitigation Biodiversity Offset Strategy (Appendix J of the PPR) for detailed discussion regarding the adequacy of the land-based offset sites for the Australasian bittern, and the detailed survey methodologies undertaken at each site for the species.

2.2.5 Threatened and Migratory Species – Humpback and Southern Right Whales

Further information is required on impacts on whales in regard to increased shipping movements. Need to state anticipated number and size of vessels expected to visit the facility each year. If NPC limits the number of vessels that are within the port and the project will not increase the number of ships, details of number of ships in the port at any one time should be provided.

Information on shipping movements and numbers is included in Section 14.3 of the EA which states that:

> At 120 Mtpa, the T4 Project is expected to service approximately 1,379 vessels of various sizes annually (based on the current average of 87,000 t per vessel loaded in the Port of Newcastle). These vessels will be accommodated at five proposed berths; three on the northern wharf and two on the southern wharf. This translates into 2,758 annual vessel movements (1,379 vessel movements into the port and 1,379 movements out) and an average of around 7.6 daily vessel movements.
>
> It should be noted that non-coal vessels can be moved from berth to berth a number of times whilst in port, unlike coal vessels that are typically moved in and then out. The estimate of 1,435 annual non-coal vessel movements includes 550 vessels that are moved in from berth to berth about 335 times.
>
> With the T4 Project operating at full capacity, it is expected that annual vessel movements within the port will increase about 60% to approximately 10,800 (accounting for other port growth), which equates to an average of around 29.6 daily movements. It is expected that this will require the operation of 16 tugs.
>
> All vessels entering and departing the Port of Newcastle are managed by NPC through its Vessel Traffic Information System (VTIC). All vessel movements are booked by vessel agents through the VTIC and advertised by NPC in the local newspaper and on its website.

Further detail regarding vessel movements can be found in Section 14.3 of the EA.

With a reduction in throughput to 70 Mtpa as a result of the modified design, the number of vessel movements will be less than those predicted in the EA and will equate to about 5 additional daily movements.

An increase of approximately 5 daily movements is not expected to result in a significant impact to whales, although the likelihood of ship strike increases with increased ship movements and increased whale population sizes along the east coast of Australia. Due to the size of the Port and the existing ship movements, the Newcastle Port is not considered likely to comprise an important habitat for whales, particularly larger whale species such as blue, humpback and the southern right whales which have been identified as being the most susceptible to impacts from ship strike (DSEWPC 2012).

In accordance with Marine Notice 12/2011 (Australian Maritime Safety Authority 2012), collision with cetaceans (ship strikes) is an issue of growing concern and has become more common due to the increase in both vessel traffic and whale populations. Ship masters and deck officers are urged to:

- maintain a look out for whales, in particular during the time and locations mentioned below;
- warn other vessels in the vicinity, using all appropriate means of communication, if whales have been sighted;
- consider reducing vessel speed in areas where whales have been sighted; and
- consider modest course alterations away from sightings.

Under the EPBC Act, if a vessel collides with a cetacean in Commonwealth waters the person in charge of the vessel is required by law to notify the Secretary of DSEWPC within seven days. The notice should contain specifics such as date of incident, location, outcome of the collision and contact details.

2.2.6 Hunter Estuary Wetland Ramsar Site – Impacts to the Green and Golden Bell Frog

The GGBF is a critical component of the Ramsar site and any significant impacts on the species will then impact the ecological characteristics of the Ramsar site.

The assertion that the green and golden bell frog is a critical component of the Hunter Estuary Wetlands Ramsar site appears to be unfounded. The Hunter Estuary Wetlands Ramsar Site comprises two locations, approximately 2 kilometres apart, within the former Kooragang Nature Reserve and at the Hunter Wetlands Centre Australia. The Hunter Estuary Wetlands Ramsar Site was listed as a wetland of international importance in 1984. The Kooragang component of the Ramsar site (comprising the portion listed in 1984) is located generally to the north of the T4 project area, covering an area of approximately 2926 hectares; and includes the estuarine habitats of the northern (natural) area of Kooragang Island, Fullerton Cove and the Tomago Wetlands. The green and golden bell frog is not currently known from this portion of the Ramsar site and suitable habitat for the species is very limited. The estuarine wetland habitats are too saline for green and golden bell frog habitation (M Stockwell pers. comm.).

Despite the Ecological Character Description (ECD) (Brereton and Taylor-Wood 2010) for the Kooragang portion of the Ramsar site describing the species as one of the critical ecosystem components of the Ramsar site it also notes that there is' 'no available data on the abundance of green and golden bell frogs within the Ramsar site at the time of listing or since the time of listing' and that there is 'limited suitable habitat' for frog species in the Ramsar site. The ECD suggests that the species has been previously recorded in habitats just within the south-western boundary of the Ramsar site on Ash Island and near the eastern portion of the KCT rail loop (Hamer *et al.* 2002), however mapping records suggest the species was recorded outside the Ramsar boundary and due to the contraction (over the last decade) of the local population to Kooragang Island, it is unlikely that the green and golden bell frog currently occurs in substantial numbers in the Ramsar site. As a result, it is very unlikely that the species is a critical component of the character of the Hunter Estuary Wetlands Ramsar site.

Similarly, the green and golden bell frog is not currently or recently known from the Hunter Wetland Centre Australia component of the Ramsar site (refer to Figure 4.7 of the Ecological Assessment in the EA Appendix K). This separate, approximately 45 hectares component of the Ramsar site was included as part of the Hunter Estuary Wetlands Ramsar site in 2002. The Ramsar Information Sheet (RIS) is a document required by the Ramsar Convention that provides information relating to the location, physical characteristics and ecological characteristic of the site and provides the documentation to support the inclusion of sites under the Ramsar convention. The RIS for the Hunter Estuary Wetlands Ramsar site states that the green and golden bell frog occurs at the Wetland Centre Australia Ramsar site based on information gathered in 1984. The RIS also states that the green and golden bell frog is subject to a reintroduction program at the site, indicating that the species was not extant at the site in 2002 when the application to be listed under Ramsar was made. It is noted that the reintroduction program was not successful (Stockwell *et al.* 2008).

The green and golden bell frog was formerly distributed from the NSW north coast near Brunswick Heads southwards along the NSW coast to Victoria where it extended into East Gippsland, west to Bathurst, Tumut and the ACT. Declines were noticed in the late 1970s and became severe in the 1980s such that today the species exists as a series of isolated coastal populations within its former known range (DEC 2005). The inclusion of the green and golden bell frog as occurring within the boundaries of the Hunter Estuary Wetlands Ramsar site is considered to be based on the former range of the species, prior to the severe declines noted during the 1980s that resulted in the species becoming listed as threatened under state and Commonwealth threatened species legislation. As the green and golden bell frog was formerly a common species, it is possible that it occurred prior to the inclusion of the sites under the Ramsar Convention, however the estuarine and marine habitat occurring with the Ramsar site is expected to have limited the value of potential habitat for the species.

Additionally, the Limits of Acceptable Change (LAC) for the species as described in the ECD for the Ramsar site states that "*there are* [to be] *no more than two years between successful breeding events (defined as a new first year adult cohort) in at least one of the three known populations*". As there is no recent information on green and golden bell frog breeding events within the Ramsar site, it is not possible to determine if the specified LAC for green and golden bell frog has been exceeded.

Importantly, as the species is not considered to comprise an important component of the ecological character of the Ramsar Wetland, it is considered that the significant impact predicted for the species as a result of the T4 Project will not result in flow on effects on the ecological character of the nearby Hunter Estuary Wetlands Ramsar site.

The proposed Biodiversity Offset Measures for the GGBF are unlikely to offset the impacts to the Hunter Estuary Ramsar site. Therefore, based on the current project design and proposed mitigation measures, further green and golden bell frog offsetting initiatives within the Hunter Estuary Wetlands appear to be appropriate.

The T4 Project Biodiversity Offset Strategy includes substantial offset measures that have been selected to compensate for the residual impacts of the T4 Project that could not be adequately avoided or mitigated. The detailed measures relating to the green and golden bell frog include the construction of compensatory habitat on site by way of the Green and Golden Bell Frog Habitat Corridor and the *in situ* conservation of a large breeding population of the species at the Brundee Offset Site. PWCS has also committed to an extensive management and monitoring program, hygiene protocol (if required), the funding of a captive breeding program and protocols for the clearance of known habitat within the T4 project area.

As detailed in the Updated Impact Mitigation and Biodiversity Offset Strategy (Umwelt 2012b), the proposed offset measures are considered to adequately compensate for the residual significant impacts of the project, in accordance with the principles described in the EPBC Act Environmental Offsets Policy (DSEWPC 2012a). This Policy makes use of an impact and offsets calculator which is designed to determine the ecological costs of a development, termed 'impact points', together with the likely ecological benefit of offset sites, termed 'offset points' in order to assess the relative value of proposed offset packages.

With the release of the Commonwealth Environmental Offset Policy in October 2012, the EPBC Offsets Calculator became available as part of the assessment process for offset strategies in addressing impacts on Matters of National Environmental Significance. At the request of DSEWPC, an early application of the calculator was undertaken and provided to DSEWPC for their consideration, on 9 November, 2012. Further consultation was undertaken with DSEWPC on 17 January 2013 regarding the application of the calculator and it was requested by DSEWPC that more information be provided regarding the T4 Project biodiversity offset sites and further justification on the application of the EPBC Offsets Calculator.

EPBC Offsets Calculator assessments were thoroughly documented in a report provided to DSEWPC on 8 March 2013 to allow them to accurately assess the adequacy of the T4 Project Biodiversity Offset Strategy. The assessments outlined in this report include the following species:

- Green and golden bell frog (*Litoria aurea*); and
- Australasian bittern (*Botaurus poiciloptilus*).

The T4 Project is also expected to result in a significant impact (without consideration of mitigation and offsetting measures) on a number of migratory shorebird species listed under international conservation conventions. The EPBC Offsets Calculator does not currently apply to migratory species, and therefore, has not been included in this assessment, however offsetting for migratory species is taken into account with the restoration of the Tomago Offset Site (refer to **Section 2.1.6**).

EPBC-listed species that were assessed as not being significantly impacted by the T4 Project (refer to Appendix 8 of the Ecological Assessment), being Australian painted snipe (*Rostratula australis*), grey-headed flying-fox (*Pteropus poliocephalus*); and large-eared pied bat (*Chalinolobus dwyeri*), are not included in this assessment. In accordance with Section 5 of the EPBC Environmental Offsets Policy they do not drive the requirements of the biodiversity offset program as the project will not have a residual significant impact on them.

The results of the EPBC Offsets Calculator, as discussed in Section 7.3 of the Updated Impact Mitigation and Biodiversity Offset Strategy (Umwelt 2012b) indicate that the land-based offset sites provide a more than adequate offset for the green and golden bell frog (*Litoria aurea*) at the Brundee Offset Site. This is also the case for the Australasian bittern (*Botaurus poiciloptilus*), based on known habitat at the Brundee and Tomago Offset Sites, as displayed in **Table 2.4** below.

Table 2.4 – EPBC Offset Calculator Outcomes for Relevant MNES

Species Assessed by Offset Calculator	Land-based Offset Site			
	Brundee Offset Site	Tomago Offset Site	Ellalong Lagoon Offset Site	Total Value of Offset Sites
Species Subject to a Likely Significant Impact				
Green and golden bell frog (*Litoria aurea*)	132.6%	-	-	132.6%
Australasian bittern (*Botaurus poiciloptilus*)	225.1%	16.0%	-	241.0%

A full copy of the EPBC Offsets Calculator is included as Appendix 7 to the Updated Impact Mitigation and Biodiversity Offset Strategy, showing the detailed measurements and scales used to estimate the adequacy of the T4 Project offset sites. The EPBC Offsets Calculator requires a minimum 90 per cent direct offset requirement following the entry of the parameters outlined in the tables above.

The results of the EPBC Offsets Calculator show that the land-based offset sites provide a more than adequate offset for the EPBC Act-listed species considered likely to be significantly impacted by the T4 Project. In both cases, the land-based offset sites are shown to exceed the minimum 90 per cent direct offset requirement for species listed under the EPBC Act. Umwelt has undertaken ongoing consultation with DSEWPC including a meeting on 15 April 2013 and a site visit by DSEWPC on 30 May 2013.

Further offsets for the green and golden bell frog in the Hunter Estuary are not considered warranted on the basis of impacts to the ecological character of the Hunter Estuary Wetlands Ramsar site as the species is not considered to comprise an important component of the ecological character of the wetlands, as described above.

2.2.7 Other Comments

Land purchased or proposed to be purchased as part of a biodiversity offset measure cannot be used more than once to compensate for the environmental impacts of development. Confirmation should be provided that proposed offsets have not been previously used as an offset for other projects.

It has been suggested that the proposed Tomago Offset Site has previously been earmarked as an offset for the NCIG Coal Export Terminal and also the Northbank Enterprise Hub development at Tomago. Umwelt has reviewed the project approval for the NCIG Coal Export Terminal, the Ecological Assessment prepared by Resource Strategies (2006), the statement of commitments and response to submissions report (NCIG 2006) and have found no requirement or commitment for offsetting on the proposed T4 Tomago Offset Site property (formerly HDC land). It has been suggested that the site was proposed as an offset for the loss of Big Pond as a result of the NCIG proposal however the Ecological Assessment (Resource Strategies 2006) and the response to submission report (NCIG 2006) state:

> Offsets have already been proposed by the NSW government for the development of Big Pond by the Department of Commerce as part of the BPHOS (Big Pond Habitat Offset Scheme) Report (Department of Commerce, 2005). The BPHOS Report proposes to enhance and create compensatory habitats in the Kooragang Nature Reserve to offset the proposed development of Big Pond (Department of Commerce, 2005).

PWCS has not been able to obtain a copy, or reference to this (Department of Commerce 2005) report and therefore cannot comment on any Big Pond Offset proposed in 2005, however we note that they were proposed for Kooragang Nature Reserve. In addition, the response to submissions report for NCIG also stated the following in relation to compensatory habitats:

> Mangroves in the Hunter Estuary have been expanding at the expense of the Coastal Saltmarsh EEC and, in some areas (e.g. Ash Island), mangroves have been removed to enhance habitat for Coastal Saltmarsh EEC and shorebirds. A financial contribution would be made to an organisation such as the KWRP for the removal of up to 6 ha of mangroves from coastal saltmarsh habitat. A financial contribution would also be made towards the construction of a flow control structure to minimise the potential for mangrove propagules to enter areas reserved for saltmarsh. Alternatively, these initiatives may also be applied to lands within the Kooragang Nature Reserve. These works are expected to enhance habitat for shorebirds as well as provide habitat for the Coastal Saltmarsh EEC.

The NCIG Response to Submissions Report (NCIG 2006) makes no reference to any land based offsetting initiative, rather the unspecified provision of funding to enhance habitat for migratory shorebirds. It is possible that the local community was led to believe that the funding would be spent on improving the habitat at the 'Rice Paddy' site which is within the boundary of the proposed Tomago Offset Site. Based on field surveys conducted by Umwelt on the site, there are no flow control structures managing water into and out of the 'Rice Paddy' area of the site that could have been funded as part of an offsetting initiative for NCIG and the flow control structures located along the eastern boundary of the Tomago Offset Site are used to manage water (and therefore shorebird habitat restoration works) in the adjacent OEH estate, as part of the Tomago Wetlands Restoration Project conducted by OEH.

Review of The NCIG Compensatory Habitat and Ecological Monitoring Plan (2011) (approved by DSEWPC) in accordance with the project approval states:

> Compensatory habitat works for migratory shorebirds are not currently proposed as part of this Compensatory Habitat and Ecological Monitoring Program, as migratory shorebird habitat loss would only occur with construction of optional rail infrastructure associated with future stages of the Project.

In summary, there is no firm evidence to suggest that the Tomago Offset Site, now in PWCS ownership and proposed to offset the impacts of the T4 Project, was ever used as an offset for the loss of Big Pond. It appears likely that NCIG funded the construction of the flow control structures that manage water for the Tomago Wetlands Restoration Project conducted by NSW OEH Parks and Wildlife Group (with technical assistance from the University of NSW Water Research Laboratory). This project is located on OEH managed land immediately adjacent to the Tomago Offset Site.

Further, it is our understanding that the Tomago Offset Site was proposed as the Northbank Enterprises Hub biodiversity offset in the ecological assessment (Ecobiological October 2011) in accordance with a memorandum of understanding (MOU) from 2005. Umwelt understands that the MOU was overturned and is no longer valid. Clearly, the Northbank Enterprises Hub cannot propose to use the Tomago Offset Site as an offset, as the site is in PWCS ownership.

In summary, no evidence has been found to suggest that the site has legitimately been used previously as an ecological offset, however we note that it is possible that the community understood the land was earmarked as an offset as part of the NCIG project approval. We also note that PWCS proposes to undertake a substantial shorebird and saltmarsh restoration project by constructing saltmarsh, mudflats and shallow lagoons to restore one of the most substantial and important historic shorebird nocturnal roost sites in the Hunter

Estuary (Herbert 2007). Strategies to minimise impacts to the eastern grass owl (*Tyto longimembris*) will be considered during the further conceptual development of the site.

It is also understood that neither the Ellalong Lagoon nor Brundee offset sites have been previously used as biodiversity offset sites.

2.3 Catchment Management Authority (CMA)

The Environmental Assessment (EA) does not contain adequate details of specific areas or locations proposed to offset the loss of 'like for like' habitat and Biodiversity outlined above.

At the time that the EA was placed on public exhibition (March 2012), the Ellalong Lagoon Offset Site was the only site commercially secured as a land-based offset for the T4 Project. The process of securing other offset sites had not been finalised and could not be reported at the time. The Biodiversity Offset Strategy outlined in Section 7.0 of the Ecological Assessment (EA Appendix K) provided a framework for the Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR.

In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, have been secured by PWCS to offset the impacts of the T4 Project on significant ecological values, should the T4 Project be approved and constructed. The Updated Impact Mitigation and Biodiversity Offset Strategy has been prepared and will be available for consideration by government during its consideration of the Preferred Project Report (PPR).

The Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR details the land-based and non-land based strategies that have been developed to compensate for the residual impacts of the T4 Project that could not be adequately avoided or mitigated. These are outlined in **Section 2.2.1** of this report.

The CMA considers Deep Pond a very important fresh water wetland within the lower Hunter estuarine complex as it sustains large numbers of migratory birds and provides a drought refuge for a range of local and regional birds, including threatened species. The unique location of this fresh water habitat within the lower Hunter estuary, and in close proximity to RAMSAR wetlands makes it a challenging site to replicate in terms of providing 'like for like' compensatory offset.

