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Flora and Fauna Assessment

Lot 1 DP // 1069961, 14 Hamilton Road, Albion Park, NSW

Flora and Fauna Assessment

Prepared for: 14 Hamilton Pty Ltd

9 October 2020 Version: 1.0 – Final

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Glossary and abbreviations

Acronym	Description
BC Act	NSW *Biodiversity Conservation Act 2016*
CEMP	Construction Environmental Management Plan
DA	Development Application
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ha	Hectares
HBT	Hollow Bearing Tree
LEP	Local Environmental Plan
LGA	Local Government Area
masl	metres above sea level
MNES	Matters of National Environmental Significance
SLEP	Shellharbour Local Environmental Plan 2013
TEC	Threatened Ecological Community, listed as vulnerable, endangered or critically endangered under either the BC Act of the EPBC Act
ToB	Top of Bank
VMP	Vegetation Management Plan
WM Act	Water Management Act 2000
WoNS	Weeds of National Significance
*	Denotes exotic species

1 Introduction

1.1 Purpose of report and legislative context

This Flora and Fauna Assessment has been undertaken for a proposed seniors housing development at Lot 1 // DP 1069961 (14 Hamilton Road, Albion Park, NSW). The purpose of this report is to identify and assess the flora and fauna within the study area, the potential ecological values and constraints that may affect the subdivision and future development, and the likely impacts of the current proposal. This report addresses the legislative context provided in **Table 1.1**, and the proposal is to be assessed under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). These investigations will be used to inform a development application (DA) being prepared for the proposed works.

Table 1.1: Legislative framework addressed in this report.

Instrument	Considerations	Context
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Matters of National Environmental Significance	An action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.
State (New South Wales)		
Biosecurity Act 2015	Priority weeds	Describes the state and regional priorities for weeds in New South Wales.
Environmental Planning and Assessment Act 1979 (EP&A Act)	Part 4	Includes the planning framework for this proposed development.
Biodiversity Conservation Act 2016 (BC Act)	Part 7.3	Assessment of the potential for an action or activity to have a significant effect on threatened species, populations or ecological communities, or their habitats.
Water Management Act 2000	Clause 91	Controlled activity approvals for waterfront land
Local (Shellharbour City)		
Shellharbour Local Environmental Plan 2013	Part 1, Clause 1.3	Land within the study area is mapped 'Environmentally Sensitive Land – Terrestrial Biodiversity'

1.2 Site description

Following the *Threatened Species Test of Significance Guidelines* (OEH 2018) the ***subject site*** is defined as the area 'directly impacted upon by the proposal', and includes all vegetation proposed to be removed following approval of the subdivision and future development. The ***study area*** is defined as the subject site and all areas that are indirectly impacted upon by the proposal. For the purposes of this report, the study area is defined by boundaries of Lot 1 // DP 1069961 (14 Hamilton Road, Albion Park, NSW) (**Figure 1.1**).

The study area is in the Shellharbour City Council (SCC) Local Government Area (LGA) and is currently zoned RU6 Transition, a rural zone under Shellharbour Local Environmental Plan (2013). The study area is approximately 300 m north of the Albion Park main street and is accessed off Hamilton Road. The area is bounded by industrial land to the east, Macquarie Rivulet to the north, residential land to the west and a currently unused, partly cleared lot to the south.

The study area is largely cleared and has recently been used for grazing of horses. Only a few scattered trees exist across the paddocks as well as garden plantings associated with an existing dwelling. The riparian area along Macquarie Rivulet, which is immediately north of the study area, has a somewhat intact canopy. However, the understory is extremely degraded and infested with weeds and exotic plants. The northern boundary of the study area marks a clear divide between the paddock and creek vegetation.

1.2.1 Locality

Unless otherwise stated, the locality is described as the area within 5 km of the study area. The locality includes land that is predominantly RU1 (Primary Production), R2 (Low Density Residential), with E3 (Environmental Management) on the escarpment to the south-west. Native vegetation accounts for 25.5% of the locality area, mostly occurring along the escarpment and in fragmented patches. A large portion of the locality has been cleared extensively for rural and urban development (**Figure 1.2**).

1.3 Description of the proposed development

The proposed development consists of 39 self-contained dwellings. The proposed works will also include new access roads, sewage, and drainage infrastructure. An Asset Protection Zone (APZ) with an access track and turning facility has been included as part of the subject site and is based on a bushfire constraints analysis (Peterson Bushfire 2020). The APZ has been considered as part of the subject site. The proposed development is shown in **Figure** 1.3.

