Jacobs

Memorandum

Level 4, 12 Stewart Avenue
Newcastle West NSW 2302 Australia
PO Box 2147 Dangar NSW 2309 Australia
T +61 2 4979 2600
F +61 2 4979 2666
www.jacobs.com

Subject	**Addendum – Exclusion fence monitoring and consideration of assessments of significance for GGBF**	**Project Name**	Kooragang Island Waste Emplacement Facility Eastern Ponds Closure Works
Attention	**Mike Bardsley**	**Project No.**	IS330300
From	Chris Thomson & Thomas Muddle		
Date	30 July 2021		
Copies to	Grant Moylan		

1. Introduction

Hunter and Central Coast Development Corporation (HCCDC) commissioned Jacobs Group (Australia) Pty Ltd (Jacobs) to undertake an assessment of the Kooragang Island Waste Emplacement Facility (KIWEF) Eastern Ponds Closure Works (the proposed action). The assessment addressed State and Commonwealth environmental legislation relating to:

- A 'self-assessment' of the proposed action in accordance with the Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act) and the Department of the Environment, Water, Heritage and the Arts (2013) Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (the guidelines). The findings of the self-assessment are documented in a report titled "Kooragang Island Waste Emplacement Facility- Eastern Ponds Closure Works: EPBC Act Self-Assessment dated 4 September 2020 (Jacobs, 2020a).

- A Review of Environmental Factors (REF) under Part 5 of the Environmental Planning and Assessment Act, 1979 (EP&A Act). The purpose of the REF is to describe the proposed action, to document the likely impacts of the action on the environment and to detail protection measures to be implemented. The REF included a test of significance pursuant to Section 7.3 of the Biodiversity Conservation Act, 2016 (BC Act). The REF is documented in a report titled "Kooragang Island Waste Emplacement Facility- Eastern Ponds Closure Works: Review of Environmental Factors dated 8 October 2020 (Jacobs, 2020b).

In addition to a range of threatened and migratory species, each assessment focused on the potential significance of any impact from the closure works on a known population of Green and Golden Bell Frog (*Litoria aurea*) (GGBF). The species is listed as vulnerable under EPBC Act and endangered under the BC Act. The assessment and conclusions were informed by the results of long-term monitoring of the GGBF population conducted by the University of Newcastle (UoN) within the K10 north ponds of which the Eastern Ponds are part of.

1.1 Addendum Purpose

Following the completion of the assessments and during the overwintering period, prior to the majority of GGBF movements; HCCDC installed fauna exclusion fencing around the proposed action works area. The exclusion fencing is a required mitigation measure to prevent GGBF from entering the

works area where they would be at risk of direct impact. The fencing, along with pre-clearance surveys and relocation of GGBF from within the fence, form a key measure to protect GGBF from direct mortality and has been implemented successfully on all prior stages of KIWEF closure.

HCCDC engaged the UoN to conduct monitoring of GGBF associated with the Eastern Ponds and the fence prior to commencement of the remediation. The purpose of this addendum is to review the data gathered from this monitoring and reconsider the findings in the EPBC Act self-assessment (Jacobs, 2020a) and BC Act test of significance (Jacobs 2020b), specifically in relation to previous conclusions regarding impact significance for GGBF.

2. Background

2.1 Project context

The Eastern Ponds are a series of partially filled waste emplacement cells. These cells historically comprised open water and over time have undergone a successive change to a more vegetated structure influenced by a change in surface hydrology, and specifically the gradual reduction of surface water. HCCDC are required under the NSW Protection of the Environment Operations Act 1997 (EP&A Act) to close the waste emplacement cells through the installation of a landfill cap. Following capping the site is intended to be rehabilitated.

The proposed action area includes the four partially filled waste emplacement cells referred to as the Eastern Ponds, and comprising a total area of approximately 4 hectares, in addition to an isolated parcel of land immediately adjacent (around 1.5 hectares), to the west of the ponds that is proposed as a stockpile area for any material used during landfill closure works.

An inspection of the Eastern Ponds confirmed there are no threatened ecological communities listed under the EPBC Act or BC Act located within the proposed action disturbance area. The assessment identified three threatened fauna species that have been previously recorded within the locality and that are likely to occur within the Eastern Ponds area. These are:

- Green and Golden Bell Frog (*Litoria aurea*).
- Australasian Bittern (*Botaurus poicilioptilus*).
- Black Bittern (*Ixobrychus flavicollis*).

The outcomes from long-term monitoring conducted for GGBF are discussed in the original assessments and were used to inform the assessment of significance for the GGBF, according to both EPBC Act, and BC Act. These assessments of significance concluded that the proposed activity was not likely to have a significant impact on the Kooragang Island population of GGBF. This was determined in the context of the size and low to marginal condition of the habitats present in the Eastern Ponds, the low importance as a breeding site, and given the range of better-quality habitats available and known to be occupied across the broader, KIWEF, Kooragang Island and Hunter Wetlands National Park. The proposed action was found to temporarily remove an area of marginal foraging habitat for GGBF at the Eastern Ponds occupied by a small proportion of the Kooragang Island population. The removal of this habitat was not expected to have a long-term impact on the size of the Kooragang Island population. The Eastern Ponds and receiving water bodies do not represent key breeding areas for the GGBF, and any temporary hydrology changes were not expected to have a long-term negative impact on the GGBF population.

