Review of Environmental Factors

Ballina Shire Council

Hutley Drive Northern Extension

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UPR	*Description*	*Date Issued*	*Issued By*
3259-1003	Version 1	20/12/18	MES
3259-1008	Version 2	07/02/19	MES
3259-1009	Version 3	13/02/19	MES

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The Proposal

GeoLINK has been engaged by Ballina Shire Council (BSC) to prepare a Review of Environmental Factors (REF) for the proposed construction of the Hutley Drive Northern Extension. The works would extend Hutley Drive from its existing terminus at Silkwood Road north east to connect to Byron Bay Road. It is proposed to construct a new roundabout at the intersection of Hutley Drive and Byron Bay Road, approximately 85 m north west of the existing Byron Bay Road/ Ballina Street/ Coast Road/ North Creek Road roundabout.

The proposed road would be approximately 300 m long. It would be constructed within the existing Hutley Drive and Byron Bay road reserves and on Ballina Shire Council owned land (Lot 2 DP620838 and Lot 31 DP787876). The proposal includes a stormwater detention basin and acoustic barrier.

Need for the Activity

Ballina Shire Council has a responsibility to provide and maintain an efficient and safe road network throughout the shire. The Hutley Drive northern extension would alleviate pressure on existing roads such as Silkwood Road, Henderson Lane and Stoneyhurst Drive, which have not been designed to carry the predicted increase in traffic. Strategic assessments of Lennox Head's road network have identified that the northern extension of Hutley Drive is required. Additionally, the Hutley Drive northern extension will form part of the future western arterial road, connecting Lennox Head to Ballina.

Activity Objectives

The primary objective of the proposal is to develop Hutley Drive into a western link road, connecting current and future residential areas located west of North Creek Road to Byron Bay Road.

Statutory and Planning Framework

All relevant statutory planning instruments have been examined in relation to the proposed road. Development consent is not required for the proposal by virtue of Clause 94 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP). However, the proposal becomes an 'activity' for the purposes of Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and is subject to an environmental impact assessment (such as this REF).

Community and Stakeholder Consultation

Extensive public notification of the proposal has occurred. Targeted consultation would occur with affected landowners. No additional/ broader community consultation is considered necessary. No consultation with public authorities (other than internal BSC consultation) is required under Part 2 of ISEPP.

Environmental Impacts

The main environmental impacts of the Activity include vegetation removal and an increase in road noise. Risks associated with these issues would be suitably managed through effective implementation of the safeguards of this REF.

Other potential environmental impacts would be generally minor in nature. A variety of safeguards have been developed to minimise the risk and magnitude of potential impacts posed by the Activity to

the environment. The Activity would have a positive environmental impact by way of improving the connectivity and safety of the local road network of Lennox Head.

Justification and Conclusion

The Activity is a northern extension to Hutley Drive, connecting it to Byron Bay Road. With effective implementation of the mitigation measures of this REF, the Activity is considered unlikely to have any significant environmental impacts; conversely it is expected to have a beneficial effect via improved connectivity and accessibility for residents of existing and future land release areas located on the western side of North Creek Road.

1. Introduction

1.1 Proposal Identification

Ballina Shire Council (BSC) proposes to construct a northern extension to Hutley Drive, linking it to Byron Bay Road. The proposed extension would occur within the existing Hutley Drive road reserve, which extends east from the existing terminus of Hutley Drive, and within Ballina Shire Council owned land (Lot 2 DP620838 and Lot 31 DP787876). The new section of road would be approximately 300 m in length. Associated works include the construction of a new two circulating lane roundabout at the intersection of Hutley Drive and Byron Bay Road, construction of an acoustic barrier on a portion of the alignment and construction of ancillary stormwater detention infrastructure. The location of the proposed works is shown in **Illustration 1.1**.

The Hutley Drive northern extension will form a key component of Ballina Shire Council's proposed western arterial road, which will ultimately provide a second north-south link between Lennox Head and Ballina. Upon completion, the Hutley Drive extension will improve the efficiency and safety of the road network, providing appropriate connectivity to Byron Bay Road for existing residents located on the western side of North Creek Road and for future residents of large land parcels yet to be developed, such as the Epiq Lennox Estate. Extending Hutley Drive would improve access to the proposed shopping centre development and new sporting fields in Epiq.

The Hutley Drive northern extension would alleviate pressure on existing roads such as Silkwood Road, Henderson Lane and Stoneyhurst Drive, which have not been designed to carry the predicted increase in traffic. A strategic assessment of Lennox Head's road network identified that the northern extension of Hutley Drive should be constructed by around 2016.

All construction and operational activities associated with the construction of the Hutley Drive extension are referred to herein as 'the Activity'.

1.2 Purpose of this Report

This Review of Environmental Factors has been prepared by GeoLINK on behalf of Ballina Shire Council. For the purposes of these works, Ballina Shire Council is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the Activity, to document the likely impacts of the Activity on the environment, and to detail safeguard/ mitigation measures to be implemented.

The description of the proposed works and associated environmental impacts have been undertaken in context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the *Biodiversity Conservation Act 2016* (BC Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, which requires the determining authority (Ballina Shire Council) to examine and consider to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the Activity.

The findings of the REF would be considered when assessing:

- Whether the Activity is likely to have a significant impact on the environment and therefore the necessity for an Environmental Impact Statement to be prepared and approval to be sought from the Minister for Planning under Division 5.1 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/ or *Fisheries Management Act 1994* (FM Act), and therefore the requirement for a Species Impact Statement
- The potential for the Activity to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister whether assessment and approval is required under the EPBC Act.

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Drawn by: AB Checked by: RE Reviewed by: MS Date: 17/01/2019
Source of base data: OpenStreetMap

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Site Locality

2. Description of the Proposal

2.1 Site Location

The Hutley Drive northern extension would be constructed partly within the Hutley Drive and Byron Bay Road reserves and partly on public land owned by Ballina Shire Council. This public land includes Lot 2 DP620838 and Lot 31 DP787876.

Lot 2 DP620838 (9 Byron Bay Road) was purchased by Ballina Shire Council to provide for an alternative route for the Hutley Drive north extension. In the past, it was thought that Hutley Drive would connect in to the existing roundabout of The Coast Road, North Creek Road, Byron Bay Road and Ballina Street. However, an acceptable design could not be achieved and therefore alternative options were examined. The proposed alignment would now turn to the north, traversing Lot 2 DP620838 before meeting Byron Bay Road, approximately 85 m north-west of the existing roundabout.

The location of the proposed Activity is shown in **Illustration 2.1**. See **Plate 2.1** to **Plate 2.5** for site features.

Plate 2.1 Existing northern terminus of Hutley Drive

Plate 2.2 Dwelling located on Lot 2 DP620838

Plate 2.3 Byron Bay Road, north of the existing roundabout

Plate 2.4 Grass field at Lot 2 DP620838 and dwelling at Lot 30 DP787876

Plate 2.5 Grass field on western portion of Lot 2 DP620838

2.2 The Proposal

The Activity is to construct a 300 m (approx.) extension to Hutley Drive, commencing at the existing northern termination of the formed road and extending to Byron Bay Road. This includes the construction of a new roundabout at the proposed intersection of Hutley Drive and Byron Bay Road. Along the northern side of the new road, there would be a 2.5 m concrete shared path. This path would be separated from the road alignment by a 1 m buffer.

Rather than constructing the Hutley Drive northern extension within the existing Hutley Drive paper road reserve (whereby intersecting with North Creek Road) the proposed formation would turn to the north, traversing part of Lot 2 DP620838, to intersect with Byron Bay Road. **Illustration 2.2** shows the proposed Activity.

Lot 2 DP620838 is Council owned including the residential dwelling located on the lot. Ballina Shire Council currently leases the property on a month to month basis. Ballina Shire Council and the current occupiers would negotiate the continuation of lease arrangements with regard to amenity impacts associated with construction activities required to enable the new road.

An acoustic wall is proposed to mitigate operational noise impacts on residences located northwest of the new road formation. The height of the wall would range between 1.8 m and 2.3 m in height. The material and final finish of the wall would be determined following further discussions with the owners of Lot 30 DP 787876.

The proposed configuration of the intersection of Hutley Drive and Byron Bay Road is a two circulating lane roundabout.

The Activity includes the construction of ancillary stormwater detention infrastructure in the adjoining Ocean Breeze Reserve (Lot 31 DP787876).

Power (overhead and underground) service adjustments would also be undertaken to accommodate the new roundabout and extension of Hutley Drive. New street lighting would also be provided.

The works period is expected to extend for around four months within the 2019-2020 financial year. A temporary site compound would be located within the Ballina Shire Council owned Lot 2 DP620838

and the residence may be temporarily used as a site office during the works period if the residence is not leased during the works period.

Design drawings of the proposed route are provided at **Appendix A**.

The proposed works are described as follows:

- Notification.
- Establishment of a temporary site compound.
- Implementation of environmental controls.
- Tree removal.
- Services works.
- Road construction.
- Acoustic wall construction.
- Site clean-up and decommissioning of site compound.

2.2.1 Proposal Objectives

The proposed northern extension of Hutley Drive, connecting to Byron Bay Road, has been a key component of Ballina Shire Council's strategic road network planning since 2002, when Council adopted the Ballina Road Contribution Plan (Version 2, October 2002). The 2002 Contributions Plan identified that by the year 2022 it would be necessary to provide substantial additional road capacity/ space, with an estimated cost of about $43 million. The proposed Hutley Drive northern extension will provide that extra capacity, as it will ultimately form part of a new western arterial road, linking Lennox Head and Ballina.

The proposed Hutley Drive northern extension appears in the current Ballina Shire Roads Contribution Plan Version 4.1 (2018) as Item 42. **Figure 2.1** below shows the proposed Hutley Drive northern extension and how it forms part of a larger future western arterial (items 12 and 18).