Figure 1.1: Study area and subject site

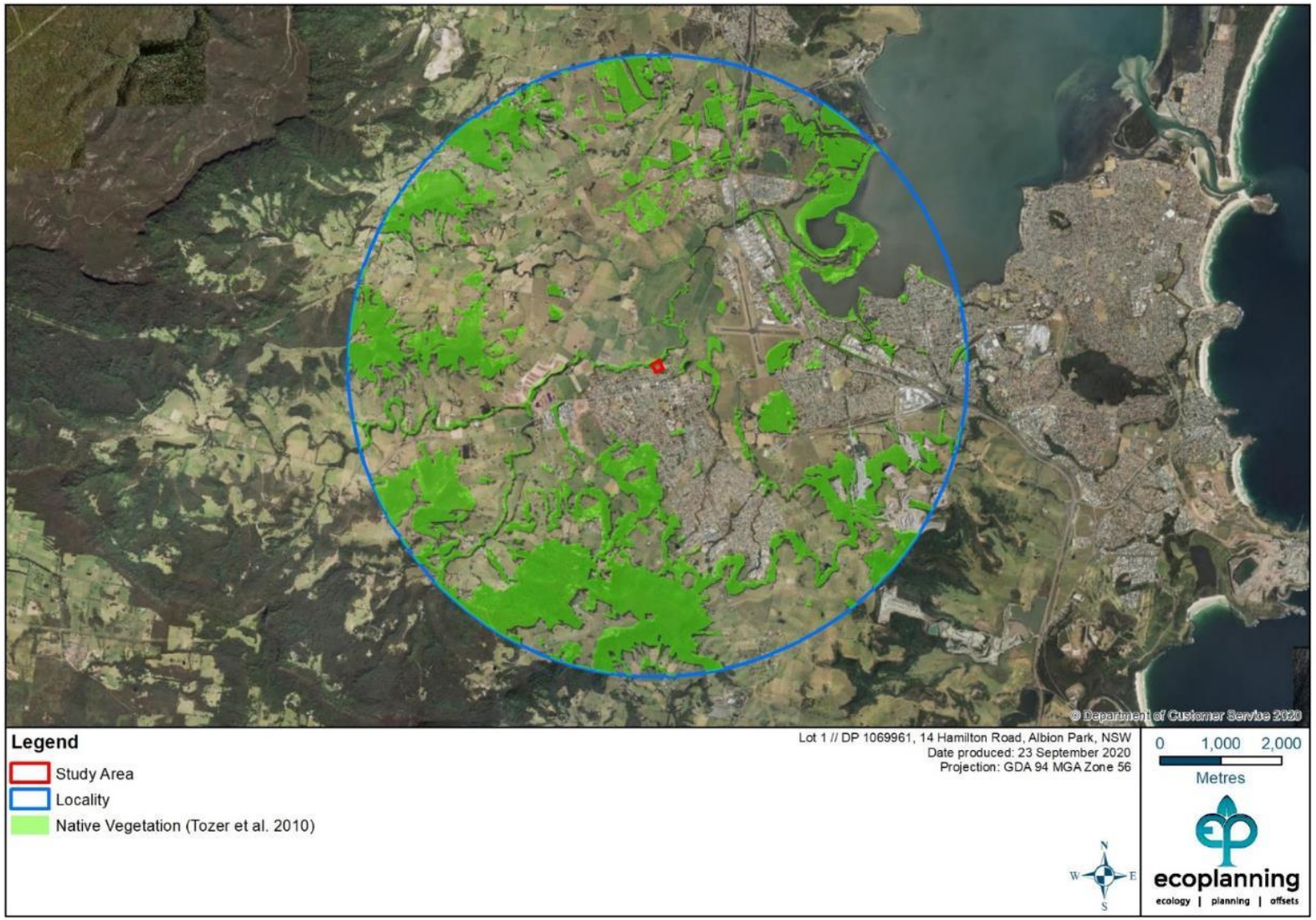

Figure 1.2: Native vegetation in the locality

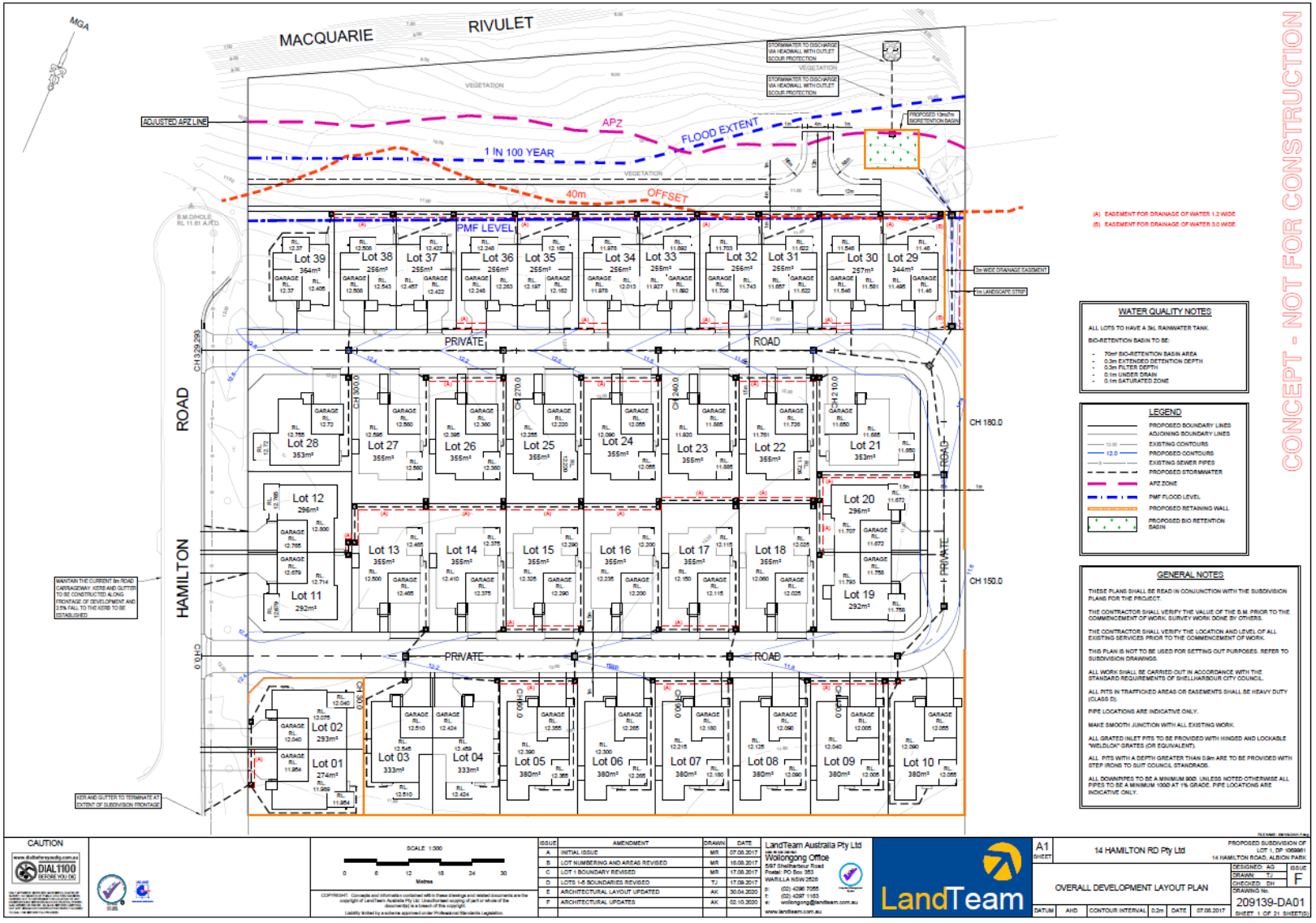

Figure 1.3: Proposed development (supplied by LandTeam 2/10/2020)

2 Methods

2.1 Literature and database review

A site-specific literature and database review were undertaken prior to field survey and report preparation. This included desktop analysis of aerial photography and regional scale information from the following sources:

- NSW Planning Portal (DPIE 2020)
- SIX Maps (LPI 2020)
- BioNet Atlas (DPIE 2020a)
- Biodiversity Values Map (DPIE 2020b)
- Protected Matters Search Tool (DAWE 2020)
- Southeast NSW Native Vegetation Classification and Mapping - SCIVI. VIS_ID 2230 (DPIE 2010)
- South East Local Land Services Biometric vegetation map, 2014. VIS_ID 4211 (DPIE 2015)

Polices and Guidelines relating to the proposal:

- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- Significant Impact Guidelines 1.2 - Matters of National Environmental Significance (DAWE 2013)
- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Biodiversity Conservation Act 2016 (BC Act)
- Threatened Species Test of Significance Guidelines (OEH 2018)
- Water Management Act 2000 (WM Act)
- Shellharbour Local Environmental Plan (SLEP 2013)

The potential for threatened species, populations and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field survey and review of available habitat within the study area, the potential for species to utilise the site and to be affected directly or indirectly by the proposal were considered as either:

- “Recent record” = Species has been recorded in the study area within the past 5 years
- “High” = Species has previously been recorded in the study area (>5 years ago) or in proximity to (for mobile species), and/or habitat is present that is likely to be used by a local population
- “Moderate” = Suitable habitat for a species is present onsite but no evidence of a species detected and relatively high numbers of recent records (5-20 years) in the locality or species highly mobile
- “Low” = Suitable habitat species for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- “Not present” = suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

2.2 Field Survey

A field survey was undertaken on 23 September 2020 by Dr John Gollan (Senior Ecologist, Ecoplanning) and Joel Nicholson (Ecologist, Ecoplanning). This survey included a general flora and fauna habitat and vegetation community assessment. Weather conditions during the site assessment were warm and overcast, with rainfall occurring in the prior 24 hours (**Table 2.1**)

Table 2.1: Daily weather observations (BoM 2020).

