# EPBC Act Significant Impact Assessments

**In accordance with *EPBC Act Matters of National Environmental Significance Guidelines 1.1***

## Wetlands of International Importance

- **Is the action likely to result in areas of the wetland being destroyed or substantially modified?**

  No.

  Environmental assessment of the approved construction and development activities, comprising the Action, has been undertaken to an agreed strategy for stormwater control, suitable objectives and sufficient details, monitoring and adaptive management controls proposed to achieve the NSW state government Project Approval with conditions. The Hunter Estuary Ramsar Wetland in proximity to the site is limited to areas inundated by the tidal, saltwater from the river. There are many points of physical separation between the Action and the wetland which disconnect the Action from the wetland, making it highly unlikely for any potential risk of the wetland being destroyed or substantially modified by the Action.

  In its existing state:

  - Deep excavated existing drains across Lot 1001, from previous farming activities, with floodgated outlet to the Hunter River, intercept existing surface runoff and shallow groundwater from the large majority of the Action catchment area, draining the site toward the river at low tides.
  - Modelling of the existing groundwater flow directions depicts groundwater naturally flowing towards the Hunter River, not towards the RAMSAR wetland.
  - The existing site, in its uncontrolled state, has no direct freshwater discharge to the wetland inundated by the tidal water.
  - The wetland is protected by a boundary perimeter levee and the North South Drain, a very large open channel, man-made drain which is deeply incised below ground level of the wetland.

  The Project Approval for proposed development has:

  - Involved referral and review by the wetland land managers, including technical 3rd party review by the Department of Planning for the ongoing protection of the wetland and the buffer wetlands closer to the site. The Project Approval with conditions has been issued.
  - There is no direct impact on the wetland because the Action of proposed construction activity and development is limited to a minimum buffer distance of 380m from the wetland, which increases to a buffer distance of 1-2km across Lot 1002 at the southern boundary.
  - The common boundary of the wetland and site for the Action, Lot 1001, is approximately 300m long, however, this is an onsite offset land, buffer conservation area of Lot 1001, not to be developed.
  - The Action includes a perimeter levee bank for control of stormwater runoff from the development activity on Lot 1001, conveyed toward the river. In consultation with the wetland land managers, adjustable pit controls are proposed within the perimeter levee.
  - Modelling of the post development groundwater flow directions remain towards Lot 1002 and the river not towards the wetland.

  Conditions of the Project Approval require further plan approvals with government agencies prior to commencement of the Construction Activities of the Action to be prepared in consultation with many government agencies including the wetland land managers:

  - Schedule 3, Condition 21 – Erosion and Sediment Control

- Schedule 3, Condition 22 – Acid Sulphate Soils Management
- Schedule 3, Condition 24 – Stormwater Management,
- Schedule 3, Condition 29 – maintain minimum setback to wetlands,

Schedule 3, Condition 30 Wetland Management and Monitoring Plan for each Stage to be prepared in consultation with many government agencies including the wetland land managers. A similar WMMP was approved as part of the Development Application for the adjoining Lot 22. The WMMP was adopted as part of the project approval (MP07_0086 - 7/8/2009) and annual monitoring commenced in 2011. Annual monitoring of the 22 ha Conservation Area which was dedicated to NSW NPWS has been undertaken annually by Kleinfelder in accordance with MP07_0086. The most recent annual monitoring report is provided in attached.

- Schedule 3 Condition 35 Biodiversity Management Plan for the management of the onsite buffer land areas of freshwater wetlands and Swamp Oak Forest between the action and wetland.
- The Project Approval conditions are focused on achieving environmental protection to the Lot 1002 conservation area and SEPP 2018 Coastal Wetlands. These areas are within the buffer, closer to the Action than the RAMSAR wetlands. These areas are proposed to be monitored and tested for potential impacts and changes, at a much closer distance to development. This provides intervention of any issues arising close to the source, offering further protection to the wetland.

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

  No.

  The wetland hydrological regime is inundated by tidal water controlled by Smart Gates at the river, with no direct freshwater runoff from external catchments. There are multiple tidal inlets to the Wetland Project to efficiently inundate and dominate the wetland area with tidal water. Change to this hydrological regime of the wetland is unlikely because:

  - The levee bank maintenance access track and North South Drain remain unchanged post development;
  - Modelling indicates that groundwater flows are intercepted by existing drain formations across the site and travel downslope toward Lot 1002 and the river, not toward the wetland;
  - Surface flows toward the North South Drain are proposed to be reduced to less than the existing uncontrolled overflows and could be shut off to merely a trickle of runoff post development. This will be via the strategy of a perimeter berm conveying runoff toward the river. The perimeter berm will have further adjustable controls and monitoring for feeding the onsite buffer areas only, reducing the extent of overflows currently experienced in its uncontrolled state. Consultation in accordance with the Project Approval will be undertaken to refine the details of these controls, management and monitoring.
  - Volumes, timing duration and frequency are to be designed and managed and approved after consultation with government agencies in accordance with Project Approval conditions Schedule 3, Condition 24 – Stormwater Management and Condition 30 Wetland Management and Monitoring for the buffer areas closer to the Action, closer than the wetland. This is also subject to further consultation with government agencies and these buffer areas are also subject to ongoing monitoring.

  Therefore, post development of the Action, it is highly unlikely there will be any change of the hydrological regime of the wetland.

- **Is the action likely to result in the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected?**

  No.

  The potential impact on aquatic or terrestrial flora and fauna dependent on the wetland is predominately associated with runoff changes to the wetland. However, the wetland is inundated by tidal water only, controlled by Smart Gates while runoff and groundwater from the Action are toward the river, with no direct runoff inundation from external catchments onto the wetland. There are several aspects to the disconnection of the Action from the wetland including the existing levee and North South Drain on the western boundary, a significant buffer to the wetland which varies from between 380m and 2km, modelled groundwater flows pre and post development toward the river, a perimeter levee bank to be installed for runoff control toward the river, further management plans of best practices and consultation with government agencies and the wetland land managers for the controls and monitoring in the buffer between the Action and the wetland. Therefore, the aquatic and terrestrial flora and fauna of the wetland is highly unlikely to be affected post development of the Action.

  From the Significant Impact Guidelines for Migratory Shorebird Species, recommended buffer zones are quoted at ranging from 165m to 255m. The Lot 1001 development sufficiently meets and exceeds the recommended minimum buffer distance.

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

  No.

  The wetland hydrology is governed by smart gates and saltwater inundation from the North South Drain and other controlled drains of the wetland. The runoff and groundwater from the Action are directed toward the river, not toward the wetland. As such, the wetland is inundated by tidal water only, controlled by Smart Gates and runoff and groundwater from the Action are toward the river, with no direct runoff inundation of the wetland. There are several aspects to the disconnection of the Action from the wetland including the existing levee and North South Drain on the western boundary, a significant buffer to the wetland which varies from between 380m and 2km, modelled groundwater flows pre and post development toward the river, a perimeter levee bank to be installed for runoff control toward the river, further management plans of best practices and consultation with government agencies and the wetland land managers for the controls and monitoring in the buffer between the Action and the wetland. Therefore, it is highly unlikely that there could be any substantial or measurable change to the water quality of the wetland post development of the action.