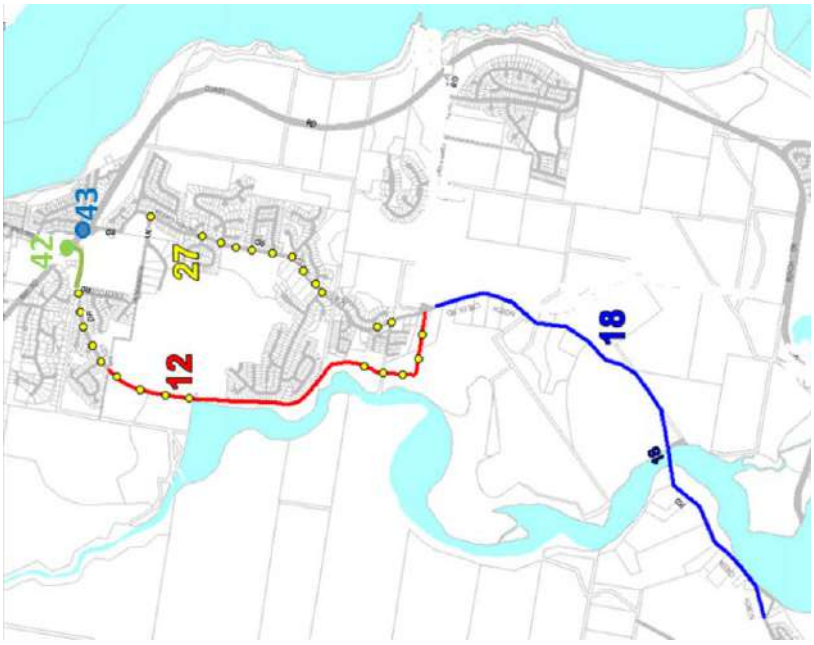


Figure 2.1 Proposed western arterial route

The Hutley Drive northern extension will enable the road network to cope with future development of the land parcel immediately to the south of Hutley Drive (known as Reservoir Hill), as well as several other large developments to the west and south west of the site (Henderson Farm and Epiq). This would prevent traffic using other roads, such as Silkwood Road, Henderson Lane and Stoneyhurst Drive, which are not designed for the increased traffic, and would provide a more direct link to Lennox village and The Coast Road for residents.

2.2.2 Landholder Agreements and Notification

Occupiers of land within 50 metres of the works areas have been notified of the works. All notification receivers have been provided with a contact telephone number for any complaints/ updates associated with the proposed works.

Lot 2 DP620838 is Council owned land and the dwelling is rented on a month to month basis. Ballina Shire Council and the current occupiers of Lot 2 DP620838 would negotiate the continuation of lease arrangements with regard to amenity impacts associated with construction activities required to enable the new road.

The materials and final finish of the proposed acoustic wall would be determined following further discussions with the owners of Lot 30 DP 787876.

2.2.3 Implement Environmental Controls

Erosion and sediment controls would be designed and implemented prior to undertaking activities that disturb the ground surface resulting in exposed sediments. The controls would be maintained during the construction activities and would not be removed until the site has been suitably stabilised with ground cover (e.g. grass). All chemicals and refuelling required onsite would be secured in bunded areas.

2.2.4 Tree Removal

The Activity would require the removal of approximately 1365 m^2 of native vegetation. Vegetation to be removed is not consistent with the description of any EEC and consists of relatively common native species, weeds and garden/ orchard plantings. This vegetation is proposed to be compensated for by the implementation of vegetation restoration works including weed control and assisted natural regeneration throughout a minimum area of 680 m^2. The vegetation restoration works are proposed at a nominated compensatory offset area located approximately 760 m southeast of the Activity (see **Appendix B**). The proposed compensatory offset area involves an extension of the compensatory offset area for the recent Ross Lane and Coast Road works.

2.2.5 Services Works

Existing stormwater infrastructure surrounding the works area would remain in place. The new section of road would have kerb and gutter on both sides, including inlet pits at regular intervals. A network of new stormwater lines would transport stormwater to a proposed new grassed detention basin to be constructed on Lot 31 DP787876. The stormwater infrastructure pollutant loads shall be managed through the first flush detention basin. A Hydraulic Capacity Assessment has been undertaken (see **Appendix H)**.

Existing electricity infrastructure would remain unchanged, except for a light pole on Byron Bay Road which would require relocating. It is anticipated that this light pole would be upgraded as part of the

new street lighting design. Additional street lighting would be installed in accordance with the design drawings (see **Appendix A**).

Existing sewer infrastructure is to be realigned to suit the road alignment. An existing sewer manhole located within the new road alignment would be removed.

The existing Telstra network would not be disturbed by the Activity. No new Telstra infrastructure is proposed.

2.2.6 Spoil and Dewatering

Spoil material would be generated from the services works and some components of the Hutley Drive extension works. This material would be tested to determine reuse opportunities for filling activities associated with the project. If the material is not able to be reused within the project the excess spoil would be removed offsite to a licensed waste facility.

Adjustments to the sites services may also require dewatering activities; mainly associated with stormwater services adjustments located in the western extent of the works areas. Ballina Shire Council would develop a dewatering plan to manage any potential impacts associated with dewatering required for the activity.

2.2.7 Acoustic Wall Construction

An acoustic wall is proposed to mitigate operational noise impacts on residences located northwest of the new road formation. The height of the wall would range between 1.8 m and 2.3 m in height. The material and final finish of the wall would be determined following further discussions with the owners of 9 Ocean Breeze Drive (Lot 30 DP 787876).

2.2.8 Site Clean-up

At the completion of the works, all exposed soil areas would be stabilised with ground cover and all excess materials and waste would be removed from the site.

2.3 Construction Activities

2.3.1 Construction Hours and Duration

For the construction of Hutley Drive, between the existing northern terminus and Byron Bay Road, works would be undertaken during the standard hours detailed below:

Monday to Friday	7:00 am to 6:00 pm
Saturday	8:00 am to 1:00 pm
Sunday and Public Holidays	No work

For construction of the new roundabout on Byron Bay Road, it is possible that Council would carry out some night works, in order to alleviate traffic impacts.

The work is proposed to commence in the 2019-2020 financial year and is expected to take around four months to complete pending weather.

2.3.2 Plant and Equipment

The main plant and equipment required for the works may include (but not be limited to):

- Excavator.
- Transport trucks (e.g. for equipment and materials).
- Compactor.
- Dump trucks.
- Asphalt trucks.
- Pavement profiler.
- Rollers and vibratory rollers.
- Bitumen sprayers.
- Line marking trucks.
- Chainsaws.
- Mulcher.
- Light vehicles/ trucks.
- Generators.
- Hand tools (angle grinder, electric saw, driller/ driver etc).

2.4 Ancillary Facilities

A temporary site compound would be located within the Ballina Shire Council owned Lot 2 DP620838. The residence on Lot 2 DP620838 may be temporarily used as a site office during the works period if not under lease. If the residence on Lot 2 DP620838 is under lease during construction, a temporary crib shed and mobile chemical toilet closets would be provided onsite for construction staff.

2.5 Property Acquisition

Property acquisition would not be required as part of the Activity.

Information shown is for illustrative purposes only

Drawn by: AB Checked by: RE Reviewed by: MS Date: 17/01/2019
Source of base data: DFS&I

LEGEND

- Extent of works
- Cadastre
- Road reserve

0 50

Site Plan

Information shown is for illustrative purposes only

Drawn by: AB Checked by: RE Reviewed by: MS Date: 17/01/2019
Source of base data: DFS&I

LEGEND

- Extent of works
- Cadastre
- Proposed design

0 50

Proposed Activity

3. Statutory and Planning Framework

3.1 Environmental Planning and Assessment Act 1979

The Activity requires development assessment and approval pursuant to Section 5.5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) whereby determining authorities, when assessing activities under Part 5, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. To ensure the Activity adequately addresses the requirements of Part 5, an assessment of the Activity's consistency with relevant EPIs including State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) has been completed.

3.2 State Environmental Planning Policies

3.2.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent on any land.

As the Activity is for a road and is to be carried out by or on behalf of a public authority (being Ballina Shire Council), it can be assessed under Part 5 of the EP&A Act.

The Activity is not located on land reserved under *the National Parks and Wildlife Act 1974* and does not affect land mapped as Coastal Wetland or Littoral Rainforest under the *State Environmental Planning Policy (Coastal Management) 2018.* The Activity is not development identified under State Environmental Planning Policy (State and Regional Development) 2011.

Clause 111 of ISEPP permits development for the purpose of stormwater management systems to be carried out by or on behalf of a public authority without consent on any land. As the Activity includes stormwater detention works to be carried out by or on behalf of a public authority (being Ballina Shire Council), those works can be assessed under Part 5 of the EP&A Act.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation as required by ISEPP is discussed in **Section 4** of this REF.

3.2.2 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The Coastal SEPP provides an integrated and coordinated approach to coastal land use planning. It defines the four coastal management areas through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities

must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas. The closest Coastal Wetland mapped area is located approximately 840 m north-west of the Activity. The closest Littoral Rainforest mapped area occurs approximately 400 m south-east of the Activity. As such, the Activity would not impact on any areas of mapped Coastal Wetland or Littoral Rainforest.

Part of the Activity is located within the mapped Coastal Use Area. Division 4 of the Coastal SEPP relates to the Coastal Use Area, setting out matters for consideration prior to the granting of development consent on land within that area. As the Activity does not require development consent, Division 4 does not apply. However, an assessment of the Activity against Clause 14 has been carried out to determine whether the Activity is consistent with the SEPP (see **Table 3.1**).

Table 3.1 Division 4 Coastal SEPP

Clause 14	***Comment***
Development consent must not be granted to development on land what is within the coastal use area unless the consent authority:	
(a) has considered whether the proposed development is likely to cause an adverse impact on the following: *(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,* *(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,* *(iii) the visual amenity and scenic qualities of the coast including coastal headlands,* *(iv) Aboriginal cultural heritage, practices and places,* *(v) Cultural and built environment heritage, and*	The Activity would improve the connectivity of the road network in Lennox Head and provide more direct access for those residents living on the western side of The Coast Road to nearby Lennox Village and beaches. The traffic impact of the Activity is discussed in **Section 5** of this REF. The Activity would not create overshadowing, wind funnelling or the loss of views. The Activity is not situated in an area where it would have an impact on visual amenity or scenic qualities of the coast or headland. In the location of the proposed roundabout, Byron Bay Road does not have high visual amenity, scenic qualities or views to the beach. An assessment of the Activity on Aboriginal and non-Aboriginal heritage is in **Section 5** of this REF.
(b) is satisfied that: *(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or* *(ii) if that impact cannot be reasonably avoided – the development is designed, sited and will be managed to minimise that impact, or* *(iii) if that impact cannot be minimised – the development will be managed to mitigate that impact, and*	Through this REF, a thorough assessment of the Activity with regard to biodiversity, heritage, visual amenity, traffic impacts etc. has been carried out. Where a potential adverse impact is identified, measures are proposed to minimise and mitigate that impact (see **Section 5**).
(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.	The Activity has been designed to achieve the transport and traffic outcomes that are required, whilst having the least impact on the surrounding environment.