Date	Temp (°C)		Rainfall (mm)	Max wind gust	
	Min	Max		Direction	Speed (km/h)
23/09/2020	11.8	22.3	0	WSW	63

Because the development had the potential to impact on 'Waterfront land' i.e. land including the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary (NRAR 2018), the top of bank (ToB) was mapped by Dr John Gollan on 15 June 2020. This was done by walking whilst carrying a handheld GPS unit. The record function on the unit was used to plot the walked path. Coordinates and a photograph (taken in the direction of downstream) were also taken at approximately every 30 m along the walked path. The recorded track and points were plotted on a Geographical Information System and a smoothed, best-fit line relating to the recorded track and fixed points was used to identify the ToB. A 40 m buffer was then applied to determine the extent of waterfront land.

In order to assess the condition of the riparian area, a Rapid Riparian Assessment (RRA) was conducted. The method for the RRA follows that developed by Findlay et al (2011), which is a rapid assessment approach that was designed to assess condition across urban stream networks. In summary, the method involves scoring a set of riparian and stream features, which are then totalled and categorised into six groups: 'Excellent', 'Good', 'Fair', 'Poor', 'Very Poor' or 'Severely Degraded'. The tool was originally developed by Ku-ring-gai Council, Sydney, to aid environmental decision making and since then has been applied to LGAs across the Sydney Basin (e.g. McDean and Tippler 2016). Knowledge of stream condition prior to future development allows management to guide rehabilitation and remediation, and/or assess the impact of development and the efficacy of management interventions. The RRA method requires a 'start' point and assesses features downstream from this point, and within a 50 × 50 m area.

2.2.1 Vegetation communities and flora

Field survey involved traversing the study area, whilst recording all visible flora species and identifying potential habitat for threatened flora species.

Field survey was undertaken to validate the regional vegetation mapping of DPIE (2010, 2015) and to prescribe Plant Community Types (PCT). Vegetation communities were checked against described Threatened Ecological Communities (TEC) listed under either the EPBC Act or the BC Act.

Nomenclature follows the Flora of NSW (Harden 1990-2002) and updates provided in PlantNET (RBGDT 2020).

2.2.2 Fauna and fauna habitat

Opportunistic fauna survey was undertaken which included opportunistic observations, along with searches for signs of direct and indirect occupancy (i.e. scats, owl pellets, fur, bones, tracks, bark scratches, foliage chew marks and chewed cones of *Allocasuarina* spp. or *Pinus* spp. as well as some of the other cultivars known to be used by native fauna). Fauna habitat searches were conducted for potential foraging, roosting, breeding, or nesting habitat of nocturnal and diurnal species. This includes inspection for the presence of tree hollows, stags, bird nests, possum dreys, decorticating bark, rock shelters, rock outcrops / crevices, mature / old growth trees, food trees (*Banksia* spp., *Allocasuarina* spp., and winter-flowering eucalypts), culverts, dens, dams, riparian areas and refuge habitats of man-made structures.

Primary sources of literature accessed for species nomenclature were:

- Birds - Christidis and Boles (2008)
- Mammals - Van Dyck and Strahan (2008)
- Reptiles and amphibians - Cogger (2014)

2.3 Survey limitations

The flora survey aimed to record as many species as possible. However, a definitive list of the flora within the study area cannot be gathered without systematic traverses and survey across several seasons. Additional species would be recorded during a longer survey over various seasons. However, the techniques used in this investigation are considered adequate to gather the data necessary to validate the vegetation communities and vegetation condition in the study area and subject site and assess the likelihood of occurrence of any threatened flora species.

A full fauna survey following *Threatened Species Survey and Assessment Guidelines* (OEH 2018) was not undertaken as sufficient detail to determine the likelihood of occurrence of threatened and migratory species for the purpose of this report was achieved through a targeted survey and a habitat assessment undertaken during the field survey

3 Results

3.1 Literature and database review

3.1.1 Topography, drainage, soils, biodiversity mapping

Topography and drainage

The subject site is approximately 12 masl and slopes gently from the southeastern corner towards Macquarie Rivulet, which is adjacent to the northwestern boundary of the study area. Macquarie Rivulet is a 5th-order Strahler stream, and flows in a northeasterly direction where it empties into Lake Illawarra around 4 km from the study area. There are no identified streams in the subject site or study area.

Soils

There are two soil landscapes identified in the study area and subject site: Albion Park (ap) and Fairy Meadow (fm). Hazelton (1992) describes the Albion Park soil landscape as having soloth soil on footslopes and in drainage lines. The vegetation is extensively cleared with some remnants of tall open-forest. Limitations include waterlogging, shrink-swell and high available water-holding capacity.

Hazelton (1992) describes the Fairy Meadow soil landscape as being found on alluvial plains, floodplains and valley flats and terraces below the Illawarra Escarpment. Soils are moderately deep with limitations being flood hazard, high permeable topsoils and high watertables. Like the Albion Park soil landscape, the vegetation has been almost completely cleared except for some isolated stands of low open-forest and woodland.

Biodiversity mapping

A small area of the northeastern corner of the study area is mapped on the Biodiversity Values (BV) Map. The subject site, however, is not mapped on the BV Map and so no further consideration is necessary.

The northern boundary of the study area and parts of the subject site are identified as “Environmentally Sensitive Land” on the Terrestrial Biodiversity Map (SLEP 2013).

None of the study area, including the subject site is included on the Koala Development Application Map, and so no further consideration is necessary.

Topography, soils and biodiversity mapping is shown in **Figure 3.1**.

3.1.2 Threatened species, populations and migratory species

A search of the relevant databases and literature identified 42 threatened or migratory species within 5 km of the subject site, including 10 threatened flora species and 32 threatened or migratory fauna species (22 birds, eight microbats, one megabat, and one arboreal mammal).

Following the site inspection, the likelihood of occurrence analysis revealed that none of the threatened species would have a ‘moderate’ or high likelihood to use the subject site (**Appendix A**). The subject site is extremely degraded and disturbed, and cleared of native

vegetation other than what has been planted in garden beds surrounding the existing dwelling. There are no hollow bearing trees in the subject site.

