

23 March 2021

Matt Johnson
Senior Planner
Habitat Planning
1/622 Macauley Street
Albury NSW 2640

Dear Matt

Re: Updated flora and fauna assessment for Kensington Gardens retention basin development, Thurgoona
Project no. 28158, 31856

Biosis Pty Ltd was commissioned by Habitat Planning in 2018 to complete a flora and fauna assessment to describe the ecological values and constraints associated with a proposed retention basin development at Kensington Gardens in Thurgoona, New South Wales (NSW) (Appendix 1; Figure 1). Sloane's Froglet *Crinia sloanei* was identified by Biosis as occurring within the retention basin development footprint in 2018. At the time of assessment, Sloane's Froglet was listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and as all works were proposed within Biodiversity Certified land under the *Albury Local Environmental Plan 2010* (LEP), a consent authority was not required to take into consideration the likely impact of the development on Sloane's Froglet in R1 zoned lands. In July 2019, Sloane's Froglet was listed as Endangered under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Albury LEP does not cover matters listed under the EPBC Act, and as no development application was lodged with Albury City Council prior to the July listing date, Biosis was again commissioned in 2020 to update the original flora and fauna assessment to include an assessment of the project's likely impacts on Sloane's Froglet against heads of consideration outlined in Commonwealth of Australia (2013).

Biosis understands the proponent proposes to develop small-lot housing and a retention basin on former agricultural land zoned R1 – General Residential (outside the study area for this assessment). The development is the next stage in the Kensington Gardens development, which includes residential housing to the north of the proposed development approved under a former development application. The R1 land is bounded to the north and east by land zoned E3 – Environmental Management (Appendix 1; Figure 2). While the majority of the retention basin development works will occur in R1 zoned lands the development also requires some minor works in E3 zoned lands including augmentation of existing drainage from a farm dam. The proponent has committed to constructing the retention basin in accordance with the Sloane's Froglet stormwater wetland design guidelines (Spiire 2017), and avoiding any development during the Sloane's Froglet winter breeding season (April to mid-October).

Areas zoned R1 are within Biodiversity Certified land under the Albury LEP. Development on biodiversity certified land is taken to be development that is not likely to significantly affect any threatened species, populations or ecological communities or its habitat. A consent authority is not required to take into consideration the likely impact of the development on biodiversity values. Therefore, no further assessment of impacts to threatened species, populations or ecological communities is required under the *Biodiversity Conservation Act 2016* (BC Act) for development on land zoned R1 – General Residential.

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Land zoned E3 is not biocertified under the Albury LEP and as such any works proposed in E3 zoned lands will need to consider threatened species and communities listed under the BC Act. The works proposed in the E3 zoned lands include augmentation and drainage line formalisation.

The Albury LEP does not cover matters listed under the EPBC Act. As such the objective of this flora and fauna assessment is to determine the presence of any threatened ecological communities (TECs) within the study area and, where applicable, assess the impacts of the project on any threatened species, populations and/or ecological communities (biota), or their habitat, listed under the EPBC Act.

Background

The study area is approximately 8 hectares and is bounded by Eight Mile Creek to the east E3 zoned lands in the north and Table Top Road to the west.

The study area is within a residential and agricultural area where native vegetation has been modified by past agricultural land uses and lot developments. Native vegetation is still present in the broader landscape on adjacent lands as small reserves, small patches of remnant vegetation, wetlands or isolated paddock trees and unimproved pasture.

Methods

Database and literature review

Prior to completing the field investigation, information provided by Habitat Planning as well as other key information was reviewed, including:

- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - *the database for the Atlas of NSW Wildlife*, Environment, Energy and Science (EES) (BC Act).
- The NSW Department of Primary Industries (DPI) Spatial Data Portal for *Fisheries Management Act 1994* (FM Act) listed threatened species, populations and communities.
- PlantNET (RBGDT 2013).

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Biodiversity Conservation Act 2016* (BC Act)
- *Water Management Act 2000* (WM Act)
- *Biosecurity Act 2015* (Biosecurity Act)

Field investigation

A field investigation of the study area was undertaken on 20 November 2018 by Ewan Kelly. Vegetation within the study area was surveyed using the random meander technique (Cropper 1993) over five person hours.

A habitat-based assessment was completed to determine the presence of suitable habitat for threatened species previously recorded (OEH 2018) or predicted to occur (Commonwealth of Australia 2018) within 5 kilometres. This list was filtered according to species descriptions, life history, habitat preference and soil preference to determine those species most likely to be present within the study area.

A targeted survey for Sloane's Froglet was undertaken on 20, 21 and 22 August 2019, within the study area and adjoining properties. Conditions on all nights were considered favourable (Table 1).

Table 1 Weather data during Sloane's Froglet survey

Survey Night*	Start time	Date	Minimum temperature	Maximum temperature	Rainfall last 72 hours (mm)	Sunset
1	1845	20 August 2019	4.3°C	11.1°C	9	1758h
2	1815	21 August 2019	6.4°C	16.8°C	9	1802h
3	1815	22 August 2019	10.0°C	15.1°C	9.2	1807h

*Weather data courtesy Bureau of Meteorology Albury Airport station no. 072160

Survey for Sloane's Froglet included observers listening for calls and scanning the area using torches to detect frogs within the transect area and/or waterbody. Call playback was also utilised wherever suitable habitat was encountered and included a quiet listening period followed by call playback in accordance with relevant guidelines.