3.2.3 State Environmental Planning Policy 44 – Koala Habitat Protection

SEPP 44 aims to encourage the conservation and management of natural vegetation areas that provide habitat for koalas, to ensure permanent free-living populations would be maintained over their present range. Clause 6 of SEPP 44 states that the SEPP applies only to land 'in relation to which a development application has been made'. Clause 94 of ISEPP precludes the Activity from requiring consent therefore Part 2 of SEPP 44 does not apply to the Activity. It is Ballina Shire Council's responsibility however, to consider environmental issues relating to their works to the fullest extent possible, including impacts on koalas.

An Ecological Assessment has been carried out for the proposed Activity (see **Appendix B**). It was determined that the site does not comprise potential koala habitat. Koala feed tree species were searched for the presence of scats and scratches and no evidence of Koala use was recorded.

3.2.4 State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

This policy applies to the non-rural areas of the State, including R2 Low Density Residential zone and R3 Medium Density Residential zone. The aims of this policy are to:

- Protect the biodiversity values of trees and other vegetation in non-rural areas of the State; and
- Preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.

The Vegetation SEPP was one of a suite of Land Management and Biodiversity Conservation (LMBC) reforms that commenced in NSW on 25 August 2017. The Vegetation SEPP works together with the BC Act and the Local Land Services Amendment Act 2016 to create a framework for the regulation of clearing of native vegetation in NSW. The SEPP would ensure the biodiversity offset scheme (BOS) (established under the LMBC reforms) applies to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that does not require development consent.

As part of the Ecological Assessment carried out for the Activity (see **Appendix B**) the BOS Entry Threshold (BOSET) Tool was accessed on 20 November 2018. The BOSET map produced shows that:

- The site is located on land Excluded from the *Local Land Services Amendment Act 2016.*
- The site does not contain mapped Biodiversity Values.

Section 7.3 of the BC Act requires a test of significance ('five-part test') for determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. **Table 3.2** considers the removal of vegetation against section 7.3 of the BC Act. The Activity will not impact threatened species, ecological communities (or their habitats), any declared area of outstanding biodiversity value (either directly or indirectly) or result in a key threatening process. A species impact statement or biodiversity development assessment report is therefore not required pursuant to Section 7.8 of the BC Act.

Table 3.2 Section 7.3 of the BC Act considerations

Section 7.3 of the BC Act (5 Part Test)	*Impact*
(a) whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction? Removal of the vegetation will not affect the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	Nil
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction* The vegetation proposed to be removed do not form any listed endangered ecological community or critically endangered ecological community.	Nil
(c) in relation to the habitat of a threatened species or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,* The vegetation proposed to be removed do not form significant habitat of a threatened species or ecological community.	Nil
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly) The Activity area does not form or is located adjacent to a declared area of outstanding biodiversity value.	Nil
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process. The removal of the native vegetation is identified as a key threatening process outlined in Schedule 4 of the BC Act, however the extent of vegetation proposed to be removed is not considered to result in significant impact on biodiversity. .	Minor

3.3 Local Environmental Plans

The Activity is located within the Ballina Shire Local Government Area (LGA) and therefore, the Activity is located on land that is affected by the Ballina Local Environmental Plan (LEP) 2012. The Activity would occur across three land use zones under the Ballina LEP 2012. The zones and their objectives are listed below:

The objectives of the RU1 Primary Production zone are:

To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.

To encourage diversity in primary industry enterprises and systems appropriate for the area.

To minimise the fragmentation and alienation of resource lands.

To minimise conflict between land uses within this zone and land uses within adjoining zones.

To maintain the rural, cultural and landscape character of the locality.

To enable development that is compatible with the rural and environmental nature of the land.

To ensure that there is not unreasonable or uneconomic demands for the provision of public infrastructure.

The objectives of the R2 Low Density Residential zone are:

To provide for the housing needs of the community within a low density residential environment.

To enable other land uses that provide facilities or services to meet the day to day needs of residents.

To provide for development that is compatible with the character and amenity of the surrounding neighbourhood.

To provide for development that meets the social and cultural needs of the community.

To encourage development that achieves the efficient use of resources such as energy and water.

The objectives of the R3 Medium Density Residential zone are:

To provide for the housing needs of the community within a medium density residential environment.

To provide a variety of housing types within a medium density residential environment.

To enable other land uses that provide facilities or services to meet the day to day needs of residents.

To provide development that is compatible with the character and amenity of the surrounding neighbourhood.

To encourage housing and infrastructure that supports the ageing population.

To provide for development that meets the social and cultural needs of the community.

To encourage development that achieves the efficient use of resources such as energy and water.

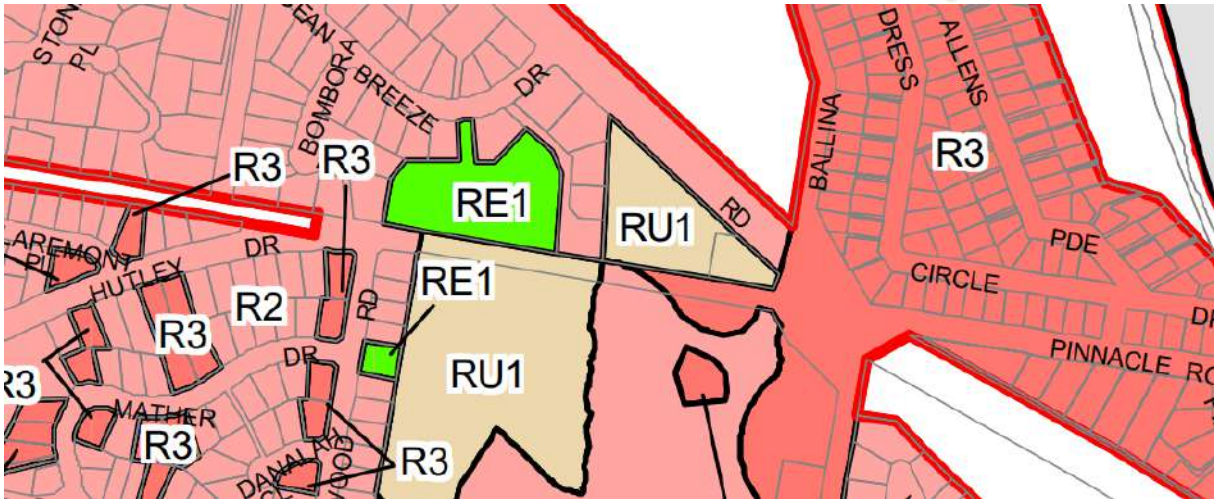


Figure 3.1 Ballina LEP 2012 Zoning

The Activity is not directly consistent with the above zoning provisions; however, the Activity is largely confined to the existing Hutley Drive and Byron Bay Road reserves. The proposed road would traverse Lot 2 DP620838 which is zoned RU1 Primary Production. This lot is approximately 9650 m^2 and is currently used for residential purposes. It has been identified as a future residential growth area and therefore it is not considered that the property would be used in future for primary production purposes.

The Activity is located approximately 175 m to the east of land mapped as acid sulfate soils, however geotechnical investigations undertaken for the proposed works indicate potential and existing sulphidic acidity. As such, the disturbance of soils will be further assessed and managed to limit the potential for harm.

The land is not located in close proximity to a wetland, a drinking water catchment, environmental conservation area, landslide risk area, terrestrial biodiversity area or riparian lands and watercourses or scenic protection land. There are no local heritage items in proximity to the site. Approximately 250 m to the south-east there is land mapped as being bushfire prone.

The Activity is precluded from requiring development consent under Clause 94 of the ISEPP.

3.4 NSW Legislation

Table 3.3 lists other NSW legislation relevant to the assessment of the Activity and comments on their implications for the Activity.

Table 3.3 NSW Legislation

Legislation	*Section(s)*	*Comment*
Environmental Planning and Assessment Regulation 2000	Clause 228	Clause 228 factors have been considered to assess the likely impacts of the Activity on the natural and built environment (refer to **Section 7.1**). It is not expected that the Activity would result in a significant impact.
Fisheries Management Act 1994	Section 199	Concurrence/ or a permit is required from the Minister for Primary Industries for dredge and reclamation works, or the obstruction of fish passage, on land that is periodically inundated by water and constitutes key fish habitat, in accordance with s199 of the

Legislation	Section(s)	Comment
		Fisheries Management Act 1994. The Activity does not require dredging or reclamation works on land that is periodically inundated by water.
Heritage Act 1977		Searches of the DoEE Australian Heritage database, OEH State Heritage Branch database and Schedule 5 of the LEPs were undertaken in relation to the Activity (refer to **Appendix C**). The road reserve at the site does not comprise any State Heritage Register listed items. Discussion on heritage impacts is provided in **Section 5.2**.
National Parks and Wildlife Act 1974	Sections 87(1), 90	The provisions of the Act are unlikely to be triggered by the Activity. Works would cease if an artefact or place of significance is disturbed or encountered during the Activity. OEH Cultural Heritage Division and the relevant Traditional Owners would be notified immediately.
Biosecurity Act 2015		The DPI biosecurity risk weed declarations for Ballina LGA lists numerous weed species. None of these weed species were identified on site; refer to **Section 5.1**.
Protection of the Environment Operations Act 1997		There are no Protection of the Environment Policies (PEPs) that are relevant to the Activity. No licenses would be required pursuant to the *Protection of the Environment Operations Act 1997*. Ballina Shire Council and/ or contractors working on behalf of Ballina Shire Council are required to notify EPA when a 'pollution incident' occurs that is likely to impact upon the environment.
	Section 115	It is an offence to negligently dispose of waste in a manner that harms the environment. Waste would be managed in accordance with the *Waste Avoidance and Resource Recovery Act 2001*. The Activity would aim to reduce the environmental impact of dumping waste and include mechanisms to recover resources and reduce the production of waste where possible.
	Section 120	It is an offence to pollute any waters of the State. This REF includes safeguard and mitigations measures to ensure that the Activity does not result in pollution of waters.
Biodiversity Conservation Act 2016	Schedules 1, 2 and 3	The Activity would not impact on any threatened flora species or communities listed in the BC Act. No threatened fauna species would be significantly impacted upon by the Activity with the adoption of the safeguards prescribed. The Activity would incrementally contribute to the Key Threatening Process (KTP) *Anthropogenic Climate Change*, through the generation of carbon dioxide during operation of machinery and vehicles and associated fuel consumption however the impact is not considered significant. No other KTPs would be noticeably contributed to by the Activity. Section 7.3 of the BC Act requires a test of significance ('five-part test') for determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats (see **Table 3.2** and **Appendix B** Ecological Assessment). The Activity would not significantly affect threatened species or communities.