3.1.3 Vegetation and threatened ecological communities

Regional vegetation mapping (DPIE 2010) and more recent mapping using Plant Community Types (PCTs) by DPIE (2015) revealed that the subject site has been cleared of native vegetation and that it does not contain a prescribed plant community. This is the case for nearly all of the study area, with the exception of the north-eastern and north-western corners which have been mapped by DPIE (2010) as containing a small area of Riparian River Oak Forest (MU37) (**Figure 3.2**) and Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion (PCT1234) by DPIE (2015) (**Figure 3.3**). The latter community is a component of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, which is an Endangered Ecological Community under the BC Act.

3.2 Field survey

Top of Bank Mapping and Rapid Riparian Assessment

Figure 3.4 shows the mapped ToB with a 40 m buffer and shows that part of the subject site is on waterfront land.

The Rapid Riparian Assessment found a heavily degraded riparian corridor infested with the exotic vine *Cardiospermum grandiflorum** (Balloon Vine), and other exotic shrubs and herbs including *Ricinus communis** (Castor Oil Plant), *Lantana camara** (Lantana), *Solanum mauritianum** (Wild Tobacco Bush), *Tropaeolum majus** (Nasturtium), *Bidens pilosa** (Cobblers Pegs) and *Tradescantia fluminensis** (Trad). In some places, the Lantana was almost impenetrable. There were two species of native trees present (*Casuarina cunninghamiana* and *Ficus coronata*), but there were no native shrubs or low growing native plants. Most of the individual trees were choked with Balloon Vine (**Figure 3.5** and **Figure** 3.6).

The diversity within the channel itself was low in terms of bed features, with only a small section of riffle sequences near the beginning of the assessment area. The remainder of the channel was a fairly straight section with a deep pool. There were small gravel bars at several points, however, they did not appear to cause constriction. The water was clear and flowing, indicating the absence of visible pollutants at the time of assessment. The lack of odours also suggested a lack of invisible pollutants. The banks appeared stable and while bare ground was present, there was no bedrock exposure nor undercutting. There were a number of knickpoints that were supported by vegetation. Bank slumping was not observed, but this erosional feature could be obscured by the high density of weeds. The summation of scores for individual riparian and stream features concluded that this section of the Macquarie Rivulet is in a 'Poor' condition (Category score = 11).

3.2.1 Vegetation communities

The field survey confirmed the vegetation mapping of DPIE (2010, 2015) in that the subject site was completely absent of native vegetation communities. Around the dwelling, garden beds were planted with a variety of ornamental specimens including *Phoenix canariensis**

(Canary Island Date Palm), *Strelitzia reginae** (Bird of Paradise) and *Jacaranda mimosifolia** (Jacaranda). The only native species identified were *Alphitonia excelsa* (Red Ash), *Brachychiton acerifolius* (Illawarra Flametree) and *Callistemon viminalis* (Weeping Bottlebrush). The remaining area of the subject site is a paddock, dominated by a variety of lawn and pasture grasses and weeds such as *Anthoxanthum odoratum** (Sweet Vernal Grass), *Ehrharta erecta** (Panic Veldgrass), *Hypochaeris radicata** (Catsear), *Bromus cartharticus** and *Plantago lanceolata** (Lamb's Tongues). *Cenchrus clandestinus** (Kikuyu) was the most dominant, accounting for around 95% of the cover.

In the study area, and in the northeastern portion that had been mapped by DPIE (2015) as Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion (PCT1234), the only native tree present was *Casuarina cunninghamiana* (River Oak). Given its dominance and the absence of *Casuarina glauca* (Swamp Oak), which is a diagnostic species of PCT1234, it was considered that the vegetation was more similar to *River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion* (PCT1105). The presence of *Ficus coronata* (Sandpaper Fig) in the riparian corridor, which is also a diagnostic species of PCT1105, further supported the presence of PCT1105. The understory and ground layer vegetation could not assist in assigning a vegetation community as it was infested with weeds such as *Lantana camara*, Solanum mauritianum** (Wild Tobacco) and *Ricinus communis** (Castor Oil Plant). Much of the canopy and mid story was also choked with the exotic climber, *Cardiospermum grandiflora** (Balloon Vine).

River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion (PCT1105) does not form part of any TEC listed under the BC Act or the EPBC Act.

3.2.2 Flora

A total of 56 species were recorded in the subject site during the site inspection (five natives and 51 exotics). A species list is provided in **Appendix B**.

Four priority weed species for the NSW South East were recorded within the subject site. All four weeds are also Weeds of National Significance.

Table 3.1: Priority weeds and Weeds of National Significance (WONS).

Common Name	Scientific Name	WoNS	Duty
Lantana	*Lantana camara**	Y	**Mandatory Measure** Must not be imported into the State or sold
Blackberry	*Rubus fruticosus* species aggregate*	Y	
Fireweed	*Senecio madagascariensis**	Y	
Madeira Vine	*Anredera cordifolia**	Y	

3.2.3 Fauna species and habitat

A total of four fauna species were identified within the site during the site survey. A species list is included in **Appendix B**.

There were no threatened fauna species identified within the subject site and it is not considered to provide any important habitat for threatened fauna.

