Review of Environmental Factors

Emigrant Creek – Riverbank Stabilisation and Rehabilitation

October 2018

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1 Introduction

1.1 Preamble

Ballina Shire Council has prepared this Review of Environmental Factors (REF) with respect to environmental restoration works along Emigrant Creek between Tintenbar village and the Old Bangalow Road and Tamarind Drive intersection.

For the purposes of these works, Ballina Shire Council is the proponent and the determining authority under Part 5 of the Environmental Planning & Assessment (EP&A) Act 1979.

The purpose of this REF is to describe the proposed works, outline the likely impacts of the proposal on the environment, and identify mitigation measures that may be implemented to avoid or minimise potential adverse environmental impacts.

The consideration of environmental factors found in Section 7 has been prepared within the context of Clause 228 of the *Environmental Planning & Assessment Regulation* 2000. This report is required under Section 111 of the *EP&A Act* 1979 to ensure that Ballina Shire Council examines and takes into account, to the fullest possible extent, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF will be considered when assessing:

- whether the proposal is likely to have any significant impact on the environment and, therefore, the necessity for an Environmental Impact Statement (EIS) under Section 112 of the EP& A Act 1979; and
- the significance of any impact on threatened species as defined by the TSC Act 1995 and, therefore, the requirement for a Species Impact Statement (SIS).

1.2 Objectives of the Proposal

The objectives of the proposed works are as follows:

- To stabilise and revegetate approximately 53,700 m2 of the riverbank of Emigrant Creek
- Improve water quality within Emigrant Creek
- Provide additional terrestrial and aquatic habitat for native fauna
- Comply with environmental legislation
- Avoid any impact on any area of Aboriginal or heritage significance
- Avoid disturbance of acid sulfate soils (ASS)
- Apply current best practice for bush regeneration in riparian locations.

1.3 Structure and Scope of Report

This report provides a general introduction to the project (Sections 1 and 2) including a review of the statutory environment for the proposed works (Section 3).

Section 4 describes the existing environment, and Section 5 examines, in detail, the environmental assessment undertaken to determine the potential for environmental impact as a result of the works both during operation and once established.

Section 6 summarises the mitigation measures for implementation of the proposal. Section 7 gives consideration to environmental factors in relation to Clause 228 of the EP& A Act and Regulations and the (Commonwealth) EPBC Act and Section 8 provides a brief conclusion.

1.4 Methodology

The steps involved in preparing this REF included:

1. Site inspection.

2. Consultation with the following:

- Ballina Shire Council;
- Fisheries NSW;
- Crown Lands;
- Landcare and Interested NGO's; and
- Local Residents.

3. A search of the following databases, registers and listings conducted to identify potential issues:

- The Office of Environment and Heritage (OEH), National Parks and Wildlife Service (NPWS) Wildlife Atlas Fauna Records;
- The Office of Environment and Heritage (OEH), National Parks and Wildlife Service (NPWS) Wildlife Atlas Flora Records
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) Protected Matters Search Tool;
- Australian Heritage Database;
- NSW State Heritage Inventory;
- Ballina Local Environmental Plan 2012 and other planning policies; and
- Office of Environment and Heritage's Aboriginal Heritage Information Management System.

4. A literature review to determine issues relating to:

- Local Environmental Plan zonings and general provisions;
- Regional Environmental Plans; and
- State Environmental Planning Policies.

2 Overview of Proposed Works

2.1 Site Location

The project will reinstate native riparian vegetation along all public lands between Old Bangalow Road and Emigrant Creek from the intersection with Tamarind Drive to the village area of Tintenbar. It will also reinstate vegetation between Crosby's Lane (on the western side of Emigrant Creek) along the riverbank. The project will also involve primary and secondary weed removal for bank stabilisation, and in some locations placing rootballs for aquatic fauna habitat.

2.2 Need for the Proposed Activity

Ballina Shire Council proposes to undertake this project to restore the natural environment by stabilising the riverbanks, removing weeds and revegetating with endemic vegetation. The project is proposing to improve terrestrial and aquatic habitat, stop erosion and improve water quality.

The 2014 Ecohealth project demonstrated that Emigrant Creek had poor water quality and poor riparian vegetation at monitored sites. Macroinvertebrates and geomorphological stability were fair. This project will improve each of these parameters, resulting in improved fish habitat, better terrestrial (EEC) connectivity along the length of the works and a reduction in nutrients and sediment entering the creek.

The cumulative impact of this project, with others over time, is designed to improve the health of the Richmond River.

2.3 Site description

2.2.1 General Site Description

The site begins at Tintenbar Road where Emigrant Creek begins to flow onto its floodplain, from the higher country with more relief. The valley is a narrow floodplain through with the creek flows, and there are some adjacent properties which demonstrate artificial drainage of varying depths. This drainage is mostly used during high flow events and does not usually intercept groundwater.

Soils are well drained Krasnozem soils, and the site is mapped as the Eltham Soil Landscape, Landscape Variant B. The valley through which the creek flows in this location would formerly have supported the transition from wetland to the Big Scrub. Privately owned land in the valley is variously utilised for agricultural purposes such as grazing, intensive plant agriculture (macadamias) and other purposes such as forestry.

The project site is located generally between Old Bangalow Road and Emigrant Creek. The eastern bank of Emigrant Creek road is almost entirely in public ownership, although liaison with private landholders will be required in one location for access to the creekbank.

The western bank between the creek and Crosbys Lane and its unformed extension is also in public ownership, as part of the road reserve.

The site is vulnerable to flooding, being mapped as having an Extreme Flood Hazard in the DCP. This has little impact on the proposed works, apart from possibly requiring replanting after a high flow event.

There are some rootballs identified for keying to the side of the riverbank, which have the potential to move during a highflow event. Correct placement and accompanying suitable planting to quickly stabilise the adjacent riverbank will be important to reduce the potential for this to occur.

There is some evidence of cows accessing the creekbank through Council's roadside reserve and private properties which is also impacting bank stability. As part of the liaison with adjoining landholders, this will be noted and addressed.

2.2.2 Vegetation

The riverbank and roadside areas generally consist of camphor laurel or coral tree dominated vegetation with smaller groundcover weeds and exotic grasses present also. There are small pockets of remnant native riparian vegetation, although these are small and isolated, sometimes consisting only of a single tree.

Previously the site's vegetation would have graded from the Big Scrub - Lowland Subtropical Rainforest in the upper portion of the creek to Eucalypt River-flat Forest on Floodplain in the lower portions of the creek as it flows on the true floodplain area. Both of these are Endangered Ecological Communities, and restoration of these along the creek will be a positive contribution to local biodiversity outcomes.

2.4 Description of Works

The proposed works are mapped at Attachment A. In general, they consist of primary weeding to poison camphor laurel and coral tree in the first instance as the main tree weed species. After dieback, the dead tree will be lopped at a convenient height and either chipped or removed to the Ballina Waste Management Centre. It is proposed to leave the stump and roots in place to rot down as a natural process, thereby retaining the stability of the bank. Coral tree will be completely removed from site after dieback to reduce the potential for regrowth. Retreatment of the Camphor laurel will occur as required, should regrowth occur.

Planting of native riparian species will be undertaken in two stages. The first stage will occur directly after the poisoning of the weed trees to allow native trees, shrubs and groundcovers to stabilise the immediate bank around the root systems and along the creek banks. Access to the dying trees will be retained for the length of works until the trunks have been removed, when a second stage of planting will occur for the balance of the site.

The works cover almost four hectares and approximately three kilometres of creek bank.

The works will occur progressively, in accordance with a contractors' proposal to fit the scheme of works. A request for quote will be prepared once the Part V receives approval and required permits/licences have been obtained.

In the longer term, there will be some picnic benches provided in the Road and Public Reserve at the rear of the Tintenbar shops and the Common (PN 17140), for fishing and passive recreational activities.