Legislation	Section(s)	Comment
Roads Act 1993	Section 138	Section 138 of the *Roads Act 1993* requires approval from the relevant roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a road. However, under Clause 5(1) in Schedule 2 of the *Roads Act 1993*, public authorities do not require consent for works on unclassified roads. Therefore, the Activity does not require approval from the relevant roads authority under the *Roads Act 1993*.

3.5 Commonwealth Legislation

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'. These are considered in **Section 5.1** of the REF.

The assessment of the Activity's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Accordingly, the Activity has not been referred to the Commonwealth Government Department of the Environment and Energy.

3.6 Confirmation of Statutory Position

All relevant statutory planning instruments have been examined in relation to the Activity. As indicated above, development consent is not required for the subject activity by virtue of Clause 94 of ISEPP. However, the pathway becomes an 'activity' for the purposes of Part 5 of the EP&A Act and is subject to an environmental assessment.

4. Consultation

4.1 Community Involvement

Shire wide public notification of the Hutley Drive northern extension has occurred throughout 2018 and in January 2019. This includes Ballina Shire Council issuing a factsheet in February 2018, a media release in April 2018, and another fact sheet in January 2019. Various statements about the extension of Hutley Drive have also appeared on Council's website. In the February 2018 fact sheet, Council stated that three potential route options for the northern extension had been assessed, and that the preferred option is the Byron Bay Road connection and roundabout as described in this REF. Council also stated that the property at 9 Byron Bay Road had been purchased by Council to allow the preferred route to proceed. A diagram of the proposed route was provided.

Council's media release in April 2018 further explained Council's intention to extend Hutley Drive to the north, connecting directly to Byron Bay Road via a roundabout. This media release was reported in the Lennox Wave magazine and in the Northern Star newspaper in April 2018.

Given the nature of the Activity, targeted consultation with adjoining land owners has occurred by way of a direct mail out. Ongoing consultation with affected land holders and standard notification/ management measures during the works would continue. Local road users would also be advised of the proposed works in sections where traffic would be affected.

4.2 ISEPP Consultation

ISEPP aims to facilitate the effective delivery of infrastructure across the State. Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

Consultation with councils is generally required in accordance with Clauses 13 to 15 of ISEPP. However, as Ballina Shire Council is the proponent and determining authority for the Activity, Council is aware of the Activity and any relevant consultation would have and would continue to occur internally throughout the process.

The Activity does not trigger any additional public authority consultation requirements pursuant to Part 2 of ISEPP.

Hence, the ISEPP consultation requirements would be satisfied.

4.3 Ongoing or Future Consultation

Ballina Shire Council shall notify all affected landholders a minimum of five working days prior to undertaking any activity on site.

5. Environmental Assessment

The following sections provide a description of the existing environment, potential impacts associated with the Activity and safeguards to manage impacts associated with the Activity. A site analysis plan is provided at **Illustration 5.1**.

5.1 Biodiversity

An Ecological Assessment has been prepared by Blackwood Ecological Services for the proposed Hutley Drive extension (see **Appendix B**).

5.1.1 Existing Environment

5.1.1.1 Flora

The southern section of the existing road reserve consists of mown grassland, with taller weedy grassland along the southern edge, where the site borders an area of lower lying wetland to the south. This wetland area supports areas of *freshwater wetland (*Threatened Ecological Community) as well as the threatened species Hairy joint grass. A clump of trees at the end of the existing Hutley Drive includes Blackwood wattle, Flame tree, Brown kurrajong, Tuckeroo and Singapore daisy.

Vegetation within the area to be cleared (including for the road batter) consists of grasses dominated by Setaria with Ragweed, Lantana, Coastal Morning Glory, Siratro, Farmer's Friends, Blue Billygoat Weed, Crofton Weed, Hairy Commelina, Tobacco Bush and Cape Gooseberry. Vegetation closer to the wetland edge consists of a higher proportion of native species including Typha, Swamp hibiscus, Smartweed, Swamp water fern and Batswing fern amongst the weeds.

An area within the Ocean Breeze Reserve (Lot 31 DP787876) has been planted out with Broad-leaved paperbark and Weeping paperbark trees that are currently about 2 – 3 m tall. A stormwater detention basin is to be constructed in this part of the site to accept runoff from the road. Further to the east, some planted vegetation along the back of houses accessed from Ocean Breeze Drive would require removal. This vegetation includes two Swamp Mahoganies, two Forest Red Gums, two Tuckeroos, a Silky Oak, Lilly Pilly, Riberry and a Syzygium "Cascade".

There is vegetation surrounding the dwelling located on Lot 2 DP 620838. Vegetation located at the south-western corner of this dwelling would be removed. This includes a large Norfolk Pine, planted Macadamia Nut, Guava, Mulberry, Loquat and Crepe Myrtle, Tuckeroo, Murraya, Camphor Laurel, Umbrella Tree, Winter Senna, Ground Asparagus, Guioa and various weeds.

Additionally, vegetation located on the noise attenuation mound located on the western side of Byron Bay Road would be removed. This includes three Swamp Mahogany trees, three Broad-leaved Paperbark, Coast Banksia, Foambark, Bangalow Palm, Guioa, Willow Bottlebrush, Weeping Bottlebrush, Blackwood Wattle, Macaranga, Tea Tree and various weeds and exotic garden plants.

No threatened flora species were recorded or are considered likely to occur within the works area. No Threatened Ecological Communities are considered to occur within the works area.

5.1.1.2 Fauna

A fauna assessment has been conducted, consisting of a review of relevant databases and literature, and an assessment of site fauna habitats.

No threatened fauna species were recorded during the site assessment. Koala feed tree species were searched for the presence of scats and scratches and no evidence of Koala use was recorded. Land within the study area is of limited value as fauna habitat for fauna occurring in neighbouring habitats. Wetland areas to the south provide habitat for wetland species including frogs and migratory wetland birds. The site itself does not provide suitable habitat for the Wallum froglet. Based upon this assessment, no threatened fauna species are considered likely to have any degree of reliance on habitats within the site.

5.1.2 Potential Impacts

5.1.2.1 Flora

Vegetation to be removed is not consistent with the description of any endangered ecological community and consists of relatively common native species, weeds and garden/ orchard plantings. No significant flora species occur within the footprint of the proposed road extension.

Hairy joint grass (HJG) has previously been recorded within wetland areas to the south of the road corridor. No known or potential locations of HJG would be directly affected by the proposed road. There is some potential for the road to result in a change of hydrological conditions to the south of the site that could have some impact on habitat values for this species. The road design incorporates a stormwater surcharge basin that would moderate flows into the northern part of the wetland area. It is unlikely that the proposed development would affect hydrological conditions in the area of known HJG habitat to the extent that the local population of HJG would be affected.

There is some potential for retained trees adjacent to the clearance corridor to be affected by accidental damage from construction vehicles or by root zone impacts. The construction corridor is quite open and easily accessible and no areas of substantial retained native vegetation area likely to be affected.

5.1.2.2 Fauna

The proposed works would require the removal of up to 1365 m^2 of vegetation. Fauna habitat to be lost is likely to be utilised by a very limited range of fauna species due to historic disturbance and the fragmented nature of surrounding vegetation.

Areas of fauna habitat adjacent to the works area may be affected by accidental damage, sedimentation, introduction of weeds and other indirect effects.

There is little potential for native fauna to be killed or injured as a result of tree removal activities or other construction works as trees to be removed are relatively small and do not provide tree hollows.

Regarding corridor values, the proposed works are unlikely to have any significant impact on fauna movement opportunities and would not sever any important wildlife corridors.

The disturbance of soils has some minor potential to affect water quality through sediment runoff. There is also some slight potential for accidental spills and/ or leaks from machinery to enter the wetland area. There is some potential for the road to result in a change in surrounding hydrological

conditions, which could impact on Freshwater wetland habitat. The proposed road and associated detention basin has been designed to ensure that changes in local hydrology are minimised.

5.1.3 Safeguards

1. Trees are to be inspected for the presence of fauna prior to removal.
2. Trimming of vegetation adjacent to the clearance corridor should be kept to a minimum where possible and is to be undertaken in accordance with Australian Standard AS4373-1996 *Pruning Amenity Trees.*
3. Vegetation waste should be removed from site or mulches and reused where required.
4. Disturbance of soils should be kept to a minimum and appropriate sediment and erosion controls established to prevent sediment laden run-off to adjacent areas.
5. Machinery movements within the drip line of retained mature trees should be kept to a minimum. The parking of vehicles and the storage of excavated material is not to be undertaken within tree drip lines.
6. All reasonable practical steps shall be undertaken to reduced noise and vibration from the site.
7. Undertake vegetation restoration works including weed control and assisted natural regeneration throughout a minimum area of 680 m^2 (see Ecological Assessment at **Appendix B** for proposed compensatory offset area).
8. No waste is to be left onsite at the completion of works.

5.2 Heritage

5.2.1 Existing Environment

The Activity is located within three distinct areas identified in **Table 5.1**. These areas have all been subject to previous construction activities that has resulted in a highly disturbed landform.

Table 5.1 Activity Area

Area	*Description*
Roundabout	The area associated with the proposed roundabout is highly disturbed and located within the existing Byron Bay Road formation.
Lot 2 DP620838	This lot has been subject to significant earthworks including excavation associated with public services and the filling and levelling of land for residential purposes.
Hutley Drive road reserve	The extension of Hutley Drive is located within in area that has been significantly modified for public services including sewer and stormwater works and the associated filling and levelling of land to accommodate the infrastructure.