As discussed in Section 3.1.1 of the Ecological Assessment (EA Appendix K) Deep Pond is recognised as being a 'highly significant foraging and roosting site' for numerous shorebirds and waterfowl and the fifth most important wetland for shorebirds and other water birds in the Hunter Estuary (Herbert 2007), despite being an artificial pond. Deep Pond has a shallow southern area that, as it dries out, provides habitat for shorebirds. The northern part of Deep Pond is deep enough to attract the deep-diving ducks such as hardhead, musk duck and the threatened blue-billed duck.

Deep Pond and its associated freshwater wetland habitat will be partially removed and modified as a result of the T4 Project. Although a small area of Deep Pond (5.2 hectares) will be retained in the southern portion of the existing pond, it is not considered that suitable shorebird habitat would remain in the area.

Deep Pond is also proximate to the coast and Hunter River where there is a high occurrence of migratory shorebirds that use Deep Pond for foraging and roosting. Deep Pond occurs on Kooragang Island as a result of industrial reclamation by infilling of the original estuarine wetlands with industrial waste (Lindsey 2008). The existence of a freshwater wetland of this

size on Kooragang Island is not representative of the natural habitats that once occurred in the area.

The proposed restoration works at the Tomago Offset Site, in proximity to Ramsar wetlands, have been designed to cater for migratory bird species that are impacted by the removal of Deep Pond. The concept design for the Restoration Project includes specific water management mechanisms that will allow control of the water levels at the site providing tidal and permanent wetland habitat in the area. It is expected that the lagoons at the Tomago Offset Site would provide substantial habitat for those species displaced by the loss of Deep Pond in the Lower Hunter Estuary. Details of the concept design for the Restoration Project can be found in Appendix K of the PPR.

Additionally, the Ellalong Lagoon Offset Site is known to provide drought refuge habitat for a number of waterfowl species including the threatened freckled duck (*Stictonetta naevosa*) as well as other inland species including the Australian shoveler (*Anas rhynchotis*), hardhead (*Aythya australis*) and grey teal (*Anas gracilis*) all of which generally occur in coastal or near coastal areas during inland drought. Some selected internationally-listed migratory shorebirds such as the sharp-tailed sandpiper (*Calidris acuminata*) and Lathams snipe (*Gallinago hardwickii*) have been previously recorded in small numbers utilising the habitats of Ellalong Lagoon. It is considered that the sub-coastal location of Ellalong Lagoon is likely to limit the diversity of migratory shorebird species that primarily utilise wetland habitats on the coast, however the in-perpetuity conservation of the site is considered to comprise a substantial gain to the security of habitats for threatened and migratory species in the Hunter Region.

In our previous correspondence, the CMA recommended that offsets be determined using either the Environmental Outcomes Assessment Methodology (EOAM) or BioBanking methodology. It is acknowledged that under the EOAM endangered ecological communities (EECs) are unable to be offset. The CMA supports this principle, however for the purposes of determining offsets for this proposal where the Native Vegetation Act (NVA}, 2003 does not apply, the CMA would support the application of either methodology.

The CMA notes that neither the EOAM or BioBanking methodology have been utilised to determine the current offsets proposed in the EA. The Consultants state that they have 'considered the principles underpinning BioBanking in the development of the Biodiversity Offset Strategy' however it is clear that a full assessment has not been completed by a qualified BioBanking practitioner.

While PWCS does not intend on utilising the BioBanking pathway for development approval, a BioBanking Assessment has been undertaken to assist in guiding the biodiversity offsetting requirements of the T4 Project. This BioBanking Assessment has been completed by utilising data collected as part of the Ecological Assessment (Umwelt 2012a) as well as data collected specifically for BioBanking purposes. The BioBanking Assessment (refer to Appendix 1 of the Updated Impact Mitigation and Biodiversity Offset Strategy (Umwelt 2012b)) for the T4 Project was completed by a qualified BioBanking Assessor accredited through OEH.

The Consultants state that they are waiting for the release of Version 2.0 of the BioBanking Credit Calculator before being able to complete a full BioBanking assessment and will provide copies of the assessment to the Office of Environment and Heritage (OEH) and Department of Primary Industries (DPI) when completed.

The CMA would also appreciate the opportunity to review the BioBanking assessment once completed.

The BioBanking Assessment for the T4 Project and the offset sites is provided in the Updated Impact Mitigation and Biodiversity Offset Strategy (refer to Appendix J of the PPR). The assessment has been prepared in close consultation with OEH, in particular the OEH Assessment Officer (Steve Lewer) and John Seidel, Principal Project Officer (OEH BioBanking expert). The latter has reviewed the detail included in the calculator and provided advice that has been adopted finalising the BioBanking Assessment.

The CMA is unable to properly assess the proposal until additional offset information is provided including the total amount of hectares of 'like for like' native vegetation proposed to be offset and the location of the offset/s. The CMA is only able to support clearing that meets the 'improve or maintain' principles of the NVA.

As addressed previously, the Updated Impact Mitigation and Biodiversity Offset Strategy has been prepared and is provided in Appendix J of the PPR. The Biodiversity Offset Strategy has been undertaken in accordance with the relevant OEH and DSEWPC Offsetting Policies, as detailed in Section 7 of Appendix J of the PPR.

2.4 Newcastle City Council (NCC)

The Ecological Assessment prepared by Umwelt notes the proposed development of the coal terminal and associated facilities will have a significant impact upon a number of species listed under the Threatened Species Conservation Act 1997 (NSW) as considered by the seven-part test. However, no Species Impact Statements (SIS) has been prepared for the species considered to be under significant impact by the proposed development. Therefore, a SIS should be prepared for the relevant threatened species considered to be under significant impact from the proposed development.

Development in NSW is facilitated by the EP&A Act. The T4 Project's approval path under the EP&A Act is that given in Part 3A. Part 3A of the EP&A Act was repealed in 2011 however the T4 Project is subject to transitional arrangements.

The ecological survey and assessment completed as part of the T4 Project was undertaken in accordance with Part 3A of the EP&A Act. Therefore, a SIS is not required to be undertaken. The Ecological Assessment is considered to provide a detailed, comprehensive and accurate account of the ecological values of the T4 project area and the impacts of the T4 Project on identified ecological values, threatened species and endangered ecological communities. The Ecological Assessment under Part 3A is likely to be more comprehensive than that of a SIS. Further assessment of threatened species impacts is not considered warranted as the Species Impact Statement process is not applicable to Part 3A assessments.

The Ecological Assessment also proposes a series of compensatory measures to offset the significant ecological impacts from the proposed development. These compensatory measures include environmental works within the adjacent Hunter Wetlands National Park, creation of wetland habitat on-site for the green and golden bell frog (Litoria aurea) and off-site purchasing of habitat (Ellalong Lagoon).

The Biodiversity Offset Strategy does not propose works within the adjacent Hunter Wetlands National Park for biodiversity offset purposes. The only work proposed in the Hunter Wetlands National Park is the reinstatement of an estuarine channel through an existing levee over the Eastern Watercourse. These works are discussed in the surface water assessment in Appendix L of the RTS/PPR.

The Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR details the land-based and non-land based strategies that have been developed to compensate for the residual impacts of the T4 Project that could not be adequately avoided or mitigated. These are summarised in **Section 2.2.1** of this report.

Appropriate justification for the compensatory habitat proposed has not been demonstrated. Further demonstration is required due to the significant loss of habitat for threatened species and permanent loss of habitat (Deep Pond). Furthermore, the compensatory package proposed does not seem adequate as it proposes environmental works in currently protected areas (Hunter Wetlands National Park) and offsetting within future protected areas (Ellalong Lagoon is zoned E2 Environmental Conservation under Cessnock Local Environment Plan 2011).

As discussed above, the Biodiversity Offset Strategy has been updated following the lodgement of the Ecological Assessment for public exhibition in March 2012. The Updated Impact Mitigation and Biodiversity Offset Strategy is considered to provide an adequate and appropriate offset for the T4 Project and will result in the in-perpetuity conservation of significant ecological features and values.

Section 7.0 of the Updated Impact Mitigation and Biodiversity Offset Strategy (Appendix J of the PPR) provides the appropriate justification of the Strategy in relation to compensating for the residual significant impacts, in accordance with the State and Commonwealth guidelines on the suitability of offsets.

The Biodiversity Offset Strategy does not propose works in currently protected areas. Compensatory habitat works are not proposed in the Hunter Wetlands National Park, with works limited to proposed land-based offset sites and on the T4 project area. While Ellalong Lagoon itself is zoned E2 Environmental Conservation, the remainder of the 409 hectare offset site is zoned rural which provides no long-term environmental protection. It is also noted that the rural portion of the site has been subject to severe development pressure in the past and any development of the woodland and forest components of the site are likely to adversely impact the lagoon in terms of water quality impacts in particular.

While it is acknowledged that a portion of the Ellalong Lagoon Offset Site is currently protected under a conservation zoning for the current LEP, this does not guarantee long-term protection. The acquisition of the site by PWCS is considered to be significant in the Hunter region, as it represents the in-perpetuity conservation of a large parcel of high conservation value land within a highly modified rural landscape. The site provides important stepping-stone corridor function linking the conserved habitats of the Watagan National Park to Werekata National Park (including associated state forests) and provides known habitat for a range of threatened woodland-dependent fauna such as the regent honeyeater (*Anthochaera phrygia*), swift parrot (*Lathamus discolor*), little lorikeet (*Glossopsitta pusilla*), grey-crowned babbler (*Pomatostomus temporalis temporalis*), varied sittela (*Daphoenositta chrysoptera*), black-chinned honeyeater (*Melithreptus gularis gularis*), brown treecreeper (*Climacteris picumnus victoriae*), squirrel glider (*Petaurus norfolcensis*), grey-headed flying-fox (*Pteropus poliocephalus*) and a range of threatened micro-bats. While the majority of these species are not being impacted by the T4 Project, the conservation of the site represents a significant environmental gain in the region.

In addition, it is proposed to transfer ownership of the Ellalong Lagoon Offset Site from private to public ownership, so that it can be managed as part of the reserve system in NSW.

3.0 Community Group and Individual Submissions

3.1 Hunter Bird Observers Club

The Hunter Bird Observers Club Inc. (HBOC) strongly objects to the proposed destruction of migratory shorebird habitat and Australasian Bittern (Botaurus poiciloptilus) habitat by the proposed Port Waratah Coal Services Terminal 4 Coal Loader (T4). The submission primarily concentrates on addressing the destruction of migratory shorebird habitat at Swan Pond on Ash Island and Deep Pond and notes the list of migratory species identified at these sites.

In addition HBOC objects to the inappropriate decision by the NSW Government to rezone land on Ash Island earmarked for protection under the NSW National Parks Act in order to facilitate this development with complete disregard for its high conservation value to biodiversity, particularly migratory shorebirds.

As discussed in the Ecological Assessment (Umwelt 2012a), the Australasian bittern is expected to be significantly impacted as a result of the T4 Project and the species was a key driver in the development of the T4 Project Biodiversity Offset Strategy. The species has been positively identified at the Brundee Offset Site, near Nowra, NSW and at the Tomago Offset Site north of the T4 project area (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR for locations). Further response to concerns around loss of Australasian bittern and migratory shorebird habitat is provided in Sections 2.1.6 and 2.2.4.

Land within the T4 project area was not rezoned on Kooragang Island or Ash Island to facilitate the T4 Project. The T4 project area on Kooragang Island was zoned to facilitate port development under the Newcastle Local Environmental Plan (LEP) 2003 where all of the T4 project area was zoned for port and industry land uses. Under the State Environmental Planning Policy (SEPP) (Major Projects) Amendment (Three Ports) 2009 (which amended the SEPP Major Development 2005), the entire T4 project area was rezoned SP1 Special Activities, which also permits port development with consent. This includes the corridor of land between the railway line and the National Park boundary.

A 50 metre wide strip of land along the northern and western boundary of the T4 project area was previously owned by OEH but was zoned SP1 Special Activities under the State Environmental Planning Policy (Major Projects) Amendment (Three Ports) 2009. EMM advise that the Hunter Wetlands National Park boundary was extended in February 2011 to include Ash Island, and this 50 metre wide strip was inadvertently included in the reservation at this time. The NPWS subsequently set about correcting this boundary error. On 25 October 2011 it was corrected by government under the *National Parks and Wildlife Legislation Amendment (Reservations) Act 2011 No. 55*. Ownership has since been transferred to NPC. The land is still zoned for port activities and its use for the T4 Project in accordance with the zoning objectives.

HBOC further objects to the fact that it is required to write a submission pertaining to a project of the magnitude and complexity of T4 when the details of the offset site for migratory shorebirds are not available for examination before the closing date for submissions.

Since finalisation of the Ecological Assessment for Public Exhibition, further work on the Biodiversity Offset Strategy has been undertaken and PWCS has committed to the following in the Updated Impact Mitigation and Biodiversity Offset Strategy (refer to Appendix J of the PPR):

- Establishment and long-term protection of the 238 hectare Tomago Offset Site that allows for the conservation of estuarine vegetation and habitats, the creation of migratory shorebird habitat; and the management of Australasian bittern (*Botaurus poiciloptilus*) habitat in proximity to both the T4 project area and an existing estuarine habitat restoration program.

- Establishment and long-term protection of the 409 hectare Ellalong Lagoon Offset Site that allows for the conservation of a drought refuge for water bird species; conservation of known habitat for threatened micro-bat species recorded in the T4 project area; and the conservation Lower Hunter Spotted Gum Ironbark Forest EEC; conservation of significant woodland and forest habitat that includes the threatened known regent honeyeater (*Anthochaera phrygia*), swift parrot (*Lathamus discolor*), little lorikeet (*Glossopsitta pusilla*), grey-crowned babbler (*Pomatostomus temporalis temporalis*), varied sittela (*Daphoenositta chrysoptera*), black-chinned honeyeater (*Melithreptus gularis gularis*), brown treecreeper (*Climacteris picumnus victoriae*), squirrel glider (*Petaurus norfolcensis*) and grey-headed flying-fox (*Pteropus poliocephalus*). Additionally, the Ellalong Lagoon Offset Site has a historical record of green and golden bell frog.

- Establishment and long-term protection of the 204 hectare Brundee Offset Site that has a substantial, breeding population of the green and golden bell frog and known habitat for the Australasian bittern (*Botaurus poiciloptilus*) and Australian painted snipe (*Rostratula australis*) located adjacent to a current.

- Funding the University of Newcastle to facilitate the development of a green and golden bell frog captive breeding program (refer to Section 7.5.1 of the Ecological Assessment) in association with NCIG to be used in approved translocation projects to supplement the wild population and also to trial the effectiveness of created habitat.

Further details regarding compensatory habitat measures can be found in the Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR.

The duration and terms of public exhibition and submissions are matters for DP&I, which facilitates this process. It is understood that DP&I will advertise and invite submissions on the modified project, including the proposed habitat works at the Tomago Offset Site.

The Australian Government must meet its obligations to protect migratory shorebirds and their habitat under international agreements with the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA), the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA), and the Government of the Republic of Korea-Australia on the Protection of Migratory Birds (ROKAMBA); the Bonn Convention for the protection of migratory wild animals and the national Environment Protection and Biodiversity Conservation Act 1999 (EPBC). These contractual imperatives conflict in that the T4 project will destroy migratory shorebird habitat which the Australian Government is committed to protect. Past and present decisions have failed to protect migratory shorebird populations in the Hunter Estuary.

As identified in Section 5.4.3 of the Ecological Assessment, DSEWPC advised on 5 August 2011 (EPBC Ref 2011/6029) that the T4 Project constitutes a Controlled Action under the EPBC Act as the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- wetlands of international importance (Sections 16 and 17B);

- listed threatened species and communities (Sections 18 and 18A); and

- listed migratory species (Sections 20 and 20A).

Therefore the T4 Project will be determined in accordance with the EPBC Act by the Commonwealth Minister for DSEWPC. Umwelt provided a detailed Assessment of Significance relating to Matters of National Environmental Significance that will or could potentially be affected by the T4 Project. The Ecological Assessment in the EA identified the T4 Project as likely to have a significant impact on migratory species listed under the international conventions listed in the HBOC submission.

The Updated Impact Mitigation and Biodiversity Offset Strategy, provided in Appendix J of the PPR, includes substantial commitments regarding restoration and creation initiatives designed to offset the loss of migratory shorebird habitat as a result of the T4 Project. The migratory shorebird offsets include the construction and remediation of a 140 hectare site in the Tomago Wetlands that previously provided the largest nocturnal roost for shorebirds in the Hunter Estuary (Herbert 2007; OEH 2011).

A summary of the background and conceptual design of the restoration project at the Tomago Offset Site is included in **Section 2.1.6** of this report.

Swan Pond and Deep Pond are more than wetlands utilised by migratory shorebirds. Many other species of shorebirds breeding in Australia, water birds and wildfowl congregate on these sites; for instance they support more than 1% of the eastern Australian population of the congregatory species, Chestnut Teal Anas castanea. This is one of the criteria set out by BirdLife International for the Hunter Estuary being designated an Important Bird Area.

Umwelt (2012) acknowledges the importance of Deep Pond and Swan Pond for a wide range of shorebirds, water birds and other species of water fowl (refer to Sections 3.1, 4.2.2.1, 4.2.4.2, 5.3.8.3 for examples) and has considered the loss of these important habitats in the ecological impact assessment, particularly in relation to the impact of habitat loss associated with the T4 Project on threatened and migratory species. The report notes that the T4 Project is likely to have a significant impact on migratory shorebird species listed under international conventions (under the EPBC Act).

The loss of bird habitat in Deep Pond and part of Swan Pond is acknowledged in the Ecological Assessment (Umwelt 2012a) and Section 6 of the PPR. The loss of freshwater and saltmarsh habitats associated with Deep Pond and Swan Pond is expected to also impact non-threatened species, including species such as the chestnut teal (*Anas castanea*). Chestnut Teal are widespread and, sometimes, in large numbers in most freshwater and saltwater wetlands throughout the Hunter Estuary. The large number of chestnut teal present in the estuary, often more than 1 per cent of the global population, contributes to the nomination of the Hunter Estuary as an 'Important Bird Area' (Herbert 2007).

All impacts into wetland habitats are contained within the SP1 zone which permits port developments (with consent) under the SEPP (Major Projects) Amendment (Three Ports) 2009.

The habitats provided by the T4 project area are proposed to be offset through the restoration of the Tomago Offset Site and by the in-perpetuity conservation of Ellalong Lagoon Offset Site and Brundee Offset Site, as described above.

HBOC notes that the NSW Government has enabled the T4 Project to have the legal right to destroy Swan Pond by manipulating the boundaries of the Ash Island site of the Hunter Wetlands National Park so that Swan Pond and other areas were not gazetted as part of the National Park. The implications for those areas not gazetted, evidenced by the destruction of Swan Pond, are clear. They do not have genuine environmental protection and can be destroyed.

HBOC's views are noted.