This addendum describes additional monitoring conducted at the Eastern Ponds since completion of the original assessments and revised assessment of significance. As there has been no additional data

collected for the other two species of concern (Australasian Bittern and Black Bittern), the conclusions of the assessment of significance for these species are current and a re-assessment is not required.

2.2 Eastern Ponds frog exclusion fence monitoring

The exclusion fence is an important measure described in the Flora and Fauna Management Plan with the objective of (i) preventing frogs from entering the project area and (ii) allowing frogs to exit the work area. The fence was constructed in September 2020 and followed with regular inspections and maintenance. At this point monitoring of GGBF commenced with a focus on the fenced area and three wetlands within the enclosed Eastern Ponds. The results of this work are documented in a report referenced herein as UoN (2021) and attached as Appendix A.

The objectives of the GGBF monitoring were to check for (i) animal welfare associated with the fence and (ii) movement and demographic data on GGBF in the vicinity of the exclusion fence, and (iii) translocate any captured GGBF inside the enclosed wetlands to nearby wetlands. Monitoring occurred during the GGBF breeding season (Sept 2020 to April 2021) and coincided with a number of significant rainfall events that occurred during this time resulting in large monthly rainfall totals for October 2020 (252 mm), December 2020 (156 mm) January 2021 (186 mm), February 2021 (156 mm), and particularly March 2021 (459 mm). The key findings of the monitoring are summarised as follows:

1. The three ponds in the enclosed fenced area (K108, K108B and K108X) filled after the spring and summer rainfall events. These wetlands are shallow and ephemeral and historically have a low hydroperiod, particularly K108B and K108X which are thought to retain surface water for only a few weeks after heavy rain. K108 may extend into a few months after heavy rain.

2. Consequently, greater numbers of GGBF have been detected in the Eastern Ponds during the monitoring compared with recent monitoring years. GGBF were detected on both sides of the fence during all monitoring periods and within the enclosed wetlands. Thus, the fence has been shown to be permeable, with movement into and out of the site possible. Although, generally more animals were found outside the fence, with the exception of the periods following the March rainfall events, where a much greater number where detected at the wetlands when compared with the numbers of individuals detected along both sides of the fence.

3. Five wetlands located outside the fenced area were surveyed as a reference (in addition to the wetlands inside the fenced area). The average number of frogs detected per pond has been relatively similar for ponds outside and ponds inside the fenced area, and the change (decline) in detections across the survey period (associated with natural seasonal weather change), was similar in wetlands both inside and outside the fence. This was important to account for a true decline in the number of frogs able to be detected in the Eastern Ponds rather than biased by translocation away from the waterbody.

4. A greater number of mature females were captured in the enclosed ponds compared to adult males and juveniles; however, no calling males were reported and no GGBF tadpoles or metamorphs captured or observed despite optimum seasonal conditions for breeding. This is suggesting that the Eastern Ponds do not provide breeding habitat for GGBF, which is consistent with previous conclusions and have not done so since at least 2015.

5. In considering the greater abundance of GGBF at the wetlands from previous years, it was speculated that the Eastern Ponds may be providing refuge habitat for adults, but it is not

clear that the wetlands are the primary component of this function, particularly given the presence of trees and plant species (e.g. introduced pampas grass) that have been observed to be used for sheltering.

6. Further to this, it is possible that the Eastern Ponds may provide a 'terrestrial refuge' habitat that is important to the GGBF in the vicinity, especially to adult females, for life-cycle activities other than associated with breeding. This presence in the terrestrial habitat may have previously been undetected due to a focus on monitoring aquatic habitats only. Due to the abundance of similar terrestrial habitats available to the Kooragang Island GGBF population (that have not been monitored), it is reasonable to suggest that such terrestrial refuge habitat is widespread.

7. In concluding on the likely importance of the Eastern Ponds for the GGBF metapopulation in the local area, the UoN findings indicate that despite the removal of the eastern ponds (through exclusion), animals have continued to be detected in all ponds located outside the fence area and often in high numbers. Evidence of calling and breeding have also been obtained for ponds outside the fenced area. These results suggest that other ponds in the K10 North are highly suitable refuge and breeding sites for GGBF and that the removal of the eastern ponds has not resulted in the frog population abandoning the K10 north habitat mosaic.

2.3 Review of Biodiversity Management Plan

In parallel with review of the recent GGBF monitoring data, consideration has been given to the mitigation measures detailed in the approved Biodiversity Management Plan to assess currency.

The management plan outlines specific measures to minimise and avoid impacts to GGBF during the remediation works, and the exclusion fence is an important part of this. Monitoring has shown that the fence is permeable, for at least a small portion of frogs attempting to access the wetlands.

Two factors have arisen from the monitoring data that warrant an adaptive management approach as follows:

- The need to inspect the exclusion fence for breaches and repair these to prevent further GGBF entering the eastern ponds; and
- Staged or progressive removal of habitat features in response to survey outcomes and in consultation with appropriately experienced ecologists to further reduce the use of the eastern ponds by GGBF prior to commencement of bulk earthworks.

These mitigation measure have been incorporated into the environmental management documentation and contractual obligations for the proposed action.