- **Is the action likely to result in an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland?**

  No.

  Specifically, the requirements in the Project Approval conditions Schedule 3, Condition 35 Biodiversity Management Plan include the requirement for a detailed weed condition map as a baseline, ongoing monitoring, a Noxious Weed Management Plan all in consultation with government agencies. This Management Plan applies to the onsite offset areas within the buffer of the Action, distant from the wetland. From the Significant Impact Guidelines for Migratory Shorebird Species, recommended buffer zones are quoted at ranging from 165m to 255m. The Lot 1001 development sufficiently meets and exceeds the recommended minimum buffer distance.

  Therefore, it's highly unlikely there could be an invasive weed issue as a result of development.

# Nationally Threatened Species and Ecological Communities

## Endangered Ecological Communities

### Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community

- **Is the action likely to reduce the extent of an ecological community?**

  Yes. This community has been listed as a TEC under the EPBC Act since the NSW State Approval was granted. Kleinfelder has undertaken a site condition assessment in April 2019 and May 2020 to determine the extent of Swamp Oak Forest within the subject site. Based on the condition criteria for the EPBC Swamp Oak Forest, approximately 9.74 ha, respectively) would meet the TEC listing (refer to **Figure 3**).

  Smaller patches within site are within the 0.5 to 2 ha size class (so are classified as 'Small Patches'). Small patches have to meet the high-quality condition threshold whereby non-native species comprise less than 20% of total understorey vegetation cover. A site condition assessment completed in April 2019 and May 2020 confirmed the smaller patches do not meet this criteria and have been identified accordingly on Figure 3.

  The proposed action will remove approximately 8.63 ha (61.4%) of this ecological community within the subject site. This accounts for a relatively small portion of the total community mapped within a 5km radius of the site, with approximately 505 ha of this community mapped within this area. A total of 5.43 ha of this community will be conserved within onsite offsets. A much larger expanse of Swamp Oak Forest extends off-site to the south across Lot 1002 (currently owned by PWCS) and into Hunter Wetlands NP. Given that the majority of Swamp Oak Forest occurring on Lot 1002 is afforded protection under SEPP Coastal Management and that large patches are preserved with the connecting national park, it is considered that the removal of 8.63 ha of Swamp Oak Forest within the subject site is unlikely to significantly reduce the extent of the Swamp Oak Forest community in the locality or across its known range within NSW.

- **Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?**

  No.

  Vegetation removal will occur within an existing fragmented and disturbed landscape and will not further fragment this ecological community.

- **Will the action adversely affect habitat critical to the survival of an ecological community?**

  No.

The highly fragmented and small size (all patches are <9 ha) of the remnant patches of this ecological community within the subject site are not considered important to the TEC's long-term survival in the locality.

- **Will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?**

  No.

  Construction is likely to result in disturbance to soil and removal of canopy and understorey vegetation. The project design will maintain existing hydrological pathways to ensure post-development flows mimic pre-development flows. Strict project controls are in place to ensure construction activities do not destroy abiotic factors (e.g. erosion and sediment control plan, weed management plan, vegetation protection zones, water quality monitoring). As long as project mitigation measures are in place, it is unlikely the proposed action will lead to a decline in the ecological community through altered abiotic interactions.

- **Will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?**

  No.

  The ecological community occurs in a fragmented and disturbed landscape where introduced vegetation cover is significant, grazing pressures are high and intensive land clearing has taken place over the past 100+ years. Land use impacts from clearing and grazing have reduced community integrity and functionality in the locality (e.g. loss of small native mammals, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing of the scale and extent required for the proposed activity is unlikely to further reduce species diversity and simplify community structure.

  The removal of 8.63 ha of the community within the subject site is therefore unlikely to result in substantial changes in species composition.

- **Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**
  - **assisting invasive species, that are harmful to the listed ecological community, to become established, or**
  - **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?**

  No.

  All locations where this community occurs are subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding agricultural land use. Construction activities will be managed through strict project mitigation measures to avoid further sedimentation and pollution or weed spread. This includes implementation of an Erosion and Sediment Control Plan, Weed Management Plan and annual weed monitoring program.

- **Will the action interfere with the recovery of an ecological community?**

  No. There is currently no Recovery Plan in place for this community however, removal of 8.63 ha of this ecological community would counter intentions for recovery.

  To compensate for the loss of the Coastal Swamp Oak Forest community, an offset package (containing both on-site and off-site offsets) has been developed in consultation with NSW OEH as part of the EP&A Act approval. NEH will retain a 5.43 ha of Swamp Oak Forest and rehabilitation of 1.05 ha of exotic grassland to Swamp Oak Forest TEC in the southern onsite offset. Offsite, a 250 ha site has been secured

containing similar vegetation to the site including 202.3 ha of Paperbark Swamp Forest and 18.2 ha of Forest Gum – Swamp Box Grassy Woodland. NEH has secured the offset via a Conservation Agreement under the *National Parks and Wildlife Act 1974* which conserves and manages the offset in perpetuity.

**Conclusion**

Removal of 8.63 ha of Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community will not significantly impact this community as the community within the subject site is disturbed and fragmented. The extent of removal is considered relatively minor when compared with the much larger amount of this community occurring within 5 km of the subject site (much of which is protected under the Coastal Management SEPP and within national park). Impacts of the removal of the community have been compensated by offsetting the community onsite and offsite at Shark Creek as part of the State approval.

## Critically endangered and endangered species

### Australasian Bittern (listed as endangered)

**Species ecology**

The species is listed as Endangered at both the NSW and Commonwealth level. There is a lack of detailed knowledge about the species' ecology. Although there have been consistent records of the Australasian Bittern utilising the Hunter estuary, little is known about their local status, including whether or not they are resident, visit the area only occasionally/seasonally or if the species actually breeds here. There are currently no known breeding records for the Hunter estuary (BirdLife Australia).

Australasian Bitterns prefer freshwater swamps comprised of dense vegetation such as reeds and sedges. They are solitary hunters and their prey generally consists of small fish, frogs, lizards, eels, crayfish and small birds. Males are known to call during the breeding season (October – February), however, breeding may occur outside of these times with favourable conditions. During the breeding season the species is territorial and pairs are thought to hold a territory of around 40-50 ha.

Key areas for the species in the Hunter Estuary include Hexham Swamp, Ash Island / Kooragang and Tomago (**Figure 4**). A national population estimate was coordinated and conducted over spring to summer 2009 – 2010 by BirdLife Australia. This resulted in an estimate of 82 – 162 birds being present in NSW.