As discussed above, the T4 Project is contained within the SP1 zone which permits port developments (with consent) under the SEPP (Major Projects) Amendment (Three Ports) 2009 and these boundaries were not amended to facilitate the T4 Project. The park boundary extension in 2011 added a considerable portion of Swan Pond into the Hunter Wetlands National Park. Umwelt cannot comment on land use planning, including the establishment of land use zones and permissibility of land uses, as these are matters for government.

The Hunter Estuary, the most important site for migratory shorebirds in NSW, has a long history of shorebird habitat being destroyed with no replacement habitat established as offsets. HBOC note that the loss Big Pond due to previous development on Kooragang Island has not been replaced and that migratory shorebird habitat compensation required by NCIG approval conditions.

Umwelt cannot comment on previous offsetting requirements or commitments of other projects. The T4 Project includes a comprehensive Biodiversity Offset Strategy that includes a land-based offset to compensate for the loss of migratory shorebird habitat from the T4 project area that could not be avoided or mitigated. The migratory shorebird offset component of the Biodiversity Offset Strategy includes the construction and remediation of a 140 hectare site in the Tomago Wetlands that previously provided the largest nocturnal roost for shorebirds in the Hunter Estuary (Herbert 2007; OEH 2011).

Please refer to **Section 2.1.6** of this report for detail on the restoration project proposed for the Tomago Offset Site.

The creation of migratory shorebird habitat, or any other habitat, is expensive and the offset system can fail through unforeseen events. For example, efforts to replace migratory shorebird habitat foundered when the Eastern Grass Owl Tyto longimembris, a locally rare species listed as Vulnerable under the NSW Threatened Species Conservation Act 1995 (TSC Act) was discovered on the site on Ash Island chosen for shorebird pond creation. The migratory shorebird project was cancelled.

It is outside the scope of this report to comment on previous potential shorebird habitat creation or restoration projects. The T4 Project Biodiversity Offset Strategy has been designed to meet criteria that determine the success of otherwise of the habitat restoration project and an adaptive management process has been included in the site Ecological Management Strategy to ensure that the restoration site functions in accordance with the stated aims and objectives of the project.

Umwelt has prepared an environmental impact assessment (EIA) as part of the approval process for the proposed Tomago Offset Site Restoration Project. The ecological assessment component of the Project has considered the impact of the habitat restoration project on threatened species, including the eastern grass owl (*Tyto longimembris*), which is known to occur on site. The Project is being considered as part of the T4 Project, and the EIA is included as an Appendix to the PPR, as Appendix K.

The cumulative impacts on biodiversity, in particular on migratory shorebirds, are reflected by the dramatic decline of these species in the Estuary. This decline is exemplified by the species, Curlew Sandpiper listed as Endangered in December, 2011 under the TSC Act. The Hunter Estuary is the most important site in NSW for the curlew sandpiper which has declined in NSW by between 80% and 94%: "Fitting a linear regression to the 29 years' data collected by the Australian Wader Study Group indicates that there has been a 94% decline in maximum annual counts of the New South Wales population between 1982 and 2010. This is equivalent to a decline of 89%

over three generations, the period recommended by IUCN (2010) for calculating population reduction" (NSW Scientific Committee). Its decline can be linked to the loss of tidal wetlands in the Hunter Estuary such as Big Pond.

It is understood that incremental habitat loss has resulted in the decline of many species within the Hunter Estuary. The Ecological Assessment concludes that the further loss of habitats from within the T4 project area will result in a likely significant impact on the Australasian bittern and migratory shorebird species, and a potentially significant impact on the following bird species:

- curlew sandpiper (*Calidris ferruginea*) (E – TSC Act);
- red-backed button-quail (*Turnix maculosa)* (V – TSC Act);
- white-fronted chat (*Epthianura albifrons*) (V – TSC Act);
- black-tailed godwit (*Limosa limosa*) (V – TSC Act); and
- Australian pied oystercatcher (*Haematopus longirostris*) (E – TSC Act).

As a result of the significant impacts predicted, PWCS has prepared a comprehensive Updated Impact Mitigation and Biodiversity Offset Strategy to compensate for the loss of important bird habitats from within the T4 Project area. Up to 140 hectares of shorebird habitat is expected to be restored at the Tomago Offset Site within the Lower Hunter Estuary, which will provide a substantial gain in foraging and roosting habitat for the curlew sandpiper and other migratory shorebirds in the region. Refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR for further details regarding the compensatory measures proposed.

Although the decline in migratory shorebirds is often attributed to the modification of their habitat in the northern hemisphere, the losses of small habitats such as Deep Pond and Swan Pond which will be either substantially or totally destroyed by the T4 project, contribute to this decline. 'Nebel et al. (2008) emphasise the importance of local threats, observing that non-migratory shorebirds experienced similar declines between 1983 and 2006 to those species that undergo migration' (NSW Scientific Committee).

Noted. The T4 Project Ecological Assessment (Umwelt 2012a) identifies the loss of local habitats within the T4 project area as likely to result in a significant impact on migratory shorebird species (and other non-migratory species). Due to the identified impacts, a comprehensive Updated Impact Mitigation and Biodiversity Offset Strategy has been prepared (refer to Appendix J of the PPR).

The features which make Deep Pond unique are twofold. They include the expansive area of sheltered non-tidal fresh water in close proximity to estuarine mudflats and its wetting and drying cycles under the influence of rainfall. When this wetland is full of water it provides a drought refuge for wildfowl and during its drying cycle it provides migratory shorebird habitat. The 80% reduction in the size of Deep Pond will obviously and clearly have a negative impact on both groups of species. The 20% retained area is unlikely to provide the same ecological attributes. HBOC believes that some amelioration may be gained by management of water levels in the retained area, but this measure does not appear to be included. During the construction stage of the Project the whole wetland will be impacted.

Umwelt (2012) notes in the impact assessment that the loss of the mud flat foraging habitat of Deep Pond is likely to result in significant impact on migratory shorebird species. As discussed above, the Tomago Offset Site and Ellalong Lagoon Offset Site have been secured in order to compensate for this loss of habitat.

As outlined in the T4 Project Ecological Assessment (Umwelt 2012a) it is proposed that a series of shorebird habitats be constructed at the Tomago Offset Site providing shallow tidal lagoons, mudflats and saltmarsh habitat for migratory shorebirds. Many of the bird habitats within the Hunter Estuary are man-made or created as a result of previous disturbance such as Deep Pond and the Kooragang Dykes. Additionally there are many examples of restoration works within the Hunter Estuary that have proven success as bird habitats such as the Hunter Wetlands Centre Australia (HWCA), Stockton Sandspit and the Ash Island restoration by the KWRP. These sites are regularly utilised by migratory shorebirds and waterfowl species, which provides confidence in the ability to recreate habitat for these species at the Tomago Offset Site.

Ellalong Lagoon is known to provide drought refuge habitat for a number of waterfowl species including the threatened freckled duck (*Stictonetta naevosa*) as well as other inland species including the Australian shoveler (*Anas rhynchotis*), hardhead (*Aythya australis*) and grey teal (*Anas gracilis*) all of which generally occur in coastal or near coastal areas during inland drought. Some selected internationally-listed migratory shorebirds such as the sharp-tailed sandpiper (*Calidris acuminata*) and Lathams snipe (*Gallinago hardwickii*) have been previously recorded in small numbers utilising the habitats of Ellalong Lagoon. It is considered that the sub-coastal location of Ellalong Lagoon is likely to limit the diversity of migratory shorebird species that primarily utilise wetland habitats on the coast, as seen at the T4 project area and surrounds, however the in-perpetuity conservation of the site is considered to comprise a substantial gain to the security of habitats for threatened and migratory species in the Hunter Region.

As noted in the HBOC submission, all of Deep Pond will be affected by the emplacement of saline dredge spoil during construction of the project infrastructure. Following construction, approximately 5.2 hectares will be retained. As discussed in Section 5.2.1 of Ecological Assessment, the retained section is not considered likely to provide an important area of habitat for migratory species, however with appropriate management may provide some drought refuge habitat and freshwater wetland habitat.

The feature which makes Swan Pond unique in the Hunter Estuary is that its ecological attributes are governed by the limited tidal transfer which occurs only during the high part of the tidal cycle. (EA, Appendix E, p.39). As a result, mudflats are exposed for longer periods than at most other areas of the Estuary thus providing high-quality roosting and/or tidal foraging habitat. HBOC has contributed 196.5 volunteer hours equating to $8315 of in-kind rehabilitation work on Swan Pond which will be destroyed and replaced by rail infrastructure. It is precisely this area where shorebirds and waterbirds congregate to roost and forage. All the shorter-legged species utilise this area including Red-necked Stint, Red Knot, Sharp-tailed Sandpiper, Curlew Sandpiper, Marsh Sandpiper and Common Greenshank as well as the longer-legged Black-tailed Godwit listed as Vulnerable under the TSC Act, and more recently, the Bar-tailed Godwit. HBOC monthly surveys over 13 years show a decline in all of these species.

Umwelt (2012) notes the importance of the habitat provided by Swan Pond in Sections 3.1, 4.2.2.1, 4.2.4.2, 5.3.8.3 and considered the loss of these important habitats in the ecological impact assessment, particularly in relation to the impact of habitat loss associated with the T4 Project on threatened and migratory species. The T4 Project will result in the loss of a small area of Swan Pond (3.3 hectares of saltmarsh habitat associated with Swan Pond), which together with the predicted loss of saltmarsh from other parts of the T4 project area

contributes to the significant impact predicted and reported for a number of threatened species and migratory shorebird species as a result of the T4 Project. The proposed offset package has been shown to more than compensate for these impacts. All impacts into wetland habitats are contained within the SP1 zone which permits port developments (with consent) under the SEPP (Major Projects) Amendment (Three Ports) 2009.

The importance of Deep Pond and Swan Pond has been increased by the progressive destruction and degradation of habitat in other areas of the Hunter Estuary. Non-tidal options such as Deep Pond and tidal foraging areas such as Swan Pond are and always will be particularly important immediately prior to migration when shorebirds must rapidly accumulate fat reserves to fuel long-distance flight. If they do not accumulate this fat, they cannot undertake the thousands of kilometres journey to their breeding grounds in the northern hemisphere. The decline of the smaller short-legged shorebird species in the Hunter Estuary during recent decades highlights the extent to which these non-tidal and tidal areas have disappeared. Together Deep Pond and Swan Pond work in tandem with shorebirds moving from one to the other in response to events such as disturbance and the relative suitability of foraging conditions.

As discussed, Umwelt (2012) details the importance of the migratory shorebird habitat within the T4 project area and this impact has been a key driver in the development of the migratory shorebird component of the compensatory habitat restoration and conservation initiatives detailed in Section 7 of the Ecological Assessment (Umwelt 2012a) and the Updated Impact Mitigation and Biodiversity Offset Strategy (Umwelt 2012b). The Tomago Offset Site is proposed to provide up to 140 hectares of restored and reconstructed shorebird habitat within an area that was formerly the primary nocturnal roost site for migratory species in the Hunter Estuary (Herbert 2007; OEH 2011). This offset could provide up to 5 times the area of habitat lost as a result of the T4 Project. PWCS seeks to provide substantial detail relating to the design, funding and ongoing management and monitoring of the site(s) as part of the T4 Project Biodiversity Offset Strategy and the proposed Tomago Offset Site Management Plan to allow approval authorities sufficient confidence that the proposed works will be successful.

PWCS remains committed to the process of providing a suitable and successful offset for the T4 Project.

Offsets

The Ecology Assessment by Umwelt (Australia) shows that the T4 Project has met the Principles for the Use of Biodiversity Offsets as defined by the Office of Environment and Heritage (OEH), which were updated in June 2010. The Kooragang Island Compensatory Habitat Framework 2008 is not relevant to T4 as offset opportunities on Ash Island are no longer available. The Offset Principles of the Environment Protection and Biodiversity Conservation Act (DEWR 2007) are not discussed in this submission as HBOC is making a separate submission in this regard.

Noted.

Other Species affected by the T4 Project

The Australasian Bittern was listed as Endangered under the TSC Act in 2010 and under the EPBC Act in 2011. Numbers of mature individuals range between 660 and 1660 in NSW where most of the population occurs (Scientific Committee). It has been seen on a number of small wetlands on the T4 site some of which will be managed for the Green and Golden Bell Frog. It is assumed that habitat managed for frogs will also be suitable for the Australasian Bittern.

The Australasian bittern is expected to be significantly impacted as a result of the T4 Project and the species was a key driver in the development of the T4 Project Biodiversity Offset Strategy. Targeted surveys were undertaken for the species at all land-based offset sties and the species was positively identified at the Brundee Offset Site, near Nowra, NSW and at the Tomago Offset Site (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR for locations). The Brundee Offset Site provides approximately 160 hectares of known freshwater wetland habitat for the Australasian bittern and the Tomago Offset Site provides approximately 11 hectares of freshwater wetland that comprises known habitat for the species and will be retained as part of the T4 Project Biodiversity Offset Strategy. A total of 27.0 hectares of habitat will be removed for the species as a result of the T4 Project. Details regarding the targeted survey methodologies and results are provided in the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR.

The Brundee Offset Site is considered to provide a high quality conservation outcome for the Australasian bittern on land that is currently subjected to farming pressures. The site is located adjacent to Brundee Swamp Nature Reserve; providing an appropriately located offset for the nationally endangered species.

Refer to the Updated Impact Mitigation and Biodiversity Offset Strategy (Appendix J of the PPR) for detailed discussion regarding the adequacy of the land-based offset sites for the Australasian bittern, and the detailed survey methodologies undertaken at each site for the species.

PWCS will supplement the Caring for Country grant of $125,000 received by the Hunter Wetlands Centre Australia (HWCA) for its Australasian Bittern Habitat Restoration Project for a period of three years for the development of a management plan. No indication of the value of the funding is mentioned. According to HBOC records, the last Australasian Bitterns reported from HWCA were in September 1997, August 1998 and September 2005 when single birds were reported. The few reported sightings of this species reflect the rarity of this species at HWCA as this site is constantly monitored. Australasian Bitterns have been reported over a number of years from the Hunter Wetlands National Park Hexham Swamp site which is adjacent to HWCA and whilst there are no guarantees of a successful outcome for this Project, it is possible that with the correct habitat in place, Australasian Bitterns may return to the HWCA. However, HBOC would prefer funding were allocated to direct habitat creation rather than a contribution to yet another desk-top study.

The funding of biodiversity initiatives was a commitment of the Biodiversity Offset Strategy that was outlined in the Ecological Assessment (Umwelt 2012a). At the time that the EA was placed on public exhibition (March 2012), the Ellalong Lagoon Offset Site was the only site officially secured as a land-based offset for the T4 Project. The process of securing other offset sites had not been finalised and could not be reported at the time. The Biodiversity Offset Strategy outlined in Section 7.0 of the Ecological Assessment (EA Appendix K) provided a framework for the Biodiversity Offset Strategy, which outlined a range of funding initiatives including funding to improve habitat quality for the species at the Hunter Wetland Centre Australia (HWCA).

In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, were secured by PWCS to offset the impacts of the T4 Project on significant ecological values (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy (Appendix J of the PPR)). These land-based offset sites were found to comprise substantial, high quality habitat for the Australasian bittern. Through preparation of the Biodiversity Offset Strategy, and with particular consideration of State and Commonwealth offset policy that favours the purchase, management and long

term conservation of land-based offset sites, funding initiatives for the Australasian bittern at HWCA were removed from the Updated Impact Mitigation and Biodiversity Offset Strategy for the T4 Project (refer to Appendix J of the PPR).

The White-fronted Chat Epthianura albifrons, a small passerine species which favours habitats with saltmarsh, is listed as Vulnerable under the TSC Act. 'Comparison of Atlas reporting rates in New South Wales indicate that there has been a 52% decline between 1977-81 and 1998-2002 (Barrett et al. 2007), equivalent to a 35% decline in reporting rate over 10 years' (NSW Scientific Committee). It occurs in small numbers at four locations in the Hunter Region (Jenner 2011; Stuart 2011) including Ash Island. It occurs on the edges of Swan Pond where saltmarsh provides habitat for this species.

The T4 Project will result in the loss of 18.9 hectares of saltmarsh habitat that is likely utilised by the white-fronted chat (*Epthianura albifrons*). Offsetting initiatives for the white-fronted chat (*Epthianura albifrons*) have been considered at the Tomago Offset Site. In addition to the 21 hectares of existing saltmarsh within the Tomago Offset Site, it is proposed that areas of saltmarsh would be created as a mosaic to the shallow tidal lagoons proposed for the creation of shorebird habitat. It is considered that up to approximately 100 hectares of additional saltmarsh would be created which would provide potential habitat for the species.

Deep Pond is a proven drought refuge for wildfowl. At times the numbers of wildfowl and the diversity of species on Deep Pond are unparalleled in the Hunter Estuary and Lower Hunter Valley. One of the factors may be that the effects of drought are felt less in the Hunter Estuary than in western areas of NSW or in western areas of the Hunter Region and, after intermittent episodes of heavy rainfall, which occur more frequently close to the coast, Deep Pond filled rapidly with fresh water thus providing the only available suitable habitat. The impact of the loss of Deep Pond on wildfowl populations moving to the Hunter Valley during periods of inland drought is unclear but would be expected to be significant for some species. Six species of duck which, under non-drought conditions, prefer wetlands in western NSW were observed on Deep Pond during the ten-year inland drought period of the 2000s. They included Grey Teal (Anas gracilis), Australasian Shoveler (Anas rhynchotis), Hardhead (Aythya australis), Pink-eared Duck, Blue-billed Duck (Oxyura australis) and Freckled Duck. The appearance of the last three species reflected the severity of the drought conditions.

As discussed in Section 3.1.1 of the Ecological Assessment (Umwelt 2012a) Deep Pond is recognised as being a 'highly significant foraging and roosting site' for numerous shorebirds and waterfowl and the fifth most important wetland for shorebirds and other water birds in the Hunter Estuary (Herbert 2007), despite being an artificial pond. Deep Pond has a shallow southern area that, as it dries out, provides habitat for shorebirds. The northern part of Deep Pond is deep enough to attract deep-diving ducks such as hardhead, musk duck and the threatened blue-billed duck.

Deep Pond, however, is not the only freshwater refuge habitat for birds in the Lower Hunter Estuary. Other examples of known freshwater refuge habitats for water birds and some migratory shorebirds in the Lower Hunter Estuary include Market Swamp, Newcastle Wetland Reserve, Hunter Wetlands Centre Australia wetlands, Pambalong Nature Reserve, Lenaghans Wetland, Hexham Swamp, 2HD Swamp, Tarro Swamp, Woodberry Swamp, Grahamstown Dam and Irrawang Swamp.