2.5 Options Considered

There are two alternative options to this proposal:-

The first alternative option is to not complete the works as presented. This option would gradually allow coral tree and camphor laurel to colonise the full extent of the creek banks over time. Camphor laurel are not salt tolerant, however, and photographs taken of creek bank root systems demonstrate that root systems are very shallow and terminate approximately 5 cm above the high water mark. Camphor laurel have already collapsed into the creek at the northern extent of the site, blocking navigation to the creek and creating eddying above the blockage during high flow events. It is likely that this eddying will result in scour occurring on creek banks and therefore damage to private land.

Local residents are concerned that these fallen trees will increase the risk of flooding to their properties.

Allowing colonisation of the creek bank with exotic and invasive species also reduces the capacity of the creek to support native macroinvertebrate and fish populations. Arguably this has already occurred with the lack of native vegetation. However, the growth patterns of the two tree weed species significantly reduce the ability of other plants to grow and they form a monoculture.

The second alternative option is a part completion of the works as described in Attachment 'A'. This would involve selecting only part of the works for completion. There would be a number of disadvantages to this option, including the inability to comprehensively revegetate the full four hectares and identified length of creekbank. This allows weeds to continue to colonise the remaining locations, potentially resulting in loss of bank stability in those locations. Although edge effects will remain an issue, even where the project is implemented in its entirety, the vulnerability of smaller sections of the project to weed re-infestation would be greater.

Council is in receipt of grant funds to implement the project in its entirety through the Healthy Waterways Program and the Office of Environment and Heritage Coastal and Estuary Grants Program. Implementing a smaller project would also mean that the grant funds applied to the project would also be smaller, and the Ballina Shire community would not be able to take advantage of the full grant offered.

2.6 Constraints

The site is narrow and follows the creek line from Tamarind Drive to the Tintenbar shop. It is not a heavily used road, and it is not in good condition so traffic does travel quite slowly along it. However, it is an 80 km/hr speed zone through its length.

The site is identified as being in the extreme category for Flood Hazard under the Ballina Development Control Plan (2012), in the lower reaches and as being at risk from flooding in the upper reaches in a 4% return interval event.

A Routine Stock Movement Permit has been issued by North Coast Local Land Services to allow one landholder to move stock between paddocks along Old Bangalow Road. This does not constrain the project itself.

3 Statutory Considerations

3.1 Legislation Applying

3.1.1. Assessment under Part 5 of the EP&A Act 1976

Under State Environmental Planning Policy (Infrastructure) 2007 – Clause 129 states that '*Development for the purpose of waterway or foreshore management activities may be carried out by or on behalf of a public authority without consent on any land*'.

These activities include the following where the development is in connection with a waterway or foreshore management activities:

(a) construction works,
(b) routine maintenance works,
(c) emergency works, including works required as a result of flooding, storms or coastal erosion,
(d) environmental management works.

This means that the proposed works do not require development consent and can therefore be assessed under Part 5 of the EP&A Act. The requirements of SEPP (Infrastructure) 2007 are discussed further within this section of the REF.

3.1.2 Ballina Environmental Plan 2012

The project area is located within the Ballina Shire Council Local Government Area. The proposed works will be located on land that is affected by the Ballina Local Environmental Plan 2012.

The project area is affected by the following zoning;

- RU1 – Primary Production
- W1 – Natural Waterways

Environmental protection works are permitted without consent in both RU1 and W1 zones. Environmental protection works are defined as works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works. Therefore the proposed works can be defined as environmental protection works and are permitted without consent under the Ballina LEP 2012.

3.1.3 State Environmental Planning Policies

Clause 129 of this SEPP allows for the management of waterway or foreshore management activities by or on behalf of a public authority to occur without the need for development consent. SEPP Infrastructure (2007) overrides other local and state planning policies.

3.1.4 Development Control Plans

Chapter 2 specifies general and environmental considerations and they will be addressed within this REF.

3.1.5 Confirmation of Part V Position

All relevant statutory planning instruments have been examined in relation to the proposal. As noted above, Development Consent is not required for the subject activity by virtue of Clause 129 of SEPP Infrastructure (2007).

However, the proposal becomes an 'activity' for the purposes of Part 5 of the *Environmental Planning and Assessment Act* 1979 and is subject to an environmental impact assessment.

3.1.6 Protection of the Environment Policies

No Protection of the Environment Policies (PEPs) are relevant to the proposed works. No licenses would be required pursuant to the Protection of the Environment Operations Act 1997.

3.2 Other NSW Legislation

The table below lists other NSW legislation that is relevant to the assessment of the proposed works and comments on their implications for the proposal.

Table 3.1 Relevant NSW Legislation

Legislation	Section(s)	Comment
Threatened Species Conservation Act 1995	**Schedules 1, 1A, 2 and 3**	The NSW BioNet was used to do a sightings/likely presence search of an area 10km x 10km centred on the Old Bangalow Road. Nine hundred and three terrestrial species were noted as being likely to have once inhabited this location. The following are the vulnerable populations noted as likely having had a presence in the general area:- Wallum Froglet, Olongburra Frog, Cotton Pygmy-Goose, Wompoo Fruit Dove, Rose-crowned Fruit Dove, Black-necked Stork, Black Bittern, Spotted Harrier, White-bellied Sea Eagle, Eastern Osprey, Brolga, Bush-stone Curlew, Pied Oystercatcher, Greater Sand-Plover, Comb-crested Jacana, Curlew Sandpiper, Great Knot, Terek Sandpiper, Eastern Grass Owl, Masked Owl, Grey-crowned Babbler, Varied Sittella, Spotted-tailed Quoll, Common Planigale, Koala, Grey-headed Flying Fox, Eastern Free-tail Bat, Eastern False Pipistrelle, Little Bentwing Bat, Eastern Bentwing Bat, Southern Myotis, Eastern long-eared Bat, Greater Broad-nosed Bat, Southern Ochrosia, Davidson's Plum, Smooth Davidson's Plum, Acalphyia, Knicker Nut, White Lace Flower, Green Leaved Rose Walnut, Onion Cedar, Arrow head Vine, Sweet Myrtle, Red Lilly Pilly, Dunrobby, Southern Swamp Orchid, Hairy Joint Grass, Ball Nut, Rough Shelled Bush Nut, Coast Euodia, Small-leaved Tamarind. The proposal is likely to positively influence the opportunity for Vulnerable Species to recover within the local area.
Crown Land Management Act 2016 – (Native Title Managers' Advice).	**Section 8.7**	A licence has been applied for, for works to be undertaken on Crown Land, both above and below mean high water mark (MHWM). Crown Lands have advised this licence process could take up to 6 months to finalise. The proposed works comply with the applicable provisions of the Native Title Act 1993. Further advice was also received from the Aboriginal Land Claim Investigation Unit in regard to land claims made upon Lot 10 Section 2 DP 785980 and Lot 7001 DP 1029333 that from an Aboriginal Land Claims perspective, permission was not required from the claimant for works in relation to bush regeneration and planting. This advice is provided in Appendix 2.
NSW Roads Act 1993.	**Section 138**	Approval will be required for contractors to undertake the works, and a traffic management plan is also required. Council will prepare this plan and approval.

NSW Fisheries Management Act 1994	Section 199	Approval is normally required under the Fisheries Management Act for this type of activity, however as a Crown Lands licence is required, this process will co-ordinate agency feedback and requirements. Therefore a separate Fisheries Permit is not required. See email from DPI – Fisheries at Appendix 2.
Water Management Act 2000	Section 91E	Controlled activities on waterfront land require an approval however public authorities such as local councils are exempt from requiring controlled activity approvals.

3.3 Commonwealth Legislation

3.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), any action that has, or is likely to have, a significant impact on matters of National Environmental Significance (NES) or other aspects of the environment, such as on Commonwealth land, may progress only with approval of the Commonwealth Minister for the Environment under Part 9 of the EPBC Act. The only matters of national environmental significance that may be affected by the proposal are threatened and migratory species. Section 7 considers such matters and concludes that no Commonwealth approval is necessary for the proposed works.