**Previous studies / database records**

Review of previous studies and database records of the species confirm that 2-4 birds were regularly recorded at Tomago Wetlands over April – September 2009 and breeding was suspected (A. Lindsey per. comm.) The only record of more than one bird since 2012 was two birds at Hexham Swamp on 9 August 2013. Two of the three Hexham Swamp records of multiple birds have each occurred during the published breeding season, suggesting Hexham Swamp could represent a possible breeding ground.

NSW BioNet Atlas records were reviewed in relation to the subject site. Two records occur within Lot 1001, however, several more are from adjacent areas in Lot 1002 and further into Hunter Wetlands NP. The most recent record from Lot 1001 is from the main track through the site on 3/10/17 – recorded opportunistically by a Hunter Bird Observers Club member.

The Hexham Swamp Rehabilitation Project, Kooragang Rehabilitation project and Tomago Wetlands rehabilitation have all resulted in restoration in saltmarsh habitat, however, at Tomago in particular, this has likely been to the detriment of Australasian Bittern habitat (due to conversion of freshwater reedland habitat to open, saltmarsh habitat suitable for shorebird species). Although it should be noted that much of the freshwater wetland habitat in the estuary has been created through land use modifications (floodgates, Main Northern Railway line).

The community surveys conducted as part of the BHP study detected two birds in November 2017 (one in Maryland (back of Hexham Swamp) and one on Ash Island. The community survey also included points at Lot 1001 and the other is from Tomago wetlands (within the NP).

The Tomago location on Lot 1001 was surveyed on 28/11/17 with no birds recorded. Another round of community surveys occurred on 20/2/18 but it seems they only surveyed the Tomago wetlands location (not Lot 1001). No birds were recorded.

Preferred vegetation/habitat types recorded in the Hunter estuary are those mapped as Freshwater Wetland and Freshwater Reedland. However, it is noted that the species tends to use the edge of ponds amongst dense vegetation for foraging, and a mosaic of open/dense vegetation and open water is preferred.

Recent studies conducted as part of the 'Bitterns in Rice' project showed that the species will make significant movements away from core breeding areas in the Riverina of NSW – as far away as the Victorian coast, hundreds of kilometres away from their breeding grounds. This suggests the possibility that the Hunter Estuary could also be home to dispersing non-breeding adults from inland wetlands.

Individuals or populations may potentially migrate/disperse away from an area due to conditions or seasons and may only use some areas partially throughout the year.

- ***Is the action likely to lead to a long-term decrease in the size of a population?***

  No.

  Targeted surveys by ecobiological (September 2011) and Kleinfelder (May and June 2020) using call playback at 6 survey locations (as well as extensive traverses throughout the study area during bird surveys, nocturnal spotlighting, targeted flora searches and vegetation mapping) did not detect the presence of this species within the subject site; however, an important population is known to exist in the adjoining Hunter Wetlands National Park and individuals have been previously recorded from the area known as the 'Rice Paddy' within the adjacent Lot 1002. Community surveys conducted in Spring 2017 and Summer 2018 (which included locations within both Lot 1001 and the Tomago section of Hunter Wetlands NP did not detect the species' presence). However, there is one known opportunistic sighting of the species flushed by a member of the Hunter Bird Observers Club from along the main access track running through the subject site from 2017. The subject site does contain potential roosting and possibly breeding habitat (although breeding has not been confirmed within the Lower Hunter). The dense reedbeds within the subject site provide little open water suitable for foraging and the constructed ephemeral drainage channels are largely unsuitable due to bank steepness and depth.

  If the subject site did constitute part of a home range of the species it is likely to support 1 – 2 individuals or possibly two breeding pairs of bitterns. Removal of up to 48.42 ha of Freshwater Wetland Complex from the subject site is unlikely to lead to a long-term decrease in the size of the local population, given the extent of similar habitat which occurs on the adjoining Lot 1002, and within Hunter Wetlands NP (see **Figure 4**).

- ***Will the action reduce the area of occupancy of the species?***

  It is possible that the removal of Freshwater Wetland Complex from Lot 1001 will reduce the area of occupancy of the species, however, continuity of Freshwater Wetland Complex is maintained by continuity across the combined area of the on-site offset area within Lot 1001 and it's common boundary with Lot 22 NPWS estate to the north. While no presence of the species in the study area was detected during targeted surveys by ecobiological (2012) & Kleinfelder (2020), it is possible that the species could use the Phragmites and Typha dominated reedbeds in the northern and north-eastern portions of the site for roosting and nesting. There is little to no open water foraging habitat present. The removal of up to 48.42 ha of Freshwater Wetland Complex may reduce the potential area of occupancy for the population known from the adjoining Hunter Wetlands National Park and from Lot 1002.

- ***Will the action fragment an existing population into two or more populations?***

  No.

  The known population in the area uses adjacent wetlands and is only likely to visit the site opportunistically.

- ***Will the action adversely affect habitat critical to the survival of a species?***

No.

The Phragmites and Typha reedbeds present in the north-eastern portion of the study area may offer roosting and nesting habitat for this species. This area of Freshwater Wetland Complex will be retained as an offset area to protect the adjacent Ramsar wetland.

The Swamp Oak Rushland Forest and Freshwater Wetland Complex communities in the north and east of the study area may provide opportunistic foraging habitat for the Bittern during wet periods. However, as the Australasian Bittern prefers permanent water bodies with areas of open water for foraging it is considered that the study area does not represent optimal foraging habitat.

Marginal foraging habitat for the Australasian Bittern may therefore be impacted by the proposed action with the loss of up to 48.42 ha of Freshwater Wetland Complex. To compensate for the loss of potential habitat, an offset package (containing both on-site and off-site offsets) has been developed in consultation with NSW OEH as part of the EP&A Act approval. NEH will retain a 10.08 ha portion of Freshwater Wetland Complex onsite, rehabilitate 0.71 ha of exotic grassland to Freshwater Wetland Complex onsite with the southern onsite offset and offsite a 250 ha site has been secured containing similar vegetation to the site including 15.7 ha of Freshwater Wetland Complex equivalent community. NEH has secured the offset via a Conservation Agreement under the *National Parks and Wildlife Act 1974* which conserves and manages the offset in perpetuity (attached).

The proposed action will therefore not adversely affect habitat critical to the survival of the species.

- ***Will the action disrupt the breeding cycle of a population?***

  There is a possibility that removal of potential freshwater reedbed habitat from Lot 1001 could disrupt the breeding cycle of up to 1 -2 pairs of Bitterns is the species was to be utilising habitats with the site for breeding, however, Australasian Bittern are not known to breeding in the Hunter (Birdlife Australia)

  The Phragmites and Typha reedbeds present in the north-eastern portion of the study area may offer roosting and nesting habitat for this species and will be retained as an offset area (380m buffer zone) to protect the adjacent Ramsar wetland. As a known population inhabits the adjacent wetlands, the species may utilise this area for nesting during the breeding season.

  To mitigate potential disruption of breeding, the on-site offset area in the north-east corner of the subject site will be clearly fenced and signposted as a “No Go” area during construction.