It is noted, however, that Deep Pond is the only open water freshwater wetland to occur adjacent to estuarine habitats such as mudflats, saltmarsh and mangroves in the Hunter Estuary. Deep Pond is also proximate to the coast and Hunter River where there is a high occurrence of migratory shorebirds that use Deep Pond for foraging and roosting. Deep Pond occurs on Kooragang Island as a result of industrial reclamation by infilling of the original estuarine wetlands with industrial waste (Lindsey 2008). The presence of a freshwater wetland of the size of Deep Pond on Kooragang Island is not representative of the natural habitats that once occurred in the area.

The restoration works proposed at the Tomago Offset Site will be designed to cater for migratory bird species that are impacted by the removal of Deep Pond. Specific water management mechanisms will allow control of the water levels at the Site providing tidal and permanent wetland habitat in the area. It is expected that the lagoons at the Tomago Offset Site would provide substantial habitat for those species displaced by the loss of Deep Pond in the Lower Hunter Estuary.

Additionally, Ellalong Lagoon is recognised as providing drought refuge habitat however it is noted that the processes that allow the filling of Deep Pond with freshwater at the coast are different to that of the sub-coastal Ellalong Lagoon. In times of drought they are considered to provide similar habitat values. Ellalong Lagoon, like Deep Pond, has records of inland waterfowl species that will journey to the coast to escape severe drought conditions inland. These include the threatened freckled duck (*Stictonetta naevosa*) and other species such as Australian shoveler (*Anas rhynchotis*), hardhead (*Aythya australis*) and grey teal (*Anas gracilis*). Some selected internationally-listed migratory shorebirds such as the sharp-tailed sandpiper (*Calidris acuminata*) and Lathams snipe (*Gallinago hardwickii*) have also been previously recorded in small numbers utilising the habitats of Ellalong Lagoon. Further detailed monitoring of Ellalong Lagoon is considered to further document the use of the site by a wide range of waterbird species. It is considered that the sub-coastal location of Ellalong Lagoon is likely to limit the diversity of migratory shorebird species that primarily utilise wetland habitats on the coast, as seen at the T4 project area and surrounds.

Contaminants and Birds

It is well known that birds accumulate contaminants when exposed to pollution. Accumulate may occur either by eating food harvested from a polluted ecosystem or by direct ingestion, although the latter is less common. When the ecosystem becomes contaminated there is also the possibility that components of the food chain are affected and the amount of available food is decreased to the extent that an area can no longer support its bird population.

Noted.

The impact of the accumulation varies with contaminant type and the species of bird involved. Each exposure will be unique and specific studies may not exist. In extreme cases accumulation can cause death of birds, as exemplified by Black Swans ingesting lead shot. However, sub-chronic impacts are probably a more serious threat because of their insidious nature. In sub-chronic instances biological functions may be impaired to an extent that although a bird survives in an apparently healthy state, key life cycle factors like reproductive success have been diminished to an extent that long-term survival of the species or local populations is threatened. The classic example is the decreased reproductive success of birds of prey as a consequence of egg-shell thinning when they are exposed to pesticides.

Noted.

The T4 site is contaminated by a cocktail of metallurgical wastes containing heavy metals e.g. jarosite, asbestos, and organic materials including tar, which includes aromatic hydrocarbons. During the construction phase of the T4 project these contaminants will be disturbed, increasing the risk of mobilisation and release to surface water and estuarine aquifers. In addition routine coal loading operations include procedures such as wetting down stockpiles, which may solubilise minerals. The T4 EA recognises this issue and outlines elaborate precautions, which will be taken to prevent their release to the environment. No doubt strict environmental regulations will be attached to the conditions of consent. However, environmental conditions of consent are almost inevitably exceeded on occasions. Indeed in the experience of the Newcastle community they are regularly breached with limited accountability, e.g. the Orica debacle.

The potential for contamination-related impacts has been studied in detail and is well understood and documented in the contamination and groundwater assessment reports in Appendices C and E of the EA and the updated assessment in Appendix E of the RTS/PPR. A remediation action plan (RAP) (pre-detailed design) has been prepared to address these matters and is provided in Appendix H of the RTS/PPR.

Use of the Hunter Estuary by the Community

As of April 2012, HBOC is no longer permitted to access the Deep Pond site. Authorities will need to consider our future access to Deep Pond so that monitoring can continue over the long term. The refusal of access raises the question of access to Area E when works commence on the rail infrastructure at Swan Pond. HBOC will object most strongly if surveys cannot continue in this area and its members, along with the general public, are locked out.

PWCS has advised that community access to the T4 project area during construction will not be permitted due to occupational health and safety reasons. The T4 Project will not however affect public access to roads or tracks outside of the project area, such as on Ash Island. Monitoring during and after construction will be undertaken in accordance with monitoring requirements agreed with government as part of the CEMP and EMP.

Conclusion

Migratory shorebirds will be left with one inappropriately located offset, Ellalong Lagoon, and a second area which involves an undemonstrated habitat creation experiment on a site which has yet to be acquired at a location which has yet to be revealed. This situation is not in accordance with the intent of international agreements or the EPBC and TSC Acts and governments are legally and morally obliged to ensure that migratory shorebirds continue to link Australia with the rest of the world. The findings of the T4 EA endorse the fact that there is a lack of available, suitable land within the lower Estuary for compensatory habitat. This being the case, it is necessary for the T4 Project to reconsider the size of its footprint so that wetlands of high conservation value are not destroyed.

The Ecological Assessment (Umwelt 2012a) prepared to assess the impacts of the T4 Project on ecological values has determined that the project is likely to have a significant impact on migratory shorebird species listed under international conventions (under the EPBC Act) and the potential to result in a significant impact on the following list of bird species (for other species please refer to the T4 Project Ecological Assessment):

- curlew sandpiper (*Calidris ferruginea*) (E – TSC Act);
- red-backed button-quail (*Turnix maculosa)* (V – TSC Act);

- white-fronted chat (*Epthianura albifrons*) (V – TSC Act);
- black-tailed godwit (*Limosa limosa*) (V – TSC Act); and
- Australian pied oystercatcher (*Haematopus longirostris*) (E – TSC Act).

The T4 Project will also result in the loss of important bird habitats associated with Deep Pond and Swan Pond.

Since finalisation of the Ecological Assessment for public exhibition, further work on the Biodiversity Offset Strategy has been undertaken and PWCS has committed to an Updated Impact Mitigation and Biodiversity Offset Strategy that aims to counterbalance the residual impacts of the T4 Project that cannot be adequately avoided, mitigated or managed. A summary of the offsetting components in the Updated Impact Mitigation and Biodiversity Offset Strategy is included in **Section 2.2.1** of this report.

3.2 The League of Independent Activists Australia

A detailed submission was received from the League of Independent Activists Australia (IndyAct) who presented their objection to the T4 Project due to the predicted environmental and social impacts and noted that the EA did not investigate some environmental matters adequately.

The Newcastle Coal Infrastructure Group is already constructing Stage 2 of the third coal export terminal, and has stated that 'compensatory habitat' for that project will be located on Part 11 land on Ash Island which 'is in the process of being gazetted as National Park and therefore the area will be maintained for conservation purposes in perpetuity'. It is crucially important that transparent information is provided by OEH, the Department of Planning, PWCS and NCIG regarding the possible overlap of the two companies' offset strategies and that these backroom deals over land trading, particularly when the land concerned is already owned and managed by OEH for conservation, is brought into the light of public scrutiny.

Umwelt cannot comment on previous offsetting requirements or commitments of other projects. PWCS is not proposing any biodiversity offset strategies or works on land on Ash Island or in other OEH estate. Additionally, the land-based offset sites secured as part of the Biodiversity Offset Strategy, being the Ellalong Lagoon Offset Site, Tomago Offset Site and Brundee Offset Site, are not part of the existing NPWS reserve system. It is proposed that the management of the offset sites would be transferred to an appropriate land manager such as NPWS for conservation in perpetuity as a nature reserve or national park, pending negotiations with OEH and following the implementation of any restoration works required as part of the Biodiversity Offset Strategy. The protection of these sites comprises a significant conservation outcome for those ecological values that required offsetting due to the residual impacts of the T4 Project.

As has been previously established, there has not been any overlap or duplication of offset properties as part of the Biodiversity Offset Strategy. This strategy has been developed openly and transparently with the government and the community.

The DGRs require a compensatory habitat framework, and 'measures to offset or mitigate the impact.' Contrary to this requirement, the Biodiversity Offset Strategy for the project is not finalised. The EA asserts that the proponent will offset the significant impacts the project is acknowledged to be likely to have, but there is no major offset site in the proponent's hands, nor is it described or located. The EA claims that, 'the

actual locations will be provided once the Biodiversity Offset Strategy is finalised, a process which is subject to potentially sensitive commercial transactions.' It is not appropriate for such a material component of the project to be deferred to future negotiation between Government Departments and the company after consent is granted, out of public view, and without any accountability.

At the time that the EA was placed on public exhibition (March 2012), the Ellalong Lagoon Offset Site was the only site officially secured as a land-based offset for the T4 Project. The process of securing other offset sites had not been finalised and could not be reported at the time. The Biodiversity Offset Strategy outlined in Section 7.0 of the Ecological Assessment (EA Appendix K) provided a framework for the Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR.

In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, were secured by PWCS to offset the impacts of the T4 Project on significant ecological values (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR). It was PWCS's intention to make the Biodiversity Offset Strategy available for government for consideration prior to any determination on the T4 Project. It is understood that the RTS/PPR, including the updated Biodiversity Offset Strategy, will be publicly exhibited and submissions invited. Further, it is understood that as part of its review, the NSW Planning Assessment Commission (PAC) will provide further opportunity for stakeholders to present their views, at a public hearing where any interested person can make representations to the commissioners. The need for any further consultation is a matter for DP&I.

Contrary to the assertions in the EA, the offsets are neither quantifiable nor targeted, nor located appropriately. The main offset site is not named, located or described in detail. The EA does not reveal how large it is, or its tenure, but does reveal that the consultants hired by PWCS failed to find the threatened species that will be affected by the development at the unnamed offset site. The threatened species they did find living there, they imply will be negatively impacted by their use of the site! (The EA says, 'The presence of eastern grass owl habitat may be a potential constraint in the development of the site as an offset for shorebirds and saltmarsh and an appropriate balance of development and retention of eastern grass owl habitat is likely to be required.')

The Biodiversity Offset sites are located in areas that contain the relevant ecological features required for offsetting the impacts of the T4 Project. The habitats identified within the Biodiversity Offset sites are representative of the habitats that will be lost within the T4 project area. The Tomago Offset Site is proximate to the T4 project area and the Ellalong Lagoon Offset Site is within the Hunter region. It is acknowledged in the Ecological Assessment (EA Appendix K) the difficulties to adequately offset for the green and golden bell frog (*Litoria aurea*) in the Hunter region and therefore offsets for the species were investigated at a wider scale and were secured at the Brundee Offset Site, near Nowra, NSW. All offset sites are located within the Sydney Basin Bioregion of which the T4 project area is located, are nearby or adjacent to reserved lands and include habitat requirements for a range of target species for the T4 Project.

In the months following the exhibition phase of the T4 Project, the 'Hunter Estuary Wetlands Offset Site', now the Tomago Offset Site, was secured by PWCS to offset the impacts of the T4 Project on migratory shorebirds, saltmarsh and Australasian bittern (*Botaurus poiciloptilus*). Subject to the T4 Project being approved and constructed, the Tomago Offset Site will be restored to provide additional habitat for migratory shorebirds in the Hunter Estuary in the form of saltmarsh beds, mudflats and shallow lagoons and manage known Australasian bittern (*Botaurus poiciloptilus*) habitat on site. This site has high conservation significance in the Hunter Estuary as it is proximate to the Hunter Wetlands National Park and Hunter Estuary Wetlands Ramsar Site and formerly comprised a historical nocturnal roosting site for migratory shorebirds (Herbert 2007; OEH 2011). It is expected that the site will restore and provide up to an additional 140 hectares of feeding and roosting habitat for these species (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy Appendix J of the PPR).

As the Tomago Offset Site will be restored to provide migratory shorebird habitat, it was not expected that these species would occur at the site in its current degraded state of disturbed grasslands and swamp oak forest. The Australasian bittern (*Botaurus poiciloptilus*) was recorded within the existing freshwater wetland to be retained as part of the Biodiversity Offset Strategy. Areas of ecological value for the T4 Project such as existing saltmarsh, mangrove forest and freshwater wetland will be retained, while the disturbed grassland and swamp oak forest will be cleared and levelled to create saltmarsh and shorebird habitat.

As stated in Section 7.4.1.4 of the Ecological Assessment the eastern grass owl (*Tyto longimembris*) has been recorded at the Tomago Offset Site and uses the grasslands and *Phragmites*-dominated freshwater wetlands for foraging and roosting. Potential impacts of the proposed habitat restoration works on the eastern grass owl are addressed in the EIA for the Tomago Offset Site Restoration Project, contained in Appendix K of the RTS/PPR. The project includes conservation of habitat for this species at the Tomago Offset Site. Details on the proposed mitigation strategies for the eastern grass owl are in the EIA.

The DGRs said the EA must 'include a compensatory habitat strategy for all impacted species based on the Kooragang Compensatory Habitat Framework (DECC) and consider compensatory habitat provided in relation to other project approvals on Kooragang Island (including the limitations of the nearby Ash Island for use as an offset area for habitat loss in the Kooragang Island and Hunter River estuary).' The DGRs also required the EA to 'consider compensatory habitat provided in relation to other project approvals on Kooragang Island (including the limitation of nearby Ash Island for use as an offset area).'

Neither of these requirements were fulfilled.

The specific offset framework developed for Kooragang Island by OEH, known as the *Kooragang Island Compensatory Habitat Framework*, was considered in the preparation of the Biodiversity Offset Strategy and is assessed against the Framework's requirements in Section 7.7.3 of the Ecological Assessment (EA Appendix K). The Framework was specifically designed to provide guidance in relation to the offsetting requirements for the green and golden bell frog, migratory shorebirds and saltmarsh EEC. As noted in Section 7.2.3 of the Ecological Assessment (Umwelt 2012a), although OEH sought for the offsetting outcomes to be located on Kooragang or Ash Islands, during the development of the Ecological Assessment OEH advised PWCS that the Framework was no longer able to be enacted in the way that was envisaged, in particular that land on Ash Island was not available for any land-based offsetting requirements. In lieu of this, PWCS investigated further opportunities with OEH and the Hunter – Central Rivers Catchment Management Authority (HCRCMA) in relation to adopting a similar approach at the offset sites secured as part of the Biodiversity Offset Strategy for the T4 Project.

In developing the Biodiversity Offset Strategy, other project approvals on Kooragang Island were considered. It is noted in Section 7.2.2 that BHP Billiton have developed compensatory green and golden bell frog habitat on Ash Island in accordance with their approvals. It was considered that Ash Island was already adequately protected by NPWS and other biodiversity initiatives and therefore PWCS focused on conserving the habitat for the species in other areas, including on site with the Green and Golden Bell Frog Habitat Corridor and the Brundee Offset Site which provides 204 hectares of suitable habitat for a large, breeding population of the species.

Very little compensatory habitat work has been undertaken by previous developments on Kooragang Island in regard to migratory shorebirds. PWCS have secured the Tomago Offsite Site to restore migratory shorebird habitat which is adjacent to Hunter Wetlands National Park and Hunter Estuary Wetlands Ramsar Site, and will provide a large expanse of migratory shorebird habitat within the Hunter Estuary outside the limitations of Ash Island.

A summary of the proposed restoration project at the Tomago Offset Site for the T4 Project is outlined in **Section 2.1.6** of this report.

The Updated Impact Mitigation and Biodiversity Offset Strategy (provided in Appendix J of the PPR) has been developed to offset the key species and communities that are expected to be adversely impacted as a result of the T4 Project and it is considered that the Strategy meets all policy and guideline frameworks for the development of offset strategies and results in the in perpetuity conservation of high conservation value lands.

Of the species that will be impacted by the project, only the Green and Golden Bell Frog and the Australasian Bittern are dealt with in any detail - and the latter is dealt with inadequately. The other impacted species: knotweed, Grey-headed Flying Fox, and the four migratory shore birds (sharp-tailed sandpiper, curlew sandpiper, marsh sandpiper, and common greenshank) are given only cursory treatment. Seven threatened bird species were recorded within the T4 project area during the surveys undertaken by Umwelt (refer to Figure 4.8) and a further seven have been recorded by HBOC between 2000 and 2010. Only one, the Australasian Bittern had targeted surveys undertaken for the EA.

Section 4.0 of the Ecological Assessment (EA Appendix K) describes the threatened species recorded within the T4 Project by Umwelt and other sources. Additionally, all threatened species with the potential to be impacted are addressed in detail in the Assessments of Significance in Appendix 7 and 8 and Section 5.4 of the Ecological Assessment.

Bird surveys undertaken by Umwelt were tailored for each species as necessary. Specific targeted surveys which required effort outside general diurnal bird surveys were undertaken for the Australasian bittern (*Botaurus poiciloptilus*) and eastern grass owl (*Tyto longimembris*). Additionally, specific call playback sessions targeted other bird species including masked owl (*Tyto novaehollandiae*), powerful owl (*Ninox strenua*), black bittern (*Ixobrychus flavicollis*), and bush-stone curlew (*Burhinus grallarius*). General diurnal bird surveys were undertaken at various times of the day, primarily in early to mid morning and mid to late afternoon. Each survey consisted of a slow walking transect within a 2 hectare area of the specific survey site within the T4 project area. Bird species were identified from characteristic calls and by observation using binoculars with magnification up to 42x and a 60x spotting scope for targeted shorebird surveys where appropriate. Two bird survey sites were specifically selected to allow diurnal bird surveys of Deep Pond and Swan Pond, identified by HBOC and others (Lindsey 2008; Herbert 2007) as providing an 'important area of bird habitat' within the T4 project area, which specifically targeted migratory shorebirds and other waterfowl.

OEH states the following in their submission regarding the T4 Project Ecological Assessment (EA Appendix K):

> It is acknowledged that Appendix K clearly indicates that extensive surveying has been undertaken at appropriate seasonal times to adequately determine the likely subject species.

Compensatory habitat is only proposed for some of the impacted species, and though there is an elaborate offset strategy proposed for the Federally-threatened Green and Golden Bell Frog, the offset proposals for the migratory shore birds and the Australasian Bittern are undeveloped, inadequate, non-existent and will not make amends for the profound impact this project will have on those species. Similarly, the EA confesses that the anonymous offset site discussed does not provide mature trees that can support the Federally-listed Grey-headed Flying Fox.

At the time that the EA was placed on public exhibition (March 2012), the Ellalong Lagoon Offset Site was the only site officially secured as a land-based offset for the T4 Project. The process of securing other offset sites had not been finalised and could not be reported at the time. The Biodiversity Offset Strategy outlined in Section 7.0 of the Ecological Assessment (EA Appendix K) provided a framework for the Updated Impact Mitigation and Biodiversity Offset Strategy (provided in Appendix J of the PPR). In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, were secured by PWCS to offset the impacts of the T4 Project on significant ecological values.

