area (88.58ha)
r - 10m
ential historical value
Pine
Fig
Island Pine

High-value intertidal mudflats (15.22ha)
(important for wading birds & aquatic wildlife)

Ecological Conservation Value

High (22.41ha)
Medium (9.70ha)
Low (2.91ha)

Figure 8 – Proposed corridor

7.0 Conclusions

The combined mapping of predicted flora and fauna habitat conservation value areas is provided in Figure 7. This predicted total constraints' mapping outlining *high, medium* and *low* conservation areas based on field habitat assessments guided the proposed rezoning plan (prepared by *Urbis* in July 2016) as depicted in Figure 3.

7.1 Appropriateness of the proposed zonings

Figure 2 shows the initial concept zoning. The initial concept zoning was then revised based on preliminary survey findings from the specialist consultants including *Travers bushfire & ecology* which lead to the current proposed zoning plan shown at Figure 3. Figure 3 also shows the indicative future uses.

The highest conservation value lands which are shown on Figure 7 include the foreshore areas and the bushland in the northern portion of the site. A very high proportion of these lands are proposed for rezoning to E1 National Park and Nature Reserves (northern areas) and RE1 Public Recreation (foreshore areas and south eastern remnant bushland). The National Park zoning protects areas with the most likely potential habitat for threatened species. The RE1 zoning of the foreshore areas is appropriate for protection of sensitive foreshore environments, as well as providing scenic protection and recreational opportunities.

Peat Island has limited vegetation of conservation significance but does contain a number of individual Pine Trees that may have a combination of historic and aesthetic value. Peat Island is proposed for rezoning as SP3 Tourist which is appropriate from an ecological view as it allows for fringing foreshore vegetation to be protected or restored as appropriate.

The surrounding landscape of the chapel is highly modified, containing some existing dwellings and therefore appears ecologically unconstrained.

There are existing residences along Kowan Road up to Point Road on the eastern side of the M1 Motorway which includes standard and cluster housing types, all low density. As much of these lands are already disturbed, they have limited value for threatened species habitat. Parts of this area have been marked as having medium conservation value because they connect an ecological gradient between ridge top, gully, floodplain and foreshore environments. As such, the provision of a 30m wide corridor is proposed such that a viable habitat link can be maintained from foreshore to conserved vegetation areas.

SP2 and B2 zoning (Infrastructure and Local Centre) is located upon areas of high disturbance, clearings, existing development or regrowth. The habitat value and vegetation significance of these areas is mostly low thus the removal or modification in this area is not significant.

The RE2 Private Recreation zone which comprises the concept marina facilities presents the highest marine impact risk from an ecological perspective as it is likely to impact upon a small area of mangroves as well as the estuarine environment. An Environmental Impact Statement (EIS) would likely need to be prepared for the marina area to determine the impacts on estuarine and aquatic ecology. As this work has not been completed we cannot comment on the appropriateness of the zoning. As an EIS is not required at this time, such matters can be dealt with following gateway determination.

Overall, the concept plan has been modified from the previous concept plan, following more detailed investigations and appropriate responses to perceived ecological values of the landscape. The highest conservation values are mostly placed into zonings that allow for ongoing protection of sensitive features or are expected to have minor impacts. Cleared and disturbed areas of low or medium conservation significance are likely suitable for future development, provided that habitat connectivity along the hilltop to foreshores gradient can be maintained where they currently exist.

The proposed concept plan and proposed zonings are considered to be sympathetic to important terrestrial habitat features within the study area. Dedication to National Park of the two largest tracts of connective open forest portions in the northern extent of the study area is a significant conservation measure. The other most notable habitat areas conserved are along the aquatic interfaces and mangrove areas. A small 30m wide corridor also links the proposed national park to the eastern foreshores.

Based on the investigations carried out and documented in this report, *Travers bushfire & ecology* believes that a balance between conservation and potential development opportunities can be achieved with the proposed zonings and is therefore suitable for gateway determination. Future survey and impact assessment will be required across the site to determine impacts and further mitigation measures and management options at the subdivision and development application stages where potential impacts are identified.

7.2 Ecological assessment matters

Further surveys will be required at the next development application stage (subdivision or building development). As part of future survey and assessment of impacts on any national or state listed threatened flora and fauna species, populations and ecological communities,

specific survey requirements have been outlined within this report. Following survey, specific requirements of the *TSC Act* must be addressed.