The surveys were undertaken in August 2019 in order to coincide with the Sloane's Froglet breeding season when males would be making advertising calls. Transect surveys consisted of two observers walking through suitable habitat and were focused around large seasonally inundated wet areas, linear drainage lines and farm dams. As the observers moved, visual encounter searches (Crump and Scott 1994) were undertaken for frogs perching on in-stream or fringing vegetation, algae, logs and exposed banks. Nocturnal searches were undertaken using LED headlamps.

Nocturnal listening surveys were undertaken at all farm dams, seasonally wet areas and permanent water bodies on or adjacent to the study area. At each listening point, two observers spent at least 10 minutes listening for calling frogs. Where no Sloane's Froglet were heard after 10 minutes, call play back was used to elicit a response for a further 10 minutes.

Measures to reduce the risk of spreading infectious pathogens such as chytrid fungus between sites were implemented where required (DECC 2008).

Results

The study area is located within an agricultural and peri-urban environment where the majority of remaining native vegetation consists of isolated riparian or aquatic vegetation in wetlands, watercourses or farm dams, scattered paddock trees or small blocks of woodland.

Regional soil landscape mapping indicates that the study area occurs on the Albury – Oaklands Hills and Footslopes landscape of the NSW South West Slopes Bioregion (Mitchell 2002). The Albury – Oaklands Hills soils landscape is characterised by lower Ordovician greywacke, phyllite, chert schist and areas of granite at general elevation between 150 and 480 metres. Soils present include shallow gritty loam amongst rock outcrops on hills containing red-brown texture contrast soils on slopes and strongly structured subsoils (Mitchell 2002). The composition of the soil influences the occurrence of dry woodland vegetation communities in the area.

The study area contains native wetland and woodland vegetation, isolated paddock trees and planted indigenous vegetation. The condition of native vegetation within the study area is generally low due to ongoing grazing pressures, soil compaction and habitat fragmentation. The proposed retention basin occurs at the site of an existing farm dam (Appendix 2; Plates 1 and 2) which receives water from the north through a shallow drainage/overflow system extending from a dam in the adjacent E3 land (Appendix 2; Plates 3 and 4). Woodland vegetation occurs to the south and north of the proposed retention basin site. The proposed housing development is in an area that has been significantly disturbed by former agricultural practices and construction activities associated with the previous housing development to the north. Native vegetation is present in this area as scattered sedges, rushes and grasses but below the densities required to be considered an intact Plant Community Type (PCT).

Native vegetation within the study area consists of modified versions of PCT 277 *Blakely's Red-gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* and PCT 5 *River Red-gum herbaceous-grassy very tall open forest wetland on the inner floodplains in the lower slopes sub-region of the NSW South Western Slopes – Bioregion and the eastern Riverina Bioregion* (Appendix 1; Figure 3).

Woodland areas that align with PCT 277 contain an open canopy consisting of Yellow Box *Eucalyptus melliodora*. The midstorey is sparse but includes Burgan *Kunzea ericoides*. The ground layer consists of a depauperate mix of native species including Wallaby Grass *Rytidosperma fulvum*, Red-leg Grass *Bothriochloa macra*, *Juncus Juncus* spp. and Tall Sedge *Carex appressa*. These areas have been invaded by introduced pasture species to varying degrees. Indigenous trees and shrubs have also been planted within this vegetation type (Appendix 2; Plate 5).

Areas that align with PCT 5 include woodland areas with a River Red-gum *Eucalyptus camaldulensis* canopy and areas containing wetland vegetation where the canopy has been historically removed for pasture development. The midstorey shrub layer and native understorey is predominantly absent from woodland areas due to over grazing and weed invasion. Drainage areas would have historically aligned with PCT 5 but have been modified through agricultural development and historical changes to hydrology in the area. These areas now contain wetland vegetation consisting predominantly of sedge and rush species such as Tall Sedge, Pong'ort *Carex tereticaulis*, Knob Sedge *Carex inversa* and several *Juncus* species (Appendix 2; Plates 6 and 7).

Vegetation that did not align with any PCTs was considered to be predominantly introduced (i.e. non-native vegetation). These areas contained scattered natives throughout but were considered below the level required to be considered intact native vegetation.

Several scattered trees, some of which contain hollows, are present where the surrounding vegetation is introduced and include River Red-Gum and Yellow Box (Appendix 2; Plate 5).

Threatened species

Background searches identified three threatened flora species and 43 threatened fauna species recorded (OEH 2018) or predicted to occur (DEE 2018) within 5 kilometres of the study area. Those species recorded or considered most likely to have habitat within the study area based on the background research are as follows:

- Floating Swamp Wallaby-grass *Amphibromus fluitans* (Vulnerable, EPBC Act and BC Act)
- Sloane's Froglet *Crinia sloanei* (Endangered EPBC Act, Vulnerable, BC Act).

Floating Swamp Wallaby-grass has been recorded in 2005 approximately 150 metres east of the study area in farm dams. While no records occur within the study area and the species was not recorded during the site assessment, suitable habitat is present in drainage lines and around the edges of the existing dam. A Significant Impact Criteria assessment has been undertaken for this species (see Appendix 3).