Offsets for migratory shorebirds and the Australasian bittern (*Botaurus poiciloptilus*) have been developed as part of the Updated Impact Mitigation and Biodiversity Offset Strategy for the T4 Project (Umwelt 2012b). Migratory shorebirds will be offset at the Tomago Offset Site through the creation of up to 140 hectares of saltmarsh, lagoon and mud flat habitat. Offsets for the Australasian bittern (*Botaurus poiciloptilus*) include in perpetuity conservation of known habitat at the Tomago and Brundee Offset Sites.

The grey-headed flying-fox (*Pteropus poliocephalus*) was recorded at nine locations flying over the T4 project area. The T4 project area is considered to provide limited foraging habitat for this species, particularly in the areas of mangrove forest, although it is likely that these would only be sparsely and infrequently used. Following detailed surveys, no roosting sites were observed and are considered unlikely to occur in the T4 project area. The T4 project area does not support an important population of this species in accordance with the Commonwealth Government significant impact criteria as it does not comprise a key source population either for breeding or dispersal; is not considered to comprise a population that is necessary for maintaining genetic diversity; and the species is not at the limit of its range in the T4 project area. Therefore the T4 Project is unlikely to result in a significant impact on the species and offsets for this species are not required.

It is noted however, that extensive areas of potential foraging habitat for the grey-headed flying-fox will be secured as part of the Ellalong Lagoon Offset Site where approximately 351 hectares of high quality woodland and forest habitat has been identified.

For the threatened bats that are impacted, the EA confesses that the unnamed offset site does not provide mangroves mature enough to provide replacement habitat for that lost in the development, but no alternative is proposed.

The biodiversity offset sites for the T4 Project contain substantial habitat for threatened micro-bats including potential roosting habitat in the form of woodland vegetation at the Ellalong Lagoon Offset Site and mangrove vegetation at the Tomago Offset Site. Although it is acknowledged that the mangroves at the Tomago Offset Site are younger and at this time are less likely to contain the extent of potential roosting habitat as the habitats within the T4

project area, mature mangroves do occur within approximately 6 hectares of the mangrove forest occurring on the site which would provide similar habitat for threatened micro-bats to that of the T4 project area. Additionally, other areas of the Tomago Offset Site provide a range of other foraging habitats for these species. The Ellalong Lagoon Offset Site contains 409 hectares of foraging and 351 hectares of potential roosting/maternity colony habitat in woodland vegetation for threatened micro-bats.

It is proposed that the proponent will replace currently functional and heavily-used migratory bird habitat by artificially constructing bird habitat on the unknown offset site, where none of these birds have been found. The enterprise is highly speculative and it would be untenable for the Director General or the Minister to approve the project for development on these terms: the loss of known and rare habitat for potentially constructed habitat on land not yet owned by the proponent. The 'the detailed design of the habitat restoration program' has not yet occurred either.

In the months following the exhibition phase of the T4 Project, the Tomago Offset Site was secured by PWCS to offset the impacts of the T4 Project on migratory shorebirds, saltmarsh and Australasian bittern (*Botaurus poiciloptilus*). The Tomago Offset Site is now in PWCS ownership. It is proposed that the Tomago Offset Site will be restored to provide migratory shorebird habitat. A summary of the proposed restoration project at the Tomago Offset Site for the T4 Project is outlined in **Section 2.1.6** of this report. It is not expected that migratory shorebird species would occur at the site in its current degraded state of disturbed grasslands and swamp oak forest.

Although it is acknowledged that Deep Pond does provide functional habitat for migratory shorebirds and waterfowl, it should be noted that many of the bird habitats within the Hunter Estuary are man-made or created as a result of previous disturbance, including Deep Pond and the Kooragang Dykes. Additionally there are many examples of restoration works within the Hunter Estuary that have proven success as bird habitats such as the Hunter Wetlands Centre Australia (HWCA), Stockton Sandspit and the Ash Island restoration by the KWRP. Similar successful shorebird restoration projects have occurred in the Penrhyn estuary in Sydney. These sites are regularly utilised by migratory shorebirds and waterfowl species, and in the case of the HWCA, listed as a Ramsar wetland of international significance.

More broadly, on cumulative impacts, the DGRs expressly require the EA to consider the project's relationship with existing port operations and approvals and the broader Hunter Valley coal transport network. The EA utterly fails to even describe, let alone assess, the cumulative impact of adding another 100Mt coal terminal to an already heavily impacted site, and treats the impacts on the Green and Golden Bell Frog and the migratory shore birds in isolation from recent developments on Kooragang Island (primarily, the NCIG coal terminal) that also impacted on these matters. There is no discussion of the NCIG offset strategy, its 'compensatory habitat and environmental monitoring plan' which is still not implemented, despite a condition of approval that required it to be in place within 6 months of construction starting.

Section 10.4.6 on the cumulative impacts notes the loss of habitat for the GGBF, but does not outline previous compensatory habitat activities undertaken by other companies (BHPB and NCIG), and deals with these matters in a cursory manner.

Section 5.3.4 of the Ecological Assessment (EA Appendix K) addresses the cumulative impacts of development on Kooragang Island on the ecological values of Kooragang Island and the T4 project area including the green and golden bell frog (*Litoria aurea*) and other flora and fauna habitat.

Umwelt cannot comment in detail on previous offsetting requirements or commitments of other projects. However, a brief discussion of the biodiversity initiatives from other developments on Kooragang Island, including BHPB and NCIG, is included in Section 7.2.2 of the Ecological Assessment and outlined below.

BHPB has undertaken the following action to offset the green and golden bell frog impacts of their waste emplacement facility:

- Green and golden bell frog habitat recreation trials on Ash Island and ongoing monitoring.
- Established a Technical Advisory Panel to guide their research priorities.
- Established a green and golden bell frog captive breeding program at the University of Newcastle, including ongoing research funding.

NCIG has undertaken the following actions to offset the impacts of their coal terminal:

- Development of a Compensatory Habitat Ecological Monitoring Program.
- Establishment of a consultative board with representatives from NCIG, DP&I, NPWS, CMA and University of Newcastle to guide the progression of the program.
- Undertake targeted research which will benefit the compensatory habitat development.
- Identification and investigation of suitable land for habitat creation on Ash Island.
- Undertake development of trial habitat area to inform future habitat creation.
- Progressive development of compensatory habitat.
- Ongoing monitoring.

NCIG have also committed to co-fund, in conjunction with PWCS, the Green and Golden Bell Frog Captive Breeding Program at the University of Newcastle from 2012.

The conclusion the EA makes that 'The Biodiversity Offset Strategy provides an adequate and appropriate means to counterbalance the residual significant impact of the T4 Project on the ecological values identified in Section 7.2.1' is not accurate in regard to the Australasian Bittern. 20ha of Freshwater wetland at Ellalong Lagoon is listed in Table 7.7 as providing a habitat offset for the Australasian bittern. The habitat creation at the unnamed estuary site is speculative enough, but it is ridiculous to propose Ellalong Lagoon as an offset for this species. Even if the proposed shorebird habitat were created at the site where it is not yet found, the proposed offset ratio for this species would be 1.5 ha of known habitat where the species is now found lost, for replacement by 1 ha of created modified habitat where the species has not been found.

Ellalong Lagoon is not considered to be an important offset site for the Australasian bittern (*Botaurus poiciloptilus*) for the T4 Project. As stated in Table 7.7 of the Ecological Assessment (EA Appendix K), the 20 hectares of freshwater wetland habitat at the Ellalong Lagoon Offset Site is acknowledged as being potential habitat only, with no records of the species at the site. In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, were secured by PWCS to offset the impacts of the T4 Project on Australasian bittern (*Botaurus poiciloptilus*), by acquiring 11 hectares of known freshwater wetland habitat for the species at the Tomago

Offset Site and 160 hectares of known freshwater wetland habitat at Brundee Offset Site. The species has been recorded by Umwelt on multiple occasions at both the Tomago Offset Site and the Brundee Offset Site.

They did not find Australasian bitterns in surveys at the unnamed offset site, but extraordinarily, mention that they were found 'in the adjacent wetlands to the east of the Hunter Estuary Wetlands Offset site' - as if their offset strategy could be bolstered by records elsewhere and outside the management control of the company.

Although the Australasian bittern (*Botaurus poiciloptilus*) had not been specifically recorded within the Tomago Offset Site at the time of public exhibition of the report, the species has been recently recorded by Umwelt (July 2012) utilising the freshwater wetland habitat within the area proposed to be managed as bittern habitat at the Tomago Offset Site. Substantial, targeted survey effort in accordance with the DEC (2004) Draft threatened Species Assessment Guidelines was employed at the site.

In Appendix K it is stated that 'When determining the impact of the T4 Project on this species reference was made to the Green and Golden Bell Frog Impact Assessment Guidelines (NPWS 2003a), the Draft Recovery Plan for the species (DEC 2005) and the EPBC Act Policy Statement 3.19 Significant Impact Guidelines for the Vulnerable Green and Golden Bell Frog (Litoria aurea) (DEWHA 2009b),' which indicates that the cumulative impacts were not assessed, as the NCIG and BHPB compensatory habitat programs are not included in this list.

Section 5.3.4 of the Ecological Assessment (EA Appendix K) specifically addresses the cumulative impacts of development on Kooragang Island on the ecological values of Kooragang Island and the T4 project area including the green and golden bell frog (*Litoria aurea*) and other flora and fauna habitat. This included impacts associated with neighbouring projects.

When determining the impact of the T4 Project on ecological values identified or known to occur in the T4 project area the cumulative loss of species and habitats was considered in the first instance. Consideration of the impact of the T4 Project on the green and golden bell frog and migratory shorebirds in particular was based on knowledge regarding the current population sizes and population trends. The current status of the populations is therefore considered in the context of historic habitat loss and population decline and the assessment clearly acknowledges the importance of those remaining habitats in the Kooragang Island industrial area in which the T4 project area occurs. The documents listed above represent the relevant government policy and guidelines that have been developed to assist in the impact assessment process.

The EA is contradictory about the impact on the frogs and unclear about which wetlands will be lost, and which saved: there is a concentration of frogs in OEH wetland 1 and 2 and Railway Pond, which the EA says PWCS are retaining as part of their mitigation strategy: 'avoidance and minimisation of disturbance of key threatened species habitat, particularly realignment of the proposed rail line to avoid OEH wetlands 1 and 2 and Railway Road Pond and the retention of approximately 5.2 hectares of Deep Pond.' (App K Part 2). Yet, elsewhere, the EA says 'it is likely that all known breeding habitat within the T4 project area will be removed during Stage 1 of construction.' (Appendix K 5.2.91' and then again, elsewhere It states that: 'The planning and construction of the green and golden bell frog corridor will commence prior to any disturbance of existing green and golden bell frog habitat associated with the approved T4 Project.' These statements appear to be contradictory.

The T4 Project design retains OEH Wetland 1, Railway Road Pond, Long Pond, Easement Pond South and approximately 5.2 ha of the southern portion of Deep Pond. OEH Wetland 1, Long Pond and Railway Road Pond are known breeding locations for the green and golden bell frog (*Litoria aurea*) and will be retained, while all other known breeding habitat within the T4 project area was expected to be removed including Railway Pond and Pond 11. PWCS's rail realignment (referenced in the submission) also avoided part of OEH Wetland 2 however the impact assessment and offset strategy development conservatively assumed that all habitat associated with OEH Wetland 2 would be lost, and it was all offset accordingly.

Subject to approval of the T4 Project, construction of the frog habitat ponds will commence during the first phase of the T4 Project's construction. In Zone 1, this will be once the area has been capped and remediated in accordance with the EPA's landfill closure requirements. Proposed habitat ponds in Zones 2 and 3 will be constructed once the first phase of the T4 Project's construction is complete and site works in these areas completed.

The frogs weren't found at either the unnamed offset site, or at Ellalong Lagoon: the last record at Ellalong Lagoon was in 1993. Similarly, the Crookhaven offset site has not been secured by PWCS.

In the months following the exhibition phase of the T4 Project, the Brundee Offset Site was secured by PWCS to offset the impacts of the T4 Project on the green and golden bell frog (*Litoria aurea*). The Brundee Offset Site has been secured by PWCS as an offset for the T4 Project, if the project is approved, and will provide in perpetuity conservation of a large breeding population of the green and golden bell frog in the Sydney Basin Bioregion.

The Tomago Offset Site and Ellalong Lagoon Offset Site are not considered to be important offsets for the green and golden bell frog, however one historic record of the species occurs at the Ellalong Lagoon Offset Site.

Despite the assessment finding that four migratory species could be significantly impacted, the EA makes the assumption that this will not affect the ecological character of the Ramsar site. We do not believe the Ramsar assessment is accurate with regard to the potential movement of contaminants in the estuary, caused by soil profile squeezing, the loss of ecological values through the modification and loss of nearby shorebird habitat, and the changed water dynamics on the site.

An assessment of significance for the Hunter Estuary Wetlands Ramsar Site is included in Appendix 8 of the Ecological Assessment (EA Appendix K) and updated in Chapter 6 of the RTS/PPR. It is acknowledged that the T4 Project will have a significant impact on some threatened and migratory species known to occur in the T4 project area. All of the migratory shorebird species recorded in the T4 project area and the Australasian bittern (*Botaurus poiciloptilus*) are known to occur in the Hunter Estuary Wetlands Ramsar site, and the site is considered to provide a considerable area of high quality habitat. While the T4 Project could result in a significant impact on individual threatened and migratory species, this is not expected to result in the loss of these species from appropriate habitats in the Hunter Estuary Wetlands Ramsar site, or a significant change to their habitat or lifecycle. It was concluded that the T4 Project is unlikely to result in a significant impact on the ecological character of a declared Ramsar wetland.

The groundwater and contamination assessments in the EA and RTS/PPR were undertaken by experienced geotechnical, environmental and groundwater engineers at Douglas Partners. They included quantitative modelling to simulate groundwater conditions with and without the T4 Project and evaluate the effectiveness of potential mitigations. This included prediction of potential alterations to water levels, hydraulic gradients, flow rates and salinity

levels, for example due to soil profile squeezing. Contaminant transport modelling was used to predict contaminant concentrations at surface water bodies.

The assessments concluded that, subject to implementing the proposed mitigations, there would be no significant impacts to existing surface flow regimes outside the project area, including wetlands in the Ramsar site. This is because the proposed mitigations will limit the influence of surface water and groundwater in the T4 project area on the flow regime of ponds and wetlands outside the project area. Quantitative modelling showed that off-site contaminant levels will not increase to an extent that would threaten environmental values in the short-term or long-term. The proposed capping will reduce rainfall infiltration and groundwater flow rates and levels, decreasing the long-term flux of contaminants. It was found that the mitigation measures will improve the long-term environmental condition of the T4 project area and surrounds by addressing risks associated with the existing contamination. More detail is provided in Douglas Partner's reports in the EA and RTS/PPR.

3.3 Dr Max Maddock – Individual Submission

A detailed submission was received from Dr Max Maddock who noted his objection to the T4 Project, the legislative and policy framework under which the EA was prepared and the Biodiversity Offset Strategy process and outcomes. It is noted that the submission did not make any comments relating to the adequacy of the Ecological Assessment. This Response to Submission Report has responded to those assertions in the submission that directly relate to the T4 Project Ecological Assessment and its outcomes.

The submission notes that the Tomago Buffer land was divided and rezoned into a north-western component zoned General Industries, and a south-eastern component zoned Environmental Conservation. A part of the land zoned for industries has been allocated to the Redlake project, referred to earlier in this report, land which has to be substantially filled to above flood level. The remaining land was also originally earmarked for industrial purposes, but is more low-lying, and hence would have required much more substantial filling to exceed flood level, in order to make it suitable for use as industrial sites.

Both areas were originally part of a saltmarsh area, historically a major night roosting site for migratory waders. Although this land has now been zoned Environmental Conservation, and is immediately adjacent to the KNR Ramsar site, it has not been transferred into the reserve.
It has also been excluded from the project for restoration of tidal flushing aimed at stimulating regeneration of saltmarsh habitat, commenced in the Tomago Wetland section of KNR in 2008.

The land in question at Tomago has been acquired by PWCS primarily as an offset for the loss of migratory shorebird from the T4 project area but also to offset the loss of Australasian bittern (*Botaurus poiciloptilus*) habitat, Coastal Saltmarsh EEC, threatened micro-bat habitat and mangrove habitat. The restoration of the Tomago Offset Site as part of the T4 Project Biodiversity Offset Strategy aims to provide up to 140 hectares of migratory shorebird habitat within the area that historically provided a significant nocturnal roost site for migratory shorebird species. PWCS proposes to transfer the Tomago Offset Site to an appropriate land manager, such as to the NPWS estate, following the successful implementation of the restoration project. The project is expected to complement existing habitat restoration works adjacent to the site. Further negotiations with OEH/NPWS will be required to give effect to this intention.

As outlined in the Ecological Assessment (EA Appendix K) it is proposed that a series of shorebird habitats be constructed at the Tomago Offset site providing shallow tidal lagoons, mudflats and saltmarsh habitat for migratory shorebirds. The concept design for these lagoons includes areas flooded by the tide, controlled by the use of adjustable tidal channels. At low tide, relatively small areas of permanent water that are predominantly mudflats would be present. The shorelines of the ponds would be graded appropriately to allow saltmarsh colonisation, with the regeneration of the community likely to occur naturally with the ingress of seed stock with tidal water as part of the habitat restoration works. Islands would provide potential diurnal roost sites that would be either bare ground or covered with low growing vegetation. Nocturnal roost sites would be constructed in very shallow water on the leeward side of islands or shores.

3.4 Hunter Communities Network

The proposal will have a cumulative impact on the significant ecological values in the Hunter Estuary. The lack of reference to past development approvals that have impacted on the ecological values of Kooragang Island and the Hunter Estuary is a failing of the assessment proposal. The assessment does not adequately refer to the conservation goals and objectives of management plans to maintain the ecological character of the Ramsar Wetlands and Hunter Wetlands National Park. An understanding of the change and abundance and diversity of ecological values since these projects have commenced is needed. These issues are not addressed in the proposal and need to be considered by DPI in a cumulative impact assessment.

Section 5.3.4 of the Ecological Assessment (EA Appendix K) addresses the cumulative impacts of development on Kooragang Island on the ecological values of Kooragang Island and the T4 project area including the green and golden bell frog (*Litoria aurea*) and other flora and fauna habitat. It is acknowledged that Kooragang Island has been subject to a range of historic disturbances from land clearing, agriculture and a variety of industrial land uses, which have had cumulative impacts on the local flora and fauna. Due to the long history of industrial development in the Newcastle Port area, a thorough literature review was undertaken as part of the Ecological Assessment (Section 3.1) which documents the ecological values of the T4 project area and surrounding area developed for industrial activities over the past few decades. Additionally, Section 1.3 of the Ecological Assessment describes the natural history and previous land use of Kooragang Island from which a comparison can be made regarding the current habitat types and species and communities that currently occur.