A significance of impact assessment under Section 5A of the *EP&A Act* based on a 7 part test of significance will be required for any development application with part of or adjacent to any foreshore or vegetation areas.

In respect to the state *FM Act*, the proposed marina will cause a large impact on existing tidal mudflats and adjacent shoreline vegetation. This proposal will require further detailed ecological investigations at the next DA stage to determine what the impact of the marina will have. This will likely include the preparation of an EIS as required by DPI (also required under the *EP&A Act*). Proposed measures to offset the loss of habitat should be considered by incorporating artificial habitat benefits within the marina design to achieve a satisfactory outcome in respect to the aquatic environment.

The national *EPBC Act* requires that Commonwealth approval be obtained for certain actions. It provides an assessment and approvals system for actions that have a significant impact on matters of *national environmental significance* (NES). In respect to the study area these may include:

- nationally listed threatened ecological communities
- nationally listed threatened species
- nationally listed migratory species

Where a proposed activity is likely to significantly affect nationally listed threatened species, ecological communities, migratory species or their habitats, then the matter will need to be referred to the Commonwealth Department of Environment (DOE) for assessment.

7.3 Biodiversity certification

Biodiversity certification offers planning authorities a biodiversity assessment process for areas marked for development at the strategic planning stage. The process may identify areas of high conservation value at a landscape scale. These areas can be avoided and protected while identifying areas suitable for development. Biodiversity certification offers a range of secure options for offsetting impacts on biodiversity.

After biodiversity certification is conferred on an area of land, development may proceed without the usual requirements under the Environmental Planning and Assessment Act 1979 for site-by-site threatened species assessment.

Biodiversity certification of land can only be conferred by the Minister where the biodiversity certification 'improves or maintains' biodiversity outcomes. The Minister will determine whether or not the overall effect of the proposed biodiversity certification is to improve or maintain biodiversity values on the basis of a biodiversity certification assessment prepared in accordance with the Biodiversity Conservation Assessment Methodology (BCAM, 2014).

The Biodiversity Certification Strategy will be supported by a Biodiversity Assessment Report, which will document the biodiversity values of land proposed for biodiversity certification and offsets, and the report will be publicly exhibited.

Biodiversity values are measured as biodiversity credits. When there is a shortfall of credits for conservation measures in a biodiversity certification proposal, the biodiversity certification credit converter may be used to convert the quantity of ecosystem or species credits into hectares of land and then into an amount for a financial contribution.

Overall, this scheme provides a well measured outcome for the conservation of various habitats which can be quantified. It will measure the values of communities as separate zones in accordance with their condition, with an output as to the credits generated. The idea is to ensure that credits can be retired into the provision of conservation areas that are expected to be maintained as such in perpetuity. The study area provides an excellent opportunity under the scheme to have the credits retired to the provision of a national park in the northern portion of the site. It will be expected that these areas will be maintained accordingly.

Future development of the study area may choose to adopt BCAM for ecological assessment instead of the traditional lines of a Section 5A Assessment (including 7 part test of significance). Given the dedication of lands to national park, biodiversity credits can be generated for the use of other developments that require biodiversity offsets to be provided.

Notwithstanding the above, BCAM does not switch off matters of national environmental significance. Therefore any nationally listed threatened species or ecological community under the EPBC Act will need Assessment under this legislation.

Attachment 1:

Threatened Flora & Fauna
Habitat Assessment

Table A1.1 - Threatened flora habitat assessment

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	**Survey required**
Acacia bynoeana OEH EPBC	E1	V	Erect or spreading shrub to 0.3m high growing in heath and dry sclerophyll Open Forest on sandy soils. Often associated with disturbed areas such as roadsides. Distribution limits N-Newcastle S-Berrima.	x	✓	5 in 10km radius, nearest 5km away	✓	low	✓
Acacia terminalis subsp. *terminalis* OEH	E1	E	Erect shrub to 2m tall, flowers from March to July. Occurs in eucalypt woodland or forest, usually in sandy soil on creek banks, hillslopes or in shallow soil in rock crevices and sandstone platforms on cliffs. Typically restricted to the Port Jackson and eastern suburbs of Sydney.	x	✓	Considered to be outside of known range, although there is a sighting at Brooklyn	x	x	x
Allocasuarina glareicola EPBC	E1	E	Small shrub 1-2m high growing in open sclerophyll forest on lateritic soils derived from tertiary alluviums. Distribution limits Castlereagh NR region.	x	x	-	-	x	x
Ancistrachne maidenii OEH	V	-	Decumbent grass. Grows in sandstone-derived soils. Distribution limits Berowra Waters, Brooklyn and Wisemans Ferry.	x	marginal	19 in 10km radius, nearest is 3km away	✓	low	✓
Asterolasia elegans OEH EPBC	E1	E	Erect shrub 1-3m high growing in moist sclerophyll forests on Hawkesbury sandstone slopes hillsides. Distribution limits Maroota region.	x	x	-	-	x	x
Astrotricha crassifolia OEH EPBC	V	V	Shrub to 2.4m high. Grows in dry sclerophyll woodland on sandstone. Distribution limits N-Patonga S-Eden.	x	x	-	-	x	x