Sloane's Froglet was recorded in drainage lines and farm dams within the study area Figure 5. A list of recommended mitigation measures has been included to minimise impacts to this species in R1 zoned land and a Significant Impact Criteria assessment has been undertaken for this species (see Appendix 3).

Vegetation communities

A key focus of the field investigation was to assess the vegetation likely to be impacted by the expansion to determine whether it qualifies as a threatened ecological community as outlined in Commonwealth of Australia (CoA 2006), and to assess the proposed development against the Significant Impact Criteria (CoA 2013).

While PCT 277 contains canopy species that align with the *White Box – Yellow Box – Blakely's Red-gum Grassy Woodlands and Derived Native Grasslands* (Box Gum Woodlands) TEC, vegetation within the study area did not meet the size or native species diversity thresholds to be considered the TEC as contained in the Commonwealth of Australia (2013) listing criteria (see Table 2 below). Furthermore, it is unlikely that any direct or indirect impacts to woodland areas are likely to occur as a result of the retention basin development.

Table 2 Justification for identifying Box Gum Grassy Woodland (criteria from COA 2006)

Criterion	Response	Justification
Is, or was, at least one of the overstorey species White Box, Yellow Box or Blakely's Red-gum?	Yes for woodland vegetation throughout the study area. No for sedge areas or areas where River Red Gum is the dominant species.	Blakely's Red-gum and Yellow Box are dominant or co-dominant canopy species throughout the study area.
Does the patch have a predominately native understorey? Requires 50% of the perennial vegetation ground cover to be made up of native species.	No, the majority of patches in environmental lands do not contain a predominantly native understorey.	The majority of patches have a ground layer dominated by introduced perennial pasture grasses and the composition of native versus introduced perennials in environmental lands generally favours introduced species.
Is the patch greater than 0.1 hectares?	Yes	Majority of patches are greater than 0.1 hectares.

Criterion	Response	Justification
Are there ≥ 12 native understorey species (excluding grasses) and one 'important species'	No, patches are generally depauperate and the majority of native perennial species are made up of grasses, sedges or rushes.	Intact patches have less than 12 native forb species in the understorey.
Is the patch 2 hectares of greater in size?	No	Patches are smaller than 2 hectares.
Does the patch have an average of 20 or more mature trees per hectare, or is there natural regeneration of the dominant overstorey eucalypts?	No	Woodland areas have less than 20 mature trees per hectare. These areas do not meet the qualification as the Box Gum Woodlands community.

Priority weeds

The Biosecurity Act outlines biosecurity risks and impacts, which in relation to the current assessment includes those risks and impacts associated with weeds. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within the State or any part of the State. A pest plant has the potential to out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight and /or harm or reduce biodiversity.

A priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled or eradicated in the region. Where a local strategic plan means a local strategic plan approved by the Minister under Division 2 of Part 4 of the *Local Land Services Act 2013* (LLS Act).

The General Biosecurity Duty states:

- *All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*

No Priority Weeds were recorded in the study area.

Impact assessment

The proposed retention basin development involves the following impacts to ecological features:

- 0.62 hectares of native vegetation removal from PCT 5 (Appendix 1: Figure 4).
- 0.01 hectares of native vegetation removal from PCT 277 (Appendix 1: Figure 4).
- Temporary removal of 0.65 hectares of potential Floating Swamp Wallaby-grass habitat.

- Temporary removal of 0.65 hectares of Sloane's Froglet habitat and probability of mortality and disturbance to a known population during construction.

The majority of the retention basin development will occur downslope of higher quality vegetation and wetland habitats in the E3 zoned land to the north. As such the hydrology of the area to the north should remain unchanged as a result of development downstream and it is considered unlikely any indirect impacts will occur to any vegetation or habitats in the E3 zoned land.

A Significant Impact Criteria assessment has been undertaken for Floating Swamp Wallaby-grass and Sloane's Froglet (see Appendix 3). The Significant Impact Criteria determined that the development was unlikely to result in a significant impact to Floating Swamp Wallaby-grass as an important population was unlikely to be present and undetected in the farm dam.

Sloane's Froglet was recorded in large numbers within and bordering the study area during targeted surveys for this species. The intention of the development is to create a retention basin in accordance with the Sloane's Froglet stormwater wetland design guidelines (Spiire 2017). Development of the retention basin to these guidelines is likely to create additional permanent habitat than is now present at the site. However, construction of the retention basin within an area known to support a large population of Sloane's Froglet is likely to result in direct impacts including mortality, disturbance and temporary loss of important habitat during construction. Due to these impacts during construction it is our recommendation that the project be referred for assessment under the EPBC Act and we understand it is the intention of Kensington Gardens to make a referral in the near future.