The Activity is located within the JALI Local Aboriginal Land Council (LALC) area. Aboriginal Heritage Information Management System (AHIMS) searches were undertaken for the site. Search results indicate that there are no registered sites within the works area or within 200 m of the works area (refer to **Appendix C**).

Based on the above information and with consideration of the Due Diligence Code of Practice for the Protection of Aboriginal Objects (DECCW 2010) there are no known Aboriginal objects within the development area and there is low probability of Aboriginal objects occurring in the area of the

proposed development. An overview of the application of the Due Diligence Code of Practice for the Protection of Aboriginal Objects is presented at **Table 5.2**.

Table 5.2 Due Diligence Code of Practice for the Protection of Aboriginal Objects

Step		Comment
1	Will the activity disturb the ground surface? Disturbed land is defined under the code as: *Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable.* *Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks*.	The Activity would require some excavation of previously disturbed land (refer to Table 5.1).
2a	AHIMS database	An AHIMS search was undertaken for the Activity Area. The results of the AHIMS search determined that no known items or objects of Aboriginal cultural heritage were identified within the development area (refer to **Appendix C**).
2b	Is the activity: - within 200m of waters. - located within a sand dune system. - located on a ridge top, ridge line or headland. - located within 200m below or above a cliff face. - within 20m of or in a cave, rock shelter, or a cave mouth. - is on land that is not disturbed land. If after completing steps 2a and 2b it is reasonable to conclude that there are no known Aboriginal objects or a low probability of objects occurring in the area of the proposed activity, you can proceed with caution without applying for an AHIP.	The development area includes land located to the west of a ridgeline connected to a coastal headland. As detailed in Step 1, the development area is consistent with the definition of disturbed land under the code.

3	Can you avoid harm to the object or disturbance of the landscape feature	This step only applies if the activity is on land that is not disturbed land or contains known Aboriginal objects.
4	Desktop assessment and visual inspection	Only applies if the activity is on land that is not disturbed land or contains known Aboriginal objects
5	Further investigations and impact assessment	If after a detailed investigation and impact assessment has been undertaken and that harm would occur to Aboriginal objects then an AHIP application must be made. Only applies if the activity is on land that is not disturbed land or contains known Aboriginal objects

Searches of the DoEE Australian Heritage database, the OEH State Heritage Branch database and Schedule 5 of the LEP were undertaken in relation to the Activity (refer to **Appendix C**). There are a few heritage items listed by the NSW Office of Environment and Heritage and by Ballina Shire Council in proximity to the site. This includes a series of dry stone walls, which are located within the original "Henderson Farm" (Lots 1 and 2 DP1070446) and at "Tara Downs" on North Creek Road (Lot 31 DP715304). The closest of these properties to the site is Lot 1 DP1070446, located approximately 870 m to the west.

Additionally, there are some Norfolk Island Pines in the vicinity of the site that have local heritage significance and are included in Schedule 5 of the BLEP. The closest of these is approximately 1.3 km away from the site. There is a Norfolk Island Pine that is located within the works area that would need to be removed. This tree is not heritage listed and is not a dominant visual feature of the area.

5.2.2 Potential Impacts

The footprint of the Activity has been subject to extensive ground disturbance and excavation associated with the previous land use activities. It is highly unlikely that any previous unidentified Aboriginal heritage items are located within the Activity area. Safeguards are provided to ensure any heritage items uncovered during the Activity are not significantly affected.

The Activity would not impact on the nearby heritage dry stone walls or heritage Norfolk Island Pines.

5.2.3 Safeguards

The following safeguards and management measures would be implemented in order to prevent adverse impacts to any items of indigenous heritage:

9. All personnel working on site would receive training in their responsibilities under the NPW Act.
10. If Aboriginal heritage objects are uncovered Jali LALC and relevant Traditional Owners would be contacted immediately. Works in the vicinity of the find would not re-commence until clearance has been received from Ballina Shire Council Project Manager and OEH.

11. Should non-Indigenous heritage items be uncovered during works, all works in the vicinity of the find would cease and Ballina Shire Council and the State Heritage Office would be contacted. Works would not re-commence until appropriate clearance has been received.
12. If any items defined as relics under the NSW *Heritage Act 1977* are uncovered during the works, all works would cease in the vicinity of the find and Ballina Shire Council and the Project Manager would be contacted immediately.

5.3 Visual

5.3.1 Existing Environment

The existing environment within the vicinity of the Activity varies from residential to rural paddocks, with clumps of established vegetation, including some native species. The site adjoins land that is identified in the Ballina Development Control Plan as a Ridgeline and Scenic Area. This is the parcel of land located to the east of Byron Bay Road (Lot 21 DP1007134), which is currently used as a horse paddock. The quality of the visual landscape is considered medium. The landscape would be considered locally important and provide a valuable characteristic to the local community.

5.3.2 Potential Impacts

Construction of a new sub-arterial road through land that is currently semi-rural in nature would have a significant visual impact, particularly for residents of Ocean Breeze Drive and Silkwood Road. The existing views of vacant paddocks and vegetation (including a tall Norfolk Pine) would be significantly altered, and the visual amenity of the area would be reduced. However, the proposed road would be constructed within the existing Hutley Drive road reserve and on Council owned land (9 Byron Bay Road). The northern extension of Hutley Drive to Byron Bay Road was identified in the Ballina Strategic Road Network Study 2008 as necessary for the connectivity of the local road network by 2016. Residents in the vicinity of the Hutley Drive road reserve would have been aware of likely future construction of the road.

For all residents of the Ballina Shire, the Activity would have a minor visual impact when driving on The Coast Road/ Byron Bay Road. Residents are accustomed to seeing a vacant paddock and the Norfolk Pine to the west in that location. Land to the west of Byron Bay Road doesn't have high visual amenity and the more significant views are to the east that includes ocean views. The long-term visual impact is considered medium as a result of the inclusion of roadside vegetation loss, removal of a tall Norfolk Pine

The Activity would not impact on the land to the east of Byron Bay Road that is identified in the DCP as Ridgeline and Scenic Area.

During construction there would be minor visual impacts associated with views of construction plant equipment and construction site activities. There would be some visual impact associated with the removal and trimming of vegetation along the route.

5.3.4 Safeguards

The following measures would be implemented to prevent and/ or minimise adverse impacts relating to visual amenity:

13. Vegetation would only be cleared to the minimum extent necessary to undertake the proposed works.
14. Soil disturbance would be minimised where possible.
15. Upon completion of the works, any works areas would be restored to an acceptable visual state.
16. All sites would be maintained, kept free of rubbish and cleaned up at the end of each work day.

5.4 Water Quality and Soils

5.4.1 Existing Environment

A geotechnical investigation has been prepared for the proposed works (see **Appendix D**). As part of that investigation, the following areas were assessed:

- Subsurface conditions, including groundwater.
- Earthworks, suitability of existing fill for re-use.
- Indicative presence of Acid Sulfate Soils.
- Indicative pavement subgrade parameters for design by others.

The investigation comprised the drilling and sampling of five boreholes to varying depths, with laboratory testing and assessment.

The site has a gentle gradient in a westerly direction. Geology mapping indicates the site is underlain by tertiary aged Lismore Basalt, part of the Lamington Volcanics, which typically comprises “Basalt”. Subsurface conditions comprise located fill over possibly alluvial clays then residual clays and weathered basalt.

Samples taken from the five boreholes indicate poorly compacted and variable predominantly clayey fill towards the western portion of the alignment up to 1.7 m depth, over alluvial clays. The fill material was often very wet to saturated and noted as having organic matter. Towards the eastern, more elevated portion of the alignment, conditions generally comprised residual clays with weathered basalt. No significant thickness of ‘soft soil’ that would likely cause significant long-term settlements were identified in the natural geology.

These conditions suggest that some ground improvement should be considered to support the new road pavement, likely to involve partial or complete removal and replacement of existing “uncontrolled” fill. Partial removal would likely require a bridging layer, whereas complete removal and replacement with “controlled” fill would provide a more predictable performance of the road pavement.

Regarding Acid Sulfate Soils, limited testing was undertaken as part of the geotechnical investigation. That testing indicates potential sulphidic acidity (SCr) of between 2 and 31 mol (H+/t) and existing acidity (TAA) measuring at 40 and 159 mol (h+/t), meaning the action criteria for disturbance of fine grained soils has been exceeded. Therefore, the disturbance of soils must be further assessed and managed to limit the potential for environmental harm.

Online contamination searches were undertaken for the site on 9 January 2019 including the EPA Contaminated Land and DPI Dip Site registers (refer to **Appendix E**). The searches did not identify any cattle dip sites or other registered contamination items within or adjacent to the works area.

Stormwater services and drainage lines associated within the southern section of the Activity area connect to low lying wetland areas to the west.

5.4.2 Potential Impacts

There is a risk of disturbing Acid Sulfate Soils that may be present on site. The safeguards listed below would be put in place to prevent any risks associated with the disturbance of Acid Sulfate Soils. There is risk from erosion and sedimentation as a result of the ground disturbance. The safeguards listed below would be put in place to prevent any risk from erosion and sedimentation as a result of the proposed disturbance to drainage swales.

There is no apparent risk associated with contaminated land. Cattle dip sites are not proximate to the route. Regardless, safeguards would be in place should unexpected contamination be encountered during the works.

Stormwater generated off the new road formation is collected within stormwater infrastructure within and adjoining the new road. This infrastructure includes a stormwater detention basin of at least 275m^3. Hydraulic capacity assessment has been undertaken by Council demonstrating the proposed development generally has a none-worsening impact on the downstream trunk drainage network (refer to **Appendix H**). The stormwater infrastructure pollutant loads shall be managed through the use of a first flush grassed swale through to the detention basin. Based on the proposed stormwater design the Activity will not significantly impact the existing hydrology or water quality of the adjoining environment including nearby wetland areas.