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	**Survey required**
Caladenia tessellata OEH EPBC	E1	V	Terrestrial orchid. Clay-loam or sandy soils. LHCCREMS guidelines suggest the species grows in Map Unit 34 – Coastal Sand Wallum Woodland - Heath. Flowers in September – November. Distribution limits N-Swansea S-south of Eden.	x	x	-	-	x	x
Callistemon linearifolius OEH	V	-	Shrub to 4m high. Dry sclerophyll forest on coast and adjacent ranges. Distribution limits N-Nelson Bay S-Georges River.	x	✓	✓	✓	✓	✓
Cryptostylis hunteriana OEH EPBC	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. Distribution limits N-Gibraltar Range S-south of Eden.	x	x	-	-	x	x
Darwinia biflora OEH EPBC	V	V	Erect or spreading shrub to 0.8m high. Grows in heath or understorey of woodland on or near shale-capped ridges underlain by Hawkesbury sandstone. Distribution limits N-Gosford S-Cheltenham.	x	marginal	No records within 5km that have been recorded since 2000.	x	unlikely	x
Darwinia glaucophylla OEH	V	-	Spreading prostrate shrub with ascending branchlets to 0.15m high. Grows in heath on shallow soils. Distribution limits Gosford district.	x	x	-	-	x	x
Darwinia peduncularis OEH	V	-	Divaricate shrub to 1.5m high. Grows in dry sclerophyll forest on sandstone hillsides and ridges. Distribution limits N-Glen Davis S-Hornsby.	x	✓	✓	✓	✓	✓
Diuris bracteata OEH	E1	Ext.	An orchid that grows in dry sclerophyll woodland. Was thought to be extinct until approximately 10yrs ago. Found in the Sydney Basin Bioregion. Flowers in September.	x	✓	Nearest is 10km away	x	unlikely	x

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	**Survey required**
Eucalyptus camfieldii OEH EPBC	V	V	Stringybark to 10m high. Grows on coastal shrub heath and woodlands on sandy soils derived from alluviums and Hawkesbury sandstone. Distribution limits N-Norah Head S-Royal NP.	x	marginal	x	x	unlikely	x
Genoplesium baueri OEH EPBC	E1	E	A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Distribution limits N – Hunter Valley S – Nowra	x	x	-	-	x	x
Grammitis stenophylla OEH	E1	-	A small lithophytic fern with fronds generally <5cm. Occurs in rainforest and wet sclerophyll forest in the coastal divisions of NSW. Usually grown on rocks.	x	marginal	7 in 10km radius	✓	low	✓
Grevillea caleyi OEH EPBC	E1	E	Shrub mostly 1-3m high. Grows in laterite. Distribution limits Terrey Hills-Belrose area.	x	x	-	-	x	x
Grevillea parviflora subsp. *supplicans* OEH	E1	-	Low spreading shrub. Grows in skeletal sandy soil over sandstone. Distribution limits Maroota – Marramarra Creek area.	x	x	-	-	x	x
Grevillea shiressii OEH EPBC	V	V	Shrub 2-5m high. Flowers mainly spring. Grows along creek banks in wet sclerophyll forest. Sandy soil on Hawkesbury sandstone. Restricted to the Gosford area. CC.	x	✓	✓	✓	✓	✓
Haloragis exalata subsp. *exalata* OEH EPBC	V	V	Shrub to 1.5m high. Grows in damp places near watercourses. Distribution limits N-Tweed Heads S-south of Eden.	x	x	-	-	x	x
Haloragodendron lucasii EPBC	E1	E	Straggling shrub to 1.5m high. Grows in open forest on sheltered slopes near creeks. Distribution limits Ku-ring-gai Plateau and Mt Wilson.	x	x	-	-	x	x