When determining the impact of the T4 Project on ecological values identified or known to occur in the T4 project area, the cumulative loss of species and habitats was considered in the first instance. Consideration of the impact of the T4 Project on the green and golden bell frog and migratory shorebirds in particular was based on knowledge regarding the current population sizes and population trends. The current status of the populations is therefore considered in the context of historic habitat loss and population decline and the assessment clearly acknowledges the importance of those remaining habitats in the Kooragang Island industrial area in which the T4 project area occurs.

A number of conclusions in the proposal concerning impacts on the surrounding ecology do not provide clear explanations of how the conclusion was reached e.g. that project activities would have no impacts on the neighbouring Ramsar Wetland or National Park. Many conclusions seemed to be based on a judgement where the criteria for the judgement are unclear.

Assessments for the T4 Project were based on assessment of the existing environment, including reviews of existing information and extensive flora and fauna surveys, groundwater and surface water testing; quantitative modelling where appropriate, including groundwater and hydrodynamic modelling; and impact assessments based on relevant guidelines and criteria. Assessments were undertaken by experienced professionals and the methodologies are provided in the EA.

In terms of the Ecological Assessment, as outlined in Section 1.4 of the Ecological Assessment (EA Appendix K), the process of undertaking an ecological assessment requires particular steps to identify the ecological features that require specific assessment, and to determine the level at which they are likely to be impacted. This is initially undertaken without consideration of any mitigation or offsetting measures, however the preliminary impact assessment informs project design and, in this case, has led to the development of project avoidance measures undertaken specifically to protect, or reduce impact on, ecological matters. Through the use of significance assessments under the EP&A Act and the EPBC Act, a decision is made as to whether or not species, populations or communities will be significantly impacted by the project. This is outlined in the Assessment of Significance in Appendix 7 and 8 of the Ecological Assessment and the Assessments have specific criteria for determining the impact of an action on threatened species, populations and communities. Additionally, the results of quantitative modelling and assessment by others, including the acoustic, contamination, groundwater and surface water modelling and assessments (provided as appendices of the EA) were considered in assessing the impacts of the T4 Project in the Ecological Assessment. Both the State and Commonwealth Governments have policies and guidelines relating to the application of significance assessment criteria which were referred to as part of the impact assessment process. For those species and communities that were determined to be significantly impacted, or potentially significantly impacted, detailed mitigation and offsetting measures were developed.

The proposal does not adequately address the potential impacts to migratory shorebird feeding areas adjacent to the proposed activities.

Section 5.5.3 of the Ecological Assessment (EA Appendix K) describes the potential impacts of the T4 Project on ecological values surrounding the project area. The potential for impacts to habitat proximate to the T4 Project operational area, including the Hunter Estuary Wetlands Ramsar site and the Hunter Wetlands National Park, were considered in the preparation of the assessment of the impact of the T4 Project on ecological values detailed in Section 5.0 of the Ecological Assessment.

There is no consideration of whether previous human activities on Kooragang Island have reduced the number of migratory shorebirds in the region, through degradation of foraging habitat and loss of benthic fauna, loss of access to foraging areas through loss of suitable roosts or increased predation pressure at feeding and roosting areas.

Umwelt notes that incremental habitat loss has resulted in the decline of many species within the Hunter Estuary. The Ecological Assessment concludes that the further loss of habitats from within the T4 project area, without appropriate mitigation and offsetting, will result in a likely significant impact on the Australasian bittern and migratory shorebird species, and a potentially significant impact on the following bird species:

- curlew sandpiper (*Calidris ferruginea*) (E – TSC Act);
- red-backed button-quail (*Turnix maculosa)* (V – TSC Act);
- white-fronted chat (*Epthianura albifrons*) (V – TSC Act);
- black-tailed godwit (*Limosa limosa*) (V – TSC Act); and

- Australian pied oystercatcher (*Haematopus longirostris*) (E – TSC Act).

As noted above, Section 5.3.4 of the Ecological Assessment (EA Appendix K) addresses the cumulative impacts of development on Kooragang Island on the ecological values of Kooragang Island and the T4 project area including the green and golden bell frog (*Litoria aurea*) and other flora and fauna habitat. The history of land reclamation, land clearing, agriculture, waste emplacement and industrial port development is acknowledged to have resulted in an incremental loss of vegetation and fauna habitat across Kooragang Island. This cumulative loss of habitat has placed further pressure on local threatened flora and fauna species and this is considered in the impact assessment on threatened flora, fauna and communities in the Assessments of Significance in Appendix 7 and 8.

The impacts of dredging on migratory bird habitat have not been adequately addressed in the proposal.

Approval for dredging is not being sought as part of the T4 Project EA. Therefore, impacts resulting from dredging activities are not assessed in the Ecological Assessment. The dredging approval was subject to an application accompanied by an Environmental Impact Statement (EIS) in 2003, which considered the ecological impacts associated with dredging. An application to modify the existing approval under the provisions of the EP&A Act will be submitted separately. The modified dredging plan's potential environmental impacts will be addressed in detail in an EA for the modification application.

3.5 Community Submissions

3.5.1 Impacts to Flora, Fauna and Habitats

A number of concerns regarding the impact of the T4 Project on flora, fauna and their habitats were included in various community submissions. These are addressed in the sections below.

3.5.1.1 Loss of Irreplaceable Migratory Shorebird Habitat in the Hunter Estuary as a Result of the T4 Project

Community submissions raised concerns regarding the loss of migratory shorebird habitat as a result of the T4 Project, and the overall reduction in available habitat for these species in the wider Hunter Estuary.

It is acknowledged in Section 2.9 of the Ecological Assessment (EA Appendix K) that the Hunter Estuary Wetlands are of high conservation value due to their unique mix of wetland types, importance for maintaining biological diversity and conservation of migratory shorebirds. The Hunter Estuary Wetlands Ramsar Site lies adjacent to approximately 1.2 kilometres of the boundary of the T4 project area and within 500 metres along the remainder of the T4 project area northern boundary. As discussed in Section 5.3.8 of the Ecological Assessment, the T4 Project is not expected to result in substantial off-site impacts such that the Hunter Estuary Wetlands Ramsar Site would be directly impacted. This internationally recognised important habitat for migratory shorebirds is expected to be unaffected by the T4 Project.

Habitat for migratory shorebirds also occurs within the T4 project area and will be disturbed as a result of the T4 Project. This includes 18.9 hectares of saltmarsh habitat known to be utilised by migratory shorebirds, together with 7.5 hectares of mudflat habitat associated primarily with Deep Pond, that together meet the specific feeding requirements for the range of migratory shorebirds recorded in the T4 project area.

The Assessment of Significance undertaken for internationally listed migratory shorebirds (Appendix 8 of the Ecological Assessment) concluded that, without appropriate mitigation and offsetting, the T4 Project is considered likely to result in a significant impact on all of the migratory shorebird species listed under international conventions that have been recorded in the T4 project area.

In response to the potential significant impact on migratory shorebirds, the Tomago Offset Site has been secured by PWCS and will be restored to provide additional habitat for migratory shorebirds in the Hunter Estuary in the form of saltmarsh beds, mudflats and shallow lagoons. This site has high conservation significance in the Hunter Estuary as it is proximate to the Hunter Wetlands National Park and Hunter Estuary Wetlands Ramsar Site and formerly comprised a historical nocturnal roosting site for migratory shorebirds (Herbert 2007; OEH 2011). It is proposed that the site will restore and provide up to an additional 140 hectares of feeding and roosting habitat for these species (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR).

3.5.1.2 Unacceptable Impacts to Threatened Fauna Species Such As the Green and Golden Bell Frog (*Litoria aurea*) and the Australasian Bittern (*Botaurus poiciloptilus*)

Concerns regarding the impacts on threatened species as a result of the T4 Project, particularly impacts on the Kooragang Island population of green and golden bell frog (*Litoria aurea*) and Australasian bittern (*Botaurus poiciloptilus*) were identified in many community submissions.

A total of 23 threatened fauna species have been recorded within the T4 project area as a result of Umwelt surveys, annual HBOC monitoring, and other ecological assessments undertaken in and adjacent to the T4 project area. The majority of these consist of threatened water bird and shorebird species, micro-bat species and the green and golden bell frog (*Litoria aurea*).

As stated in Section 5.4.1 of the Ecological Assessment (EA Appendix K) an assessment of significance was undertaken using an initial screening process to identify species that may be potentially impacted by the T4 Project (Tables 1, 2 and 3 of Appendix 2), with a consequential full assessment of the likely significance of impacts being completed for these species (Appendix 7 and 8). Based on the threatened species assessment, the T4 Project, without mitigation and offsetting, is likely to result in significant impact on the following threatened species:

- green and golden bell frog (*Litoria aurea*) (E – TSC Act, V – EPBC Act); and
- Australasian bittern (*Botaurus poiciloptilus*) (E – TSC and EPBC Acts).

Based on the threatened species assessment and applying the precautionary principle, without mitigation and offsetting, the T4 Project will also potentially result in a significant impact on the following threatened species and ecological community:

- pondweed (*Zannichellia palustris*) (E – TSC Act);
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC (TSC Act);
- curlew sandpiper (*Calidris ferruginea*) (E – TSC Act);
- red-backed button-quail (*Turnix maculosa*) (V – TSC Act);

- white-fronted chat (*Epthianura albifrons*) (V – TSC Act);
- black-tailed godwit (*Limosa limosa*) (V – TSC Act);
- Australian pied oystercatcher (*Haematopus longirostris*) (E – TSC Act); and
- east coast freetail-bat (*Mormopterus norfolkensis*) (V – TSC Act).

Substantial impact mitigation and offset strategies have been formulated to minimise and mitigate the impact of the T4 Project on threatened species and in particular the green and golden bell frog (*Litoria aurea*) and Australasian bittern (*Botaurus poiciloptilus*).

Impact mitigation for the green and golden bell frog (*Litoria aurea*) will involve the creation of an extensive and complex series of habitat features that together form a linkage across the T4 project area to habitat under construction or retained on public and private lands adjacent to the T4 project area. This will form the Green and Golden Bell Frog Habitat Corridor for the existing population on Kooragang and Ash Islands to allow the continuity of the population in the area. This is further discussed in the Updated Impact Mitigation and Biodiversity Offset Strategy provided in Appendix J of the PPR.

As discussed above, additional freshwater wetland habitat will be created as part of the Green and Golden Bell Frog Habitat Corridor within the T4 project area. These freshwater wetlands will also provide potential habitat for a range of native flora and fauna species that currently occupy the freshwater wetland habitats of the T4 project area including threatened species such as the Australasian bittern (*Botaurus poiciloptilus*).

The Updated Impact Mitigation and Biodiversity Offset Strategy for the T4 Project (2012b) was prepared in order to compensate for the residual impacts of the T4 Project that could not be adequately avoided, mitigated or managed and consists of a number of components designed to address the identified impacts on threatened species and EECs. These measures include land based, non-land based offsets and funding of ongoing research. A summary of the components of the Updated Impact Mitigation and Biodiversity Offset Strategy is provided in **Section 2.2.1** of this report.

3.5.1.3 Loss of Deep Pond is Unacceptable as it is the Only Freshwater Refuge Habitat for Birds in the Lower Hunter Estuary

Many community submissions raised concerns regarding the loss of Deep Pond as an important drought refuge for birds in the Hunter Estuary.

As discussed in Section 3.1.1 of the Ecological Assessment (EA Appendix K) Deep Pond is recognised as being a 'highly significant foraging and roosting site' for numerous shorebirds and waterfowl and the fifth most important wetland for shorebirds and other water birds in the Hunter Estuary (Herbert 2007), despite being an artificial pond. Deep Pond has a shallow southern area that, as it dries out, provides habitat for shorebirds. The northern part of Deep Pond is deep enough to attract deep-diving ducks such as hardhead, musk duck and the threatened blue-billed duck.

Deep Pond, and its associated freshwater wetland habitat, will be partially removed and modified as a result of the T4 Project. Although a small area of Deep Pond (5.2 hectares) will be retained in the southern portion of the existing pond, it is not considered that suitable shorebird habitat would remain in the area.

Umwelt disputes the claim that Deep Pond is the only freshwater refuge habitat for birds in the Lower Hunter Estuary. Other examples of known freshwater refuge habitats for water birds and some migratory shorebirds in the Lower Hunter Estuary include Market Swamp,

Newcastle Wetland Reserve, Hunter Wetlands Centre Australia wetlands, Pambalong Nature Reserve, Lenaghans Wetland, Hexham Swamp, 2HD Swamp, Tarro Swamp, Woodberry Swamp, Grahamstown Dam and Irrawang Swamp.

It is noted, however, that Deep Pond is the only open water freshwater wetland to occur adjacent to estuarine habitats such as mudflats, saltmarsh and mangroves in the Hunter Estuary. Deep Pond is also proximate to the coast and Hunter River where there is a high occurrence of migratory shorebirds that use Deep Pond for foraging and roosting. Deep Pond occurs on Kooragang Island as a result of industrial reclamation by infilling of the original estuarine wetlands with industrial waste (Lindsey 2008). The presence of a freshwater wetland of the size of Deep Pond on Kooragang Island is not representative of the natural habitats that once occurred in the area.

The restoration works proposed at the Tomago Offset Site will be designed to cater for migratory bird species that are impacted by the removal of Deep Pond. Specific water management mechanisms will allow control of the water levels at the Site providing tidal and permanent wetland habitat in the area. It is expected that the lagoons at the Tomago Offset Site would provide substantial habitat for those species displaced by the loss of Deep Pond in the Lower Hunter Estuary. **Section 2.1.6** provides detailed discussion regarding the proposed offset for migratory shorebirds at the Tomago Offset Site, including commitments around anticipated restoration timing.

Additionally, the Ellalong Lagoon Offset Site is known to provide drought refuge habitat for a number of waterfowl species including the threatened freckled duck (*Stictonetta naevosa*) as well as other inland species including the Australian shoveler (*Anas rhynchotis*), hardhead (*Aythya australis*) and grey teal (*Anas gracilis*) all of which generally occur in coastal or near coastal areas during inland drought. Some selected internationally-listed migratory shorebirds such as the sharp-tailed sandpiper (*Calidris acuminata*) and Lathams snipe (*Gallinago hardwickii*) have been previously recorded in small numbers utilising the habitats of Ellalong Lagoon. It is considered that the sub-coastal location of Ellalong Lagoon is likely to limit the diversity of migratory shorebird species that primarily utilise wetland habitats on the coast, as seen at the T4 project area and surrounds, however the in-perpetuity conservation of the site is considered to comprise a substantial gain to the security of habitats for threatened and migratory species in the Hunter Region.

3.5.1.4 Impacts to the Surrounding Habitats Including the Adjacent Hunter Wetlands National Park, Hunter Estuary Wetlands Ramsar Site and Ash Island

Numerous submissions raised concerns regarding the potential impacts of the T4 Project on surrounding lands, in particular the habitats within the Hunter Wetlands National Park and the Hunter Estuary Wetlands Ramsar Site.

The T4 project area is located adjacent to the Hunter Wetlands National Park which lies immediately to the north, east and west of the T4 project area and adjoins approximately 5 kilometres of the T4 project area boundary at the northern edge of the proposed water and gas easement realignment. The Hunter Estuary Wetlands Ramsar Site lies approximately 500 metres to the north of the boundary of the T4 project area for approximately 3 kilometres and within 500 metres along the remainder of the T4 project area north-eastern boundary. The T4 project area does not include National Parks estate or Ramsar land.

The only work proposed in the National Park is reinstatement of an estuarine channel through an existing levee in the park (the Eastern Watercourse Levee), to enable tidal exchange with the freshwater lagoon south of the levee. This will maintain this area's tidal regime and mitigate impacts of the proposed rail embankment, including on vegetation communities in the National Park and Ramsar site. Further details on these proposed works are provided in Appendix L of the RTS/PPR document. These works require separate

approval under the *National Parks and Wildlife Act 1974* and Part 5 of the EP&A Act. PWCS has been consulting NPWS about these works. NPWS has stated that they support this approach in principle subject to appropriate assessment. The ecological assessment (refer to Section 6 of the PPR) concluded that removing or modifying the Eastern Watercourse levee will result in an ecological gain by restoring the area of disturbed wetland communities to an estuarine mangrove complex, characteristic of the surrounding naturally occurring vegetation and habitats. Therefore, subject to NPWS's approval, indirect impacts within the National Park will be mitigated by the proposed works at the Eastern Watercourse Levee.

The EA assessed potential indirect impacts off-site, including at the National Park, for example to flora and fauna habitat, water quality, flow regimes and noise levels. Mitigation measures were developed to minimise the potential for off-site impacts, including at the National Park, and are in Chapter 15 of the RTS/PPR. This includes the estuarine channel realignment and levee modification to prevent any significant impacts to the tidal regime of wetlands to the north of the project area, within the National Park and Ramsar site. As described in the EA and RTS/PPR, modelling and assessment showed that with the proposed mitigation measures no significant adverse impacts are anticipated in the Hunter Wetlands National Park, including to water quality, levels or flows regimes. The T4 Project will improve management of existing contamination in the T4 project area, which will benefit receiving environments in the National Park.

A number of measures will be undertaken to minimise the likelihood of adverse impacts. Measures including channel realignment works across Mosquito Creek are proposed to mitigate any impacts to the tidal regime to areas beyond the project area. As a result, based on the analyses undertaken by SMEC (Appendix J of the EA), any ecological change resulting from indirect impacts to these areas is expected to be negligible.

As a result of detailed impact mitigation measures it is unlikely that there will be off-site impacts on the Hunter Wetlands National Park and the Hunter Estuary Wetlands Ramsar Site.

3.5.1.5 Impacts to Aquatic and Estuarine Species and Habitats Including Mangroves as a Result of Dredging and Changes via Tidal Hydrodynamics and Salinity

A number of submissions raised concerns regarding the potential impacts of the T4 Project on aquatic and estuarine species and habitats in the Hunter River including the habitats provided by mangroves. Concerns were raised regarding the impact on estuarine habitats via changes to tidal hydrodynamics and salinity and the potential of creating stagnant deep holes, altering currents, riverbed erosion and the release of pollutants that are currently trapped within the bottom sediments as a result of the T4 Project. A Hydrodynamic Assessment (Worley Parsons 2012) was undertaken for the T4 Project and is included in Appendix I of the EA. It is currently being updated and will be submitted with the EA for the modification application for dredging.