Figure 3.1: Topography, soils and biodiversity mapping

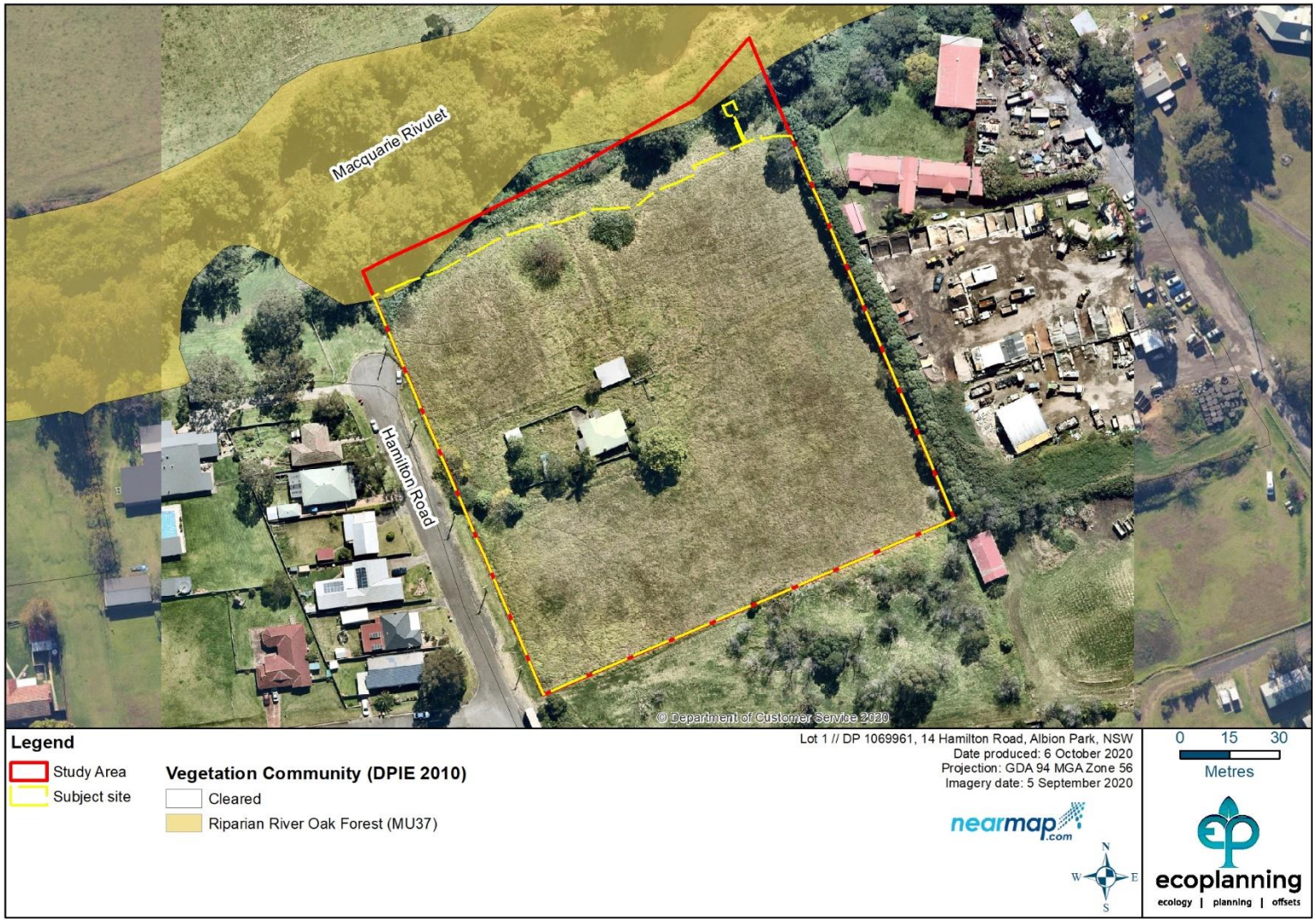

Figure 3.2: Native vegetation mapping (DPIE 2010)

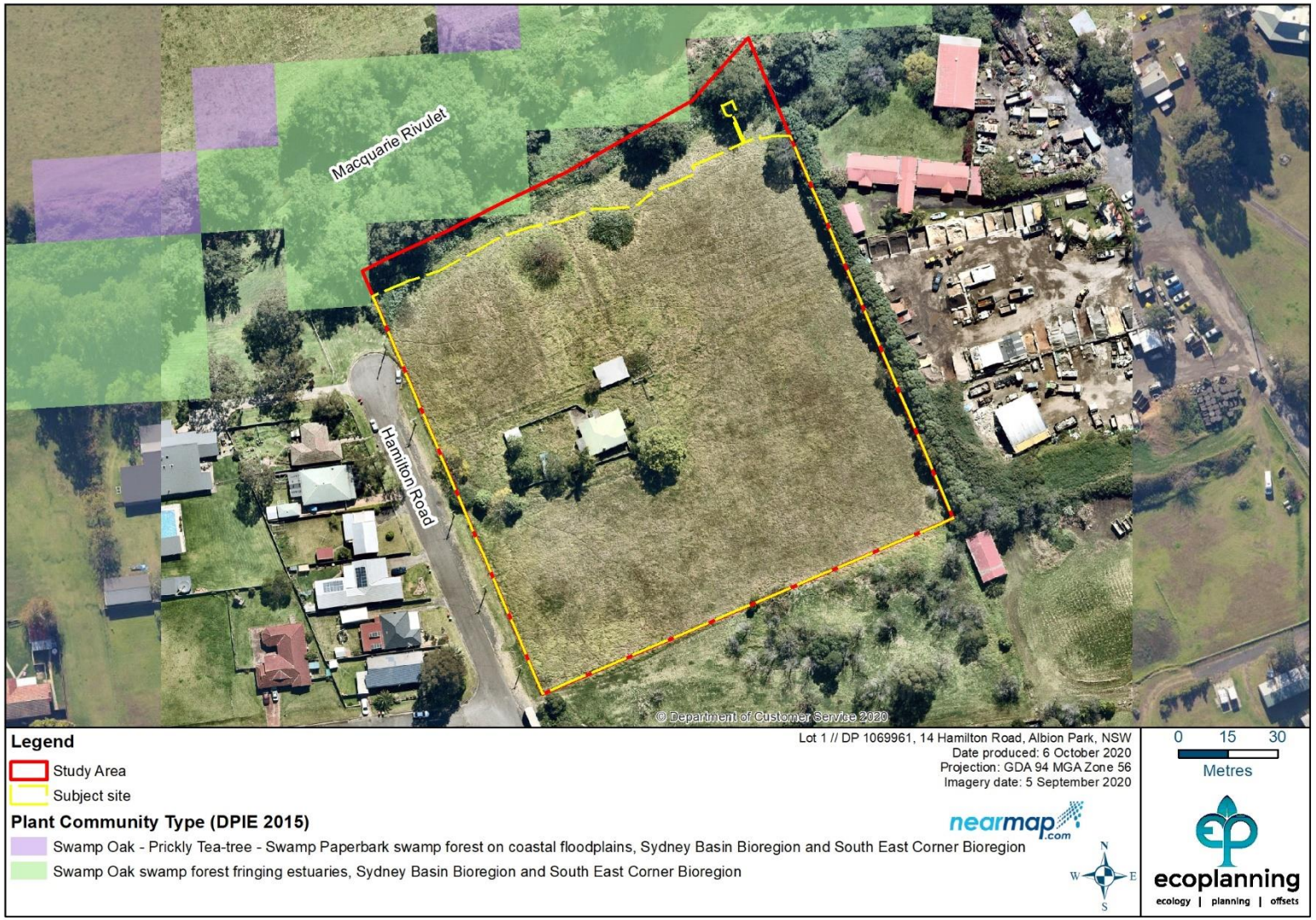

Figure 3.3: Native vegetation mapping (DPIE 2015)

Figure 3.4: Mapped Top of Bank with 40 m buffer

Figure 3.5: Riparian zone showing *Casuarina cunninghamiana* with weed infested understory

Figure 3.6: Riparian zone showing *Casuarina cunninghamiana* with weed infested understory

4 Impact Assessment

The development is located entirely on exotic pasture with ornamentals planted in the gardens of the existing dwelling. The development will not directly impact on the native vegetation outside the subject site. The proposed development therefore has successfully implemented the avoidance principle in accordance with the BC Act.

4.1 Direct impacts

The direct impact imposed by future development will only occur to the exotic pastures which includes paddock trees consisting of *Erythrina x sykesii* (Coral Tree) and garden ornamentals, the majority of which are exotic species. There are two native species (three individuals) planted in the vicinity of the dwelling: *Alphitonia excelsa* (Red Ash) and *Brachychiton acerifolius* (Illawarra Flame Tree). These are not listed as threatened species.