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	**Survey required**
Hibbertia procumbens OEH	E1	-	Prostrate shrub with linear leaves which occurs in heath on sandy soils but is only known from Mangrove Mountain.	x	marginal	Possibly outside of geographic distribution	✓	low	✓
Hibbertia puberula OEH	E1	-	Shrublets with branches up to 30cm long. Not been seen for 40 years however early records are from Hawkesbury River area in Sydney and the Blue Mountains.	x	x	-	-	x	x
Kunzea rupestris OEH EPBC	V	V	Shrub to 1.5m high. Grows in cracks and fissures on Hawkesbury sandstone rock platforms. Distribution limits N-Maroota S-Glenorie.	x	✓	8 within 10km radius, nearest is 2km away	✓	✓	✓
Lasiopetalum joyceae OEH EPBC	V	V	Erect shrub to 2m high. Grows in heath and open forest on Hawkesbury sandstone. Distribution limits Hornsby Plateau.	x	x	-	-	x	x
Leptospermum deanei EPBC	V	V	Shrub to 5m high. Grows on forested slopes. Distribution limits Near watershed of Lane Cove River.	x	x	-	-	x	x
Melaleuca biconvexa EPBC	V	V	Tall shrub. Grows in wetlands adjoining perennial streams and on the banks of those streams, generally within the geological series known as the Terrigal Formation. Distribution limits N-Port Macquarie S-Jervis Bay.	x	x	-	-	x	x
Melaleuca deanei OEH EPBC	V	V	Shrub to 3m high. Grows in heath on sandstone. Distribution limits N-Gosford S-Nowra.	x	marginal	11 within 10km, nearest is 2km away	✓	low	✓
Micromyrtus blakelyi OEH EPBC	V	V	Low erect shrub. Grows in cracks and fissures on Hawkesbury sandstone rock platforms. Distribution limits N-Maroota S-Berowra.	x	marginal	36 within 10km, nearest is 2km away	✓	low	✓

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	**Survey required**
Olearia cordata EPBC	V	V	Shrub to 2m high. Grows in dry sclerophyll forest and shrubland on Hawkesbury sandstone. Distribution limits N-Wollombi S-Wiseman's Ferry.	x	marginal	No records within 10km, thus likely to be outside of known geographic range	-	unlikely	x
Pelargonium sp. *Striatellum* EPBC	E1	E	Herb to 90cm tall which grows in damp places especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Varied distribution from SE NSW to QLD.	x	x	-	-	x	x
Persoonia hirsuta OEH EPBC	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. Distribution limits N-Glen Davis S-Hill Top.	x	✓	3 within 10km radius, nearest is 3km away	✓	low	✓
Persoonia mollis subsp. *maxima* OEH EPBC	E1	E	Erect to prostrate shrub. Grows in moist to wet sclerophyll forests on Hawkesbury sandstone. Distribution limits N-Cowan S-Hornsby.	x	x	-	-	x	x
Pimelea curviflora var. *curviflora* OEH EPBC	V	V	Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury sandstone near shale outcrops. Distribution Sydney.	x	x	-	-	x	x
Prostanthera junonis OEH EPBC	E1	E	Small shrub. Grows in sclerophyll forest and heath in shallow soil on sandstone. Distribution limits Somersby region.	x	x	-	-	x	x
Rhizanthella slateri EPBC	V	E	Underground orchid that is poorly known. Grows in sclerophyll forests. Usually only seen if the soil is disturbed. Flowers in Oct – Nov.	x	x	-	-	x	x
Syzygium paniculatum OEH EPBC	V	V	Small tree. Subtropical and littoral rainforest on sandy soil. Distribution limits N-Forster S-Jervis Bay.	x	✓	3 within 10km radius, nearest is 4km away	✓	limited to sheltered gullies	✓

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	**Survey required**
Tetratheca glandulosa OEH	V	-	Spreading shrub to 0.2m high. Sandy or rocky heath or scrub. Distribution limits N-Mangrove Mountain S-Port Jackson.	x	✓	✓	✓	limited to eastern side of M1 on mid-upper slopes	✓
Thesium australe EPBC	V	V	Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. Distribution limits N-Tweed Heads S-south of Eden.	x	x	-	-	x	x
Zieria involucrata OEH EPBC	E1	V	Tall erect shrub to 2m tall. Occurs primarily on Hawkesbury sandstone. Also occurs on Narrabeen Group sandstone and on Quaternary alluvium. Found primarily in sheltered forests on mid-to lower slopes and valleys although some populations extend upslope into drier vegetation. The canopy typically includes *Syncarpia glomulifera, Angophora costata, Eucalyptus agglomerata* and *Allocasuarina torulosa*. Distributed throughout Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains local government areas.	x	x	-	-	x	x