5.4.3 Safeguards

The following mitigation measures would be implemented in order to prevent adverse impacts relating to soil, erosion and sedimentation:

17. Further testing for Acid Sulfate Soils would need to be carried out. If Acid Sulfate Soils are found within the works area, an Acid Sulfate Soils Management Plan must be prepared.
18. Erosion and sediment controls would be implemented in accordance with the Landcom/ Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book).
19. Works would only commence once all erosion and sediment controls have been established. The controls would be maintained in place until the works are complete and all exposed erodible materials are stabilised.
20. All sediment control measures would be checked and repaired or re-installed (if required) if heavy rainfall was forecast.
21. Progressive, site-specific erosion and sediment control plan would be developed and approved prior to commencement of the works.
22. If unexpected contaminated land is encountered during the works, works would stop immediately and relevant procedures outlined in a CEMP would be followed. The EPA would be notified immediately in response to incidents causing or threatening actual or potential harm to the environment in accordance with section 148 of the POEO Act (via EPA Environment Line on 131 555).

23. Only clean equipment and vehicles would be used, with equipment being cleaned down before being brought to the site.

5.5 Noise and Vibration

5.5.1 Existing Environment

The proposed Hutley Drive extension would traverse land that is currently rural but is in proximity to a number of residences (noise sensitive receivers) that would potentially be affected by the works. The nearest noise sensitive receivers are located at the western portion of the works area, being numbers 3, 5, 7 and 9 Ocean Breeze Drive. There is a residence to the immediate east of the proposed extension alignment, being number 9 Byron Bay Road. This residence falls within the same parcel of land as the road extension and is owned by Council. The residence is currently leased for residential purposes; however, its future use is yet to be determined and would be at the discretion of Council.

5.5.2 Potential Impacts

A Road Traffic Noise Impact Assessment has been prepared by CRG Acoustics (see **Appendix F**).

The proposed Hutley Drive extension is predicted to carry in the order of 10,000 vehicles per day by year 2036, with 3% being heavy vehicles. Hutley Drive is considered a sub-arterial road given that it provides access to local streets along Hutley Drive to Byron Bay Road.

The Road Traffic Noise Impact Assessment assesses the impact of the extension on the nearest noise sensitive receivers, numbers 3, 5, 7 and 9 Ocean Breeze Drive (as directed to be assessed by Council). The residence at number 9 Byron Bay Road has been deemed non-noise sensitive.

An ambient noise survey was undertaken and predicted traffic noise impacts were identified. The assessment identified that for two dwellings (7 and 9 Ocean Breeze Drive) the predicted 'relative increase' in noise levels would be 14db, exceeding the maximum of 12db prescribed under the NSW Road Noise Policy. As such, acoustic treatment in the form of a physical barrier would be required.

Three scenarios for acoustic treatment were identified and assessed, including a 1.8 m, 2.0 m and 2.3 m high acoustic barrier. Additionally, different road surfaces in combination with these barrier heights were assessed. It was determined that an acceptable level of increase in noise levels would be achieved for the dwelling at 7 Ocean Breeze Drive by constructing a 1.8 m high acoustic barrier. For 9 Ocean Breeze Drive, the acoustic barrier would need to be 2.0 m high, combined with an Open Graded Asphalt (OGA) or Stone Mastic Asphalt (SMA) road surface to achieve an acceptable increase in road noise. Or 2.3 m high with a Dense Graded Asphalt (DGA) road surface.

The Road Traffic Noise Impact Assessment identifies that for 9 Ocean Breeze Drive construction of a 2.3 m high barrier (or 2.0 m high barrier with OGA or SMA road surface) would provide an additional 1.6 dB noise reduction over the 1.8 m high acoustic barrier scenario. The assessment also notes that it is generally considered that the average person cannot typically detect a 3dB variation in sound pressure level. As such, the 2.3 m high acoustic barrier (or 2.0 m with OGA or SMA road surface) would unlikely provide a perceived noise difference from the 1.8 m high barrier.

At the time of preparation of this REF, Council has not resolved the height of the proposed acoustic barrier or the road surface. Based on the findings of the Road Traffic Noise Impact Assessment, either a 1.8 m or 2.3 m (or 2.0 m with OGA or SMA road surface) barrier would be acceptable, and

ultimately Council would need to weigh competing interests (such as cost and visual amenity) and make the decision it deems to be appropriate.

During construction of the Hutley Drive extension, under the EPA's Interim Construction Noise Guidelines:

- The noise management level for works during the recommended standard hours is background + 10 dB(A). Above this noise level the proponent needs to implement all feasible and reasonable work practices, as defined in the Guideline, to minimise noise impacts.
- For works outside the recommended standard hours, the noise management level is background + 5 dB(A).
- The highly noise-affected level of LAeq 75 dB(A) represents the point above which there may be strong community reaction to noise and indicates a need to consider other feasible and reasonable ways to reduce noise, such as restricting the times of very noisy works to provide respite to affected residences.

5.5.3 Safeguards

The following mitigation measures would be implemented in order to address adverse impacts relating to noise and vibration:

24. Construction activities would be restricted to the following times where possible:
    - Monday to Friday 7:00 am to 6:00 pm.
    - Saturday 8:00 am to 1:00 pm.
    - No work would take place on Sundays or public holidays.
25. Where construction is to occur at night, notice would be provided to nearby sensitive receivers.
26. Best practice mitigation and management measures would be used to minimise construction noise impacts at sensitive residential receivers; guided by the EPA's Interim Construction Noise Guidelines.
27. An acoustic wall is required to mitigate operational noise impacts on residences located northwest of the new road formation. The height of the wall would range between 1.8 m and 2.3 m in height. The material and final finish of the wall would be determined following further discussions with the owners of 9 Ocean Breeze Drive (Lot 30 DP 787876).
28. All employees, contractors and subcontractors are to receive an environmental induction. This would include, but not be limited to, all relevant project specific and standard noise and vibration measures; permissible hours of work; location of nearest sensitive receiver(s); any limitation on high noise generating activities; construction parking; loading and unloading areas; and compound site practices.
29. Residences within 50 m of the route would be notified of the proposed works and the duration of such works at least two weeks prior to undertaking the works. All notified receivers would be provided with a contact telephone number for any complaints/ updates associated with the proposed works.
30. All equipment would be well maintained in accordance with the manufacturer's specifications.
31. All plant would be fitted with appropriate exhaust systems to ensure compliance with pollution and noise emission standards.
32. All vehicles and equipment would be turned off and not left idling when not required for works uses.

33. Noise complaints would be recorded, including suitable identification/ description of the noise source (e.g. continual/ impulsive) and general location of the complaint. Any noise complaints would be investigated and actioned as required.

5.6 Traffic and Access

5.6.1 Existing Environment

Currently, residents of those streets that feed into the existing portion of Hutley Drive e.g. Gradwell Drive and Beryl Place, and residents of Kell Mather Drive and Silkwood Road (commonly referred to as The Meadows) use Henderson Lane and North Creek Road to access The Coast Road and Byron Bay Road. Hutley Drive terminates in a concrete barrier to the north and the vacant road reserve is utilised by pedestrians.

Pedestrians currently use the unformed Hutley Drive road reserve to access the existing roundabout from residential areas west of Byron Bay Road. A sealed path on the western side of Byron Bay Road also links residential areas west of Byron Bay Road to the existing roundabout.

5.6.2 Potential Impacts

Ultimately, it is anticipated that residents of The Meadows, along with residents of the new land release areas 'Epiq' and 'Reservoir Hill' would use the Hutley Drive northern extension to travel to Lennox Village and to travel further north e.g. to Byron or to the Pacific Highway. In the short term, current residents of Hutley Drive would not experience a significant increase in traffic volume. However, there would be a significant increase once those new land release areas are developed.

The impact of constructing a new roundabout at the intersection of Hutley Drive and Byron Bay Road has been assessed (see Intersection Analysis at **Appendix G**). The proposed roundabout would be approximately 85 m west of the existing Byron Bay Road/ Ballina Street/ Coast Road/ North Creek Road roundabout. The proposed configuration of the intersection is a two circulating lane roundabout (see design drawings at **Appendix A**). The Intersection Analysis determines the performance of the proposed roundabout in peak hours in the year 2036. The year 2036 is the planning horizon year used in Council's strategic modelling of the road network based on adopted strategic land use planning predictions. This analysis determined that the proposed intersection would perform well within capacity and ample storage is available on Byron Bay Road to accommodate queues without affecting the existing roundabout to the east. The intersection would perform satisfactorily with more than sufficient capacity to accommodate predicted traffic volume growth up to and beyond the year 2036.

During the first phase of construction, from the existing terminus of Hutley Drive up to Byron Bay Road, the construction impacts would be quite minor. There would be traffic impacts associated with the construction of the proposed roundabout. These impacts would need to be mitigated via the safeguards recommended below.

During the construction period pedestrian access along the Hutley Drive road reserve and Byron Bay Road will need to be managed to ensure safety of pedestrians using these routes.

5.6.3 Safeguards

The following mitigation measures would be implemented in order to prevent adverse impacts relating to traffic and access:

34. Prepare a Traffic Control Plan that encompasses all movements to and from the site so as to manage construction vehicle movements. The Plan would encompass traffic movements on The Coast Road, Byron Bay Road, North Creek Road, Henderson Lane, Silkwood Road and Hutley Drive.
35. An Access Management Plan shall be prepared to manage internal site traffic and pedestrian movements to ensure the safety of workers and public.
36. In the unlikely event of a requirement to alter existing access to a site or close a road, sufficient and appropriate notification would be provided to the affected traffic users.
37. Regard to public safety would be maintained at all times.
38. Appropriate signage would be erected, and details would be confirmed by appropriate Ballina Shire Council personnel responsible for site safety during the Activity.

5.7 Air Quality

5.7.1 Existing Environment

The Activity is located in a residential and rural context. Potential airborne particles within the locality are largely restricted to vehicle emissions and minor dust generated by vehicle movements in the broader landscape.

5.7.2 Potential Impacts

The Activity may temporarily affect air quality through exhaust emissions from machinery and associated transportation. There may also be minor dust generated during earthworks and the removal of trees. There is potential that emissions and dust generated from the works may result in air quality impacts to adjacent sensitive receivers. However, given the temporary duration of the works and nature of the Activity, the level of potential impact is not considered significant and can be managed or minimised through implementation of safeguards and management measures.

The Activity would contribute to greenhouse gas emissions to a minor extent via the emissions from construction equipment and traffic, as well as the consumption of materials requiring carbon emissions and the removal of vegetation that may otherwise act as a carbon sink. Given the scale of the works however, the influence on greenhouse gas emissions would be negligible. However, it is appropriate to implement measures that can reduce or minimise such effects.