- ***Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

  No.

  The Phragmites and Typha reedbeds present in the north-eastern portion of the study area may offer roosting and nesting habitat for this species and will be retained as an offset area (380m buffer zone) to protect the adjacent Ramsar wetland.

  The Swamp Oak Rushland Forest and Freshwater Wetland Complex communities in the north and east of the study area may provide opportunistic foraging habitat for the Bittern during wet periods. However, as the Australasian Bittern prefers permanent water bodies with areas of open water for foraging it is considered that the study area does not represent optimal foraging habitat.

  Marginal foraging habitat for the Australasian Bittern may therefore be impacted by the proposed action with the loss of up to 48.42 ha of Freshwater Wetland Complex. To compensate for the loss of potential habitat, an offset package (containing both on-site and off-site offsets) has been developed in consultation with NSW OEH as part of the EP&A Act approval. NEH will retain a 10.08 ha portion of Freshwater Wetland Complex onsite, and offsite a 250 ha site has been secured containing similar vegetation to the site including 15.7 ha of Freshwater Wetland Complex equivalent community. NEH has secured the offset via a Conservation Agreement under the *National Parks and Wildlife Act 1974* which conserves and manages

the offset in perpetuity.

The proposed action will therefore not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- ***Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?***

  No.

  A Soil and Water Management Plan, including erosion and sediment control will be required with each stage of development as part of the CEMP as well as a Management Plan for the control of noxious weeds to ensure invasive species do not become an issue on or offsite. Weed monitoring will also be undertaken as part of the Wetland Management and Monitoring Plan and weed control implemented where required.

  Provided mitigation measures within these Plans are adhered to, the action will not result in the establishment of invasive species into surrounding habitat.

- ***Is the action likely to introduce disease that may cause the species to decline?***

  No.

  Disease spread to threatened birds has not been identified as a risk from the proposed action. However, weed control measures to be implemented as part of the CEMP, including vehicle, equipment and personnel cleaning and hygiene measures, will also prevent the spread of disease.

- ***Is the action likely to interfere with the recovery of the species?***

  No.

  No populations or individuals were recorded during previous surveys in 2012 or during more recent community surveys undertaken in late 2017/early 2018. There is one opportunistic record of the species from the subject site from October 2017 indicating that the site forms part of the home range of potentially 1 – 4 individuals, however, removal of this habitat is unlikely to interfere with the recovery of the species. No recovery plan is in place for this species to date.

**Conclusion**

Based on the above assessment it is unlikely that the Australasian Bittern will be significantly impacted by the proposed activity. This is consistent with commentary contained within the project approval for the adjoining business park (MP07_0086) which found that: no individuals were recorded on site; some opportunistic foraging is available in areas; and, other suitable foraging and breeding habitat is located adjacent to the site (including Lot 1002 and the Hunter Wetlands NP). The Department of Planning was satisfied at the time of approval that the project would have minimal impact on the species.

## Mahony's Toadlet (listed as endangered)

**Species ecology**

Mahony's Toadlet (Uperoleia mahonyi) is distributed throughout the mid-north coast of NSW with current records reported from Kangy Angy in the south to Seal Rocks in the north. From the known sites where the species has been detected, habitat preferences include "coastal and semi-permanent swamps and swales, and occasionally man-made dams, in heath or wallum habitats almost exclusively on a substrate of white/leached sand" (Clulow et al 2016). The distribution of many Uperoleia species is highly specific to their preferred substrate, which for Mahony's Toadlet, is leached (highly nutrient impoverished) white sands. Vegetation communities in which Mahony's toadlet has been found include wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Aquatic vegetation at breeding sites includes sedges (Shoenoplectus spp., Baumea spp. and Lepironia articulata) and Broadleaf Cumbungi (Typha orientalis). Breeding habitat can consist of permanent or semi-permanent swamps and

ponds of moderate size with no apparent flow of water. Typically, breeding activity peaks after rainfall events where ephemeral water bodies have collected water.

The species has not been detected within the subject site during surveys (nor have any other members of the genus been detected in which it could have possible been confused with). Following the species commonwealth listing in March 2021, the subject site was further inspected to assess habitat suitability for the species. While the species is known to occur in the area, and in close proximity to? the site, there is limited suitable habitat within the subject site. The small patches of Swamp Sclerophyll Forest may provide suitable habitat for the species however do not constitute preferred habitat. These Swamp Sclerophyll patches are mostly concentrated around a narrow (1-2m), shallow constructed drain/swale that runs from the western boundary towards the northern boundary (approx. 550m). Water may collect within the drain/swale following heavy rainfall, evidence by the presence of a small number of emergent plant species. The ground cover within the drain/swale is mostly devoid of terrestrial vegetation due to high coverage of She-oak leaf litter. Nonetheless, given the proximity to higher quality habitat on the northern side of Tomago Road (lands of Tomago Aluminium and Hunter Water), Mahony's Toadlet may occasionally utilise the Swamp Sclerophyll patch during suitable conditions. It is very unlikely that the species would utilise other habitats within the subject site.

- ***Is the action likely to lead to a long-term decrease in the size of a population?***

  No.

  The subject site lies on the periphery of a large area of suitable habitat for the species in the locality (tomago sandbeds). However, the species is not associated with freshwater wetland communities dominated by Phragmites and Typha reedbeds, nor is the species found along rivers. Given that the distribution of the local population is concentrated within Tilligerry State Conservation Area and Hunter Water lands, the removal of a small area of marginally suitable habitat along the southern edge of their local range is unlikely to lead to a long-term decrease in the size of the population. The population is unlikely to be distributed further south of Tomago Road due to changes in broad vegetation form (brackish wetlands and mangrove forests that border the Hunter River).

- ***Will the action reduce the area of occupancy of the species?***

  It is possible that the removal of Swamp Sclerophyll will result in a small reduction (1.47 ha) in the area of occupancy for the species. However, connectivity is limited between areas of suitable habitat within the site and other areas where the species is known to occur (further to the north-east along Tomago Road). Dispersing individuals may occasionally arrive at the subject site, yet habitats are largely unsuitable for breeding. Core breeding sites generally contain sedges, grasses and semi aquatic groundcover that provide calling locations for males and vegetation to adhere eggs. The species is unlikely to regularly occupy the Swamp Sclerophyll Forest due to the absence of most these groundcover features.

- ***Will the action fragment an existing population into two or more populations?***

  No.

  The known population in the locality uses ephemeral and semi-permanent swamps to the north-east while the site is at the extreme edge of the local population (distribution cannot extend further to the south as habitats become unsuitable closer towards the Hunter River).

- ***Will the action adversely affect habitat critical to the survival of a species?***

No.

The Swamp Sclerophyll Forest provides marginally suitable habitat and is unlikely to support large numbers of breeding individuals (if any individuals). Due the absence of many of the micro-habitat features required for breeding (as identified above), the site is unlikely to support breeding that would be critical to the survival of the population or the species.