3. Revised Assessment of Significance (EPBC Act)

A revised assessment of significance is provided for GGBF. As per the Self-Assessment, this revised Significance assessment has been completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of Environment, 2013) and takes into consideration new data provided from monitoring at the project area as summarised in this addendum.

Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude, and

geographic extent of the impacts (Department of Environment, 2013). This advice has been considered while undertaking the assessment.

1) Lead to a long-term decrease in the size of an important population

The Green and Golden Bell Frog population within Kooragang Island can be considered an important population and one of the Key Populations in the Lower Hunter, for which there is a draft Management Plan (OEH 2007). The University of Newcastle (UoN 2019a) has conducted regular monitoring of the Green and Golden Bell Frog (GGBF) population over the KIWEF since 2011. This work involves repeated visual encounter surveys during the breeding season targeting a range of artificially created ponds which has included the Eastern Ponds (K108 wetland located in SE cell of the Eastern Ponds). From these surveys the UoN (2019a) has reported regular encounters of frogs in K108 (Eastern Ponds) from surveys conducted between 2011-16 leading to assessment in 2014 that this pond comprises a healthy population (Clulow 2014). Since 2013-14 however, the overall pattern of GGBF in the Eastern Ponds has been one of decline (UoN 2019a), a phenomenon that is consistent with the reported gradual reduction in the area of open water available to frogs over this same period. Indeed both 2016-17 and 2017-18 were dry years and no GGBF were recorded in the Eastern Ponds at this time (UoN 2019). Very low numbers were reported in the following wetter season of 2019-20 however these numbers remain low compared to the ponds in the remainder of the KIWEF (McHenry 2020).

Monitoring in spring-summer 2020-21 coincided with a number of significant rainfall events which subsequently filled the three wetlands in the eastern ponds. Consequently, greater numbers of GGBF have been detected in the Eastern Ponds during the monitoring compared with the recent monitoring years. While a greater number of mature females were captured in the enclosed ponds during this period compared to adult males and juveniles, no calling males were reported and no GGBF tadpoles or metamorphs captured or observed despite optimum seasonal conditions for breeding. This is suggesting that the Eastern Ponds do not provide important breeding habitat for GGBF, which is consistent with previous conclusions and have not done so since at least 2015. There is no data to indicate that breeding would not occur at the Eastern Ponds during optimum conditions, however observations from the site and surrounding ponds that have been monitored to date indicate, that if breeding did occur at the Eastern Ponds, it is likely to be a less frequent occurrence then breeding in adjacent waterbodies.

The most recent monitoring results may imply that the Eastern Ponds may provide a 'terrestrial refuge' habitat that is important to the GGBF in the vicinity, especially to adult females, for life-cycle activities other than associated with breeding.

The longer term and recent monitoring data suggest the ponds do continue to provide foraging and refuge habitat for a portion of the Kooragang Island GGBF population, although the ponds are not important breeding sites. Indeed, McHenry (2020) describes the Eastern Ponds as ephemeral and semi-permanent wetlands, considered to have limited 'refuge' habitat value for GGBF due to the lack of open water. While this remains true in relation to aquatic habitat availability, the value of the site as terrestrial habitat refuge is not fully understood, but may account for the numbers of frogs found in the ponds after they were enclosed by the exclusion fence and following significant rainfall events.

Importantly, when considering the longer-term and recent monitoring data and the likely importance of the Eastern Ponds for the GGBF metapopulation in the local area, the UoN findings indicate that despite the removal of the eastern ponds (through exclusion), animals have continued to be detected in all ponds located outside the fence area and often in high numbers. Evidence of calling and breeding have also been obtained for ponds outside the fenced area. These results suggest that other

ponds in the K10 North are highly suitable refuge and breeding sites for GGBF and that the removal of the eastern ponds has not resulted in the frog population abandoning the K10 north habitat mosaic.

As the wetlands referred to in the locality are in addition to the eastern ponds that are subject to closure, and these habitats will remain in-situ, it can be inferred that the project will not lead to a long-term decrease in the size of the Kooragang Island GGBF population.

2) Reduce the area of occupancy of an important population

The proposed activity at the Eastern Ponds will remove an area of around 4 hectares of identified habitat used by this population (comprising 2 hectares of known ponded habitat and a further 2 hectares of terrestrial habitat that is suspected to be utilised), and so will reduce the area of occupancy of an important population in the short term.

Surveys in 2019-20 have described the habitat in the Eastern Pond as being infrequently occupied by GGBF and there is no evidence of breeding taking place within them. This is consistent with data from the University's annual monitoring program over the broader KWIEF which shows that for the last five consecutive years (2015-20) the Eastern Ponds have provided terrestrial and ephemeral aquatic habitat that is only occasionally occupied by GGBF (McHenry, 2020). Further monitoring since establishment of the exclusion fence support this conclusion, although also suggest GGBF may use terrestrial habitat at the eastern ponds, and their presence previously undetected due to a focus on monitoring aquatic habitat.

This GGBF presence in terrestrial habitat may have previously been undetected due to a focus on monitoring aquatic habitats only. Due to the abundance of similar terrestrial habitats available to the Kooragang Island GGBF population (that have not been monitored), it is reasonable to suggest that such terrestrial refuge habitat is widespread.