Recommendations

Given there are requirements for the temporary removal of all native vegetation within the retention basin area, the focus of the recommendations is to minimise disturbance to any surrounding native vegetation and fauna habitat and to construct and manage the retention basin in a way that would not preclude it from becoming threatened species habitat in the future. These recommendations are:

- The project should be referred to the Minister of Environment for assessment under the EPBC Act.
- Avoid all augmentation or disturbance to the northern dam.
- The retention basin should be constructed in accordance with the Sloane's Froglet stormwater wetland design guidelines (Spiire 2017).
- Monitor the success of habitat creation by undertaking ongoing monitoring of Sloane's Froglet in the study area.
- All construction activities should occur in dry weather in summer when Sloane's Froglet should have retracted from flooded winter breeding habitat to summer refuge habitat.
- All dam areas scheduled for development should be dewatered prior to construction and all frogs and frog metamorphs should be translocated to the nearest suitable habitat by trained fauna relocation experts.
- Consider retaining, augmenting or creating hydrological and habitat connectivity between dams, drainage lines and constructed retention basins or wetland habitats to allow for dispersal of Sloane's Froglet within the study area. This includes retaining suitable hydrological flows from the proposed retention basin south of the study area into adjacent wet areas.
- Implement strict weed and pathogen hygiene protocols during construction of the basin, with particular focus on vehicle and contractor hygiene and wash down stations to manage the spread of chytrid fungus during construction.

- Revegetation should not be limited to the retention basin area but should also extend upstream and into dryland areas.
- Livestock should be permanently excluded from the retention basin area.
- To the fullest extent practicable, minimise disturbance to any native vegetation surrounding the development area.
- Retained trees should be protected in accordance with Australian Standard AS4970 – 2009 Protection of trees on development sites, during construction, operation and decommissioning of the site compound.
- In the unlikely event that additional unexpected threatened species are identified during the project, works should cease and an ecologist contacted.
- Soil transportation should be minimised within, into or out of the study area to reduce the spread of weeds.
- Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values.

Given there is a likelihood that construction of the retention basin will result in some temporary disturbance to Sloane's Froglet, referral of the proposed action to the Australian Government Minister for the Environment to determine whether the action requires approval under the EPBC Act is recommended.

I trust that this advice is of assistance to you however please contact me if you would like to discuss any elements of this ecological advice further.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'E. Kelly', written over a light blue rectangular background.

Ewan Kelly
Senior Ecologist, Albury, mob. 0438 210 030

References

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- Brannelly *et al.* 2017. Non-declining amphibians can be important reservoir hosts for amphibian chytrid fungus. *Animal conservation*. 21:91-101.
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- Threatened Species Scientific Committee. (2019). *Crinia sloanei* (Sloane's Froglet) Conservation Advice. Department of Environment, Canberra.

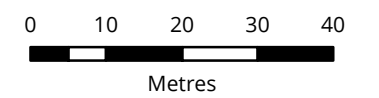
Appendices

Appendix 1 Figures



- Legend**
-  Study area
 - Land zones**
 -  E3 - Environmental Management
 -  R1 - General Residential

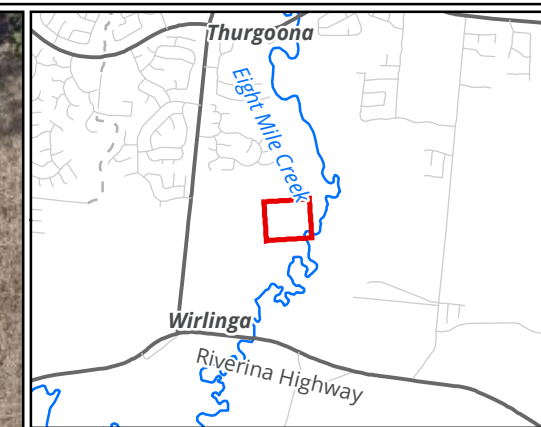
Figure 2 Land zoning



Scale: 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

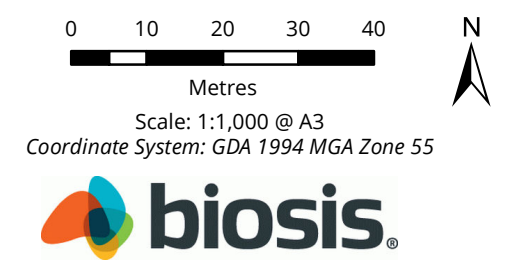


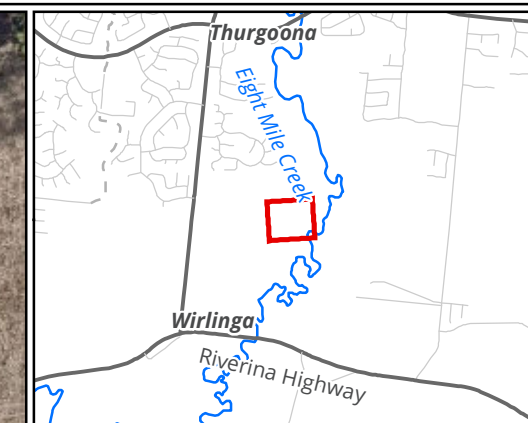
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Checked by: EK, Drawn by: AEDM, Last edited by: amurray
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- Legend**
- Study area
 - Proposed development
 - Proposed development
 - ▲ Large trees
- Vegetation communities**
- 277 - Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
 - 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.

Figure 3 Ecological features of the study area





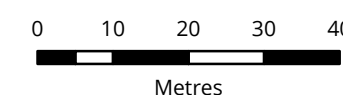
Legend

- Study area
- Proposed development
- Proposed development

Vegetation removed

- 277 - Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.