The proposed action will therefore not adversely affect habitat critical to the survival of the species.

- ***Will the action disrupt the breeding cycle of a population?***

  The Swamp Sclerophyll Forest may provide marginal breeding habitat during suitable conditions, however there is limited connectivity to other areas where the species has been recorded and the small, fragmented nature of the Swamp Sclerophyll Forest patch reduces the likelihood the species would use the site for breeding. If breeding were to occur within the Swamp Sclerophyll Forest, the removal of this habitat would be unlikely to disrupt the breeding cycle of the local population, as the area of potential breeding habitat is small and would be unlikely to significantly support the local population.

- ***Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

  No.

  The patch of Swamp Sclerophyll Forest present in the north-western portion of the subject site may provide habitat for the species during suitable conditions. However, due to the location (in respect to other areas where the species occurs) and nature of the habitat (lack of microhabitat features), the removal of 1.47 ha of marginally suitable habitat is unlikely to lead to a decline in species numbers. The subject site occurs on the edge of the range of the local population where fewer records of the species are known from (due to the transition from coastal forest communities to wetland areas that border the Hunter River). As such, most of the site is unsuitable for the species, apart from a few smaller isolated patches of Swamp Sclerophyll Forest which broadly meet the habitat type for the species. The habitat patches are unlikely to be support or maintain the species within the locality.

- ***Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?***

  No.

  A Soil and Water Management Plan, including erosion and sediment control will be required with each stage of development as part of the CEMP as well as a Management Plan for the control of noxious weeds to ensure invasive species do not become an issue on or offsite. Weed monitoring will also be undertaken as part of the Wetland Management and Monitoring Plan and weed control implemented where required.

  Provided mitigation measures within these Plans are adhered to, the action will not result in the establishment of invasive species into surrounding habitat.

- ***Is the action likely to introduce disease that may cause the species to decline?***

  No.

  Disease spread to threatened amphibians has not been identified as a risk from the proposed action. General weed control measures to be implemented as part of the CEMP, including vehicle, equipment and personnel cleaning and hygiene measures, will also prevent the spread of disease. Should Chytrid fungus be suspected or detected in any frog species caught onsite, a suitably qualified ecological consultant will advise on appropriate site hygiene measures to manage the risk.

- ***Is the action likely to interfere with the recovery of the species?***

No.

The NSW Saving Our Species Program identifies a number of management objectives for the species, however, there is no Commonwealth Recovery Plan for the species. Management objectives include:

- Determine the distribution of the species through targeted regional surveys at known and modelled sites. Surveys are to collect data that will be used in detection probability calculations and likelihood of occurrence modelling.

- Determine population size through genetic structuring.

- Determine the presence of chytrid, its prevalence and its effect on the species.

- Determine critical habitat requirements for the species including non-breeding habitat.

- Determine life-history and population dynamics.

The proposed action in unlikely to interfere with any other above mentioned management actions given the low suitability of habitat within the subject site.

**Conclusion**

Based on the above assessment it is unlikely that the Mahony's Toadlet will be significantly impacted by the proposed activity. While the Swamp Sclerophyll Forest onsite broadly meets the habitat type of the species, these habitats are unlikely to be important to the species given the lack of microhabitat features important to the species and the limited connectivity to other areas where the species in known to occur. Furthermore, no individuals were recorded on site nor any other members of the genus that it would be confused with. Large areas of high-quality habitat (where the local population is concentrated) will continue to persist within Hunter Water lands and the Tilligerry State Conservation Area to the north-east.

## Australian Painted Snipe (listed as endangered)

**Species ecology**

The species is listed as Endangered at both the NSW and Commonwealth level. The species has a wide distribution extending across all states and territories, however, records are sparse and mostly confined to eastern Australia. The Australian Painted Snipe predominately inhabits wetlands or waterbodies that are shallow, brackish or freshwater, particularly those which are ephemeral and have muddy margins and small, low-lying islands. Suitable wetlands usually support a mosaic of low, patchy vegetation, as well as lignum and canegrass. The species nests on the ground in a shallow scrape lined with woody or grassy vegetation. Australian Painted Snipe breeding habitat requirements are thought to be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are almost all from or near small islands in freshwater wetlands. This species is mainly crepuscular (active at dawn and dusk), preferring to sit quietly under cover of grass, reeds or other dense cover during day, becoming more active at dawn, dusk and during night. They generally remain in dense cover when feeding, although may forage over nearby mudflats and other open areas such as ploughed land or grassland.

Within the locality, there are two records of the Australian Painted Snipe from Kooragang Island (2014, 2004), approximately 2kms from the subject site. Further away, there is one record from Hexham Swamp (2009) and Pambalong Swamp (2006). However, there are only 11 records overall for the species from the Hunter region.

- ***Is the action likely to lead to a long-term decrease in the size of a population?***

  No.

  Targeted surveys were conducted by ecobiological (September 2011) and Kleinfelder (May and June 2020) for the Australasian Bittern (as well as extensive traverses throughout the study area during bird surveys, nocturnal spotlighting, targeted flora searches and vegetation mapping) and these did not detect the Australian Painted Snipe. Nocturnal, dawn and dusk bird surveys (mainly targeting the Australasian Bittern) focused on areas of freshwater wetland complex which is likely to be the most suitable habitat for Australian Painted Snipe within the subject site. No individuals were detected. As such, the proposed action

is unlikely to long-term decrease in the local population.

- ***Will the action reduce the area of occupancy of the species?***

  It is possible that the removal of Freshwater Wetland Complex from Lot 1001 will reduce the area of occupancy of the species. While no presence of the species in the study area was detected during surveys by ecobiological (2012), it is possible that the species could use the Phragmites and Typha dominated reedbeds in the northern and north-eastern portions of the site for roosting and foraging. However, there is little to no open water or mudflats suitable for foraging present onsite. The removal of up to 48.42 ha of Freshwater Wetland Complex may reduce the potential area of occupancy for the hunter population, however, the species has not been detected from the subject site.

- ***Will the action fragment an existing population into two or more populations?***

  No.

  The proposed development is unlikely to fragment the hunter population (if a resident population does occur) given the mobile nature of the species and availability of habitats within the region (particularly, adjacent wetlands, Kooragang wetlands, Hexham wetlands etc).

- ***Will the action adversely affect habitat critical to the survival of a species?***

  No.

  The Phragmites and Typha reedbeds present in the north-eastern portion of the study area may offer roosting and foraging habitat for this species. This area of Freshwater Wetland Complex will be retained as an offset area to protect the adjacent Ramsar wetland.