4.1.1 Vegetation clearing

Impacts to vegetation are anticipated through the clearing of a total of 1.74 ha. Direct impacts are confined to the subject site only, which consists of exotic pasture, weeds and ornamental plants that are part of garden beds.

4.1.2 Loss of fauna habitat

The subject site does not provide habitat for threatened species and therefore there is unlikely to be any impact to listed threatened flora, fauna or ecological communities. There are two native species (three individuals) planted in the vicinity of the dwelling: *Alphitonia excelsa* (Red Ash) and *Brachychiton acerifolius* (Illawarra Flame Tree). While they may provide some habitat and feed for native animals at various times of the year, the loss of these is unlikely to affect threatened species.

4.1.3 Waterfront land

Part of the subject site, which includes the APZ, approximately half of the access track and all of the bioretention basin and stormwater discharge area, is on waterfront land (**Figure 4.2**). Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary (NRAR 2018). Therefore, the proposal constitutes a controlled activity regulated by the Water Management Act 2000 (WM Act).

The Natural Resources Access Regulator (NRAR) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. To preserve the integrity of riparian corridors, the NRAR recommends a vegetated riparian zone (VRZ) width based on watercourse order. A VRZ is to be enacted through a Vegetation Management Plan (**Section 4.3.3**).

4.2 Indirect impacts

It is difficult to quantify indirect impacts of the proposal, but these may include impacts such as erosion and runoff that may be associated with the construction phase of the project.

The project is also considered unlikely to impact adjacent native vegetation or habitat due to edge effects, noise, dust or light spill, or disturbance to breeding habitats, provided the suggested management measures are implemented.

4.3 Avoidance and mitigation

4.3.1 Vegetation clearing

The following avoidance and mitigation measures are recommended to minimise potential impacts to threatened species and native vegetation on the site:

- any exotic biomass cleared within the subject site will be removed from the study area and disposed of at an approved facility.
- erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the study area has been stabilised to prevent off-site transport of eroded sediments.
- landscaping works should not include environmental or known weedy species.

4.3.2 Construction Environmental Management Plan (CEMP)

To avoid potential indirect offsite impact during any construction, an appropriate erosion and sedimentation control plan (ESCP) should be in place following best practice protocols, such as those detailed in Landcom (2004). These control measures should be established before work begins, maintained throughout the works and kept in place until the impact area has been stabilised. Any areas of bare soil created as part of the proposed works should be stabilised as soon as practicable to avoid off-site transport of eroded sediments into Macquarie Rivulet.

It is recommended that the ESCP is included in a site-specific Construction Environmental Management Plan (CEMP) (that includes tree clearing), prior to any construction works taking place.

4.3.3 Vegetation Management Plan (VMP)

As parts of the subject site is on waterfront land (**Figure 4.2**), a controlled activity approval will be required from the NSW Natural Resources Asset Regulator (NRAR).

The NRAR recommends a vegetated riparian zone (VRZ) width based on watercourse order as classified under the Strahler system of ordering watercourses and using Hydroline Spatial Data which is published on the department's website (NSW DPIE 2018). Given this, the VRZ for the proposal is 40 m, measured from the top of bank.

A Vegetation Management Plan (VMP) is to include the impacted riparian corridor. The VMP should aim to:

- improve bed and bank stability and reducing bank and channel erosion
- protect water quality by trapping sediment, nutrients and other contaminants
- provide diversity of habitat for terrestrial, riparian and aquatic plants (flora) and animals (fauna)
- reduce the cover and abundance of weed species
- provide connectivity between wildlife habitats, and

- convey flood flows and controlling the direction of flood flows

A VMP will also address the potential impacts to the 'Environmentally Sensitive Land' as identified in the Shellharbour LEP (2013) (**Figure 4.3**). Even though the proposed development is likely to have a negligible impact, a VMP will not only mitigate unforeseen impacts, but enhance the ecological condition of the already highly degraded riparian corridor.

4.4 Legislative context

4.4.1 Commonwealth listings

There were no threatened flora/fauna and migratory species assessed as having a 'moderate' or 'high' likelihood of occurring within the subject site. As such, a Referral to the Commonwealth Minister is not required.

4.4.2 State listings

Biodiversity Conservation Act 2016

The Biodiversity Offset Scheme is not triggered because none of the subject site is identified on the Biodiversity Values Map (OEH 2020) and the clearing of native vegetation is below the clearing threshold for the minimum lot size.

Threatened species 'test of significance' were not undertaken as there were no threatened flora/fauna and migratory species assessed as having a 'moderate' or 'high' likelihood of occurring within the subject site. The only native vegetation to be removed is part of ornamental plantings. There are no hollow bearing trees, further reducing the likelihood of threatened species utilising the site.

Water Management Act 2000

The Natural Resources Access Regulator (NRAR) administers the *Water Management Act 2000* (WM Act) and is required to assess the impact of any activity proposed for waterfront land (called a controlled activity) to minimise the harm done to waterfront land as a result of the work. Since the subject site is on waterfront land, a controlled activity approval from the NRAR must be obtained before commencing. A VMP (see **Section 4.3.3**) is to address the requirements of the recommended vegetated riparian zone to establish and preserve the integrity of the riparian corridor.

4.4.3 Local listings

Shellharbour Local Environmental Plan (2013)

Part 6.5 Terrestrial biodiversity

This clause applies to land identified as "Environmentally Sensitive Land" on the Terrestrial Biodiversity Map (**Figure 3.1** and **Figure 4.3**).

As set out in the Shellharbour LEP (2013), the objective of this clause is to maintain terrestrial biodiversity by—

(a) protecting native fauna and flora, and

(b) protecting the ecological processes necessary for their continued existence, and

(c) encouraging the conservation and recovery of native fauna and flora and their habitats.

The proposed development has been designed and sited on already disturbed and highly degraded land, and thus it is not likely to have further negative impacts to native vegetation, threatened species or their habitat. A Vegetation Management Plan (VMP) will not only mitigate unforeseen impacts but enhance the ecological condition of the already highly degraded riparian corridor. As described in **Section 3.2**, the riparian corridor is in poor condition and infested with the exotic vine, *Cardiospermum grandiflorum** (Balloon Vine), and other exotic shrubs and herbs including *Ricinus communis** (Castor Oil Plant), *Lantana camara** (Lantana), *Solanum mauritianum** (Wild Tobacco Bush), *Trapaeolum majus** (Nasturtium), *Bidens pilosa** (Cobblers Pegs) and *Tradescantia fluminensis** (Trad). Lantana is extremely dense in places and Balloon Vine has formed think curtains of stems amongst the canopy of the native River Oak. A VMP will go towards meeting the three objectives of the Shellharbour LEP (2013) (see **Section 4.3.3**).