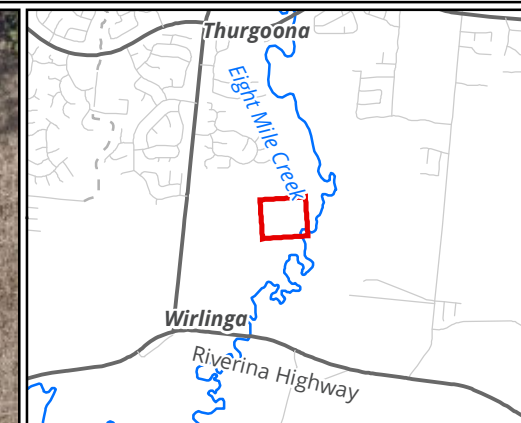
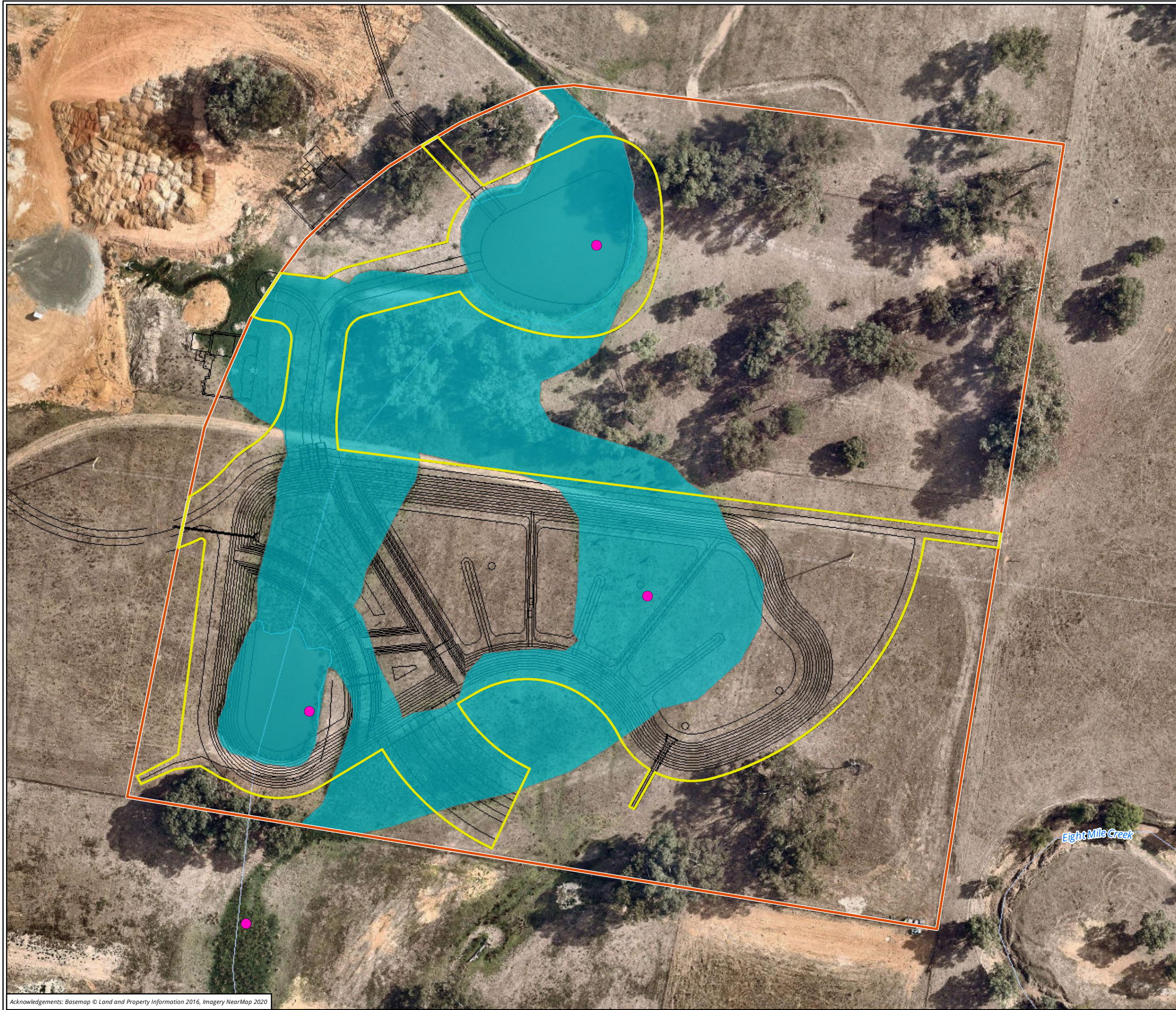
Figure 4 Vegetation removal



Scale: 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55



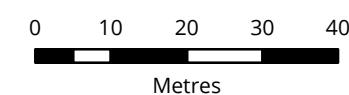
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Legend

- Study area
- Proposed development
- Proposed development
- Sloane's Froglet record
- Sloane's Froglet habitat

Figure 5 Sloane's Froglet habitat



Scale: 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55



Matter: 31856,
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Appendix 2 Plates



Plate 1 Existing farm dam at the site of the proposed retention basin, facing south (photo taken 20 November 2018).