  The Swamp Oak Rushland Forest and Freshwater Wetland Complex communities in the north and east of the study area may provide opportunistic foraging habitat for the Snipe during wet periods. Marginal foraging habitat for the Snipe may be impacted by the proposed action with the loss of up to 48.42 ha of Freshwater Wetland Complex. To compensate for the loss of potential habitat, an offset package (containing both on-site and off-site offsets) has been developed in consultation with NSW OEH as part of the EP&A Act approval. NEH will retain a 10.08 ha portion of Freshwater Wetland Complex onsite, and

offsite a 250 ha site has been secured containing similar vegetation to the site including 15.7 ha of Freshwater Wetland Complex equivalent community. NEH has secured the offset via a Conservation Agreement under the *National Parks and Wildlife Act 1974* which conserves and manages the offset in perpetuity (attached).

The proposed action will therefore not adversely affect habitat critical to the survival of the species.

- ***Will the action disrupt the breeding cycle of a population?***

  While there is little data on the species breeding within the Hunter, the species is known to nest in and near swamps, canegrass swamps, flooded areas including samphire, grazing land, among cumbungi, sedges, grasses, salt water couch (*Paspalum*), saltbush (*Halosarcia*) and grass, also in ground cover of water-buttons and grasses, at the base of tussocks and under low saltbush. There is a possibility that freshwater reedbed habitat from Lot 1001 could potentially be used by the species as breeding habitat, however, the species has not been detected within the subject site and local records are sparse.

  The Phragmites and Typha reedbeds present in the north-eastern portion of the study area may offer foraging and nesting habitat for this species and will be retained as an offset area (380m buffer zone) to protect the adjacent Ramsar wetland.

- ***Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

  No.

  The Phragmites and Typha reedbeds present in the north-eastern portion of the study area may offer foragiing and nesting habitat for this species and will be retained as an offset area (380m buffer zone) to protect the adjacent Ramsar wetland.

  The Swamp Oak Rushland Forest and Freshwater Wetland Complex communities in the north and east of the study area may provide foraging habitat for the Snipe during wet periods.

  Marginal foraging habitat for the Snipe may therefore be impacted by the proposed action with the loss of up to 48.42 ha of Freshwater Wetland Complex. To compensate for the loss of potential habitat, an offset package (containing both on-site and off-site offsets) has been developed in consultation with NSW OEH as part of the EP&A Act approval. NEH will retain a 10.08 ha portion of Freshwater Wetland Complex onsite, and offsite a 250 ha site has been secured containing similar vegetation to the site including 15.7 ha of Freshwater Wetland Complex equivalent community. NEH has secured the offset via a Conservation Agreement under the *National Parks and Wildlife Act 1974* which conserves and manages the offset in perpetuity.

  The proposed action will therefore not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- ***Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?***

  No.

  Specifically, the requirements in the Project Approval conditions Schedule 3, Condition 35 Biodiversity Management Plan include the requirement for a detailed weed condition map as a baseline, ongoing monitoring, a Noxious Weed Management Plan all in consultation with government agencies. This Management Plan applies to the onsite offset areas within the buffer of the Action, Provided mitigation measures within these Plans are adhered to, the action will not result in the establishment of invasive species into surrounding habitat.

- ***Is the action likely to introduce disease that may cause the species to decline?***

No.

Disease spread to threatened birds has not been identified as a risk from the proposed action. However, weed control measures to be implemented as part of the CEMP, including vehicle, equipment and personnel cleaning and hygiene measures, will also prevent the spread of disease.

- ***Is the action likely to interfere with the recovery of the species?***

  No.

  No populations or individuals were recorded during previous surveys in 2012 or during more recent community surveys undertaken in late 2017/early 2018. Removal of this habitat is unlikely to interfere with the recovery of the species. No recovery plan is in place for this species to date.

**Conclusion**

Based on the above assessment it is unlikely that the Australian Painted Snipe will be significantly impacted by the proposed activity. While the freshwater wetland complex onsite may provide foraging or nesting habitat on occasion, these habitats are unlikely to be important to the species. Furthermore, no individuals were recorded on site and very few records are known from the Hunter region, particularly within the recent past. Potential foraging is available in areas of Coastal Saltmarsh TEC; and, other suitable foraging and breeding habitat is located adjacent to the site (including Lot 1002 and the Hunter Wetlands NP).

## Vulnerable species

### Green and Golden Bell Frog (listed as vulnerable)

- ***Is the action likely to lead to a long-term decrease in the size of an important population?***

  No.

  An important population of Green and Golden Bell Frog exists on Kooragang Island to the south of the study area (southern side of the Hunter River) and is one of the largest remaining known populations in NSW. This population occurs approximately 2.5 kms from the study area and is separated by the northern arm of the Hunter River (130m width at its narrowest point). Potential connectivity in the form of drainage lines and wetlands connects the study area to northern side of the Hunter River.

  Mostly marginal habitat for the Green and Golden Bell Frog exists across the study area. Apart from a small area of natural drainage line near the northern boundary (associated with the Swamp Sclerophyll patch), areas of wetland generally have no open water, prolific numbers of *Gambusia holbrooki*, steep banks, few logs or other ground shelter and thick weed cover, making most of the study area unsuitable as breeding, over-winter or foraging habitat. Some areas of ponding as a result of heavy rainfall generally have little aquatic vegetation. Much of the existing wetland is largely ephemeral with areas that dry out completely and become inundated with water during and after heavy rain. However, given the close proximity of a known Bell Frog population on Kooragang Island, it is possible that the study area may provide dispersal habitat for the species and suboptimal aquatic habitat after periods of heavy rainfall.

  Surveys for the Green and Golden Bell Frog by ecobiological were undertaken during favourable conditions, however, no Green and Golden Bell Frogs were detected on, or adjacent to, the study area (refer ecobiological 2012). It is therefore considered unlikely that the Green and Golden Bell Frog inhabits the study area based on these targeted surveys and habitat validation surveys (Kleinfelder, 2020). The mapped wetland in the study area forms only a small fraction of the wetlands present in the surrounding area which consists in part of the adjoining Lot 1002, Hunter Wetlands National Park and SEPP (Coastal Management) 2018 wetlands.

  This species was not identified as occurring in the study area and is unlikely to inhabit the study area on a

permanent basis based on the quality of habitats present; therefore, the proposed activity is unlikely to lead to a long-term decrease in the size of an important population in the locality or the region.

- ***Will the action reduce the area of occupancy of an important population?***

  No.

  The proposed activity will remove a small area of ephemeral habitat suitable for this species (approximately 5.88 ha) and a large area of potential dispersal habitat (approximately 205.52 ha). The extent of occupancy reduction, however, is considered minor as no population was recorded.

- ***Will the action fragment an existing population into two or more populations?***

  No. No populations or individuals were recorded.

- ***Will the action adversely affect habitat critical to the survival of a species?***

  No.

  The proposed activity will remove a small area of ephemeral habitat suitable for this species (approximately 5.88 ha) and a large area of potential dispersal habitat (approximately 205.52 ha). This is not considered habitat critical to the survival of the species.

  Loss of potential fauna habitat has been compensated by securing of offsets onsite and offsite at Shark Creek. Onsite, this includes retaining 10.08 ha of Freshwater Wetland Complex in the eastern part of the site, a minimum 380 m buffer to common boundary with Hunter Estuary Ramsar Wetland, 5.78 ha of Swamp Oak Forest and rehabilitation of 1.1 ha of Swamp Oak Forest in the southern part of the site.