OEH	- Denotes species listed within 10km of the subject site on the *Atlas of NSW Wildlife*
EPBC	- Denotes species listed within 10km of the subject site in the *EPBC Act* habitat search
V	- Denotes vulnerable listed species under the relevant Act
E or E1	- Denotes endangered listed species under the relevant Act
CE	- Denotes critically endangered listed species under the relevant Act
NOTE:	1. This field is not considered if no suitable habitat is present within the subject site 2. 'records' refer to those provided by the *Atlas of NSW Wildlife* 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle

Table A1.2 - Threatened fauna habitat assessment

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT ***Distribution Limit***	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Giant Burrowing Frog *Heleioporus australiacus* OEH EPBC	V	V	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. *Distribution Limit: N-Near Singleton S-South of Eden.*	possible	× 2-3km north	✓	unlikely	✓ Habitat searches
Stuttering Frog *Mixophyes balbus* EPBC	E	V	Terrestrial inhabitant of rainforest and wet sclerophyll forests. *Distribution Limit: N-near Tenterfield S-South of Bombala.*	×	-	-	×	×
Giant Barred Frog *Mixophyes iteratus* EPBC	E	E	Terrestrial inhabitant of rainforest and open forests. *Distribution Limit: N-Border Ranges National Park. S-Narooma.*	×	-	-	×	×
Red-crowned Toadlet *Pseudophryne australis* OEH	V	-	Prefers sandstone areas, breeds in grass and debris beside non-perennial creeks or gutters. Individuals can also be found under logs and rocks in non-breeding periods. *Distribution Limit: N-Pokolbin. S-near Wollongong.*	possible	×	✓	✓	✓
Green and Golden Bell Frog *Litoria aurea* EPBC	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. *Distribution Limit: N-Byron Bay S-South of Eden.*	marginal	×	×	unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT ***Distribution Limit***	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Littlejohn's Tree Frog *Litoria littlejohnii* EPBC	V	V	Found in wet and dry sclerophyll forest associated with sandstone outcrops at altitudes 280-1,000m on eastern slopes of Great Dividing Range. Prefers flowing rocky streams. *Distribution Limit: N-Hunter River S-Eden.*	×	-	-	×	×
Rosenberg's Goanna *Varanus rosenbergi* OEH	V	-	Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops. *Distribution Limit: N-Nr Broke. S-Nowra Located in scattered patches near Sydney, Nowra and Goulburn.*	Marginal	×	×	unlikely	✓
Superb Fruit-dove *Ptilinopus superbus* OEH	V	-	Rainforests, adjacent mangroves, eucalypt forests, scrubland with native fruits. *Distribution Limit: N-Border Ranges National Park. S-Bateman's Bay.*	Sub-optimal	×	×	unlikely	✓
Australasian Bittern *Botaurus poiciloptilus* EPBC	E	E	Found in or over water of shallow freshwater or brackish wetlands with tall reedbeds, sedges, rushes, cumbungi, lignum and also in ricefields, drains in tussocky paddocks, occasionally saltmarsh, brackish wetlands. *Distribution Limit: N-North of Lismore. S- Eden.*	Unlikely	×	×	Not likely	×

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT *Distribution Limit*	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Black Bittern *Ixobrychus flavicollis* OEH	V	-	Found in shadowy, leafy waterside trees such as callistemons, casuarinas, paperbarks, eucalypts, mangroves and willows along tidal creeks, freshwater and brackish streams and ponds, sheltered mudflats and oyster slats. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	×	×	unlikely	✓
Little Eagle *Hieraaetus morphnoides* OEH	V	-	Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. *Distribution Limit - N-Tweed Heads. S-South of Eden.*	✓	×	×	unlikely	✓
Eastern Osprey *Pandion cristatus* OEH	V	-	Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	✓	✓	✓	✓
Bush Stone-curlew *Burhinus grallarius* OEH	E	-	Utilises open forests and savannah woodlands, sometimes dune scrub, savannah and mangrove fringes. *Distribution Limit: N-Border Ranges National Park. S-Near Nowra.*	✓	×	×	unlikely	✓
Pied Oystercatcher *Haematopus longirostris* OEH	V	-	Inhabits coastal beaches and estuarine flats. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	×	×	unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT ***Distribution Limit***	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Australian Painted Snipe *Rostratula australis* EPBC	E	E	Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	×	-	-	×	×
Eastern Curlew *Numenius madagascariensis* EPBC	-	CE	Primarily coastal especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. Often recorded among saltmarsh and on mudflats fringed by mangroves and also in coastal saltworks and sewage farms. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	✓	×	✓	✓
Glossy Black-Cockatoo *Calyptorhynchus lathami* OEH	V	-	Open forests with *Allocasuarina* species and hollows for nesting. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	✓	✓	✓	✓
Little Lorikeet *Glossopsitta pusilla* OEH	V	-	Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	×	✓	✓	✓