3.4 Consultation

Consultation has been undertaken as follows in Table 3.2. This represents both formal consultation as well as informal discussion with community groups regarding the project.

Table 3.2 Summary of Consultation

Agency	Comments
NSW Department of Industry – Land and Water (Crown Lands)	A licence has been formally applied for, for works on Crown Land and below MHWM (for rootball placement).
DPI - Fisheries	Informal (email) correspondence has been undertaken to ascertain the requirements under the Fisheries Act, 1994. Advice has been obtained as noted above (See Appendix 2).
Office of Environment and Heritage – Coasts and Estuaries Staff	Liaison with OEH staff with respect to the grant and to the formal government processes has begun.
Residents and Landholders	Letters advising local residents of the successful grant application have been sent to all nearby landholders and occupiers as at 12 September 2018. Responses have been received from the following:- 4 residents have contacted the project team. All were supportive of the project, however raised concerns that the proposed plantings along Old Bangalow Road may increase flooding of private property. All contact received will be considered by the project team in the final detailed design phase.

Ozfish Unlimited (Non-government organisation)	Ozfish Unlimited are supportive of the project with respect to its potential benefits to fish populations.
Tuckombil Landcare Group	This work complements other work that Tuckombil Landcare Group have been involved in.

4 Existing Environment

4.1 Climate

The nearest Bureau of Meteorology weather station to the project site is Ballina Airport approximately five kilometres to the South East. The climate is characterised by mild winters and warm summers. As indicated in Table 4.1, the mean annual rainfall is approximately 1708 mm. Most of this rain typically occurs between December and May. The dry season typically occurs during spring and the latter part of winter.

Table 4.1 Climate Data for the BALLINA AIRPORT (1948– 2013)

Month	Mean Daily Max Temp (°C)	Mean Daily Min Temp (°C)	Mean Monthly Rainfall (mm)
January	27.5	20.7	161.2
February	27.5	20.6	191.6
March	26.5	19.5	212.1
April	24.5	17.2	184.1
May	22.0	15.0	185.1
June	19.8	12.2	155.9
July	19.4	11.7	100.4
August	20.3	12.5	91.5
September	22.1	14.4	65.0
October	23.3	16.0	102.8
November	24.7	17.8	116.2
December	26.4	19.5	141.6
Annual	23.7	16.5	1707.6

Source: Commonwealth Bureau of Meteorology.

Storm events and high flow events would be most likely to occur between November and June. Wet summers present favourable growing conditions for many plants, and once they have been in the ground for three months they are usually resilient to high flow events.

4.2 Geology and Soils

The site occupies the location where Emigrant Creek opens out onto a narrow, although expanding floodplain. There is a general fall along the location of the site from the northern part of the site to the southern part of the site. The site would previously have been a moist closed forest location, and sometimes wet for extended periods. The country rock is highly weathered basalt, which is represented in the Eltham Soils Landscape classification (Morand, 1994). Induced acidity is an issue on some adjacent cultivated floodplain locations, and agricultural drainage has been constructed also. These issues will not be addressed by this proposal as planting will not occur on these lands, but on the publicly owned land along the creek banks and roadsides.

Morand (1994) notes that bank erosion is common and active, and that woody weeds (ie camphor laurel and coral tree) are prolific along stream banks. There is some potential for acid sulfate soils to be intercepted around floodgate locations, and testing has been undertaken to identify whether or not this is an issue. See Section 5.1 for more information. A levee has formed along parts of the creekbank, although it is not known if this is a natural levee or man-made. It is not proposed to change the profile of the creekbank or levee.

The soils are noted as Krasnozems forming on basalt derived from alluvium, and they are quite uniform in their grain size along their vertical depth. They do have a recognisable 'topsoil' and 'subsoil' layer but the boundary is often gradual or diffuse. The soils are deep, up to 150cm. As they are floodplain soils, they are susceptible to slumping, waterlogging, erosion and are located in an area of high flood hazard.

They are noted as 'acid soils' as opposed to acid sulfate soils, although sampling has been undertaken to ensure this issue is understood. See Section 5.1 for more information.

Morand (1994) notes that 'planting of native riparian trees is encouraged'.

4.3 Vegetation

Vegetation along the banks at the moment consists of occasional remnant native species, usually *Melaleuca spp*. Grasses are present, with some native herbs or groundcovers.

However, the site is mostly populated with woody weeds such as *Camphor laurel* and Coral tree, and *Lantana camara*. Weedy vine species are also present.

5 Environmental Assessment

5.1 Acid Sulfate Soils

Acid Sulfate Soil (ASS) materials in subsurface sediments do not pose a problem if left undisturbed. However, when exposed to air by either lowering of the water table or by excavation, the ASS materials oxidise and in the presence of water, will form sulfuric acid. This acid can lead to major problems for soil and groundwater, and leach heavy metals from the soil, which if allowed to enter waterways, can have devastating effects on aquatic habitats.

The acid risk map is included in Appendix 2. The project area is predominantly mapped as Class 3 ASS in the NSW Planning risk maps with some areas of class 5 also being present. In Class 3 ASS there is a risk of disturbing ASS when works extend beyond 1 metre below the natural ground surface or if the water table level is lowered by more than 1 metre. In Class 5 ASS, there is a risk of disturbing or exposing ASS if works lower the water table by more than 1 metre in nearby Classes 1 to 4 ASS.

Some works may be required to the existing culverts to stabilise them and prevent further scouring and erosions. These works may require works beyond 1 metre below the natural ground level. Therefore soil samples were collected for analysis, laboratory results and sampling locations are shown at Appendix 2.

The results show that at 1 metre below ground level the acid sulfate soils will require management if disturbed. Therefore an Acid Sulfate Soil Management Plan has been prepared under separate cover. The results also show the soil at all levels are quite acidic so liming and mulching may be required when planting to assist with the survival and establishment of the revegetation works. As noted by

Morand (1994) krasnozems are 'acid soils' in any case, so these results are within expected parameters and confirm the knowledge of the site.

5.2 Water Quality

Water quality at the site was noted by *The Richmond Ecohealth Project 2014 Report* (UNE, June 2015) as Very Poor. The Tintenbar Road bridge over Emigrant Creek was Site EC2 in the report and scored an F both for riparian condition and water quality. As a whole, the site scored a D- overall, partly due to a Fair (C+) score for geomorphological stability of the creek at that location. Macroinvertebrates were not scored at this site as the site is often brackish.

The upstream freshwater site scored better for both riparian condition (D+) and water quality (C+) were, and macroinvertebrate assemblages were scored as Fair.

Poor water quality was predominantly driven by concentrations of bioavailable nutrients consistently exceeding ANZECC trigger thresholds. Phosphorus exceeded the trigger levels by more than four times, and nitrogen by more than seven times. Very high concentrations of chlorophyll *a* at one of the sites monitored within Emigrants Creek were associated with an algal bloom early in the study period.

Dissolved oxygen was consistently low, being lower than the minimum threshold in two-thirds of samples at this site.

The creek in the study area is usually turbid with heavy sediment loads which increase following rainfall.

The upstream Emigrant Creek Dam provides transparent discharges to Emigrant Creek for all low to medium flows, from the top layer of water. It is considered that there should therefore be little or no impact on either water quality or macroinvertebrate populations from the presence of the dam.

5.3 Odour and Air Quality

The area is rural in nature and includes the small village of Tintenbar. Generally the air quality would be good however at times may be impacted due to rural land practices that may produce dust, smoke and odours due to cattle or fertiliser use.

5.4 Noise and Vibration

The area is generally of quiet rural character however both ends of the project area would be impacted by traffic noise from either the Pacific Highway or Tintenbar Road. The rural activities in the locality may also result in noise from plant (pumps, chainsaws etc), machinery (tractors etc) and animals.

5.5 Socio-Economic Considerations

There is the potential for good social outcomes associated with this project. An initial letter to nearby residents has identified some residents with an interest in complementary plantings on their own (adjacent) land. Over time, the expected positive fish habitat outcomes are expected to provide enhanced fish populations locally which will also provide positive social outcomes amongst the groups within the community who like to fish.