5.7.3 Safeguards

The following mitigation measures would be implemented in order to prevent adverse impacts relating to air quality:

39. Vegetation or other materials are not to be burnt on-site.
40. Vehicles transporting waste or other materials that may produce odours or dust would be covered during transportation.
41. Construction works would not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.

42. Machinery and vehicles not in use during construction would be turned off and not left to unnecessarily run idle.
43. Vehicles, machinery and equipment would be maintained in accordance with manufacturer's specifications in order to meet the requirements of the *Protection of the Environment Operations Act 1997* and associated regulation.

5.8 Socio-economic

5.8.1 Existing Environment

The proposed Activity would be located on vacant land, within a road reserve and council owned property.

5.8.2 Potential Impacts

The Activity is unlikely to cause any negative socio-economic impacts. There is unlikely to be any significant disruption to businesses, traffic or access during construction. Traffic access along Byron Bay Road would continue throughout construction.

Lot 2 DP620838 is Council owned land and the dwelling is rented on a month to month basis. Ballina Shire Council and the current occupiers of Lot 2 DP620838 would negotiate the continuation of lease arrangements with regard to amenity impacts associated with construction activities required to enable the new road.

Noise and vibration impacts are expected during the works, as discussed previously including provision of an acoustic wall on the boundary of Lot 30 DP 787876. The materials and final finish of the proposed acoustic wall would be determined following further discussions with the owners of Lot 30 DP 787876.

The Activity would ultimately result in positive socio-economic outcomes, by providing better connectivity of the road network for residents and therefore reducing travel times. The Activity would increase the accessibility of Lennox Village and towns further to the north.

Given the nature of the Activity, the site context and temporary construction period, no adverse long-term socio-economic impacts are anticipated.

5.8.3 Safeguards

The following safeguards and management measures would be implemented in order to prevent adverse social impacts:

44. Contractors/ workers would be mindful of the needs of the local community.
45. Any potentially impacted parties or landholders would be notified/ consulted prior to construction with a goal of minimising or eliminating any adverse impacts.
46. In accordance with the *Work Health and Safety Act 2011*, workers would be provided with appropriate safety clothing and equipment. Supervisory staff and any visitors to the work area would also be required to wear protective clothing. Works personnel would be provided with or expected to have protective equipment and appropriate training.
47. The materials and final finish of the proposed acoustic wall would be determined following further discussions with the owners of Lot 30 DP 787876.

5.9 Waste

5.9.3 Potential Impacts

The Activity would be undertaken to ensure minimal impacts are generated from waste produced on-site by ensuring that all waste is managed appropriately. Waste generated from the Activity may include, but is not limited to:

- Packaging materials.
- General site rubbish.
- Oils and grease from machinery.
- Scrap metal.
- Soil spoils.
- General building materials waste.

Any excess cleared vegetation and soil not utilised on-site would be deposited at a licensed waste facility or reused as a resource (e.g. mulched) at a later date on Council projects wherever possible and as deemed fit/ suitable in accordance with NSW waste legislation.

Waste has the potential to disperse into the surrounding environment and cause visual impacts and potential harm to terrestrial and aquatic flora and fauna. Waste products may also transport contaminants that may degrade local water quality (e.g. fuels, lead-based paint and oils). This risk can be reduced and managed through the implementation of safeguards.

5.9.4 Safeguards

The following safeguards and management measures would be implemented in order to prevent adverse impacts in relation to waste generated by the Activity:

48. Working areas would be maintained, kept free of rubbish and cleaned up at the end of each day.
49. Waste material would not be left on-site once the works have been completed.
50. Ensure the responsible environmental management of wastes that cannot be avoided and promote opportunities for the re-use of waste products where appropriate.
51. Waste would be disposed of at a licensed waste or recycling facility as appropriate.

5.10 Cumulative Impacts

Under Clause 228 of the EP&A Regulation 2000, any cumulative environmental effect with other existing or likely future activities must be taken into account when assessing the impact of an activity for the purposes of Part 5 of the EP&A Act. The Activity is expected to add to a number of minor cumulative impacts including resource consumption, vegetation clearing and generation of greenhouse gas emissions (e.g. through operation of vehicles and equipment). However, the mitigation measures stated in this REF and the final methodology for completion of the Activity would aim to minimise the extent to which the Activity contributes to cumulative adverse environmental impacts.

5.12 Ecologically Sustainable Development

The principles of ecologically sustainable development are outlined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000, in relation to EIS requirements. Whilst an EIS is not required for this project, a consideration of these principles is useful.

5.12.3 Precautionary Principle

Schedule 2 of the Environmental Planning and Assessment Regulation 2000 states that *"the 'precautionary principle', namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
ii) an assessment of the risk-weighted consequences of various options".

To satisfy the precautionary principle, this REF has conducted a thorough analysis of potential environmental, economic and social concerns. This assessment has identified and examined potential impacts and developed appropriate mitigation measures and safeguards to help avoid and/or minimise any impacts and safeguard the environment. Considering this assessment's findings, the Activity is unlikely to impose significant and/or long-term adverse impacts on the environment, economy or community. The mitigation measures and safeguards outlined in this REF would be implemented to ensure sound environmental outcomes in all aspects of the Activity.

5.12.4 Intergenerational Equity

Schedule 2 of the Environmental Planning and Assessment Regulation 2000 defines inter-generational equity as *"the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations"*.

The Activity would not significantly affect the viability of local or threatened species, or any EECs. Therefore, local biodiversity values would not be substantially adversely affected by the Activity and would be maintained for future generations.

5.12.5 Conservation of Biological Diversity and Ecological Integrity

Schedule 2 of the Environmental Planning and Assessment Regulation 2000 requires the *"conservation of biological diversity and ecological integrity"*, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.

The impacts to ecological integrity and conservation of biological diversity at the site have been thoroughly assessed as part of this REF. No threatened species, endangered populations or EECs are likely to be significantly affected by the Activity. No populations of native species are likely to be made locally rare or unviable as a result of the Activity. Consequently, the ecological integrity and biological diversity would be maintained at the site.

5.12.7 Improved Valuation, Pricing and Incentive Mechanisms

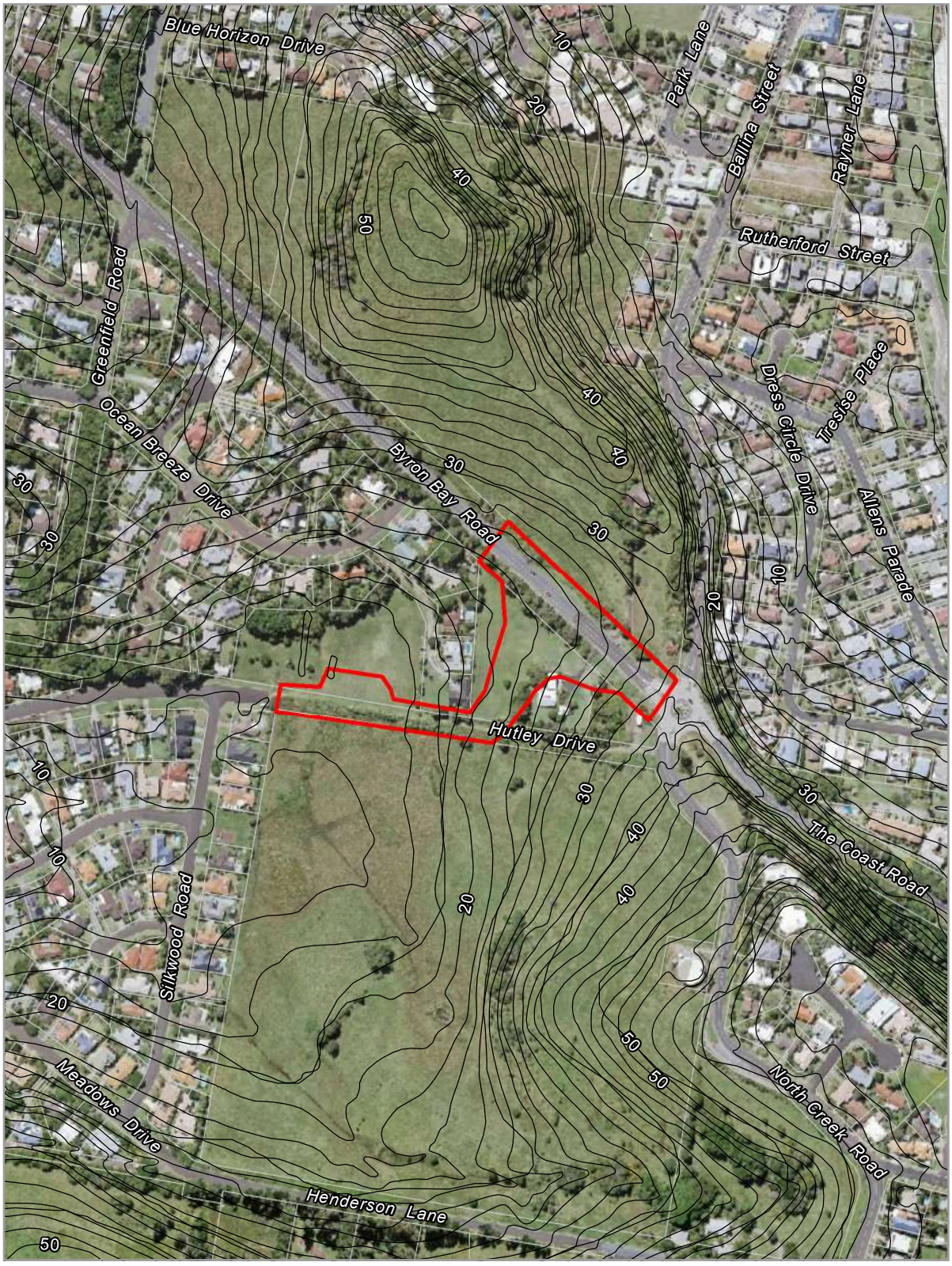
The following principles of valuation, pricing and incentive as per Schedule 2 of the Environmental Planning and Assessment Regulation 2000 are acknowledged as part of this review:

i) Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement.
ii) The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.
iii) Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

It is difficult, however, to assign a monetary value to the environment of a locality or to environmental resources not considered for commercial use. The proponent has taken an approach to manage the potential environmental impacts of the Activity by identifying appropriate safeguards to avoid or mitigate adverse environmental effects. This would ensure that the integrity of the environment is not degraded, is managed and enhanced.