While the project will reduce the area of occupancy of an important population, the area of habitat to be removed is not considered breeding habitat nor represents a unique habitat in the context of habitat that is available to the population for all life-cycle activities. Following, closure works the site will be rehabilitated using techniques demonstrated to be affective in providing habitat for GGBF through past closure stages.

3) Fragment an existing important population into two or more populations

The work proposed at the Eastern Ponds is not expected to fragment the Kooragang Island GGBF population. Monitoring of this population has shown the GGBF is effective at movements and dispersal across spatially separated ponds (UoN 2019).. The majority of the works will be in disturbed areas dominated by exotic species, with very limited permanent surface water present.. Wetland areas and open lands to the south and west of the ponds that are known to be used by this species and provide potential movement opportunities, will not be impacted and no fragmentation of the population is anticipated.

4) Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of a species refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development, or
- For the reintroduction of populations or recovery of the species.

The habitat within the Eastern Ponds is not considered critical habitat for survival of the species or Kooragang Island population. The most recent surveys in 2019-20 have described the ponded habitat in the Eastern Ponds site as being infrequently occupied by GGBF and there is no evidence of breeding taking place within them. This is consistent with data from the University's annual monitoring program which shows that for the last five consecutive years (2015-20) the Eastern Ponds have provided terrestrial and ephemeral aquatic habitat that is only occasionally occupied by GGBF (McHenry, 2020). While this remains true in relation to aquatic habitat availability, it has been acknowledged that the value of the habitat as terrestrial refuge is not fully understood, but may account for the numbers of frogs found in the ponds after they were enclosed by the exclusion fence and following significant rainfall events, that were not previously detected. What is apparent, is that there is an abundance of similar terrestrial habitats available to the Kooragang Island GGBF population (that have not been monitored), and therefore it is reasonable to suggest that such terrestrial refuge habitat is widespread.

The University of Newcastle has conducted regular monitoring of the GGBF population over the KIWEF since 2011, which has included the Eastern Ponds. It is evident from this work, that critical habitat is present and dispersed throughout the KIWEF and broader Kooragang Island and Ash Island and not centred on the Eastern Ponds. This includes breeding ponds, as well as foraging and refuge areas as well as open areas between ponds that are used for dispersal.

5) Disrupt the breeding cycle of an important population

Surveys in 2019-20 have described the habitat in the Eastern Ponds as being infrequently occupied by GGBF and there is no evidence of breeding taking place within them. This is further supported by monitoring during the 2020-21 breeding season (UoN 2021), which occurred during optimum seasonal and weather conditions. From this monitoring, no calling males have been located, and no tadpoles or metamorphs observed or captured at the eastern ponds. There is no data to indicate that breeding would not occur at the Eastern Ponds during optimum conditions, however observations from the site and surrounding ponds that have been monitored to date indicate, that if breeding did occur at the Eastern Ponds, it is likely to be a less frequent occurrence then breeding in adjacent waterbodies.

On this basis, the Eastern Ponds are not considered important breeding habitat for the GGBF population and the removal of this habitat will not disrupt the breeding cycle of the population.

6) Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed closure works will temporarily remove an area of ponded habitat (2.0 ha) and a further 2.0 hectares of terrestrial refuge habitat for the GGBF population by removal of vegetation and draining any residual surface water. Mitigation has been applied to prevent frogs entering the site area during the closure works (i.e. frog fencing with adjacent vegetation suppression zone), and this activity may temporarily impact habitat availability for a portion of the Kooragang Island population, and the movements and survival of frogs in the vicinity of the eastern ponds.

Longer-term and recent monitoring indicate the habitat to be impacted is not used for breeding or if it is, breeding activity would be infrequent relative to other surrounding known breeding ponds, although the terrestrial habitat may be used as refuge, and thus potentially important for life-cycle activities other than breeding. Due to the abundance of similar terrestrial habitats available to the Kooragang Island GGBF population (that have not been monitored), it is reasonable to suggest that such terrestrial refuge habitat is widespread and that the removal of the 2.0 hectare area would not lead to a long-term decline of the Kooragang Island population.

The information gathered from extensive monitoring suggests that any impact on the habitat from the eastern ponds closure activity is unlikely to lead to a significant decline in the population.

After the works are complete the area will be capped, revegetated and new ponds established, therefore the loss of available habitat and interruption to movements of frogs is considered temporary. This area impacted represents a small proportion of the total potential foraging habitat available to the species in the KIWEF and it is likely that the temporary loss of a small proportion of foraging habitat and any interruption or impact on frogs from proposed mitigation will not result in an overall significant decline to the Kooragang Island GGBF population.

7) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Weeds are prevalent at the Eastern Ponds and dominant within areas of terrestrial habitat, including noxious weeds. The works provide an opportunity to reduce the prevalence of noxious weeds within the capping area, upon revegetation. Appropriate controls will be implemented to vehicles and equipment to avoid the introduction of any other invasive species to the site. The wetland areas should be considered restricted areas for personnel and no material should be exchanged between other wetland areas which may transport Eastern Gambusia, an invasive species which predates tadpoles.

8) Introduce disease that may cause the species to decline, or

The Project is not expected to introduce any diseases that may cause the species to decline. Chytrid fungus has been linked to declines in the GGBF, however the pathogen is considered widespread on Kooragang island (DECC 2007) and therefore it is unlikely that the proposed works will cause any further spread.