There are some economic benefits which can be qualitatively identified. These include tourism, fishing associated benefits (bait sales, fishing and camping sales etc), enhanced land prices as a result of

improved aesthetics and less weeds. These cannot be realistically quantified, however, and are included as a note only.

5.6 Heritage

5.6.1 European Heritage

Formally recognised European Heritage

Searches were conducted of the Australian Heritage Council database, the National and NSW Heritage Office databases and Ballina Shire Council heritage listings under Schedule 5 of the Ballina LEP (2012). Under these listings, no heritage items were identified within the proposed area of works. The site is not known to have any heritage significant and no impacts are therefore likely to occur on any heritage items.

The Tintenbar Cemetery is located at Hill Street, above the Emigrant Creek Floodplain, and was the only item found in the immediate vicinity of the works with formally recognised heritage significance.

Environmental Heritage

The creek banks at the moment support very minimal native vegetation. Generally this vegetation is restricted to isolated and mature native trees, with the occasional smaller shrub. Much of the bank is either grassed or is progressively becoming more dominated by weeds. The scale of weeding proposed by this project and the planting of native vegetation will enhance the environmental heritage of the site, for a number of reasons.

Some work has been undertaken upstream both by the community and by Rous County Council as part of their catchment management activities. This has included weeding and revegetation activities. This proposal will continue to enhance the banks of Emigrant Creek with native vegetation which provides connectivity for both flora and fauna. The site would have variously supported a mosaic of the following Endangered Ecological Communities:-

- River flat Eucalypt Forest
- Lowland Rainforest on Floodplain
- Subtropical Lowland Rainforest

Although maintenance weeding will still be required from time to time, it is also expected that weeds will be less likely to establish once canopy cover has been achieved. It is therefore expected that the proposed works will significantly enhance the environmental heritage values of the site, and Emigrant Creek also.

Social and cultural values of the open space and Emigrant Creek

The waterways of Ballina Shire are an integral part of the lifestyle of many residents and the holiday experience for holidaymakers. Emigrant Creek provides low key boating opportunities up to the existing barrier that has been created by Camphor Laurel trees that have fallen across the creek. It is also used for fishing, and provides a nursery for estuarine fish species.

The values held by the community are unlikely to be affected by this proposal. The reinstatement of native vegetation along the banks and for a varying distance landward will provide a number of advantages for the future use of the creek for both low-key boating and fishing. These advantages include:-

1. Reinstatement of connected native riparian vegetation will provide a food source for macroinvertebrates within the creek itself, which in turn will provide a food source for fish. Partial shading of the creek in some locations will also reduce the temperature differential between summer and winter and night and day currently experienced within the water column, again providing a better environment for fish. Revegetation of the banks will reduce the likelihood of bank erosion into the future, reducing sediment load within the creek.
2. Reinstatement of rootballs in some locations will provide resting and breeding locations for local native fish, which will boost their future populations. It is acknowledged that the rootballs will increase the need for vigilance whilst boating, it is considered that this can be managed with signage in strategic locations. Boating at speed within the creek is not a desired outcome and there will be no hazard for kayaks and canoes.
3. Trees which have already fallen into the creek are not proposed to be removed within this project (Civil Services are separately looking into this issue).
4. Fishing will still be available from the two public reserves close to Tintenbar.

5.6.2 Aboriginal Heritage

Potential disturbance to indigenous objects and places, if present on site may result from ground disturbance. A search was undertaken of the Department of Environment and Conservation's Aboriginal Heritage Information Management System sites register. This search resulted in three Aboriginal sites or places being identified within the general location of the proposed area of works, but none are located on the site itself. The results of the search are noted at Appendix 2.

There were no Native Title issues identified by Council's Property Officer – Community Lands that would be associated with the proposed works for this project (weeding and bush regeneration). Internal advice was received to this effect on 10 September 2018.

A Land Claim has been made on two of the properties that are the subject of this REF. These sites are Lot 10 Section 2 DP 758980 and Lot 7001 DP 1029333, both of which are public reserves. Advice has been received from the Co-ordinator Case Manager with the Aboriginal Land Claim Investigation Unit, Department of Industry – Crown Lands that the proposed works are such that consent is not required from the claimant.

5.7 Traffic and Access

A traffic management plan has been prepared. It is attached in Appendix 3.

5.8 Waste Management

Where possible weed trees will be poisoned and left in place to provide habitat and break down naturally over time. However it will be necessary to remove some of the weed trees due to proximity to roads or other infrastructure or due to the high density present. Where trees need to be removed they will either be mulched for reuse during the project or possibly removed by contractor for on-selling (Camphor Laurels) or disposal at a place that can lawfully receive them.

5.9 Services

Aboveground and underground assets will be checked prior to any works occurring to identify any potential areas of concern that might need to be marked and managed.

6 Environmental Management

6.1 Flora and Fauna

At present there are few native species on the banks of the creek for the length of the project site. There are a few native trees growing within the broader woody weeds of camphor laurel and coral tree, as well as shrub weeds. Existing native trees and plants will be identified and protected during the works.

A detailed flora planting plan will be prepared as part of an overall works plan by a suitably qualified consultant to ensure that the correct species are utilised in the correct locations. An effort will be made to include threatened flora species in slightly higher ratios than would occur naturally to enhance their likely survival.

Within this plan, discussion with a local company that removes camphor trunks for on-selling will be undertaken to ascertain the potential for this to occur at the site. As previously noted, roots will be left in situ to retain the stability of the bank. They will naturally rot down and the second stage of planting will then expand to fill the gaps left by rotting roots.

Both camphor stumps and coral tree will be stem injected to induce dieback. Vine weeds and shrubs will be treated appropriate as per the works plan. Once dead, coral tree will be removed entirely from the site.

Planting will occur as soon as practicable after the stem injection of the woody weeds, to begin the bank stabilisation process. There will be two main planting events, over two consecutive planting seasons. Planting will consist of groundcovers, shrubs and tree species, and the species list will generally be obtained from "The Landholders Guide to Looking After Waterways in the Richmond River Catchment".

Tubestock will be grown on from local provenance seed, partly by the Council nursery. Longstem stock planting will be utilised in the first instance to enhance the root system and increase resilience in the first few months to possibly inundation or flooding. Other tubestock will be sourced from other local nurseries as required and available.

Natives remaining onsite will be tagged by bush regenerators and left intact.

The aim of this project is to reinstate ecologically resilient vegetation along the length of the site and hence any 'mitigation' is not applicable in the usual sense.

6.2 Soil Erosion and Sedimentation

There is some potential for erosion and sedimentation in this project, although it will be kept to a minimum. The main risks for direct impacts on Emigrant Creek will be the removal of coral trees after they have died back after stem injection. Further specialist advice will be sought on a tree by tree basis to assess whether this removal is required. Normal advice is to remove the tree and all its component branches to remove the biosecurity risk for other locations.

Where removal of coral tree is required, mulch, sediment socks, hay bales and a sediment boom will be utilised, as required, to reduce the potential for movement of sediment into the creek.

The batter will then have jute mat installed and dense, diverse plantings undertaken. The jute mate will be pegged in.

More generally, erosion and sediment controls will be installed in accordance with the requirements of the Managing Urban Stormwater – Soils and Construction, LANDCOM, March 2004. To ensure contractors are aware of what is required in this regard, an erosion and sediment control plan will be prepared prior to works commencing. Apart from bank stabilisation as an issue, the main issue will be ingress and egress to planting areas during wet periods as the soils retain moisture for long periods after rain and can be highly erodible. To reduce the potential for gravel movement offsite in a high flow event, it is likely that the erosion and sediment control plan will utilise heavy grade geotextile pegged down for use by vehicles. Each site will only be in use for a maximum of 10 days or so at a site, so this will be simple to achieve.

Sediment and erosion controls will include stabilised access points, control of access to the side utilising various means including the installation of hay bales in lieu of sediment fencing. Whilst more expensive, where high flows are experienced, hay bales are less likely to cause a snag or pollution hazard should they move offsite.