Plate 2 Existing farm dam at the site of the proposed retention basin, facing east (photo taken 20 November 2018)



Plate 3 Existing farm dam in the E3 lands, facing north-west (photo taken 20 November 2018)



Plate 4 Existing farm dam in the E3 lands, facing south-west (photo taken 20 November 2018)



Plate 5 **PCT 277 in E3 lands north of retention basin site, facing west (photo taken 20 November 2018)**



Plate 6 **PCT 5 in E3 lands north of retention basin site, facing north (photo taken 20 November 2018)**



Plate 7 **Modified (derived) PCT 5 in wet areas north of retention basin site, facing south
(photo taken 20 November 2018)**

Appendix 3 EPBC Significant Impact Criteria assessments

Floating Swamp Wallaby-grass *Amphibromus fluitans*

Status: Floating Swamp Wallaby-grass is listed as Vulnerable under the EPBC Act.

Distribution: The mainland distribution is situated along the major rivers and tributaries of northern Victoria and southern NSW. With scattered occurrences in southern Victoria and South Australia. In NSW the distribution is centred from the Albury region and north to Narrandera (DEWHA 2008).

Habitat: Occurs in natural and manmade water bodies including rivers, swamps and dams (DEWHA 2008).

Occurrence in study area: Floating Swamp Wallaby-grass has not been recorded within the study area but has been recorded in farm dams approximately 250 metres east of the site in 2005. The site is not connected by any drainage lines or overflow areas to this farm dam. The species was not recorded during the general flora and fauna assessment of the site, which was undertaken during November when the species would have been detectable. A targeted survey was not conducted for this species.

Table A3.1 Floating Swamp Wallaby-grass - assessment against Significant Impact Criteria

Significant Impact Criteria	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population	Highly unlikely	An 'important population' is defined as a population that is necessary for the long-term survival and recovery of the species (CoA 2013). The species was not recorded during the site assessment and given the long term and on-going grazing history it is unlikely that an important population is present within the retention basin area. If a local population was present and undetected at the retention basin site it is unlikely that local mortality during construction would lead to a decline in that population to the point where it would be at risk of local extinction given the area of available habitat around the northern dam that will be retained and undisturbed during construction.
Reduce the area of occupancy of an important population	Unlikely	The species was not recorded during the site assessment and given the ongoing grazing history it is unlikely that an important population is present within the retention basin area. If individuals were present the area of occupancy would remain relatively unchanged during and post construction, as the areas of available habitat around the northern dam and habitat more broadly north and south of the study area would be unchanged during construction. As such the overall areas of occupancy in Thurgoona would remain unchanged and suitable for this species.

Significant Impact Criteria	Likelihood of significant impact	Justification
Fragment an existing important population into two or more populations	Highly unlikely	The species was not recorded during the site assessment and given the grazing history it is unlikely that an important population is present within the retention basin area. If individuals were present and undetected during the flora and fauna assessment it is unlikely that disturbance at this site would lead to permanent population fragmentation given the areas of retained available habitat surrounding the development and the retention of hydrological flows through the study area.
Adversely affect habitat critical to the survival of the species	Highly unlikely	Critical habitat has not been declared for Floating Swamp Wallaby-grass but any habitat disturbance isolated to one farm dam would not affect the survival of the species at a national scale.
Disrupt the breeding cycle of an important population	Unlikely	The species was not recorded during the flora and fauna assessment and given the grazing history it is unlikely that an important population is present within the retention basin area. If individuals were present disruption to their breeding cycle would not be a significant impact on an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Floating Swamp Wallaby-grass was not recorded during the site assessment. If individuals are present and undetected it is unlikely that the impacts of the retention basin development would impact habitat to the extent that the species was likely to decline. Habitat within the retention basin footprint is degraded and subject to significant grazing pressures so long term persistence in these areas would be relatively tenuous, furthermore habitat around the northern dam would be retained allowing some opportunity for persistence at the site during construction.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of current agricultural land use. The proposed works are unlikely to result in an increase of invasive species. Construction activities will be managed through standard practices to avoid further spread of weeds.
Introduce disease that may cause the species to decline	Highly unlikely	The project will not result in the introduction of a disease that is harmful to Floating Swamp Wallaby-grass.

Significant Impact Criteria	Likelihood of significant impact	Justification
Interfere with the recovery of a species	Highly unlikely	A National Recovery Plan for Floating Swamp Wallaby-grass has not been produced, however the Approved Conservation Advice (DEHWA 2008) identifies a range of local and regional priority actions, the project will not interfere substantially with the actions or the recovery of Floating Swamp Wallaby-grass.

Conclusions for Floating Swamp Wallaby-grass

Floating Swamp Wallaby-grass was not recorded during the site assessment, nor is it considered likely that an important population is present and undetected in or around the existing farm dam. On this basis a significant impact on this species is considered unlikely.

Sloane's Froglet *Crinia sloanei*

Status: Sloane's Froglet is listed as Endangered under the EPBC Act.