Nevertheless, hygiene procedures will be implemented for personnel and equipment in order to prevent any spread of the disease. The proposed works are considered unlikely to change the hydrological conditions and water quality parameters to a level that would constitute an impact on the GGBF population through spread of Chytrid fungus.

9) Interfere substantially with the recovery of the species.

The decline of this species can be attributed to a number of likely factors including Chytrid fungus, predation of tadpoles by the Eastern Gambusia and habitat loss. The proposed works will not impact on an identified area of important habitat and breeding habitat will remain unaffected by this Proposal. It is anticipated that the Proposal will not affect the recovery of the species and the carrying capacity of the habitat within the area will remain largely unchanged. Appropriate mitigation measures and hygiene controls will prevent other factors such as Chytrid fungus and Gambusia becoming prevalent in the species habitat. The proposed works are considered a low risk to the species recovery.

3.1 Assessment of Significance Conclusion

The proposed closure of the Eastern Ponds will temporarily remove an area of known habitat for the Kooragang Island important population of Green and Golden Bell Frog. Based on the results of long-term monitoring of the population by University of Newcastle (UoN 2019a) it is evident that potential impacts will be limited to the temporary removal of an area of refuge and marginal foraging habitat only, and that the habitat is not important for breeding or considered critical to the survival of the population. With consideration of each assessment question, it is concluded that the proposed activity is not expecting to have a significant impact on this important population.

4. Revised Test of Significance (BC Act)

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Proposal will temporarily remove an area of marginal foraging habitat (2.0 ha) and unknown area of potential terrestrial refuge habitat for the GGBF population by removal of vegetation and draining any residual surface water. The wetlands are not considered to be used for breeding or dispersal, although may provide a 'terrestrial refuge' habitat that is important to the GGBF in the vicinity, especially to adult females, for life-cycle activities other than associated with breeding. Due to the abundance of similar terrestrial habitats available to the Kooragang Island GGBF population, it is reasonable to suggest that terrestrial refuge habitat is widespread and that the removal at the project site would not place the local population at risk of extinction.

In concluding on the likely importance of the Eastern Ponds for the GGBF metapopulation in the local area, the UoN findings indicate that despite the removal of the eastern ponds (through exclusion), animals have continued to be detected in all ponds located outside the fence area and often in high numbers. Evidence of calling and breeding have also been obtained for ponds outside the fenced area. These results suggest that other ponds in the K10 North are highly suitable refuge and breeding sites for GGBF and that the removal of the eastern ponds has not resulted in the frog population abandoning the K10 north habitat mosaic. Thus, the physical removal of this habitat required for remediation is not expected to have a long-term impact on the size of the Kooragang Island population.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

c. in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

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

The total area of the Eastern Ponds is around 4.3 hectares including the raised slag walls and the proposed activity would remove around 1.5 hectares of native regrowth vegetation comprising predominantly rushes, Phragmites australis and Typha orientalis (0.8 ha) and regrowth Swamp Oak (0.7 ha) that may be used by this species as refuge. The activity will remove this vegetation used by the frogs to undertake the site closure works, and the site would be revegetated and new ponds developed as part of the activity. Mitigation will be applied to prevent frogs entering the site area during the closure works (i.e. frog fencing with adjacent vegetation suppression zone), and this activity may also temporarily impact habitat availability, and the movements and survival of any frogs in the vicinity of the eastern ponds.

The discharge of surface water from Eastern Ponds would transfer to the Windmill Road drain (K100A) and Long Pond (K100E), and these two habitats also provide non-breeding habitat for GGBF. This discharge would only be required during periods of prolonged high rainfall when the capped Eastern Ponds have filled. At this time, the existing drainage system would be charged and receiving flow from a variety of surface runoff sources, suggesting that a change in water quality or inundation levels would already be expected. These habitats do not represent key breeding areas for the GGBF, and any temporary hydrology changes are not expected to have a long-term negative impact on the GGBF population.

After the works are complete the area will be capped, revegetated and new ponds established, therefore the loss of available habitat and interruption to movements of frogs is considered temporary.

The aquatic and terrestrial habitat within the eastern ponds that will be temporarily impacted represents a small proportion of the total potential foraging and refuge habitat available to the species in the KIWEF and it is likely that the temporary loss of a small proportion of foraging and refuge habitat and any interruption or impact on frogs from proposed mitigation will not result in an overall significant decline to the Kooragang Island GGBF population. Importantly, the action would not result in any long-term fragmentation of habitat for the GGBF. This species is known to move between habitats within the KIWEF and will be able to navigate around the Eastern Ponds, using wetlands constructed during previous closure work stages.

d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The Proposal would not impact on any declared area of outstanding biodiversity value.

e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

With respect to the Green and Golden Bell Frog, the Proposal is consistent with two key threatening processes listed under the BC Act:

- Clearing of native vegetation
- Chytridiomycosis due to amphibian Chytrid Fungus.

The extent of native vegetation clearing, and habitat removal associated with the Proposal has not changed since the original assessment. The ponds continue to be ephemeral, with low hydroperiod and considered unlikely to be significant in terms of available habitat for the Green and Golden Bell Frog in the surrounding landscape.

The disease Chytridiomycosis already exists across Kooragang Island and as such it is unlikely that the Proposal would further exacerbate this Key Threatening Process. Construction activities will follow frog hygiene practises outlined in the Biodiversity Management Plan to limit the spread of this disease.