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT *Distribution Limit*	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Swift Parrot *Lathamus discolour* OEH EPBC	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	Possible	×	✓	✓	✓
Turquoise Parrot *Neophema pulchella* OEH	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. *Distribution Limit: N-Near Tenterfield. S-South of Eden.*	Sub-optimal	×	×	unlikely	✓
Barking Owl *Ninox connivens* OEH	V	-	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. *Distribution Limits: N-Border Ranges National Park. S-Eden.*	✓	×	×	unlikely	✓
Powerful Owl *Ninox strenua* OEH	V	-	Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. *Distribution Limits: N-Border Ranges National Park. S-Eden.*	✓	✓	✓	✓	✓
Masked Owl *Tyto novaehollandiae* OEH	V	-	Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. *Distribution Limit: N-Border Ranges National Park. S-Eden.*	✓	×	×	unlikely	✓
Sooty Owl *Tyto tenebricosa* OEH	V	-	Tall, dense, wet forests containing trees with very large hollows. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	Sub-optimal	×	×	unlikely	✓

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT *Distribution Limit*	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Eastern Bristlebird *Dasyornis brachypterus* EPBC	E	E	Coastal woodlands, dense scrubs and heathlands, especially where low heathland borders taller woodland or dense tall tea-tree. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	marginal	×	×	Not likely	×
Regent Honeyeater *Xanthomyza Phrygia* OEH EPBC	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution Limit: N-Urbanville. S-Eden.*	Possible	✓	×	Unlikely	✓
Painted Honeyeater *Grantiella picta* EPBC	V	V	A nomadic bird occurring in low densities within open forest, woodland and scrubland feeding on mistletoe fruits. Inhabits primarily Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. *Distribution Limit: N-Boggabilla. S-Albury with greatest occurrences on the inland slopes of the Great Dividing Range.*	Possible	×	×	Unlikely	✓
Varied Sittella *Daphoenositta chrysoptera* OEH	V	-	Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	✓	×	×	✓	✓

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT *Distribution Limit*	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Scarlet Robin *Petroica boodang* OEH	V	-	Found in foothill forests, woodlands, watercourses; in autumn-winter, more open habitats: river red gum woodlands, golf courses, parks, orchards, gardens. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	×	×	Unlikely	✓
Flame Robin *Petroica phoenicea* OEH	V	-	Summer: forests, woodlands, scrubs, from sea-level to *c.* 1800 m. Autumn-winter: open woodlands, plains, paddocks, golf courses, parks, orchards. *Distribution Limit: N northern NSW tablelands. S-South of Eden.*	✓	×	×	Unlikely	✓
Spotted-tailed Quoll *Dasyurus maculatus* OEH EPBC	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. *Distribution Limit: N-Mt Warning National Park. S-South of Eden.*	✓	✓	✓	✓	✓
Koala *Phascolarctos cinereus* OEH EPBC	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	Unlikely	×	×	Not likely	×
Eastern Pygmy Possum *Cercatetus nanus* OEH	V	-	Found in a variety of habitats from rainforest through open forest to heath. Feeds on insects but also gathers pollen from banksias, eucalypts and bottlebrushes. Nests in banksias and myrtaceous shrubs. *Distribution Limit: N-Tweed Heads. S-Eden.*	✓	✓	×	✓	✓