The Hunter Estuary contains estuarine habitats for aquatic species including mangrove forests, saltmarsh and estuarine creeks. It is acknowledged in Section 5.3.9 of the Ecological Assessment (EA Appendix K) that there may be a localised loss of productivity in the estuary with the removal of estuarine habitats including mangrove forest and saltmarsh. This reduction in productivity is a result of the mangroves supporting juvenile fish species, commercial fish species, many species of decapods and other macroinvertebrates that all contribute to the productivity of the estuary.

The proposed construction activities may result in short term disruption to fish and other mobile fauna movement during the initial stages of the T4 Project development however this impact is not expected to be significant as these marine species are expected to return following the completion of construction activities.

Dredging was not specifically addressed in the EA as it is being dealt with through a separate approval process. As noted in Section 1.1.1 of the Ecological Assessment (Umwelt 2012a), the majority of dredging in the Hunter River south arm required for the T4 Project currently has development consent from 2005, under the EP&A Act (DA-134-3-2003-i). Impacts of dredging were assessed by GHD (2003) and mitigation measures developed to minimise potential impacts. Details are in the GHD (2003) report. The potential impacts and proposed management and monitoring measures were deemed acceptable by government and approved in 2005 under DA-134-3-2003-i; dredging in accordance with this consent has proceeded as far upstream as NCIG's site. Modifications have also been assessed and approved since this time. The dredging design for the access to the proposed T4 berth sites has been modified since the development consent was issued and so it is proposed to further modify the existing consent. The modified dredging plan's potential environmental impacts will be addressed in detail in an EA for the modification application. Further discussion on this is provided in **Section 2.1.7**.

The T4 Project will result in the direct loss of estuarine habitats by way of 18.9 hectares of Saltmarsh and 28.3 hectares of Mangrove Forest habitats, including 4.1 hectares of Open Water habitat associated with these communities. In addition, there will be a localised impact to benthic habitats through the construction of the wharf structure at the Hunter River south arm and noise impacts associated with construction activities have the potential to affect marine species in the short term. While the T4 Project will result in the direct and indirect loss of aquatic habitats and species, this loss is not expected to be significant in a regional context due to the availability and extent of estuarine habitats associated with the Hunter Estuary.

3.5.1.6 Impacts to Potential Micro-Bat Maternity Roosting Habitat in Mangroves as a Result of the T4 Project

One submission raised specific concerns regarding the potential impacts of the T4 Project on possible maternity roosts within mangrove habitats for threatened micro-bats in the Hunter Estuary. Concerns raised included suggestions that the T4 Project would remove approximately 11.3 per cent of the total old growth mangroves in the Hunter Estuary, suggestions that the survey effort in these areas were lacking and highlighting the need for a specific offset strategy to address the impacts to threatened micro-bat species as a result of the loss of potential maternity roosting habitat.

As discussed in Section 5.3.8.2 of the Ecological Assessment (EA Appendix K), tree hollows in mangroves were identified as providing a locally important resource for hollow-dependant micro-bat species given the recent identification of maternity colonies on Kooragang and Ash Islands (Anna McConville pers. comm.). Mature stands of Mangrove Forest grow on the intertidal flats in the T4 project area with a small stand identified on the banks of the Hunter River south arm (5.9 hectares), and larger areas occurring in the proposed rail and utility corridor (24.1 hectares). These areas were identified as potential micro-bat roosting habitat for threatened micro-bat species, in particular the east coast freetail-bat (*Mormopterus norfolkensis*).

Three survey techniques were employed to target threatened micro-bat species in these areas, including habitat assessments, Anabat surveys and stag watching (refer to Figure 3.2 in the Ecological Assessment). The habitat assessment involved a count of trees within mangrove communities with potential to provide roost sites for the targeted micro-bat species. Micro-bat roosting resource assessments undertaken in mangrove forest habitat included the recording of information on dominant species cover, ground cover, presence and quantity of perch sites, litter presence, number of stags, stumps and logs and any other information that was deemed relevant to provide a condition assessment of the habitat. A 50 metre by 50 metre quadrat was sampled in the micro-bat roosting resources survey area

located within the proposed rail and utility corridor where all natural hollows in each habitat tree were counted to develop a hollow density count per hectare. It is considered that this survey effort was adequate as per OEH survey guidelines for threatened species (DEC 2004) as the habitat searches were completed across preferred roosting habitat within the T4 project area.

The T4 Project will result in the loss of a total of 28.3 hectares of mangrove forest and 19.8 hectares of this is considered to contain mature mangroves with the potential to contain hollows for maternity roosts for micro-bat species. The area of mature mangroves across the site was calculated by noting mangrove age during field surveys and confirming this using aerial photograph interpretation (Department of Lands, 1:25,000 flown 22/7/1954). As such, the loss of potential maternity roosts in the Hunter Estuary is more likely to be approximately 7.5 per cent of the total old growth mangroves available for micro-bat species use.

However, the potential loss of maternity colonies may result in reduced breeding success and recruitment into the local populations which may result in a potentially significant impact on the local population. Based on the above, the possibility of a significant impact could not be ruled out based on current knowledge and, therefore, following the application of the precautionary principle, the Ecological Assessment (EA Appendix K) concluded that there is a potential for a significant impact on the east coast freetail-bat (*Mormopterus norfolkensis*) as a result of the T4 Project.

The biodiversity offset sites for the T4 Project contain substantial habitat for threatened micro-bats including potential roosting habitat in the form of woodland vegetation at the Ellalong Lagoon Offset Site and mangrove vegetation at the Tomago Offset Site. Although it is acknowledged that the mangroves at the Tomago Offset Site are younger and at this time are less likely to contain the extent of potential roosting habitat as the habitats within the T4 project area, mature mangroves do occur within approximately 6 hectares of the mangrove forest occurring on the site which would provide similar habitat for threatened micro-bats to that of the T4 project area. Additionally, other areas of the Tomago Offset Site provide a range of other foraging habitats for these species. The Ellalong Lagoon Offset Site contains 409 hectares of foraging and 301 hectares of potential roosting/maternity colony habitat in woodland vegetation for threatened micro-bats.

3.5.1.7 Impacts to the Rare Yellow Wagtail as a Result of Disturbing Wetlands

One submission raised specific concerns regarding the potential impacts of the T4 Project on the yellow wagtail (*Motacilla flava*) listed as migratory under the international bird conventions China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

The yellow wagtail is occasionally recorded in small numbers on Ash Island along Wagtail Way and around Swan Pond adjacent to the T4 project area (Herbert 2007). The species breeds in the northern hemisphere and is a summer migrant to sporadic locations along the Australian coast including the Hunter Estuary. The species are usually recorded in grassland, saltmarsh and swamp margins near wetlands on Ash Island.

The yellow wagtail was not recorded within the T4 project area during the surveys undertaken by Umwelt or during yearly monitoring surveys undertaken by HBOC (2010), however Herbert (2007) suggests the species has been recorded near the Deep Pond side of the rail embankment. The T4 Project is expected to remove approximately 18.9 hectares of saltmarsh and 172 hectares of surrounding disturbed areas that may be potential habitat for the species. However, given that the majority of records for the species occur along Wagtail Way on Ash Island and this area would not be impacted, it is considered unlikely that the species would be substantially impacted by the T4 Project.

3.5.1.8 Impacts to Coastal Saltmarsh and Freshwater Wetlands Endangered Ecological Communities

A range of submissions raised concerns regarding the impacts of the T4 Project on the EECs listed under the TSC Act and occurring within the T4 project area. These are Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC.

As discussed in the assessments of significance in Appendix 7 of the Ecological Assessment (EA Appendix K), the T4 Project will result in the loss of 18.9 hectares of Coastal Saltmarsh EEC representing approximately 1.7 per cent of the extent of saltmarsh in the Hunter Estuary. The assessment of significance concluded that this loss represents a potentially significant area of known habitat to be removed or isolated from currently interconnecting or proximate areas at either the local or regional level. The uncertainty relates to the condition of, and potential threat to, the remaining area of the local and regional occurrence in the Hunter Estuary. Based on the information provided above, the possibility of a significant impact cannot be ruled out based on current knowledge and therefore, following the application of the precautionary principle, it was concluded that there is potential for a significant impact on Coastal Saltmarsh EEC as a result of the T4 Project, without appropriate mitigation and offsetting.

Additionally, the T4 Project will result in the loss of 3.8 hectares of Freshwater Wetlands EEC, which represents less than 0.1 per cent of the extent of Freshwater Wetlands EEC in the Hunter Region, which was estimated to be approximately 3500 hectares in the 1990s (NSW Scientific Committee 2008). Although the T4 project area contains 34.5 hectares of freshwater wetland habitat, the majority of this is derived wetlands on fill material and is not considered to be part of the EEC. The loss of approximately 3.8 hectares of Freshwater Wetlands EEC does not represent a significant area of known habitat to be removed or isolated from currently interconnecting or proximate areas at either the local or regional level. As such it is unlikely that the T4 Project would have a significant impact on Freshwater Wetlands EEC.

Due to the potential significant impact on Coastal Saltmarsh EEC and the loss of a small area of Freshwater Wetlands EEC, the Biodiversity Offset Strategy includes adequate offsets for these communities at a local and regional scale. The Tomago Offset Site will conserve approximately 21 hectares of existing saltmarsh and create up to a further 100 hectares of the EEC in the Hunter Estuary, proximate to the T4 project area. Additionally, this site will conserve approximately 11 hectares of Freshwater Wetland EEC in the north of the Site. The Ellalong Lagoon Offset Site will facilitate the in-perpetuity conservation of a Wetland of National Significance in the Directory of Important Wetlands in Australia (Environment Australia 2001) where approximately 20 hectares conforms to the Freshwater Wetlands EEC.

3.5.1.9 Impacts to Black Swan (*Cygnus atratus*) on Kooragang Island

One submission raised concerns regarding the potential impacts of the T4 Project on the local population of black swan (*Cygnus atratus*) that inhabit Kooragang Island.

Black swans are widely and regularly recorded throughout the Hunter Estuary sometimes in large numbers. The species can be found on almost every wetland in the estuary when water levels are suitable (Herbert 2007). Black swans are regularly recorded on Kooragang Island and often seen from Cormorant Road in Long Pond foraging or nesting. The species is known to breed within the wetland habitats of the T4 project area.

The species is considered secure in NSW and would not be in danger of becoming threatened as a result of the T4 Project. Many other freshwater wetland habitats are available to the species adjacent to the T4 project area and within the wider Hunter Estuary including the Ellalong Lagoon Offset Site which provides known habitat for the species. Additionally, the T4 Project does not propose to impact Long Pond.

3.5.1.10 Impacts to the Efforts of the Community to Restore Wetland Habitats in the Hunter Estuary

A number of submissions raised concerns regarding the potential impacts of the T4 Project on the work completed by the local community on Ash Island and surrounding areas to restore wetland habitat.

It is understood that a substantial amount of work and volunteer hours have contributed to the restoration and maintenance of the wetland habitats on Ash Island, adjacent to the T4 project area. The Kooragang Wetland Rehabilitation Project (KWRP) commenced in 1993 and aims to restore the loss of fisheries, shorebird, threatened species and other wildlife habitat in the Hunter Estuary by conserving, restoring and improving Kooragang Wetlands for nature conservation. These restoration works have been initiated around Ash Island, Tomago and restoration works by the KWRP include the recreation of saltmarsh habitats on Ash Island and the re-establishment of green and golden bell frog (*Litoria aurea*) habitat in the area.

The T4 Project will primarily impact disturbed areas of the Kooragang industrial site. The surrounding habitats of the Hunter Wetlands National Park will not be impacted as a result of the T4 Project. A small area (3.3 hectares) of wetland habitat associated with Area E that has been subject to some restoration works will be impacted by the construction of the rail infrastructure for the T4 Project. It is noted that the T4 Project would interfere with any community efforts to restore wetlands in this port zoned land on Kooragang Island however would not impact any restoration activities outside of this zone, including on Ash Island. PWCS's Biodiversity Offset Strategy includes substantial habitat restoration works in the Hunter Estuary.

The Tomago Offset Site could provide opportunities for local community groups to be involved in restoration and monitoring activities at the site as it is developed as a foraging and roosting site for migratory shorebirds.

3.5.1.11 Loss of Aquatic Habitat Will Negatively Impact the Local Fishing Industry

A small number of submissions raised concerns regarding the potential impacts of the T4 Project on the local fishing industry.

As discussed in Section 5.3.9 of the Ecological Assessment (EA Appendix K) there may be a localised loss of productivity in the estuary with the removal of estuarine habitats including mangrove forest and saltmarsh communities. This reduction in productivity is a result of the mangroves supporting juvenile fish species, commercial fish species, many species of decapods and other macroinvertebrates that all contribute to the productivity of the estuary.

The proposed construction activities will potentially result in short term disruption to fish and other mobile fauna movement during the initial stages of the T4 Project development however this impact is not expected to be significant as these marine species are expected to return following the completion of construction activities. While the T4 Project will result in the direct and indirect loss of aquatic habitats and species, this loss is not expected to be significant in a local or regional context due to the availability and extent of estuarine habitats associated with the Hunter Estuary.

Impacts on the fishing industry are discussed further in the Social Impact Assessment (Appendix S) of the EA.

3.5.1.12 The T4 Project Contravenes Australia's Obligation to CAMBA, JAMBA, ROKAMBA and Bonn Conventions by Failing to Protect Migratory Species Habitat

A number of submissions raised concerns regarding the impacts of the T4 Project on migratory species and whether the actions of the T4 Project contravene Australia's obligation to the international bird conventions CAMBA, JAMBA, ROKAMBA and the Bonn Convention.

The fundamental principles of the above listed migratory species conventions of which Australia is signatory, include seeking means to prevent damage to migratory birds and their environment and taking appropriate measures to preserve and enhance the environment of migratory birds. The Assessment of Significance undertaken for internationally listed migratory shorebirds (Appendix 8 of the Ecological Assessment) concluded that the T4 Project, without appropriate mitigation and offsetting, is considered likely to result in a significant impact on all of the migratory shorebird species that have been recorded in the T4 project area due to the loss of important habitat.

As identified in Section 5.4.3 of the Ecological Assessment, DSEWPC advised on 5 August 2011 (EPBC Ref 2011/6029) that the T4 Project constitutes a Controlled Action under the EPBC Act as the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- wetlands of international importance (Sections 16 and 17B);
- listed threatened species and communities (Sections 18 and 18A); and
- listed migratory species (Sections 20 and 20A).

Therefore the T4 Project will be determined in accordance with the EPBC Act by the Commonwealth Minister for DSEWPC. Umwelt provided a detailed Assessment of Significance relating to Matters of National Environmental Significance that will or could potentially be affected by the T4 Project. The Ecological Assessment identified the T4 Project as likely to have a significant impact on migratory species listed under the international conventions listed above.

Consequently, due to the potential significant impact on migratory shorebirds, the Tomago Offset Site has been secured by PWCS and will be restored to provide additional habitat for migratory shorebirds in the Hunter Estuary in the form of saltmarsh beds, mudflats and shallow lagoons. This site has high conservation significance in the Hunter Estuary as it is proximate to the Hunter Wetlands National Park and the Hunter Estuary Wetlands Ramsar Site and formerly comprised a historical nocturnal roosting site for migratory shorebirds (Herbert 2007; OEH 2011). It is expected that the restoration of the site will provide up to an additional 140 hectares of feeding and roosting habitat for these species and eventually be transferred to National Park Estate (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy in Appendix J of the PPR) subject to agreement with OEH. The international migratory species agreements also highlight the importance of creating sanctuaries and designating conservation areas for migratory species to protect their habitat.

It is noted that the T4 Project will be removing and disturbing identified important habitat for internationally-listed migratory shorebirds, however the development of the Tomago Offset Site into saltmarsh, mudflats and lagoons will provide a substantial area of migratory shorebird habitat to be protected in-perpetuity in the Hunter Estuary. Additionally, the Tomago Offset Site as part of the Biodiversity Offset Strategy is consistent with offsetting policies published by the state (OEH) and the Commonwealth (DSEWPC).

3.5.1.13 Loss of Access to Recreational Birding Routes on Ash Island and Deep Pond

Community submissions also raised concerns regarding the loss of access to recreational birding routes to Ash Island and Deep Pond as a result of the T4 Project.

As discussed in Section 2.9 of the Ecological Assessment (EA Appendix K) the Hunter Estuary contains some of the most significant wetlands in NSW and regularly supports a high diversity of bird species. The wetlands of Kooragang and Ash Islands are considered to provide important habitat for bird species particularly international migratory shorebirds and water birds. As a result these areas are often visited by bird watchers and enthusiasts.

The T4 Project will result in the loss of Deep Pond and although a small area (5.2 hectares) will be retained in the southern portion of the existing pond, it is not considered that suitable bird habitat would remain in the area. It is expected that bird watching in the Deep Pond area would no longer be possible during or after the construction of T4 due to safety reasons. The T4 Project is restricted to land zoned for port development.

Bird watching on Ash Island is unlikely to be affected by the construction of the T4 Project. The location of the rail and utility corridor will encroach on bird habitat in Area E and Swan Pond on the western side of the T4 project area. However the T4 Project is not expected to affect public access to existing roads and tracks outside of the project area, such as Wagtail Way or other tracks on Ash Island.

3.5.1.14 Inappropriate Decision to Rezone Land Protected Under the NSW National Parks

As discussed in **Section 3.1** above, land within the current T4 project area was not rezoned on Kooragang Island or Ash Island to facilitate the T4 Project. The T4 project area was zoned to permit port development under the Newcastle Local Environmental Plan (LEP) 2003. Under the State Environmental Planning Policy (SEPP) (Major Projects) Amendment (Three Ports) 2009 (which amended the SEPP Major Development 2005), the entirety of the T4 project area was rezoned SP1 Special Activities, which also permits port development with consent. This includes the corridor of land between the railway line and the National Park boundary.

A 50 metre wide strip of land along the northern and western boundary of the project area was previously owned by OEH but was zoned SP1 Special Activities under the State Environmental Planning Policy (Major Projects) Amendment (Three Ports) 2009. EMM advises that the National Park boundary was extended in February 2011 to include Ash Island, and this 50 metre wide strip was inadvertently included in the reservation at this time. The NPWS subsequently set about correcting this boundary error. On 25 October 2011 it was corrected by government under the *National Parks and Wildlife Legislation Amendment (Reservations) Act 2011 No. 55*. Ownership has since been transferred to NPC. The land is still zoned for port activities and its use for the T4 Project accords with the zoning objectives.

3.5.1.15 T4 Project Appears to be Within Hunter Wetlands National Park

Community submissions commonly raised concerns suggesting that the T4 Project appears to be within Hunter Wetlands National Park.