4.1 Test of Significance Conclusion

The Proposal is considered unlikely to result in a significant impact to the Green and Golden Bell Frog.

5. Conclusion

Following the completion of the original assessments and during the overwintering period, prior to the majority of GGBF movements; HCCDC installed fauna exclusion fencing around the proposed action works area. The exclusion fencing is a required mitigation measure to prevent GGBF from entering the works area where they would be at risk of direct impact. The fencing, along with pre-clearance surveys and relocation of GGBF from within the fence, form a key measure to protect GGBF from direct mortality and has been implemented successfully on all prior stages of KIWEF closure.

Subsequent monitoring of the enclosed wetlands and exclusion fence has shown that the fence is not entirely impermeable, and that the wetlands continue to be occupied by GGBF. This occupation has been more evident from the recent breeding season (2020-21) and likely due to this period being considerably wetter than recent monitoring years.

Monitoring indicates that greater numbers of frogs, particularly adult females, are present in the eastern ponds than recorded in recent monitoring years. This has occurred despite the presence of the exclusion fence and may be attributed not only to favourable hydroperiod but also the fact that only aquatic habitats have been monitored in the past. These results also suggest that the terrestrial habitat in the eastern ponds may be used as refuge. On the basis that similar terrestrial habitats are widespread on Kooragang Island, the habitat to be removed would not be considered critical to the population, particularly as breeding does not occur. Indeed, monitoring of adjacent wetlands during the exclusion fence monitoring period at the eastern ponds has shown GGBF to be abundant and breeding elsewhere.

Two factors have arisen from the monitoring data that warrant an adaptive management approach as follows:

- The need to inspect the exclusion fence for breaches and repair these to prevent further GGBF entering the eastern ponds; and
- Staged or progressive removal of habitat features in response to survey outcomes and in consultation with appropriately experienced ecologists to further reduce the use of the eastern ponds by GGBF prior to commencement of bulk earthworks.

The findings of the Self-Assessment are reconfirmed that the proposed action is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Agriculture, Water and the Environment is not required. Similarly, this same conclusion remains for the test of significance under Section 7.3 of the BC Act, supporting that the impact is not expected to be significant for the local GGBF population.

6. References

Clulow, S., Stockwell, S. Clulow, J & Mahony, M. 2014. Research program on the green and golden bell frog (Litoria aurea) on Kooragang Island. Annual Report prepared for PWCS

Jacobs (2020a). Kooragang Island Waste Emplacement Facility- Eastern Ponds Closure Works: EPBC Act Self-Assessment dated 4 September 2020.

Jacobs (2020b). Kooragang Island Waste Emplacement Facility- Eastern Ponds Closure Works: Review of Environmental Factors dated 8 October 2020.

McHenry, C. 2020. *Green and Golden Bell Frog 2019-20 survey – preliminary summary: Eastern Ponds.* University of Newcastle.

University of Newcastle (UoN), 2017. *Research Program on the Green and Golden Bell Frog (Litoria aurea) on Kooragang Island. Annual report (2016-2017)*

University of Newcastle (UoN), 2018. *Area 1 and Area 3 Closure Works for Remediation of the former BHP Kooragang Island Waste Emplacement Facility. Summary of the Impact and Benefit to the Green and Golden Bell Frog (Litoria aurea) and Its Habitat*. Prepared for Hunter Development Corporation.

University of Newcastle (UoN), (2019a) Eastern Ponds Action Plan (EPAP) Green and Golden Bell Frog Habitat Review August 2019

University of Newcastle (UoN) 2019b. *Green and Golden Bell Frog (Litoria aurea) Research Program on Kooragang Island: Annual Report (2018-2019).* Prepared for Port Waratah Coal Services, Newcastle Coal Infrastructure Group and Hunter and Central Coast Development Corporation

University of Newcastle (UoN), (2021) Night surveys of Eastern Ponds fence and wetlands – Progress report. June 2021

National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999 (Department of Environment, 2013)

Appendix A: Eastern Ponds GGBF Monitoring (UoN 2021)

Appendix B: Biodiversity Management Plan

Biodiversity Management Plan	
Objective	To comply with contractual and legislative requirements and ensure that native fauna and flora are protected from construction activities.
Targets	No death or injury to fauna including the Green and Golden Bell Frog No unapproved destruction of habitat
Legal, Contractual & Other Requirements	*Environmental Protection and Biodiversity Conservation Act 1999* *Biodiversity Conservation Act 2016*
Site specific planning / approval conditions / licence conditions	**State Documents** NSW EPA (2010), Approval of the Surrender of a Licence – License 6437, (Ref: 1111840, and as varied by notice number 1510956 and 1520063) Golders (2011), KIWEF Closure Works, Green and Golden Bell Frog Management Plan (Ref: 117623029-001-R-Rev0) Jacobs (2020) KIWEF Eastern Ponds Closure Works Review of Environmental Factors (IS330300_02) **Commonwealth Documents** Jacobs (2020), KIWEF Eastern Ponds Closure Works EPBC Self-Assessment (IS330300_01)
General Flora and Fauna Mitigation Measures and Controls	General mitigation measures to be considered include: ▪ Adequate run-off, erosion and sedimentation controls should be in place during construction, particularly in areas where run-off has the potential to impact on nearby waterways, surrounding native vegetation, EEC regrowth, and existing drainage line and dam areas ▪ Care should be taken that any noxious weeds occurring on the site are not further dispersed as a result of the Proposal. A follow up Weed Control Program may be necessary to control the encroachment of these species into surrounding areas. The landowner has a legal responsibility to control and suppress these species on their property under the *Biosecurity Act 2015*. The Weed Control Program should require removal of weeds by physical means and avoid the use of herbicides ▪ Stockpiling of soil that may contain seeds of exotic species shall be stockpiled away from adjacent vegetation or drainage lines where they could be spread during rainfall events ▪ Placement of soil stockpiles away from vegetated areas ▪ Utilising existing disturbed corridors such as cleared areas, roads, tracks, and existing easements, where possible for set up of equipment, stockpile areas and site facilities ▪ Noxious weeds to be managed in accordance with the expectations under the *Biosecurity Act 2018*. It is recommended that the plants be removed by physical removal where practicable, as herbicides may impact GGBFs and their habitat