  Offsite, 250.8ha of land has been protected at Shark Creek, including 15.7ha of Freshwater Wetland Complex and 202.3 ha of Swamp Mahogany - Paperbark Swamp Forest which may provide potential habitat and/or dispersal habitat for the Green and Golden Bell Frog.

- ***Will the action disrupt the breeding cycle of an important population?***

  No. No important populations or individuals were recorded.

- ***Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

  No.

  The proposed activity will remove a small area of ephemeral habitat considered marginally suitable for this species (approximately 5.88 ha) and a large area of potential dispersal habitat (approximately 205.52 ha). This is not considered likely to cause further decline of the species in the locality.

  Loss of potential fauna habitat has been compensated by securing of offsets onsite and offsite at Shark Creek. Onsite, this includes retaining 10.08 ha of Freshwater Wetland Complex in the eastern part of the site, 0.71 ha of exotic grassland to be rehabilitated to Freshwater Wetland Complex, a minimum 380 m buffer between the development extents to the common boundary with Hunter Estuary Ramsar Wetland, 5.78 ha of Swamp Oak Forest and rehabilitation of 1.1 ha of Swamp Oak Forest in the southern part of the site.

  Offsite, 250.8ha of land has been protected at Shark Creek, including 15.7ha of Freshwater Wetland Complex and 202.3 ha of Swamp Mahogany - Paperbark Swamp Forest which may provide potential habitat and/or dispersal habitat for the Green and Golden Bell Frog.

- ***Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?***

No.

A Soil and Water Management Plan, including erosion and sediment control will be required with each stage of development as part of the CEMP as well as a Management Plan for the control of noxious weeds to ensure invasive species do not become an issue on or offsite. Weed monitoring will also be undertaken as part of the Wetland Management and Monitoring Plan and weed control implemented where required.

Provided mitigation measures within these Plans are adhered to, the action will not result in the establishment of invasive species into surrounding habitat.

- ***Is the action likely to introduce disease that may cause the species to decline?***

  No.

  Disease spread to threatened amphibians has not been identified as a risk from the proposed action. General weed control measures to be implemented as part of the CEMP, including vehicle, equipment and personnel cleaning and hygiene measures, will also prevent the spread of disease. Should Chytrid fungus be suspected or detected in any frog species caught onsite, a suitably qualified ecological consultant will advise on appropriate site hygiene measures to manage the risk.

- ***Is the action likely to interfere with the recovery of the species?***

  No. No populations or individuals were recorded.

**Conclusion**

Based on the above assessment it is unlikely that the Green and Golden Bell Frog will be significantly impacted by the proposed activity.

## Grey-headed Flying-fox (listed as vulnerable)

- ***Is the action likely to lead to a long-term decrease in the size of an important population of a species?***

  No.

  Targeted surveys for the Grey-headed Flying-fox (diurnal inspection to locate any flying-fox camps and spotlighting surveys) detected a number of individuals foraging within the subject site. No roosts or congregations of individuals were detected. It is however highly likely that the Grey-headed Flying-fox uses the study area as part of its nocturnal foraging range given the presence of a range of flowering myrtaceous species across the site. An important population of this species is not considered to occur within the subject site. One nationally important Grey-headed Flying-fox camp is known to occur at Carrington Mangroves (Identification number 608) approximately 8kms to the south. The next closest flying-fox camp (not listed as nationally important) occurs within the mangroves along the north arm of the Hunter River (Tomago, Fullerton Cove – identification number 43). This camp is approximately 1.6kms to the south-east of the site and is likely to be the source of individuals observed foraging within the subject site. These camps are unlikely to be affected by the proposed action, however, some foraging habitat will be removed (1.47 ha of Swamp Sclerophyll Forest). The removal of this foraging habitat is not expected to result in a long-term decrease in the size of the population.

- ***Will the action reduce the area of occupancy of the of an important population?***

  The proposed activity will remove a small area of foraging habitat (1.47 ha of Swamp Sclerophyll Forest) within the north portion of the subject site. One nationally important Grey-headed Flying-fox camp is

known to occur at Carrington Mangroves (Identification number 608) approximately 8kms to the south. Individuals from this population are likely forage, on occasion, within the study site. The extent of occupancy reduction, however, is considered minor area of foraging habitat to be removed and the availability of additional foraging habitat within the locality and within the foraging range of the population.

- ***Will the action fragment an existing population into two or more populations?***

  No. The foraging habitat within the subject site is a small, isolated patch and is unlikely to support connectivity between greater areas of habitat for populations within the locality.

- ***Will the action adversely affect habitat critical to the survival of a species?***

  No, the two narrow strips of Swamp Sclerophyll Forest would not be considered habitat critical to this species survival. Given the high mobility of the species, individuals are able to forage across large areas within the region.

- ***Will the action disrupt the breeding cycle of an important population?***

  No. No breeding camps occur within the subject site.

- ***Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

  The action proposed to remove a small area of foraging habitat, however, the loss of this foraging habitat is unlikely to lead to a decline in species numbers, given the availability of foraging habitat in the locality and highly mobile nature of the species.

- ***Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?***

  No.

  Specifically, the requirements in the Project Approval conditions Schedule 3, Condition 35 Biodiversity Management Plan include the requirement for a detailed weed condition map as a baseline, ongoing monitoring, a Noxious Weed Management Plan all in consultation with government agencies. This Management Plan applies to the onsite offset areas within the buffer of the Action. Provided mitigation measures within these Plans are adhered to, the action will not result in the establishment of invasive species into surrounding habitat.

- ***Is the action likely to introduce disease that may cause the species to decline?***

  No.

  The effects of the pathogens, Australian bat Lyssavirus (ABL), Bat Paramyxovirus and Menangle Pig virus (Hoar et al. 1998), on the Grey-headed Flying-fox are unknown. However, the proposed action is unlikely to introduce the disease or accelerate the disease load among individuals.

- ***Is the action likely to interfere with the recovery of the species?***

  Offsetting obligations for removal of habitat for the species will be fulfilled at the NSW State level.

**Conclusion**

Based on the above assessment it is unlikely that the Green and Golden Bell Frog will be significantly impacted by the proposed activity.

## EPBC referral guidelines for the vulnerable Koala

Assessing whether an action is likely to have a significant impact on a Vulnerable species includes assessing whether habitat critical to the survival of the species will be adversely impacted. For some EPBC Act listed species, critical habitat has been identified or clearly defined.
Critical koala habitat is defined as habitat that is important for the species' long-term survival and recovery. The *EPBC Act referral guidelines for the Vulnerable Koala (*DotE 2014) aim to provide guidance on whether habitat is critical to the survival of the species and on how to determine whether an action is likely to have an adverse impact on critical habitat. An impact area that scores 5 or more using the habitat assessment tool contained in the guidelines is considered highly likely to contain critical koala habitat.