Sediment socks and sediment fencing may also be utilised as required.

When required dust controls will also be undertaken in accordance with the recommendations of No Dust No Fuss booklet and factsheets (NSW EPA). Dust control measures will include mulching bare soil, wetting down work areas and stopping work in high wind conditions (if dust is not effectively controlled).

It is anticipated that in the medium to longer term, the project will term improve soil erosion and sedimentation as currently eroding banks are stabilised and revegetated.

6.3 Water Quality

As noted above, there are existing water quality issues within the creek. Additional issues will be avoided by the use of;

- Erosion and sediment controls
- Suppression of dust
- Ensuring chemicals are stored and used accordance with their MSDS and label, and
- ASS will be avoided or when they cannot be avoided will be managed including treating with lime at the rate calculated by the laboratory, see the acid sulfate soil management plan.

As above, in the medium to longer term the project will provide improvements to the local water quality through controlling erosion and providing native riparian vegetation which act as bank stabiliser and filter to stormwater.

6.4 Air Quality

Air quality will be controlled by suppressing dust and by ensuring plant and equipment is operating efficiently and is not emitting excessive exhaust fumes.

6.5 Noise and Vibration

The works may result in the generation of noise and possible localised vibration from the use of motorised augurs to dig planting holes, or use of chainsaws over a short time for the removal of camphor laurel trunks. The use of machinery and power tools will generate noise. The movement of plant and equipment may cause vibration which is unlikely to be at a problematic level due to the largely rural nature of the planting locations and will not require management or mitigation.

Noise will be managed by complying with Australian Standard 2436:2010 Guide to noise and vibration control on construction, demolition and maintenance sites and the NSW Interim Construction Noise Guidelines (DEC 2009).

The following standard hours will also be complied with to minimise any impacts on nearby sensitive receivers:

Construction

The hours of operation for any noise generating construction activity (including the delivery of materials to and from the site) on the proposed development are to be limited to within the following times:

Monday to Friday	*7.00am to 6.00pm*
Saturday	*8.00am to 1.00pm*

No noise generating construction activities are to take place on Sundays or public holidays.

6.6 Heritage

It is unlikely that any items of Aboriginal or European heritage will be uncovered during the works. This is both due to the nature of the works (being planting and weeding and therefore no excavation required (except possibly for the removal of dead coral tree) and the geomorphological nature of the site. As it is a floodplain occurring in a catchment which has been previously cleared, large sediment slugs moving through the catchment would have buried most evidence of previous Aboriginal presence.

However, should items of Aboriginal or European heritage be uncovered during the works, the following procedures will take place:-

- Where material that appears to be of Aboriginal origin is identified, work will cease and the Jali Local Aboriginal Land Council and OEH will be contacted; and
- Where material that appears to be of European Heritage is discovered during the project works, works will halt until a course of action acceptable to the approving authority (in this case, Council) can be identified. Jali LALC will also be notified as a courtesy and to reduce the potential for misidentification of any artefacts.

6.7 Traffic Management

A traffic management plan has been prepared for this work and is attached at Appendix 3.

6.8 Operational Hazards and Risks

In accordance with the *Work Health and Safety Act* 2011, workers will be provided with appropriate safety clothing and equipment. Supervisory staff and any visitors to the work area will be inducted onto the site and will also be required to wear protective clothing.

7. Provisions of EPBC Act 1999

Under the Environment Protection and Biodiversity Conservation Act 1999, any action which has a significant impact on a matter of national environmental significance or Commonwealth land triggers the Act, and therefore, requires a Commonwealth Environmental Impact Assessment. See **Appendix 2.6** for results of the Department of Environment and Energy "Protected Matters Search Tool" undertaken for the REF.

It is noted that the Matters of National Significance Checklist does not apply to this project, as the project is not negatively impacting on existing protected flora and fauna. The project will enhance the opportunities for better connectivity and enhanced population potential for these species. The project does not therefore trigger the Act and a Commonwealth Environmental Impact Assessment is not required.

8. Conclusion

The Emigrant Creek Riverbank Restoration project has the potential to restore just over five hectares of riverbank back to native vegetation with the accompanying improvements in bank stability, fauna habitat, macroinvertebrate populations and potentially dissolved oxygen levels within the water column. Resting locations will be provided for fish which should, over time, provide for increased finglings and populations of native fish. Restoration to more natural conditions will reduce the likelihood that carp utilise the creek (they prefer warmer, more turbid waters with lower roughness co-efficients).

There is no suggestion at present that adjacent landuse will change, so it is likely that both phosphorus and nitrogen levels will remain at levels higher than desirable.

Local biodiversity will be enhanced both intrinsically with the plantings undertaken onsite, but also because there will be connectivity with upstream native vegetation plantings/remnant vegetation. Removal of woody and other weeds also reduces the local seed source, at least temporarily. Once canopy cover has been achieved, maintenance of plantings will be much reduced.

Risks to the environment through erosion are manageable. The risk to acid sulfate soils is minimal and manageable.

The natural values for Threatened Species and Endangered Ecological Communities will be enhanced by the removal of weed seed sources, the consolidation of native riparian communities and improvement in aspects of the water quality. Stable creek banks will also enhance the resilience of the floodplain to high flow events, reducing scouring and potential for stream migration.

Finally, there is the possibility to add value to works already occurring on private lands to revegetate creekbanks. This will enhance outcomes for both locations, reducing edge effects and building positive relationships between Council and local landholders.

In summary, and with regard to the need for planning consent:-

- the proposed works are not likely to significantly affect threatened species, populations or ecological communities as listed in the TSC Act 1995. Therefore, a Species Impact Statement is not required;

- the proposed works will not have a significant impact on NES or Other Matters as described in the EPBC Act 1999 (refer to Section 7.2) and therefore the works do not need to be referred to the Minister;
- appropriate mitigation measures can be implemented to manage any potential short term environmental impacts;
- the proposed works will not have any significant adverse impacts on the natural or human environment; and
- the proposed works will have long term environmental benefits.

All relevant statutory planning instruments have been examined in relation to the proposal. Based on the review undertaken, the subject proposal does not require development consent and is subject to environmental impact assessment under Part V of the Environmental Planning & Assessment Act 1979.

9. Appendices

Appendix 1.1:- Consideration of Environmental Factors

Clause 228 Checklist

As part of its obligation under Section 5.5 of the Environmental Planning and Assessment Act, the consent authority is required to take into account, to the fullest extent possible, all matters likely to affect the environment. The consent authority is required by Clause 228 of the Environmental Planning and Assessment Regulations 2000 to give consideration to a number of factors that are listed below. The following provides a summary of the key issues relevant to each factor and the key mitigation measures proposed.

CONSIDERATION OF ENVIRONMENTAL FACTORS

Notes for completing this section:

Tick appropriate 'Impacts' as follows;

(NA) Not Applicable, (-ve) Negative Impact, (NIL) No Impact, (+ve) Positive Impact.

Provide comments for each factor in support of the opinion circled in the Impacts column, to the degree of detail appropriate to the proposal and its interaction with the environment.