Biodiversity Management Plan	
	▪ Open excavations and storage areas to be inspected regularly for the presence of fauna species ▪ Plant and equipment brought on to site must be cleaned and free of deleterious material, mud and other material that may harbour weed seeds ▪ Standard construction hours are to be maintained to restrict noise and light impacts on nocturnal fauna, to the extent practical. Any after hour activities will be limited to delivery of materials, environmental surveys, or other action that has been assessed to have a minimal impact to nocturnal fauna ▪ Utilise an onsite ecologist during construction to re-locate any native fauna which may be displaced ▪ Avoid rubbish and other waste build up to deter feral animals ▪ Habitat features such as woody debris that may be utilised by fauna within the construction area would be retained and set-aside during the construction period for reinstatement at completion of works ▪ Any water required for dust suppression will be drawn from ponds established for the purpose. No water for dust suppression will be drawn from existing ponds on the site. The establishment of dedicated dust suppression ponds will be undertaken to prevent the potential spread of Plague Minnow into ponds currently free of this species. The location and procedure for those dedicated dust suppression ponds will be communicated during the site induction and training ▪ No night works are permitted without additional assessment of potential noise and light impacts ▪ Lighting of site compounds, if required for safety and security, will avoid light spill outside of the construction works footprint and will be undertaken in accordance with *Australian Standard 4282—1997 Control of the obtrusive effects of outdoor lighting.*
GGBF Management	GGBF impact avoidance is to be based on the following: ▪ Establishment and use of Chytrid Hygiene procedures such that the Chytrid fungus is not brought to site or transferred between areas of the site as described in the following row ▪ GGBF pre-clearance/disturbance surveys and relocation to ensure to the extent possible that direct disturbance areas are free of GGBF on commencement of works in each area ▪ Establishment, inspection and repair of GGBF exclusion fencing such that the risk of GGBF re-entering surveyed areas is reduced ▪ Establishment and maintenance of a vegetation/structure buffer (nominally 1-2m wide) outside of the GGBF exclusion fencing to minimise potential for GGBF to use overgrown vegetation or existing fencing to gain access into the works footprint. The buffer is to be managed proactively, through implementing lessons learnt from prior incidents and to minimise potential for frogs to become trapped and exposed which may include provision of habitat refuge, mulch cover over exposed surfaces, watering, and regular inspections

Biodiversity Management Plan	
	▪ Staged or progressive removal of habitat features (including vegetation removal and dewatering during construction) in response to survey outcomes and in consultation with appropriately experienced ecologists to further reduce the use of the eastern ponds by GGBF prior to commencement of bulk earthworks ▪ Establishment of clear boundaries of works areas such that unnecessary disturbance is avoided, particularly adjacent to existing ponds ▪ Establishment of appropriate erosions and sediment controls to prevent sedimentation and pollution of waters ▪ Implementation of GGBF risk consideration to all decision making such that unintended consequences to GGBF can be avoided. This includes in considering suitability of imported materials from a Chytrid risk and nutrient perspective and use of chemicals including flocculants, herbicides, and pesticides ▪ Where unintended impacts to GGBF are identified all necessary efforts to reduce the severity and avoid reoccurrence are to be implement ▪ Rehabilitation using species preferred by GGBF (refer to rehabilitation management plan).
Chytrid Fungus hygiene protocol	A Chytrid Hygiene procedure in accordance with the NSW Threatened Species Management Information Circular No.6 – Service Hygiene Protocol for the Control of Disease in Frogs (April (2008) or most recent revision of that document, must be implemented on the Closure Works site during all works and any other activities undertaken as part of the action. This procedure is to include: ▪ Dedicated disinfection bays established at site entry and all vehicles required to enter via this bay ▪ All disinfection processes will be monitored and controlled at the Closure Works entry point ▪ The location of these disinfection bays, and the obligations of disinfection, will be communicated during the site induction and training ▪ Cleaning and disinfection of workers boots upon entry and exit from the site ▪ Procedures will be implemented to inspect mobile plant entering the Project site during construction activities to control soil and/or organic matter and to disinfect tyres and wheels of vehicles entering the Project site ▪ Vehicles arriving at site muddy will be sent away for more intensive cleaning prior to disinfection.
Chytrid Fungus Risk Assessment Process	The contractor is to demonstrate that suitable risk assessment has been undertaken by an appropriately qualified and experienced ecologist on all imported capping and revegetation materials to demonstrate that it contains a low risk of containing Chytrid. Risk assessment should consider as a minimum: ▪ Material not sourced from known, suspected or likely amphibian habitat areas, or material has been isolated for sufficient period to eliminate chytrid risk ▪ Material unlikely to have had contact with amphibians and no amphibians present in material