**Koala Habitat Assessment Tool (Section 6) – Coastal Context**

| Attribute | Score | Habitat Appraisal |
|---|---|---|
| Koala occurrence | 0<br>(low) | *Evidence of one or more koalas within 2 km of the edge of the impact area within the last 2 years.*<br><br>*No* koalas have been recorded in a 2km radius of the study area on the Atlas of NSW Wildlife in the past 2 years. |
| Vegetation composition | +2<br>(high) | *Two Koala feed trees (Port Stephens CKPoM) occur within the 1.47 ha area of Swamp Sclerophyll Forest in the north of subject site) – Swamp Mahongany (Eucalyptus robusta) and Forest Red Gum (Eucalyptus tereticornis). The vegetation community is also contains Broad-leaved Paperbark (Melaleuca quinquenervia) which is listed Koala feed tree under the SEPP (2021). Forest Oak (Casuarina glauca) is now also be considered to be a koala feed tree under the SEPP 2021, however, this is likely to be a used irregularly.* |
| Habitat connectivity | 0<br>(low) | *Vegetation patches within the study site have poor connectivity with adjacent vegetation. Some connectivity with Swamp Oak Forest exists to the south, however, vegetation surrounding Fullerton Cove is somewhat disjunct from larger patches of suitable habitat (mostly mangroves).* |
| Key existing threats | 0<br>(low) | *Low Koala occurrence and significant dog/vehicle threat.* |
| Recovery value | 0<br>(low) | *Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context given the low connectivity of habitats and small size of suitable habitat.* |
| **Total** | **2** | **Habitat not critical to the survival of the koala. Assessment of adverse effects on critical koala habitat is not required.** |

## Conclusion

Based on the assessment above, the proposed action is unlikely to have a significant adverse impact on a local population of koalas such that their local occurrence would be placed at risk. As such, an assessment of significance was not required. Impacts have previously been assessed in accordance with the Port Stephens CKPoM.

## Listed migratory species - significant impact criteria

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Seven migratory and/or marine species were considered to have potentially suitable habitat on the study area (Common Sandpiper, Pacific Golden Plover, Latham's Snipe, White-throated Needletail, Fork-tailed Swift, Cattle Egret and White-bellied Sea-Eagle). The two marine species were recorded during surveys (Cattle Egret and White-bellied Sea-Eagle). A migratory species assessment using the Matters of National Environmental Significance Guidelines has been undertaken below.

The study area does not contain 'important habitat' for shorebirds as defined by the EPBC Act Policy Statement 3.21, however, the site adjoins a Ramsar wetland in the northeast which contains habitat that may be indirectly impacted by the project. Indirect impacts on SEPP coastal wetlands and the downstream Hunter Estuary Wetlands Ramsar site have been considered within the Referral.

**An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:**

- ***Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species***

A discussion of habitat removal / modification of migratory species whose habitat is likely to be impacted is provided below.

The Common Sandpiper is considered uncommon in the Hunter Estuary. They are usually observed as single birds, and rarely in pairs, mostly in saltwater habitats. The species is a non-breeding migrant, arriving in the Hunter Estuary during October and departing during April (Herbert, 2007). The species has been recorded on Ash Island, roosting at Fern Bay, Kooragang Dykes, and in the Stockton Channel (both roosting and foraging) (Herbert, 2007). The species is rarely recorded on intertidal mudflats, preferring rocky creeks, channels, dams, mangrove-lined inlets and occasionally piers and jetties (Geering et al. 2007), however; the species has not been recorded along the upper sections of the Hunter River North Arm (i.e. in the vicinity of Tomago) before. It is possible that a small number of birds might roost on the rocky shore of the river foreshore of the study area, but the habitat is considered marginal. This habitat will not be directly impacted by the proposed action. Indirect impacts will be managed to avoid impacts on the Hunter River estuary and downstream wetlands.

Pacific Golden Plovers are known to mainly frequent the North Arm of the Hunter River and Ash Island. The species is a non-breeding migrant, arriving in the Hunter Estuary during September and departing during April to early May (Herbert, 2007). Most birds regularly roost at high tide at the Kooragang Dykes and lesser numbers in Stockton Channel. The species is known to forage on the North Arm sandflats, Fullerton Cove and Kooragang Dyke ponds with small numbers of plovers foraging in Stockton Channel and on Ash Island ponds (Herbert, 2007). The species forages on intertidal sand and mudflats, coastal saltmarsh and rocky shores (Geering et al. 2007) however; the species has not been recorded foraging along the upper sections of the Hunter River North Arm (i.e. in the vicinity of Tomago) before. It is possible that a small number of birds might roost on the rocky shore of the river foreshore of the study area but the habitat is considered marginal. This habitat will not be directly impacted by the proposed action. Indirect impacts will be managed to avoid impacts on the Hunter River estuary and downstream wetlands.

The Latham's Snipe is a non-breeding migrant to the south-east of Australia including Tasmania, passing through

the north and New Guinea on passage. This species breeds in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture (Higgins & Davies 1996). This species was not observed in the study area despite several meandering surveys covering patches of potentially suitable habitat containing small shallow pools fringed by reeds and grasses. It is considered that habitat present within the study area is marginal for this species, due to the lack of any permanent dams or water bodies with muddy margins and the dominance of the exotic grasslands by dense Kikuya to 50 cm in height. More suitable habitat for this species is present in the locality within the adjoining Hunter Wetlands National Park, Hexham Swamp Nature Reserve and on Kooragang Island. Future proposed development is unlikely to have any significant effect on this species in the locality.

The White-throated Needletail and Fork-tailed Swift are aerial foragers, mostly over open country, farmland, and woodland and sometimes over urban areas. They are likely to be seen aerially foraging over the study area on occasion, however, future proposed development is unlikely to have any significant effect on these species in the locality.

Suitable habitat is present across the pasturelands on the study area for the Cattle Egret, however, very few (<5) birds were observed at any one time during surveys. No nests were observed within the Swamp Oak Forest patches. Considering the large amount of similar habitat in the locality, future development of the study area is unlikely to significantly impact on local populations of this species.

The White-bellied Sea-Eagle was also observed flying over the Hunter River to the east of the study area; however, no suitable foraging or nesting habitat is present on site. Future development of the study area is unlikely to significantly impact on local populations of this species.

- ***Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species***

A Noxious Weed Management Plan under the Biodiversity Management Plan and Wetland Management and Monitoring Plan (WMMP) are to be prepared in consultation with NPWS to reduce the likelihood of any invasive weed species becoming established in adjoining important habitat for these species.

- ***Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.***

It is considered that the proposed action will not seriously disrupt the lifecycle of any ecologically significant proportion of the population of a migratory species.

**Conclusion:** Provided sufficient offsets are protected in perpetuity and mitigation measures as outlined in section 4 of the referral are adhered to, there is unlikely to be any significant impact on migratory species.