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT *Distribution Limit*	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Squirrel Glider *Petaurus norfolcensis* OEH	V	-	Mixed aged stands of eucalypt forest & woodlands including gum barked & high nectar producing species & hollow bearing trees. *Distribution Limit: N-Tweed Heads. S-Albury.*	Possible	×	✓	Unlikely	✓
Long-nosed Potoroo *Potorous tridactylus* EPBC	V	V	Coastal heath and dry and wet sclerophyll forests with a dense understorey. *Distribution Limit: N-Mt Warning National Park. S-South of Eden.*	✓	×	×	Not likely	×
Brush-tailed Rock-wallaby *Petrogale penicillata* EPBC	E	V	Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country. *Distribution Limit: N-North of Tenterfield. S-Bombala.*	Marginal	×	×	Not likely	×
Grey-headed Flying-fox *Pteropus poliocephalus* OEH EPBC	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy. *Distribution Limit: N-Tweed Heads. S-Eden.*	✓	✓	✓	✓	✓
East-coast Freetail Bat *Micronomus norfolkensis* OEH	V	-	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. *Distribution Limit: N-Woodenbong. S-Pambula.*	✓	×	✓	Unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT ***Distribution Limit***	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Large-eared Pied Bat *Chalinolobus dwyeri* EPBC	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. *Distribution Limit: N-Border Ranges National Park. S-Wollongong.*	✓	×	×	Unlikely	✓
Eastern Falsistrelle *Falsistrellus tasmaniensis* OEH	V	-	Recorded roosting in caves, old buildings and tree hollows. *Distribution Limit: N-Border Ranges National Park. S-Pambula.*	✓	×	✓	Unlikely	✓
Little Bentwing-bat *Miniopterus australis* OEH	V	-	Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. *Distribution Limit: N-Border Ranges National Park. S-Sydney.*	✓	×	✓	Unlikely	✓
Eastern Bentwing-bat *Miniopterus orianae oceansis* OEH	V	-	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	✓	✓	✓	✓	✓
Large-footed Myotis *Myotis macropus* OEH	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. *Distribution limits: N-Border Ranges National Park. S-South of Eden.*	✓	×	×	Unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT ***Distribution Limit***	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Greater Broad-nosed Bat *Scoteanax rueppellii* OEH	V	-	Inhabits areas containing moist river and creek systems, especially tree lined creeks. *Distribution Limit: N-Border Ranges National Park. S-Pambula.*	✓	×	✓	Unlikely	✓
Eastern Cave Bat *Vespadelus troughtoni* OEH	V	-	Inhabits drier open forests and woodlands. Roosts in well-lit parts of caves and mineshafts. *Distribution Limit: Along GDR from N-Tweed Heads. S-Kempsey.*	✓	×	✓	Unlikely	✓
Eastern Chestnut Mouse *Pseudomys gracilicaudatus* OEH	V	-	Inhabits heathland including dense wet heath and swampy areas, occasionally in woodland with grassy understorey. *Distribution Limit: N-Border Ranges National Park. S-Brisbane Water National Park.*	×	-	-	×	×
New Holland Mouse *Pseudomys novaehollandiae* EPBC	-	V	Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations have a marked preference for sandy substrates, a heathy understorey of leguminous shrubs less than 1m high and sparse ground litter. Recolonise of regenerating burnt areas. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	Possible	×	✓	Unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT ***Distribution Limit***	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Giant Dragonfly *Petalura gigantean* OEH	E	-	Inhabits large relatively deep permanent swamps and bogs with high water quality and moss or other soft vegetation along the edge for egg laying. *It occurs in the far NE NSW, south to Kempsey, & in a patch between Gosford & Nowra.*	x	-	-	x	x
Dural Woodland Snail *Pommerhelix duralensis* EPBC	-	E	Occurs on shale-sandstone transitional landscapes The species is found within the Local Government Areas of Blue Mountains City, Penrith City, The Hills Shire, Wollondilly Shire, Hornsby Shire and Parramatta City. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	x	-	-	x	x

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	PREFERRED HABITAT *Distribution Limit*	IF NOT RECORDED ON-SITE				Survey Required (✓)
				Potential habitat present in subject site? (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur in subject site	
Macquarie Perch *Macquaria australasica* EPBC	V (FM Act 1994)	E	Occurs in south east Australia at moderate to high altitudes in rivers and reservoirs. Historical records show the species was widespread and abundant in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers and their tributaries. Allen (1989) states that introduced populations are present in Nepean River and water supply dams in the Sydney area. Occurs in lakes and flowing streams, usually in deep holes.	×	-	-	×	×
Australian Greyling *Prototroctes maraena* EPBC	Part 2, Section 19 – Protected Fish (FM Act 1994)	V	Clear, moderate to fast flowing water in the upper reaches of rivers (sometimes to altitudes above 1,000m). Typically found in gravel bottom pools. Often forming aggregations below barriers to upstream movement (e.g. weirs, waterfalls).	×	-	-	×	×