The T4 project area is located adjacent to the Hunter Wetlands National Park which lies immediately to the north, east and west of the T4 project area and adjoins approximately 5 kilometres of the T4 project area boundary at the northern edge of the proposed gas easement realignment. However it does not include any land in the National Park or owned by OEH.

The only work proposed in the Hunter Wetlands National Park is reinstatement of an estuarine channel through an existing levee in the park (the Eastern Watercourse levee), as discussed in Section 2.1.3 of this report. These works are to prevent impacts in the National Park and are expected to provide a positive environmental outcome. These works are subject to NPWS's approval however NPWS has stated that they support this approach in principle subject to appropriate assessment.

3.5.2 Biodiversity Offsets

3.5.2.1 Ellalong Lagoon Does Not Adequately Compensate for the Loss of Species and Habitats on Kooragang Island in Particular for Migratory Shorebirds

Submissions also raised concerns -that the Ellalong Lagoon Offset Site was not an adequate offset for the impacts of the T4 Project particularly in relation to the impact of the T4 Project on migratory shorebirds.

The Ellalong Lagoon Offset Site was described in detail in Section 7.4.2 of the Ecological Assessment (Umwelt 2012a). It is acknowledged that the Ellalong Lagoon Offset Site would not provide like-for-like habitat structure and vegetation communities as the T4 project area. The site was secured by PWCS as a component of the Biodiversity Offset Strategy as it is known to provide habitat for water birds, woodland birds, micro-bats and, historically, the green and golden bell frog (*Litoria aurea*).

At the time that the EA was placed on public exhibition (March 2012), the Ellalong Lagoon Offset Site was the only site officially secured as a land-based offset for the T4 Project. The process of securing other offset sites had not been finalised and could not be reported at that time. It was not considered or suggested that the Ellalong Lagoon Offset Site alone could adequately offset all identified impacts of the T4 Project.

In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, have been secured by PWCS to offset the impacts of the T4 Project on significant ecological values (refer to the Updated Impact and Mitigation Biodiversity Offset Strategy in Appendix J of the PPR). The Tomago Offset Site allows for the conservation of estuarine vegetation and habitats; the creation of migratory shorebird habitat; and the conservation of Australasian bittern (*Botaurus poiciloptilus*) habitat in proximity to the T4 project area. Additionally, the Brundee Offset Site near Shoalhaven allows for the long-term protection of a substantial breeding population of the green and golden bell frog within the Sydney Basin Bioregion and conservation of known Australasian bittern (*Botaurus poiciloptilus*) habitat.

The Ellalong Lagoon Offset Site provides a range of foraging and roosting habitats for threatened micro-bat species and is considered to provide a direct, valuable land-based offset for all of the threatened micro-bats recorded in the T4 project area. Furthermore, the lagoon itself provides a similar function of drought refuge habitat as Deep Pond for a number of waterfowl species including the threatened freckled duck (*Stictonetta naevosa*) and other species including Australian shoveler (*Anas rhynchotis*), hardhead (*Aythya australis*) and grey teal (*Anas gracilis*) all of which generally occur in coastal or near coastal areas during inland drought. Some selected internationally-listed migratory shorebirds such as the sharp-tailed sandpiper (*Calidris acuminata*) and Lathams snipe (*Gallinago hardwickii*) have been previously recorded in small numbers utilising the habitats of Ellalong Lagoon. It is considered that the sub-coastal location of Ellalong Lagoon is likely to limit the diversity of migratory shorebird species that primarily utilise wetland habitats on the coast, as seen at the T4 project area and surrounds.

Ellalong Lagoon has regional significance in the Hunter and has been intended for protection for many years. Despite this, the site has been subject to threats from various forms of development and approximately 75 per cent of the site is currently zoned rural. PWCS intends to transfer the Ellalong Lagoon Offset Site to an appropriate land manager such as the NPWS for conservation in perpetuity as a nature reserve or national park. The acquisition of the Ellalong Lagoon Offset Site by PWCS provides protection in-perpetuity of significant environmental values in the Lower Hunter region such as:

- 283 hectares of known regent honeyeater (*Anthochaera phrygia*), swift parrot (*Lathamus discolor*) and little lorikeet (*Glossopsitta pusilla*) habitat;
- 301 hectares of likely roosting habitat for a range of threatened micro-bat species and foraging habitat for grey-headed flying-fox (*Pteropus poliocephalus*);
- 283 hectares of known habitat for squirrel glider (*Petaurus norfolcensis*);
- 301 hectares of habitat for threatened woodland birds including grey-crowned babbler (*Pomatostomus temporalis temporalis*), varied sittela (*Daphoenositta chrysoptera*), black-chinned honeyeater (*Melithreptus gularis gularis*) and brown treecreeper (*Climacteris picumnus victoriae*);
- 35 hectares of Freshwater Wetlands EEC;
- 17.7 hectares of Swamp Oak Floodplain Forest EEC;
- 152 hectares of Lower Hunter Spotted Gum Ironbark Forest EEC; and
- 111 hectares Hunter Lowland Redgum Forest EEC.

3.5.2.2 Current Offset Package is Not Detailed in the Ecological Assessment and is Inadequate and Will not Compensate for the Loss of Flora, Fauna and Their Habitats within the T4 Project Area.

Many community submissions raised concerns that the Ecological Assessment (Umwelt 2012a) did not provide sufficient detail on the Biodiversity Offset Strategy and the package presented was not adequate to offset the loss of flora, fauna and their habitats within the T4 project area.

At the time that the EA was placed on public exhibition (March 2012), the Ellalong Lagoon Offset Site was the only site officially secured as a land-based offset for the T4 Project. The process of securing other offset sites had not been finalised and could not be reported at the time. The Biodiversity Offset Strategy outlined in Section 7.0 of the Ecological Assessment (EA Appendix K) provided a framework for the Updated Impact Mitigation and Biodiversity Offset Strategy.

In the months following the exhibition phase of the T4 Project, two other substantial offset sites, the Tomago Offset Site and Brundee Offset Site, have been secured by PWCS to offset the impacts of the T4 Project on ecological values (refer to the Updated Impact Mitigation and Biodiversity Offset Strategy).

The Updated Impact Mitigation and Biodiversity Offset Strategy for the T4 Project (Umwelt 2012b) consists of a number of components designed to address the identified impacts on threatened species of the T4 project area. These measures are summarised in **Section 2.2.1** of this report.

3.5.2.3 Created Habitats for Migratory Shorebirds are Unlikely to be Successful and the Birds Will Not Know Where to Find Them

Concerns that the proposed habitats to be created at the Tomago Offset Site would not be effective as a foraging and roosting site for migratory shorebirds were highlighted in submissions. Some submissions questioned the practicality of migratory shorebirds identifying the site as suitable habitat and navigating their way there.

As outlined in the Ecological Assessment (Umwelt 2012a) it is proposed that a series of shorebird habitats be constructed at the Tomago Offset site providing shallow tidal lagoons, mudflats and saltmarsh habitat. The concept design for these lagoons includes areas flooded by the tide controlled by the use of adjustable tidal channels. At low tide, relatively small areas of permanent water that are predominantly mudflats would be present. The shorelines of the ponds would be graded appropriately to allow saltmarsh colonisation, with the regeneration of the community likely to occur naturally with the ingress of seed stock with tidal water as part of the habitat restoration works. Islands would provide potential diurnal roost sites that would be either bare ground or covered with low growing vegetation. Nocturnal roost sites would be constructed in very shallow water on the leeward side of islands or shores.

A conceptual design of migratory shorebird and saltmarsh habitat restoration works at the Tomago Offset Site has been prepared by shorebird expert Phil Straw, who has many years experience in creating successful shorebird habitat in Australia and around the world.

It is considered that the migratory shorebirds that journey to the Hunter Estuary in the warmer months will easily find and utilise the restored habitats of the Tomago Offset Site. It appears that migratory shorebirds follow landscape features such as the coastline and river systems to navigate to appropriate roosting and foraging habitat (P. Straw pers. comm.). The Tomago Offset Site is located on the northern shore of the north arm of the Hunter River approximately 2 kilometres north of known habitat at Deep Pond within the T4 project area and 4 kilometres north-west of known roosting habitat at the Kooragang Dykes and Stockton Sandspit. This is considered to be a prime location for the restoration of migratory shorebird habitat in the Lower Hunter Estuary. Additionally, the site was previously one of the most substantial and important shorebird nocturnal roost sites in the Hunter Estuary (Herbert 2007).

It should be noted that many of the bird habitats within the Hunter Estuary are man-made or created as a result of previous disturbance such as Deep Pond and the Kooragang Dykes. Additionally there are many examples of restoration works within the Hunter Estuary that have proven success as bird habitats such as the Hunter Wetlands Centre Australia (HWCA), Stockton Sandspit and the Ash Island restoration by the KWRP. These sites are regularly utilised by migratory shorebirds and waterfowl species, and in the case of the HWCA, listed as a Ramsar wetland of international significance.

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Personal Communications

M. Stockwell Research Associate, University of Newcastle.

S. Clulow Amphibian Research Group, University of Newcastle.

APPENDIX 1

Additional Assessments of Significance

Appendix 1 – Additional Assessments of Significance – EP&A Act

Part 3A of the EP&A Act requires an assessment of significance relating to the potential impacts of the T4 Project on listed threatened species, endangered populations or threatened ecological communities (TECs). As a formal assessment method format has not been established by the relevant government authorities, an assessment that applies the key principles of the Section 5A assessment is used here to assess the potential for the T4 Project to impact on threatened species, populations and TECs.

Since the Environmental Assessment (EMM 2012) was published there have been some modifications made to the T4 project design. This has been in response to submissions received and government feedback; to further minimise environmental impacts; and to incorporate identified engineering improvements and further project definition available as the engineering design and biodiversity offset package have progressed. As such, a number of assessments of significance prepared in the Ecological Assessment (Umwelt 2012a) have been updated and revised here.

Maundia triglochinoides was raised as a concern from the Office of Environment and Heritage (OEH) in their submission on the impact of the T4 Project. Umwelt's response is included in Section 2.1.1 of the main report. As a precautionary approach, an assessment of significance for this species has been carried out and is included below.

Additionally, a revised assessment of significance has been undertaken for pondweed (*Zannichellia palustris*) following the revision of the impact area quoted in the Ecological Assessment (Umwelt 2012a).

Key threatening processes (KTPs) and critical habitat listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the NSW *Fisheries Management Act 1994* (FM Act) are addressed in the latter parts of this Appendix.

Maundia triglochinoides – Vulnerable TSC Act

a) Whether the life cycle of the species is likely to be disrupted such that a local viable population of the species is likely to be placed at risk of extinction.

Maundia triglochinoides is a perennial herb that occurs in permanent swamps and shallow freshwater wetlands 30 - 60 centimetres deep on heavy clay with low nutrients. The species is almost restricted in its distribution to coastal New South Wales, extending into southern Queensland. The current southern limit is near Wyong on the Central Coast of NSW.

Targeted searches for *M. triglochinoides* were undertaken during the flora surveys undertaken for the T4 Project Ecological Assessment (Umwelt 2012). The species was not recorded within the T4 project area, despite that the site contains freshwater wetland habitat where the species has the potential to occur. The similar species *Triglochin procera*, with which *M. triglochinoides* can be readily confused and which inhabits similar habitat, was also not recorded. Freshwater wetlands in the T4 project area were typically brackish due to the historic marine sediments underlying the wetlands and their proximity to tidal levels. As such, the freshwater habitat of the T4 project area is not ideal for *M. triglochinoides.* The species has been previously recorded in wetland habitats at Tomago approximately 5 kilometres north-west and at Williamtown 8 kilometres north-east of the site (S. Lewer pers comm.).

The T4 Project will result in the loss of 24.8 hectares of freshwater wetland ponds within the T4 project area that have potential to contain the species. However, given that the species has not been recorded on site and the habitats are considered marginal for the species, it is unlikely that the T4 Project will disrupt the life cycle of the species such that a local viable population could potentially be placed at risk of extinction.

b) In relation to the regional distribution of the habitat of the threatened species, whether a significant area of known habitat is to be modified or removed, or isolated from currently interconnecting or proximate areas.

Approximately 24.8 hectares of potential freshwater wetland habitat for this species will be modified, removed, or isolated as a result of the T4 Project. The Hunter estuary supports other freshwater wetlands that contain known and potential suitable habitat for the species.

In relation to the regional distribution of potential habitat for this species, the loss of approximately 24.8 hectares of potential freshwater wetland habitat for the species is not expected to modify, remove or isolate a significant area of known habitat from currently interconnecting or proximate areas.

c) Whether the species, or its habitat, are adequately represented in conservation reserves (or other similar protected areas) in the region.

This species is not known to occur in any conservation reserves within the region. Given this, it is unlikely that the species is adequately represented in conservation reserves in the region.

d) Whether the species is at the limit of its known distribution.

The currently known southern limit for the species is in Wyong on the Central Coast of NSW. The species is not at the limit of its known geographical distribution around the T4 project area.

Conclusion

Based on the information provided above, and taking into account the application of the precautionary principle, the proposed restoration works are unlikely to result in a significant impact on the *Maundia triglochinoides*.

Pondweed (*Zannichellia palustris*) – Endangered TSC Act

a) Whether the life cycle of the species is likely to be disrupted such that a local viable population of the species is likely to be placed at risk of extinction.

Uncertainty exists regarding the provenance of the species, with some researchers and studies suggesting that it is not native to Australia (Greenwood 2012). Greenwood (2001) queried the heritage of the species, suggesting ballast water may have contributed to its establishment during early European settlement, citing 18th Century distribution/shipping patterns in the southern hemisphere as support for the argument. Although the scientific uncertainty regarding its provenance is substantial, it is treated here as native and in accordance with its listing under the TSC Act.

Notwithstanding the above, there is a significant paucity of data and knowledge about this species. It appears to have been very poorly surveyed, and it is only readily detectable in October and November each year when it fruits. It is also readily misidentified in favour of more common species. Considering this, and the fact that targeted surveys for this species for the T4 Project fairly readily recorded occurrences of it, there is a very high likelihood that it is in fact much more abundant in the lower Hunter than previously thought.

Pondweed (*Zannichellia palustris*) has been recorded in 8 ponds within the T4 project area and it has the potential to occur in all fresh to brackish wetlands in the T4 project area. The T4 project area was found to support approximately 2.3 hectares of core habitat for the species, which was determined as comprising a 2 metre buffer around each of the ponds where the species has been recorded and expected to occur, and 1.1 hectares of potential habitat (using the same methodology applied at each of the remaining freshwater ponds in the T4 project area). The 2 metre buffer was used to provide an estimate of core habitat for the species as it is likely to be restricted to depths of 0.5 metre (M. Greenwood pers. comm.).

The majority of NSW records of the species are located at Hexham Swamp and Kooragang Island, however there are other historic records of this species in the local area, including in Hexham Swamp, Ironbark Creek, Black Creek (near Cessnock) and near Belmont (NSW Scientific Committee 2004). These records may be part of a single local population, although the extent of genetic exchange among sites is unknown. The likelihood of cross-pollination between local records is unknown, thus the records within the T4 project area could be a distinct population and are cautiously treated as such. If Kooragang Island is considered to support a single population then the T4 Project would be likely to adversely affect the viability of this population.

The T4 Project will result in the loss of four ponds within the T4 project area that have been shown to support this species. Thus, it is possible that the T4 Project will disrupt the life cycle of the species such that a local viable population could potentially be placed at risk of extinction.

b) In relation to the regional distribution of the habitat of the threatened species, whether a significant area of known habitat is to be modified or removed, or isolated from currently interconnecting or proximate areas.

Approximately 2.3 hectares of core habitat and 1.1 hectares of potential habitat for this species will be modified, removed, or isolated as a result of the T4 Project. The T4 Project will remove four ponds (Railway Pond, Pond 11, FDF Pond and Easement Pond) known to currently support the species. The hydrology of a third pond in the north-west of the T4 project area known to support the species (OEH Wetland 1) is not expected to be substantially altered such that the species would be affected. Other areas of potential habitat within the T4 project area would be removed or modified by hydrological changes. This constitutes a large proportion of the known habitat for the species in the estuary and is therefore of importance for this population.

The records of this species within the T4 project area are likely to form a substantial part of a distinct population of this species. Notwithstanding the likely paucity of records of this species that probably stem from a lack of survey effort, the T4 Project could result in the removal of a substantial area of known habitat for this species in the region.

c) Whether the species, or its habitat, are adequately represented in conservation reserves (or other similar protected areas) in the region.

The species is only known to occur in one conservation reserve within the region being Hunter Wetlands National Park. The majority of records of this species occur outside the national park. Given this, it is unlikely that this species is adequately represented in the conservation reserves in the region.

d) Whether the species is at the limit of its known distribution.

In NSW, this species is only currently known to occur in the Lower Hunter. This species would be considered at the limit of its geographical distribution in the region within the T4 project area.

Conclusion

Based on the information provided above, the possibility of a significant impact cannot be ruled out based on current knowledge and, therefore, following the application of the precautionary principle, it is concluded that there is potential for a significant impact on pondweed (*Zannichellia palustris*) as a result of the T4 Project.

Key Threatening Processes

a) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

There are currently 37 key threatening processes (KTPs) listed under the Schedules of the TSC Act, as well as eight listed under the Schedules of the FM Act. Those KTPs with the potential to be exacerbated by the T4 Project are discussed below.

- **Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands (TSC Act)** – This KTP may occur as a result of the T4 Project. Most of the waterbodies and channels in the T4 project area are not natural and have established on fill brought on to the T4 project area. However, some of the lower elevation waterbodies to the north and west of the T4 project area are possibly remnant natural waterbodies. Alteration of hydrology may contribute to impacts on wetland-dependent species.

  OEH Wetland 1, Easement Pond South and Railway Road Pond will not be directly impacted as a result of the T4 Project; however the potential for indirect impacts due to alterations in surface water and groundwater regimes has been investigated to determine the level of impact (Douglas Partners 2012). Douglas Partners has determined that water levels in OEH Wetland 1 and Railway Road Pond are primarily controlled by rainfall and evaporation, with groundwater flows being a relatively minor control. This is clearly evidenced in OEH Wetland 1 which has been observed to dry following periods of low rainfall whilst the adjacent Deep Pond still has significantly higher water levels (Douglas Partners 2012).

  Water levels in the tidal flats to the north of the site, including OEH Wetlands 2 and 3, are not expected to be affected by the T4 Project as the water levels are controlled primarily by rainfall and evaporation, as well as occasional tidal inundation for more elevated areas. Lower areas are primarily controlled by tidal fluctuations (Douglas Partners 2012).

  Minor alteration to the natural flow regime of rivers, streams, floodplains and wetlands may occur as a result of the T4 Project, however the hydrological impacts are not expected to be significant.

Critical Habitat

a) Will critical habitat be affected?

No critical habitat for *Maundia triglochinoides* or *Zannichellia palustris* is currently listed.

Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au