Figure 4.1: Proposed lot layout

Figure 4.2: Waterfront land in relation to proposed development

Figure 4.3: 'Environmentally Sensitive Land' (SLEP 2013) in relation to proposed development

5 Conclusions and recommendations

This Flora and Fauna Assessment has been undertaken for a proposed seniors housing development at Lot 1 // DP 1069961 (14 Hamilton Road, Albion Park, NSW) ('the study area'). The proposed development consists of 39 self-contained dwellings and includes new access roads, sewerage and drainage infrastructure. An Asset Protection Zone (APZ) with an access track and turning facility has also been included as part of the subject site. A dwelling surrounded by a paddock currently occupies the subject site. Adjacent to the north of the study area is Macquarie Rivulet, a 4th-order Strahler stream.

A database search of threatened species records found no threatened species or populations within the study area and a desktop review using vegetation mapping found that the subject site does not support a prescribed native vegetation community. A field survey confirmed this result. Around the dwelling, garden beds were planted with a variety of ornamental specimens. The paddock was dominated by a variety of lawn and pasture grasses and weeds. There were no hollow bearing trees on the subject site, further indicating that threatened fauna would be unlikely to utilise the subject site. No threatened flora were found during the field survey. Given the low likelihood that threatened species would utilise the site, it is concluded that there would negligible impacts on threatened flora, fauna or ecological communities as a result of the proposed development and therefore no threatened species 'tests of significance' were undertaken.

The proposed development is, however, on waterfront land and so requires a controlled activity approval from NRAR. The NRAR recommends a 40 m vegetated riparian zone (VRZ) to establish and preserve the integrity of the riparian corridor. The VRZ should be enacted through a Vegetation Management Plan (VMP). Since some of the subject site also coincides with "Environmentally Sensitive Land", as identified in the Shellharbour Local Environmental Plan (2013), a VMP would also enhance the ecological condition of the already highly degraded riparian corridor and thus meet the objectives for this land.

To avoid potential indirect offsite impact during construction, an appropriate erosion and sedimentation control plan (ESCP) should be in place following best practice protocols, such as those detailed in Landcom (2004). These control measures should be established before work begins, maintained throughout the works and kept in place until the impact area has been stabilised. Any areas of bare soil created as part of the proposed works should be stabilised as soon as practicable to avoid off-site transport of eroded sediments into Macquarie Rivulet.

Other avoidance and mitigation measures that address indirect impacts include:

- removal of all exotic biomass form the study area and disposal at an approved facility,
- establishment of erosion and sediment control measures before work begins and maintenance of such measures in effective working order throughout the duration of the works and until the study area has been stabilised, to prevent off-site transport of eroded sediments, and
- Avoidance of environmental or known weedy species in landscaping works.

In conclusion, the proposal is unlikely to affect threatened species, ecological communities or their habitats and any potential indirect impacts would be mitigated via a VMP in the riparian corridor that is adjacent to the site.

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Appendix A Species likelihood of occurrence

The potential for each threatened species, population and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the Subject site, the potential for species to utilise the site and be affected directly or indirectly by the proposal were considered as either:

- "Recent record" = species has been recorded in the study area within the past 5 years
- "High" = species has previously been recorded in the study area (<5 years ago) or in proximity (for mobile species), and/or habitat is present that is likely to utilised by a local population
- "Moderate" = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- "Low" = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- "Not present" = suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area.

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Animalia; CLASS: Aves						
Ardenna pacifica Wedge-tailed Shearwater	EPBC Act = J	1	4.4 km (05/10/2018)	4.4 km (05/10/2018)	Low	Low
Botaurus poiciloptilus Australasian Bittern	BC Act = E1 EPBC Act = E	1	3.6 km (07/06/2016)	3.6 km (07/06/2016)	Low	Low
Calidris acuminata Sharp-tailed Sandpiper	EPBC Act = C,J,K	20	1.2 km (28/02/2007)	4.1 km (12/03/2016)	Low	Low
Calidris melanotos Pectoral Sandpiper	EPBC Act = J,K	1	1.2 km (28/02/2007)	1.2 km (28/02/2007)	Low	Low
Circus assimilis Spotted Harrier	BC Act = V	1	1.6 km (18/10/2013)	1.6 km (18/10/2013)	Low	Low
Daphoenositta chrysoptera Varied Sittella	BC Act = V	1	1.3 km (12/10/2009)	1.3 km (12/10/2009)	Low	Low
Gallinago hardwickii Latham's Snipe	EPBC Act = J,K	11	4.1 km (04/03/2016)	4.1 km (04/03/2016)	Low	Low
Glossopsitta pusilla Little Lorikeet	BC Act = V	1	0.5 km (16/09/2014)	0.5 km (16/09/2014)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Haliaeetus leucogaster White-bellied Sea-Eagle	BC Act = V	10	4.1 km (24/06/2016)	4.1 km (24/06/2016)	Low	Low
Hieraaetus morphnoides Little Eagle	BC Act = V	2	4.1 km (24/06/2016)	4.1 km (24/06/2016)	Low	Low
Hirundapus caudacutus White-throated Needletail	EPBC Act = V,C,J,K	1	4.1 km (28/02/2016)	4.1 km (28/02/2016)	Low	Low
Hydroprogne caspia Caspian Tern	EPBC Act = J	6	4.1 km (01/01/2016)	4.1 km (01/01/2016)	Low	Low
Lathamus discolor Swift Parrot	BC Act = E1 EPBC Act = CE	1	0.2 km (22/09/2008)	0.2 km (22/09/2008)	Low	Low
Lophoictinia isura Square-tailed Kite	BC Act = V	2	4.1 km (24/06/2016)	4.1 km (24/06/2016)	Low	Low
Ninox strenua Powerful Owl	BC Act = V	1	3.3 km (14/11/2012)	3.3 km (14/11/2012)	Low	Low
Oxyura australis Blue-billed Duck	BC Act = V	37	4.1 km (24/06/2016)	4.1 km (24/06/2016)	Low	Low
Pandion cristatus Eastern Osprey	BC Act = V	14	4.1 km (31/07/2016)	4.1 km (31/07/2016)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Petroica boodang Scarlet Robin	BC Act = V	2	2.2 km (01/05/2011)	4.1 km (15/08/2015)	Low	Low
Petroica phoenicea Flame Robin	BC Act = V	1	1.5 km (11/12/2012)	1.5 km (11/12/2012)	Low	Low
Pluvialis squatarola Grey Plover	EPBC Act = C,J,K	1	3.4 km (10/08/2013)	3.4 km (10/08/2013)	Low	Low
Stictonetta naevosa Freckled Duck	BC Act = V	37	3.2 km (26/05/2003)	4.1 km (10/06/2016)	Low	Low
Tyto tenebricosa Sooty Owl	BC Act = V	1	4.6 km (19/08/2015)	4.6 km (19/08/2015)	Low	Low
KINGDOM: Animalia; CLASS: Mammalia						
Chalinolobus dwyeri Large-eared Pied Bat	BC Act = V EPBC Act = V	4	2.6 km (11/10/2018)	2.6 km (03/03/2019)	Low	Low
Falsistrellus tasmaniensis Eastern False Pipistrelle	BC Act = V	5	1.5 km (11/12/2012)	2.6 km (03/03/2019)	Low	Low
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	BC Act = V	7	1.7 km (20/02/2015)	3.9 km (09/04/2015)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Miniopterus australis Little Bent-winged Bat	BC Act = V	10	1.5 km (11/12/2012)	1.7 km (12/11/2019)	Low	Low
Miniopterus orianae oceanensis Large Bent-winged Bat	BC Act = V	10	1.3 km (12/10/2009)	1.7 km (12/11/2019)	Low	Low
Myotis macropus Southern Myotis	BC Act = V	3	2.6 km (11/10/2018)	2.6 km (03/03/2019)	Low	Low
Petaurus norfolcensis Squirrel Glider	BC Act = V	2	2 km (08/12/2018)	2 km (08/12/2018)	Low	Low
Phascolarctos cinereus Koala	BC Act = V EPBC Act = V	1	1.2 km (25/12/2014)	1.2 km (25/12/2014)	Low	Low
Pteropus poliocephalus Grey-headed Flying-fox	BC Act = V EPBC Act = V	53	0.4 km (01/01/1900)	4.4 km (23/03/2019)	Moderate	Low
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	BC Act = V	4	2.6 km (03/03/2019)	2.6 km (03/03/2019)	Low	Low
Scoteanax rueppellii Greater Broad-nosed Bat	BC Act = V	5	2.6 km (03/03/2019)	2.6 km (03/03/2019)	Low	Low
KINGDOM: Plantae						