Description: Sloane's Froglet is a small ground dwelling frog that superficially resembles other common species of *Crinia* from which it is not easily distinguished. The species can be reliably identified by the distinctive male call (OEH 2017). Sloane's Froglet historical distribution includes north central Victoria through central western NSW to the Queensland border (Knight 2013; 2014; OEH 2017). Although historically infrequently recorded throughout its range, the species is considered to have undergone a population contraction in recent years. A number of factors have been attributed to this decline, which include habitat modification and reduction via agricultural and residential development (OEH 2017), predation by introduced fish (Knight 2014) and possibly the amphibian disease chytridiomycosis caused by the pathogen *Batrachochytrium dendrobatidis* (chytrid fungus) (OEH 2017). The life-cycle of Sloane's Froglet is poorly understood but the breeding season is typically thought to commence in mid-April throughout winter and into spring, with eggs being deposited on submerged vegetation and metamorphosis observed in spring (Knight 2014). Tadpoles are thought to take 11 weeks to reach metamorphosis but this may vary depending on water temperature (Anstis 2012).

Habitat: Sloane's Froglet is commonly associated with still or slow moving, shallow water bodies, including farm dams and wetlands, with abundant aquatic or semi aquatic fringing vegetation (Knight 2013). Sloane's Froglet is often found in inundated paddocks, table drains and drainage lines particularly where they are connected to more permanent refuge habitat such as dams and permanent wetlands.

Occurrence in study area: Sloane's Froglet was recorded in both dams within the study area and in wet drainage areas between dams and downstream of the study area indicating a connected functioning population in the study area. It is likely the population within the study area forms part of the broader Thurgoona population which is reliant on a series of interconnected wetland habitats. Although the significant impact assessment presented below is focussed on impacts, and according to Commonwealth of Australia (2013) such assessments should not consider the beneficial outcomes of the project, it is important to note that the project is primarily focussed on development of a constructed wetland system (retention basin) that has a high likelihood of providing future habitat for Sloane's Froglet. This is demonstrated by other such developments in the Thurgoona area that have applied the Spiire (2017) guidelines to create wetland systems that now support Sloane's Froglet populations. This retention basin design will also incorporate the current hydrological patterns of the area and retain hydrological connectivity south of the study area.

The impact assessment undertaken here is based on the following potential impacts to develop the retention basin:

- Existing extent of Sloane's Froglet habitat, including two farm dams and seasonally wet areas is 1.45 hectares.
- Retained habitat in the study area and proposed refuge habitat to be protected during construction is 0.8 hectares.
- Refuge habitat to be temporarily disturbed during dry conditions is 0.1 hectares (southern dam).
- Winter habitat to be temporarily disturbed during dry conditions is 0.64 hectares.
- Total area of new wetland (retention basin) system to be created is 1.36 hectares.
- Total wetland area within the study area post construction will be 2.16 hectares.

Table A3.2 Sloane's Froglet - assessment against Significant Impact Criteria

Significant Impact Criteria	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely, provided mitigation measures are successful	Sloane's Froglet was recorded throughout the study area in both constructed and natural permanent and seasonal water bodies. The construction of the retention basin will require disturbance to 0.65 hectares of existing habitat for this species. This includes 0.1 hectares of summer refuge habitat in the form of a farm dam and 0.64 hectares of winter breeding habitat in the form of seasonally inundated wet areas. Construction is scheduled to occur in summer when frogs, for the most part, should have moved out of seasonally inundated wet areas. However, dewatering and construction at the site of the southern farm dam is likely to result in localised mortality and removal of habitat during the construction period. This is likely to lead to a short-term decrease in the size of the population present in the retention basin area as the constructed wetlands will take several years to become suitable habitat for the species. If the constructed wetland fails to be recolonised by Sloane's Froglet it is possible a long-term decrease in the site population would occur. However, there is evidence of the success of retention basins built to the Spiire standards being successfully colonised by Sloane's Froglet in Thurgoona. In a broader population context, the site is part of the connected population present between Kerr Road and Table Top Road. This broader population is unlikely to experience a long-term decline as a result of the proposed retention basin development. Provided ongoing monitoring demonstrates overall success of the habitat creation it is unlikely that the development would lead to a long-term decline.

Significant Impact Criteria	Likelihood of significant impact	Justification
Reduce the area of occupancy of the species	Unlikely, provided mitigation measures are successful	Currently 1.45 hectares of Sloane's Froglet habitat is present at the site of the proposed retention basin. This habitat within the study area and the extensive habitat between Table Top Road and Kerr Road supports a large population of Sloane's Froglet. During construction this habitat will be reduced by 0.65 hectares and this reduction includes summer refuge habitat (0.1 hectares) and winter breeding habitat (0.64 hectares). Post construction it is expected that the site will provide 2.16 hectares of suitable habitat including 1.36 hectares of additional summer refuge habitat (permanent water). This net gain in habitat area is contingent on the constructed wetland being successfully colonised by Sloane's Froglet and if this does not occur it is possible the area of occupancy for the species at this site will be reduced. However, there is evidence of the success of retention basins built to the Spiire standards being successfully colonised by Sloane's Froglet in Thurgoona. Provided ongoing monitoring demonstrates overall success of the habitat creation it is unlikely that the development would lead to an overall reduction in the area of occupancy of the species.
Fragment an existing population into two or more populations	Unlikely, provided mitigation measures are successful	Construction of the retention basin is scheduled to occur in summer when Sloane's Froglet will have, for the most part, retracted to summer refuge habitat. The proposed development is unlikely to fragment an existing population during the construction period as this species will not be dispersing during summer. It is intended to overcome longer term fragmentation by re-instating physical and hydrological connectivity between the retained northern dam and the southern part of the site. If the constructed wetland does not become suitable habitat, there is a possibility of population fragmentation occurring. However, there is evidence of the success of retention basins built to the Spiire standards being successfully colonised by Sloane's Froglet in Thurgoona. Provided ongoing monitoring demonstrates overall success of the habitat creation it is unlikely that the development would lead to an overall fragmentation of populations within the area.