FACTOR (NSW LEGISLATION)	IMPACTS
a Any environmental impact on a community? Comments: During removal of trees there may be adverse environmental impacts including vegetation removal, dust, vibration, noise and possible erosion. These are expected during clearing works only, and will be mitigated by limiting the clearing to camphor laurel trees noted on the plan, ensuring specified working hours are adhered to (between 7am and 6pm Mon –Fri and 8am to 1pm Sat), and implementing sediment and erosion control measures. Herbicides will be utilised adjacent to Emigrant Creek. This will be generally through stem injection, or scrape and paint. Spraying will be avoided. Only herbicides approved for use adjacent to water will be utilised and will be used in accordance with their label and MSDS. There will be a positive environmental impact on the community with the removal of large camphors and coral trees which are a weed source, and reinstatement of native riparian vegetation.	NA ☐ -VE ☒ NIL ☐ +VE ☒

b	Any transformation of a locality? Comments: There will be no transformation of the locality, apart from some possible replacement of woody weeds with native riparian species. There may be some visual impacts to some residences in the short to medium term as rainforest species are planted to replace the larger camphor laurels.	NA -VE NIL +VE	☐ ☐ ☐ ☒
c	Any environmental impact on the ecosystems of the locality? Comments: There will be a positive impact on the ecosystems of the locality with the mass removal of camphor, coral tree and other weeds as a weed source impacting on Emigrant Creek both upstream and downstream. There is the short term potential for weed incursion, which will be managed using follow-up weed maintenance and a mass planting of riparian species.	NA -VE NIL +VE	☐ ☐ ☐ ☒
d	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? Comments: There will be some aesthetic changes to the locality in the short to medium term as woody weeds and other weeds are removed and native species planted. In the medium to long term the aesthetic, recreational and environmental quality of the location will be significantly improved.	NA -VE NIL +VE	☐ ☐ ☐ ☒
e	Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? Comments: Positive benefits are anticipated with respect to ecological communities (aquatic and terrestrial) and river health. An AHIMS search was undertaken and no Aboriginal Sites or Places registered. Please see Appendix 2 for more information.	NA -VE NIL +VE	☐ ☐ ☐ ☒

f	Any impact on the habitat of any protected fauna (within the meaning of the National Parks and Wildlife Act, 1974)? Comments: At present, the presence of native fauna is likely to be minimal at best due to the overwhelming weed presence, and this is true for both land and water based species. A number of threatened fauna species are noted in Table 4 (p11) of the VMP. These and other species are likely to be positively impacted in the medium to long term with the enhancement of habitat both onsite and as a connecting corridor along Emigrant Creek.	NA -VE NIL +VE	☐ ☐ ☐ ☒
g	Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? Comments: For the reasons given above (point f) there is minimal negative impact expected for native species and the project will result in an improvement for both flora and fauna.	NA -VE NIL +VE	☒ ☐ ☐ ☐
h	Any long-term effects on the environment? Comments: Medium to long term effects on the environment are anticipated to be positive. An improvement in river health along the length of the site is expected, as is enhanced connectivity of native vegetation communities.	NA -VE NIL +VE	☐ ☐ ☐ ☒
i	Any degradation of the quality of the environment? Comments: There is potential for sediment to enter the creek if the works are not appropriately managed during possible dead tree removal (coral tree) Works will require sediment control and professional tree lopping services to minimise the potential for this to occur. ASS is also a risk of degrading the environment. Proper management will avoid this risk.	NA -VE NIL +VE	☐ ☐ ☐ ☒
j	Any risk to the safety of the environment? Comments: Poor herbicide practice could impact upon the environment. This risk will be managed through the use of professional bush regenerators utilising approved herbicides for waterway locations.	NA -VE NIL +VE	☐ ☒ ☐ ☐

k	Any reduction in the range of beneficial uses of the environment?	NA	☐
	Comments: None	-VE	☐
		NIL	☐
		+VE	☒
l	Any pollution of the environment?	NA	☐
	Comments: Possible pollution to the environment may occur during works. Mitigation measures are to be implemented to minimise any pollution, including proper management of ASS, the use of stabilised access and hay bales for sediment and erosion management.	-VE	☒
		NIL	☐
		+VE	☐
m	Any environmental problems associated with the disposal of waste?	NA	☐
	Comments: There will be some organic waste material generated. Most organic material will be left to rot in situ after being poisoned. Large trunks will be removed by the contractor and exported offsite. Coral tree (depending on advice) may need to be disposed of at the Council's Waste Management Facility located in the Southern Cross Industrial Estate.	-VE	☐
		NIL	☒
		+VE	☐
n	Any increased demands on resources, natural or otherwise which are, or are likely to become in short supply?	NA	☒
	Comments: No	-VE	☐
		NIL	☐
		+VE	☐
o	Any cumulative environmental effect with other existing or likely future activities?	NA	☐
		-VE	☐
	Comments: Positive environmental effects are expected as a result of this work, in the medium to long term. Short term effects will be managed to reduce any possible negative impacts that could affect the adjacent Emigrant Creek.	NIL	☐
		+VE	☒

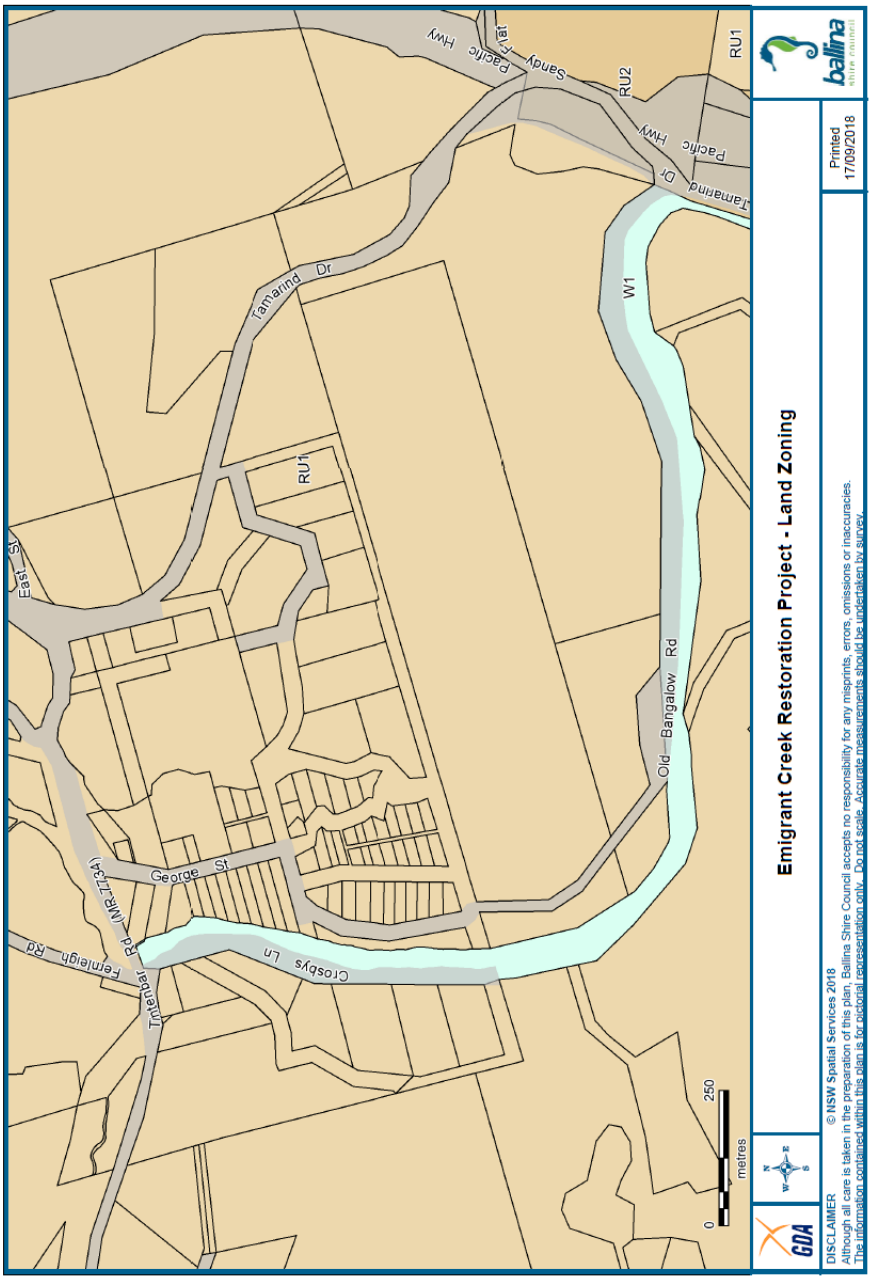
FACTOR (COMMONWEALTH LEGISLATION)	**IMPACTS**