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Chorizema parviflorum Chorizema parviflorum Benth. in the Wollongong and Shellharbour Local Government Areas	BC Act = E2	112	4.7 km (14/10/2019)	1.8 km (02/09/2014)	Low	Not present
Cynanchum elegans White-flowered Wax Plant	BC Act = E1 EPBC Act = E	15	3.5 km (05/04/2018)	1.4 km (18/10/2005)	Low	Not present
Daphnandra johnsonii Illawarra Socketwood	BC Act = E1 EPBC Act = E	17	3.7 km (30/11/2016)	3.7 km (30/11/2016)	Low	Not present
Gossia acmenoides Gossia acmenoides population in the Sydney Basin Bioregion south of the Georges River	BC Act = E2	1	2.3 km (23/04/2016)	2.3 km (23/04/2016)	Low	Not present
Irenepharsus trypherus Illawarra Irene	BC Act = E1 EPBC Act = E	7	3.5 km (17/01/2019)	1.8 km (09/11/2016)	Low	Not present
Pimelea curviflora var. curviflora	BC Act = V EPBC Act = V	18	1.7 km (16/07/2019)	1.7 km (16/07/2019)	Low	Not present
Pterostylis gibbosa Illawarra Greenhood	BC Act = E1 EPBC Act = E	145	4.1 km (14/10/2019)	1.7 km (01/11/2018)	Low	Not present
Rhodamnia rubescens Scrub Turpentine	BC Act = E4A	3	3.7 km (05/04/2018)	2.4 km (23/04/2016)	Low	Not present

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Solanum celatum	BC Act = E1	3	1.8 km (21/09/2019)	1.8 km (21/09/2019)	Low	Not present
Zieria granulata Illawarra Zieria	BC Act = E1 EPBC Act = E	32	3.8 km (26/04/2020)	1.2 km (01/09/2005)	Low	Not present

Appendix B Flora and fauna species

FLORA

Family	Scientific Name	Common name	Native/Exotic
Agavaceae	*Yucca* sp.		Exotic
Apocynaceae	*Araujia sericifera*	Moth Vine	Exotic
Apocynaceae	*Nerium oleander*	Oleander	Exotic
Apocynaceae	*Plumeria* sp.	Frangipani	Exotic
Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	Exotic
Arecaceae	*Syagrus romanzoffiana*	Cocos Palm	Exotic
Asteliaceae	*Cordyline* sp.		Exotic
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	Exotic
Asteraceae	*Cirsium vulgare*		Exotic
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	Exotic
Asteraceae	*Hypochaeris radicata*	Catsear	Exotic
Asteraceae	*Senecio madagascariensis*	Fireweed	Exotic
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	Exotic
Asteraceae	*Taraxacum* sp.		Exotic
Basellaceae	*Anredera cordifolia*	Madeira Vine	Exotic
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda	Exotic
Brassicaceae	*Camellia sasanqua*	Camellia	Exotic
Brassicaceae	*Sisymbrium* sp.		Exotic
Commelinaceae	*Tradescantia fluminensis*	Trad	Exotic
Ericaceae	*Dracophyllum* sp.		Exotic
Fabaceae (Faboideae)	*Erythrina x sykesii*	Coral tree	Exotic
Fabaceae (Faboideae)	*Medicago minima*	Woolly Burr Medic	Exotic
Fabaceae (Faboideae)	*Trifolium repens*	White Clover	Exotic
Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle	Native

Family	Scientific Name	Common name	Native/Exotic
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	Exotic
Lauraceae	*Persea americana*	Avocado	Exotic
Malaceae	*Spiraea cantoniensis*	May Bush	Exotic
Malvaceae	*Brachychiton acerifolius*	Illawarra Flame Tree	Native
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	Exotic
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	Exotic
Meliaceae	*Melia azedarach*	White Cedar	Native
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush	Native
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	Exotic
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	Exotic
Oxalidaceae	*Oxalis pes-caprae*		Exotic
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	Exotic
Poacaeae	*Cynodon dactylon*	Couch	Exotic
Poacaeae	*Holcus lanatus*	Yorkshire Fog	Exotic
Poaceae	*Briza subaristata*		Exotic
Poaceae	*Bromus cartharticus*	A Brome	Exotic
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	Exotic
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	Exotic
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	Native
Poaceae	*Paspalum dilatatum*	Paspalum	Exotic
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	Exotic
Poaceaea	*Anthoxanthum odoratum*	Sweet Vernal Grass	Exotic
Polygonaceae	*Rumex crispus*	Curled Dock	Exotic
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	Exotic
Rosaceae	*Rubus fruticosus* spp. agg.	Blackberry	Exotic
Solanaceae	*Solanum linnaeanum*	Apple of Sodom	Exotic
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	Exotic
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	Exotic

Family	Scientific Name	Common name	Native/Exotic
Strelitziaceae	*Strelitzia reginae*	Bird of Paradise	Exotic
Verbenaceae	*Lantana camara*	Lantana	Exotic
Verbenaceae	*Verbena bonariensis*	Purpletop	Exotic

FAUNA

Family	Scientific Name	Common name	Native/Exotic
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	Native
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	Native
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	Native
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	Native