Significant Impact Criteria	Likelihood of significant impact	Justification
Adversely affect habitat critical to the survival of the species	Unlikely	The Thurgoona population is recognised as an important population and along with the Corowa population is considered one of the strongholds of the species in NSW. Knight (2014) outlines the importance of a matrix of wetland types and sizes with suitable drainage lines and wet areas connecting these refuge habitats. With this matrix system in mind, the habitat present between Table Top Road and Kerr Road is highly suitable and is likely to be critical to the species persistence in the area as it contains a system of dams, wetlands and shallow aquatic habitats that extends in all directions. The retention basin is situated in the middle of this highly suitable matrix and construction activities will temporarily affect site-level habitat. Although there is some risk to the site population mainly related to the constructed wetlands not being recolonised, it is unlikely that habitat critical to the survival of the species more broadly in the Thurgoona area would be significantly impacted.
Disrupt the breeding cycle of a population	Unlikely, provided mitigation measures are successful	Construction activities will occur in dry periods during summer-early Autumn when Sloane's Froglet have, for the most part, contracted back to summer refuge habitat. It is intended that the constructed wetlands will provide breeding habitat but these wetlands may not become suitable for several years so there is a possibility that the site population's breeding cycle will be disrupted in the short term. However, this site level disruption of the breeding cycle is expected to be temporary and provided habitat creation is successful will not continue over multiple breeding seasons.

Significant Impact Criteria	Likelihood of significant impact	Justification
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely, provided mitigation measures are successful	Currently 1.45 hectares of Sloane's Froglet habitat is present at the site of the proposed retention basin. During construction this habitat will be reduced by 0.65 hectares and this reduction includes winter breeding habitat and summer refuge habitat. Post construction it is expected that the site will provide 2.16 hectares of suitable habitat including 1.36 hectares of additional summer refuge habitat (permanent water). If the constructed wetlands are successfully colonised by Sloane's Froglet, it is unlikely this temporary reduction in habitat will lead to a broader species decline, particularly as there will be large areas of suitable habitat available for this species throughout the Thurgoona area during construction. If the constructed wetland does not become suitable habitat, there is a possibility of the site population declining. However, there is evidence of the success of retention basins built to the Spiire standards being successfully colonised by Sloane's Froglet in the Thurgoona. Provided ongoing monitoring demonstrates overall success of the habitat creation it is unlikely that the development would lead to an overall species decline in the area.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The proposed action will not 'open up' habitat that was previously inaccessible to invasive species and as such is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to Sloane's Froglet.
Introduce disease that may cause the species to decline	Unlikely	While <i>Crinia</i> species are thought to be less susceptible to chytrid fungus (Brannelly <i>et al</i> 2017) the risk of introduction of pathogens including chytrid fungus is high and strict vehicle and contractor protocols will need to be developed. These process should be documented in the project's Construction Environmental Management Plan and will need to be monitored and enforced by the project manager. All wet areas, farm dams and wetlands outside the construction footprint should be fenced and bunted off to reduce the risk of persons or vehicles entering these areas and spreading chytrid fungus. Provided these measures are implemented and enforced, the risk of introducing a disease that may cause the species to decline is unlikely.

Significant Impact Criteria	Likelihood of significant impact	Justification
Interfere with the recovery of a species	Unlikely	A national recovery plan for the Sloane's Froglet has not been prepared. However, the Thurgoona population of Sloane's Froglet is likely to be important in the species overall recovery. Provided the avoidance measures outlined above are adhered to the impacts to the broader Thurgoona population can be minimised and given the ultimate aim of creating additional permanent habitat the project is unlikely to interfere with the recovery of the species.

Conclusions for Sloane's Froglet

Sloane's Froglet was recorded in large numbers within the study area during targeted surveys for this species. The intention of the development is to create a retention basin (constructed wetlands) in accordance with the Sloane's Froglet stormwater wetland design guidelines. Development of the retention basin to these guidelines is likely to create additional permanent habitat at the site than was present prior to construction. However, construction of the retention basin within an area known to support a large population of Sloane's Froglet is likely to result in direct impacts including mortality, disturbance and temporary loss of habitat during construction. There is also some risk that the constructed wetlands will not be recolonised by Sloane's Froglet and if this eventuates the project could lead to a site-level population decline and habitat fragmentation. However, there is evidence of the success of retention basins built to the Spiire standards being successfully colonised by Sloane's Froglet in the Thurgoona. Due to the possibility of some level of impact during the construction and post-construction phase, it is recommended that the project be referred for assessment under the EPBC Act and we understand it is the intention of Kensington Gardens to make a referral in the near future.