a	Any environmental impact on a World Heritage property?	NA	☒
	Comments: Not applicable.	-VE	☐
		NIL	☐
		+VE	☐
b	Any environmental impact on wetlands of international importance?	NA	☒
	Comments: Not applicable.	-VE	☐
		NIL	☐
		+VE	☐
c	Any environmental impact on Commonwealth listed threatened species or ecological communities?	NA	☐
		-VE	☐
	Comments: There are no negative impacts expected on listed species (Olongburra Frog (V), Koala (V), Spotted-Tailed Quoll (E), Eastern Freshwater Cod (E), and Curlew Sandpiper (Crit E). Flora species have not been identified, however it is not expected that there will be negative impact on any Commonwealth – listed threatened species. There is potential for there to be positive outcomes for Coastal Swamp-oak Forest of NSW and Lowland Rainforest of Subtropical Australia.	NIL	☒
		+VE	☐
d	Any environmental impact on Commonwealth listed migratory species?	NA	☒
		-VE	☐
		NIL	☐
	Comments: None	+VE	☐
e	Does any part of the proposal involve a nuclear action?	Yes	☐
	Comments: Not applicable	No	☒
f	Any environmental impact on a Commonwealth marine area?	NA	☒
	Comments: Not applicable	-VE	☐
		NIL	☐
		+VE	☐

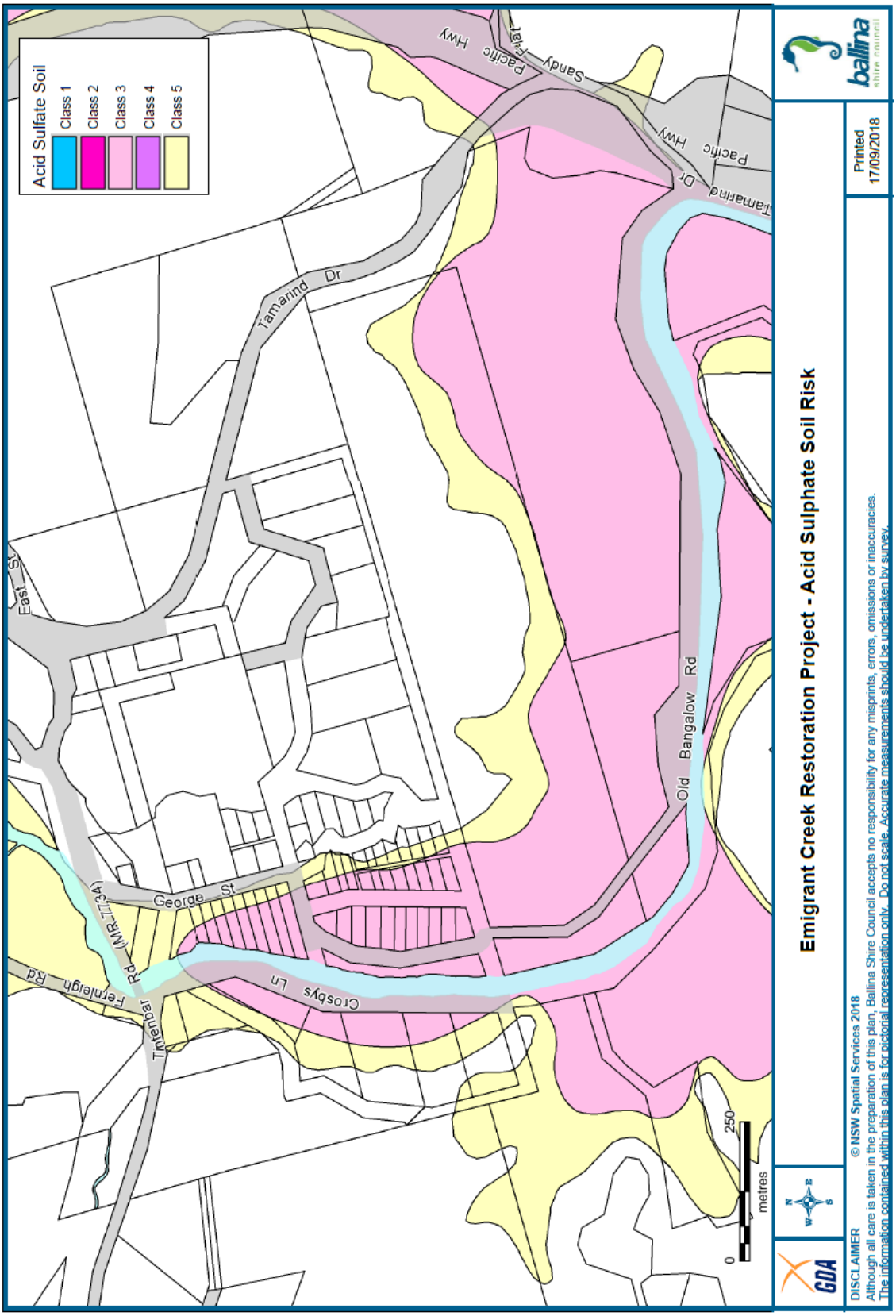
g	Any direct or indirect effect on Commonwealth land?	NA	☒
	Comments: Not Applicable	-VE	☐
		NIL	☐
		+VE	☐

Appendix 2 – Miscellaneous Information

Land zoning – Appendix 2.1



Acid Sulfate Soil Mapping and Results of Testing – Appendix 2.2



RESULTS OF ACID SULFATE SOIL ANALYSIS

4 samples supplied by Ballina Shire Council on 17th September, 2018. Lab Job No.H4084
Analysis requested by Rachael Jenner. Your Job: Emigrant Creek

PO Box 450 BALLINA NSW 2478

Sample Identification	EAL Lab Code	Texture	Moisture Content		Potential Sulfidic Acidity (Chromium Reducible Sulfur - CRS)			Actual Acidity (Titratable Actual Acidity - TAA)	Retained Acidity ($\%S_{HCl} - \%S_{KCl}$)		Non-treated soil: Acid Neutralising Capacity (ANC_{BT})		Non-treated soil: Net Acidity	Non-treated soil: Lime Calculation
			(% moisture of total wet weight)	(g moisture / g of oven dry soil)	($\%S_{Cr}$)	(mol H^+/t)	pH_{KCl}	(mol H^+/t)	($\%S_{NAS}$)	(mol H^+/t)	(% $CaCO_3$)	(mol H^+/t)	(mol H^+/t)	(kg $CaCO_3$/t DW)
Method info.		**	**		*(In-house method S20)*		*(In-house method 16b)*		**		*(In-house method S14)*		**	**
S1 0-0.2	*H4084/1*	Fine	67.6	2.09	0.036	22	4.25	136	0.031	14	..	..	173	13
S2 0.5	*H4084/2*	Fine	63.3	1.73	0.079	49	4.59	87	..	..	..	..	136	10
S2 1.0	*H4084/3*	Fine	75.8	3.14	0.698	435	4.64	98	..	..	..	..	533	40
S2 1.5	*H4084/4*	Fine	77.5	3.45	0.547	341	4.67	96	..	..	..	..	437	33

NOTES:

1. All analysis is reported on a dry weight (DW) basis, unless wet weight (WW) is specified.
2. Samples are dried and ground immediately upon arrival (unless supplied dried and ground).
3. Analytical procedures are sourced from Sullivan L, Ward N, Toppler N and Lancaster G. 2018. National acid sulfate soils guidance: national acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT. CC BY 4.0.
4. The Acid Base Accounting Equation, where Acid Neutralising Capacity has not been corroborated by other data, is **Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity** (Eq. 3.2; Sullivan et al. 2018 - full reference above).
5. The Acid Base Accounting Equation for post-limed soil materials is **Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - (post treatment Acid Neutralising Capacity - initial Acid Neutralising Capacity)** (Eq. 3.3; Sullivan et al. 2018 - full reference above).
   While the Acid Neutralising Capacity of a soil material may not be included in the Net Acidity calculation (Note 4), it must be measured to give an Initial Acid Neutralising Capacity if verification testing is planned post-liming.
   The Inital Acid Neutralising Capacity must be provided by the client to enable EAL to produce Net Acidity and Liming calculations for post-limed soil materials.
6. The Acid Base Accounting Equation, where Acid Neutralising Capacity has been corroborated by other data, is Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - Acid Neutralising Capacity (Eq. 3.1; Sullivan et al. 2018 - full reference above).
7. The lime calculation includes a Safety Factor of 1.5 as a safety margin for acid neutralisation (Sullivan et al. 2018). This is only applied to positive values. An increased Safety Factor may be required in some cases.
8. Retained Acidity is required when the pH_{KCl} < 4.5 or where jarosite has been visually observed.
9. A negative Net Acidity result indicates an excess acid neutralising capacity.
10. **An acid sulfate soil management plan is triggered by Net Acidity results greater than the texture dependent criterion: coarse texture ≥ 0.03% S or 18 mol H^+/t; medium texture ≥ 0.06% S or 36 mol H^+/t; fine texture ≥ 0.1% S or 62 mol H^+/t)** (Table 1.1; Sullivan et al. 2018 - full reference above)
11. For projects that disturb > 1000 t of soil material, the coarse trigger of ≥ 0.03% S or ≥ 18 mol H^+/t must be applied in accordance with Sullivan et al. (2018) (full reference above).
12. Acid sulfate soil texture triggers can be related to NCST (2009) textures: coarse and peats = sands to loamy sands; medium = clayey sand to light clays; fine = light medium to heavy clays (Sullivan et al. 2018 - full reference above).
13. Bulk density is required to convert liming rates to soil volume based results. Field bulk density rings can be submitted to EAL for bulk density determination.
14. A negative Net Acidity result indicates an excess acid neutralising capacity.
15. '..' is reported where a test is either not requested or not required. Where pH_{KCl} is < 4.5 or > 6.5, zero is reported for S_{NAS} and ANC in Net Acidity calculations, respectively.
16. Results refer to samples as received at the laboratory. This report is not to be reproduced except in full.
17. ** NATA accreditation does not cover the performance of this service.

checked: .....
Graham Lancaster
Laboratory Manager

Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

Appendix 2.3 – Preliminary Email from NSW DPI – Fisheries

Dear Suzanne

The subject works, ie fencing and bank revegetation will not trigger any approvals under the Fisheries Management Act 1994.

Resnagging works will however trigger dredging and reclamation provisions within the Fisheries Management Act 1994. However the need for a permit will probably be overshadowed by the need to obtain a licence from Crown Lands under the Crown Lands Management Act 2016 for the deployment of the snags on Crown land.

A specific provision in the Fisheries Management Act 1994, section 199, states that a Fisheries dredging and reclamation permit is not required if the works are approved by another (state) public authority. In short with a Crown lands licence you don't need a Fisheries Permit - however you can't get a Fisheries permit unless you have landholder's consent and relevant licences from the Crown.

So the important next stop has to be talking to Crown lands. Please let me know when you begin that consultation and DPI Fisheries will sent you a letter of advice indicating
that the proposal is consistent with DPI Fisheries policy and guidelines and objects of both the Fisheries Management Act and the Marine Estate Management Act.

Sincerely

PAT

Patrick Dwyer | Senior Fisheries Manager - Coastal Systems (North Coast)
Aquatic Environment | Primary Industries NSW
T 02 6626 1397 | M 0407 264 391 | E patrick.dwyer@dpi.nsw.gov.au
W: www.industry.nsw.gov.au | www.dpi.nsw.gov.au
Postal Address: | 1243 Bruxner Hwy | Wollongbar NSW 2477 |

Appendix 2.4 – Email from Department of Industry – Crown Lands – Aboriginal Land Claims Consideration

Hi Rachael

I have reviewed Council's proposed works for Lot 10 section 2 DP 758980 and Lot 7001 DP1029333 which are subject of undetermined Aboriginal Land Claims 33502 and 33520 respectively.

I am of the view that from an Aboriginal Land Claims investigation perspective only, consent from the claimant Land council is not required in this instance.

This is due to the low impact of the proposed works, the proposed works are consistent with and ancillary to the reservation purpose of public recreation as well as the proposed works can be seen as land management practices being conducted by the land manager.

Standard approvals/land owners consent for works from your Crown lands district office may still apply.

Kind regards

Shane Smith

Coordinator Case Management

Aboriginal Land Claim Investigation Unit
NSW Department of Industry - Crown Lands
45 Wingewarra Street Dubbo NSW 2830 | PO Box 2185 | Dangar NSW 2309
T: +61 2 6883 3396 |
E: alc@crownland.nsw.gov.au
W: www.industry.nsw.gov.au/lands

Appendix 2.5 – AHIMS Search

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Tintenbar

Client Service ID : 371509

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
04-5-0181	PAD 2, Ballina Bypass	AGD	56	551470	6813700	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	**Recorders**	Ms.Jacqueline Collins					**Permits**	2713	
04-5-0179	PAD 3, Ballina Bypass	AGD	56	551525	6813975	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	**Recorders**	Ms.Jacqueline Collins					**Permits**	2272,2713	
04-5-0197	BallinaBypassPAD2	AGD	56	551470	6813790	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact Searle	**Recorders**	Ms.Penny McCardle					**Permits**		

Report generated by AHIMS Web Service on 19/09/2018 for Malcolm Fox for the following area at Lat, Long From : -28.8097, 153.506 - Lat, Long To : -28.7934, 153.5319 with a Buffer of 50 meters. Additional Info : To be used in approval for a revegetation area. Number of Aboriginal sites and Aboriginal objects found is 3

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 1

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Tintenbar

Client Service ID : 371507

Ballina Shire Council

Date: 19 September 2018

po box 450
ballina New South Wales 2478
Attention: Malcolm Fox

Email: malcolm.fox@ballina.nsw.gov.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -28.8086, 153.5063 - Lat, Long To : -28.7923, 153.5322 with a Buffer of 50 meters, conducted by Malcolm Fox on 19 September 2018.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

3	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

Appendix 2.6 – EPBC Act Protected Matters Report

Australian Government
Department of the Environment and Energy

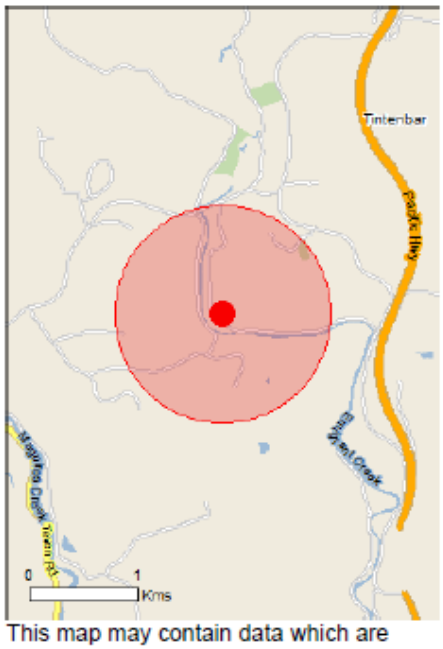
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

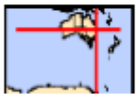
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/10/18 11:33:04



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	42
Listed Migratory Species:	18

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	23
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	35
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Frogs		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat may occur within area
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat may occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Other		
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat may occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat likely to occur within area
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat may occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Davidsonia jerseyana Davidson's Plum [67219]	Endangered	Species or species habitat may occur within area
Davidsonia johnsonii Smooth Davidsonia, Smooth Davidson's Plum, Small-leaved Davidson's Plum [67178]	Endangered	Species or species habitat likely to occur within area
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat likely to occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat may occur within area
Floydia praealta Ball Nut, Possum Nut, Big Nut, Beefwood [15762]	Vulnerable	Species or species habitat likely to occur within area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area
Ochrosia moorei Southern Ochrosia [11350]	Endangered	Species or species habitat likely to occur within area
Owenia cepiodora Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area
Syzygium moorei Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple [12284]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine,		Species or species