OEH	-	Denotes species listed within 10km of the subject site on the *Atlas of NSW Wildlife*
EPBC	-	Denotes species listed within 10km of the subject site in the *EPBC Act* habitat search
V	-	Denotes vulnerable listed species under the relevant Act
E	-	Denotes endangered listed species under the relevant Act
CE	-	Denotes critically endangered listed species under the relevant Act
NOTE:	1.	This field is not considered if no suitable habitat is present within the subject site
	2.	'records' refer to those provided by the *Atlas of NSW Wildlife*
	3.	'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle

Table A1.3 – Migratory fauna habitat assessment

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	Potential to constrain development
Oriental or Horsfield's Cuckoo (*Cuculus optatus*)	It mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.	✓	unlikely
White-bellied Sea Eagle (*Haliaeetus leucogaster*)	Coasts, islands, estuaries, inlets, large rivers, inland lakes, reservoirs. *Sedentary; dispersive.*	✓	✓ if nesting locations is recorded present within or close to the subject site.
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies forage often along favoured hilltops and timbered ranges. *Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.*	✓	unlikely
Rainbow Bee-eater (*Merops ornatus*)	Open woodlands with sandy, loamy soil; sandridges, sandspits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands, golf courses. *Breeding resident in northern Australia. Summer breeding migrant to south east and south west Australia.*	✓	unlikely
Spectacled Monarch (*Monarcha trivirgatus*)	Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. *Summer breeding migrant to south-east Qld and north-east NSW down to Port Stephens from Sept/Oct to May. Uncommon in southern part of range.*	×	-
Black-faced Monarch (*Monarcha melanopsis*)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. *Summer breeding migrant to coastal south east Australia, otherwise uncommon.*	✓	unlikely
Yellow Wagtail (*Motacilla flava*)	The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	✓	unlikely
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. *Breeds mostly south east Australia and Tasmania over warmer months, winters in north east Qld.*	✓	unlikely
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. *Breeding migrant to south east Australia over warmer months. Altitudinal migrant in north east NSW in mountain forests during warmer months.*	✓	unlikely

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	Potential to constrain development
Great Egret (*Ardea alba*)	Shallows of rivers, estuaries; tidal mudflats, freshwater wetlands; sewerage ponds, irrigation areas, larger dams, etc. *Dispersive; cosmopolitan.*	✓	unlikely
Cattle Egret (*Ardea ibis*)	Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains. *Breeds in summer in warmer parts of range including NSW.*	✓	unlikely
Latham's Snipe (*Gallinago hardwickii*)	Soft wet ground or shallow water with tussocks and other green or dead growth; wet parts of paddocks; seepage below dams; irrigated areas; scrub or open woodland from sea-level to alpine bogs over 2,000m; samphire on saltmarshes; mangrove fringes. *Breeds Japan. Regular summer migrant to Australia. Some overwinter.*	✓	unlikely
Bar-tailed Godwit (*Limosa lapponica*)	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh.	✓	unlikely
Common Greenshank (*Tringa nebularia*)	Found in a wide variety of inland wetlands and sheltered coastal habitats (with large mudflats and saltmarsh, mangroves or seagrass) of varying salinity, Habitats include embayments, harbours, river estuaries, deltas and lagoons. It uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. Also artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. In NSW the Hunter River estuary has been identified as a site of international importance. *Breeds in Eurasia, the northern British Isles, Scandanavia, east Estonia and north-east Belarus, through Russia and east.*	✓	unlikely

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	Potential to constrain development
Little Curlew (*Numenius minutus*)	Feeds in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used. When resting, congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. Prefers pools with bare dry mud and they do not use pools if they are totally dry, flooded or heavily vegetated. *Breeds in Russia.*	✓	unlikely
Little Tern (*Sternula albifronds*)	In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. Little Terns nest on sand-spits, banks, ridges or islets and also on wide and flat or gently sloping sandy ocean beaches, and occasionally in sand-dunes. Forage in shallow waters of estuaries, coastal lagoons and lakes, frequently over channels next to spits and banks or entrances, and often close to breeding colonies. They also forage along open coasts, especially around bars off the entrances to rivers and lagoons, less often at sea, and usually within 50 m of shore.	✓	unlikely
Osprey (*Pandion haliaetus*)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Breeds from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometer of the sea.	✓	✓ if nesting locations is recorded present within or close to the subject site.
Fork-tailed Swift (*Apus pacificus*)	Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. *Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.*	✓	unlikely