Biodiversity Management Plan	
	▪ Material are not to be stored in, or come in contact with material sourced from, areas of known, suspected or likely amphibian habitat prior to transport ▪ Material has been subject to temperature exceeding 28 degree which is considered to exceed the thermal tolerance of chytrid fungus.
Pre-clearance survey design and clearance methodology.	The Contractor will be responsible for developing a pre-clearance survey and clearing methodology suitable for implementation with the contractor's specific construction methods that minimises potential harm to GGBF species. The survey methodology should consider the following factors: ▪ Level of effort warranted in different areas and habitats ▪ Seasonal factors on GGBF use of habitat ▪ Need for nighttime surveys ▪ Survey effort required is likely to include: Targeted active searches of potential GGBF habitat located within the disturbance footprint Conducted to minimise disruption of breeding activities: relocated tadpoles or metamorphs ▪ Be conducted in accordance with hygiene protocol ▪ Habitat resources including all wet areas as well as rocks, logs, tussock forming vegetation, and other cover will be searched during diurnal visual inspections ▪ A nocturnal habitat search including visual search, spotlighting and call playback may be conducted to assess nocturnal use (breeding/calling) in the habitat supported in disturbance area, if the surveys are conducted during core breeding season (spring/summer) ▪ Any GGBF observed within the disturbance footprint will be relocated in accordance with relocation procedure provided in the GGBF Management Plan (or procedure otherwise endorsed by HCCDC in consultation with the University of Newcastle) prior to commencement of disturbance ▪ The survey methodology implemented should allow the qualified and experienced ecologist to confirm that the risk of GGBF mortality has been reduced to the extent reasonable and feasible for the applicable habitat type/area. The clearing methodology should include the following: ▪ Consideration of most appropriate time to install frog exclusion fences ▪ Presence of an appropriately qualified and experienced ecologists during clearing ▪ Gradual degradation of higher risk habitat areas progressing from areas furthest away from pond towards areas of refuge ▪ Relocation of cleared vegetation to areas away from immediate works that allow remaining amphibians to escape ▪ Construction of ramps on the internal side of the exclusion fence to allow for GGBF to escape from within the site, whilst maintaining a perimeter and restricting fauna entry to the work site.

Biodiversity Management Plan	
Amphibian Relocation	If any frog specimens thought to be a GGBF are observed and are within project disturbance area the following relocation procedure will be implemented: ▪ Observer to notify Site supervisor who in turn is to notify the HCCDC, a suitably qualified ecologist, and the Contractor's supervisor of the frog's location immediately ▪ Contractor supervisor to halt work in the immediate vicinity to prevent accidental interaction with the frog ▪ The ecologist or HCCDC's environmental representative will determine whether the frog is likely to be harmed by works or is likely to migrate to an area that it could be harmed ▪ If likely to be harmed by works, the GGBF will be captured by the ecologist or suitably trained frog handler following GGBF handling and Hygiene procedures ▪ A one frog per bag policy will be observed with disinfection of all equipment undertaken immediately following any contact with frogs of any description ▪ If healthy the frog will be relocated outside the impact footprint as soon as possible to a nearby wetland with suitable habitat and water (note that the requirement of the GGBF Management Plan to hold frogs until nighttime has been superseded by advice from the University of Newcastle) ▪ GGBF showing Chytrid symptoms will be handled in accordance with the GGBF management requirements unless otherwise agreed with HCCDC in consultation with the University of Newcastle.
Actions	The contractors CEMP is required to establish the actual pre-clearance and clearance methodology, exclusion fence designs and Chytrid Risk assessment and documentation proposed.
Responsibilities	Contractor's Ecologist is responsible for ensuring risks to Fauna is minimised to the extent reasonable and feasible. Contractor's Project Manager is responsible for allowing sufficient time within program to conduct pre-clearance and clearance in a manner that maximises survival of GGBF and other fauna following the advice of the Ecologist. Contractor is responsible for notifying the Principal of any sick or dead GGBF. All personnel are responsible for ensuring that the clearing limits are addressed, and native flora and fauna species are protected. All site personnel to undertake toolbox talks in relation to the reporting process for injury/ death to fauna or clearing of flora occurring beyond the required limits for construction.
Timeframe	Duration of the works.
Monitoring & Reporting	Daily visually monitoring by site supervisors for obvious signs of fauna and the functioning of controls including fences and Chytrid hygiene stations. Inspection of inside and outside of exclusion fencing and provision of water in microhabitats when temperature is forecast to exceed 30 degrees with less than 50% humidity.

Biodiversity Management Plan	
	Weekly inspections to be documented on a Weekly Environmental Inspection Checklist. Outcomes of pre-clearance surveys are to be documented and provided to the HCCDC. Observed sick or dead GGBF are to be notified to the Principal immediately.