Information shown is for illustrative purposes only

Drawn by: AB Checked by: RE Reviewed by: MS Date: 17/01/2019
Source of base data: DFS&I



LEGEND

- Extent of works
- Cadastre
- Contour at 2m intervals

0 100

Site Analysis

GeoLINK environmental management and design

Illustration 5.1

6. Environmental Management

6.1 Construction Environmental Management Plan (CEMP)

A CEMP would be prepared to describe safeguards and management measures identified. This plan would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The CEMP would be prepared prior to commencement of works and must be reviewed and certified by Council's Project Officer, prior to the commencement of any on-site works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

6.2 Licensing and Approvals

Table 6.1 provides an assessment of licences, permits or approvals required prior to commencement of the Activity.

Table 6.1 Checklist of Approvals, Licences and Permits

Item	*Locations that may trigger an external approval, licence or permit*	*Check one*	
6.1	Working in an area containing endangered, threatened, vulnerable or protected species, populations, ecological communities or critical habitat (flora and fauna). – *Office of Environment and Heritage (OEH), Department of Primary Industries (Fisheries and Aquaculture).*	☐ Yes	☒ No
6.2	Working on land reserved under the National Parks and Wildlife Act (e.g. National Park, Nature Reserve, Aboriginal area, wilderness area, conservation area or wild river). – *OEH (National Parks and Wildlife Service).*	☐ Yes	☒ No
6.3	Working in an area of national environmental significance (RAMSAR Wetlands, threatened species, migratory birds, World Heritage, National Heritage, Nature Reserve, etc) or on Commonwealth land or marine area. – *Department of Environment (Commonwealth).*	☐ Yes	☒ No
6.4	Working within an area that is subject to any conservation agreement entered into under the *National Parks and Wildlife Act 1974.* – *OEH (National Parks and Wildlife Service),*	☐ Yes	☒ No
6.5	Working within an area that is subject to any plan of management under the *National Parks and Wildlife Act 1974.* – *OEH (National Parks and Wildlife Service),.*	☐ Yes	☒ No
6.6	Working within an area that is subject to any joint management agreement under the *National Parks and Wildlife Act 1974* – *OEH (National Parks and Wildlife Service),*	☐ Yes	☒ No

Item	Locations that may trigger an external approval, licence or permit	Check one	
6.7	Working in an area subject to a joint management agreement entered into under the *Threatened Species Conservation Act 1995.* – *OEH (National Parks and Wildlife Service).*	☐ Yes	☒ No
6.8	Working in an area subject to a biobanking agreement entered into under Part 7A of the *Threatened Species Conservation Act 1995* that applies to the whole or part of the land to which the activity relates. – *OEH (National Parks and Wildlife Service).*	☐ Yes	☒ No
6.9	Working in an aquatic reserve or in marine vegetation such as seagrass, mangroves, saltmarsh, etc. – *Department of Primary Industries (Fisheries and Aquaculture), NSW Marine Parks, OEH.*	☐ Yes	☒ No
6.10	Working in a Marine Park declared under the *Marine Parks Act.* – *NSW Marine Parks.*	☐ Yes	☒ No
6.11	Dredging or reclamation of water. (Note that councils do not need approval for a controlled activity under the *Water Management Act 2000*). – *Department of Primary Industries (Fisheries and Aquaculture and/or Office of Water), Roads and Maritime Services.*	☐ Yes	☒ No
6.12	Enlarge, deepen or sink a new water bore. – *Department of Primary Industries (Office of Water).*	☐ Yes	☒ No
6.13	An activity that will pollute water (e.g. dewatering). – *NSW Environment Protection Authority.*	☐ Yes	☒ No
6.14	Working within the curtilage of a 'Heritage Place' or 'Heritage Item' identified on the LEP Heritage Schedule, the State Heritage Register or the National Heritage List. – *Australian Heritage Council, NSW Heritage Council, OEH, Ballina Shire Council.*	☐ Yes	☒ No
6.15	Working within a 'heritage conservation area' identified in Ballina LEP Schedule 5 Environmental Heritage – Part 2. – *Ballina Shire Council.*	☐ Yes	☒ No
6.16	Working where a 'Relic' is likely to be discovered (e.g. Archaeological Zoning Plans). – *NSW Heritage Council or OEH.*	☐ Yes	☒ No
6.17	Working near Aboriginal relics or places where an Aboriginal Heritage Impact Permit (AHIP) may be required. – *Local Aboriginal Land Council, OEH (National Parks and Wildlife Service).*	☐ Yes	☒ No
6.18	An activity comprising a fixed or floating structure in or over a navigable waterway. – *NSW Roads and Maritime Services.*	☐ Yes	☒ No
6.19	An activity comprising work on Crown land not subject to a plan of	☐	☒

Item	Locations that may trigger an external approval, licence or permit	Check one	
	management. – *NSW Trade and Investment (Crown Lands).*	Yes	No
6.20	Working at sites at which asbestos or asbestos-containing materials exist. (Determine if a licence or exemption will be required). – *NSW WorkCover.*	☐ Yes	☒ No

6.3 Summary of Safeguards and Management Measures

Environmental safeguards outlined in this document aim to minimise any potential adverse impacts arising from the Activity on the surrounding environment. The safeguards and management measures are summarised in **Table 6.2**.

Table 6.2 Summary of Site Specific Environmental Safeguards

No.	*Impact*	*Environmental Safeguard*
General		A Construction Environmental Management Plan (CEMP) would be prepared to guide the implementation of environmental impact mitigation measures, identify key roles and responsibilities for environmental monitoring and methods of reporting incidents. All works staff and site personnel are to be made aware of their environmental responsibilities and the safeguard measures in the CEMP to minimise environmental impacts. Onsite meetings are to be held with each relevant contractor, construction staff, and site personnel before the commencement of works/activities, including site establishment. The purpose of the meeting is to discuss the environmental safeguards that are required to be implemented for the relevant phase of works. The meeting would also include relevant environmental awareness and toolbox talks and who is responsible for the various components, e.g. inspection and maintenance of sedimentation and erosion controls, etc. Environmental awareness/toolbox talks should commence early in the program and continue as new personnel/ contractors are engaged.
5.1	Biodiversity	1. Trees are to be inspected for the presence of fauna prior to removal. 2. Trimming of vegetation adjacent to the clearance corridor should be kept to a minimum where possible and is to be undertaken in accordance with Australian Standard AS4373-1996 *Pruning Amenity Trees.* 3. Vegetation waste should be removed from site or mulches and reused where required. 4. Disturbance of soils should be kept to a minimum and appropriate sediment and erosion controls established to prevent sediment laden run-off to adjacent areas. 5. Machinery movements within the drip line of retained mature trees should be kept to a minimum. The parking of vehicles and the storage of excavated material is not to be undertaken within tree drip lines. 6. All reasonable practical steps shall be undertaken to reduced noise and vibration from the site. 7. Undertake vegetation restoration works including weed control and assisted natural regeneration throughout a minimum area of 680 m^2 (see Ecological Assessment at **Appendix B** for proposed compensatory offset area). 8. No waste is to be left onsite at the completion of works.
5.2	Heritage	9. All personnel working on site would receive training in their responsibilities under the NPW Act. 10. If Aboriginal heritage objects are uncovered Jali LALC and relevant Traditional Owners would be contacted immediately. Works in the vicinity of the find would not re-commence until clearance has been received from Ballina Shire Council Project Manager and OEH.

No.	Impact	Environmental Safeguard
		11. Should non-Indigenous heritage items be uncovered during works, all works in the vicinity of the find would cease and Ballina Shire Council and the State Heritage Office would be contacted. Works would not re-commence until appropriate clearance has been received. 12. If any items defined as relics under the NSW *Heritage Act 1977* are uncovered during the works, all works would cease in the vicinity of the find and Ballina Shire Council and the Project Manager would be contacted immediately.
5.3	Visual	13. Vegetation would only be cleared to the minimum extent necessary to undertake the proposed works. 14. Soil disturbance would be minimised where possible. 15. Upon completion of the works, any works areas would be restored to an acceptable visual state. 16. All sites would be maintained, kept free of rubbish and cleaned up at the end of each work day.
5.4	Water quality and soils	17. Further testing for Acid Sulfate Soils would need to be carried out. If Acid Sulfate Soils are found within the works area, an Acid Sulfate Soils Management Plan must be prepared. 18. Erosion and sediment controls would be implemented in accordance with the Landcom/ Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book). 19. Works would only commence once all erosion and sediment controls have been established. The controls would be maintained in place until the works are complete and all exposed erodible materials are stabilised. 20. All sediment control measures would be checked and repaired or re-installed (if required) if heavy rainfall was forecast. 21. Progressive, site-specific erosion and sediment control plan would be developed and approved prior to commencement of the works. 22. If unexpected contaminated land is encountered during the works, works would stop immediately and relevant procedures outlined in a CEMP would be followed. The EPA would be notified immediately in response to incidents causing or threatening actual or potential harm to the environment in accordance with section 148 of the POEO Act (via EPA Environment Line on 131 555). 23. Only clean equipment and vehicles would be used, with equipment being cleaned down before being brought to the site.
5.5	Noise and vibration	24. Construction activities would be restricted to the following times where possible: ▪ Monday to Friday 7:00 am to 6:00 pm. ▪ Saturday 8:00 am to 1:00 pm. ▪ No work would take place on Sundays or public holidays. 25. Where construction is to occur at night, notice would be provided to nearby sensitive receivers.

No.	Impact	Environmental Safeguard
		26. Best practice mitigation and management measures would be used to minimise construction noise impacts at sensitive residential receivers; guided by the EPA's Interim Construction Noise Guidelines. 27. An acoustic wall is required to mitigate operational noise impacts on residences located northwest of the new road formation. The height of the wall would range between 1.8 m and 2.3 m in height. The material and final finish of the wall would be determined following further discussions with the owners of 9 Ocean Breeze Drive (Lot 30 DP 787876). 28. All employees, contractors and subcontractors are to receive an environmental induction. This would include, but not be limited to, all relevant project specific and standard noise and vibration measures; permissible hours of work; location of nearest sensitive receiver(s); any limitation on high noise generating activities; construction parking; loading and unloading areas; and compound site practices. 29. Residences within 50 m of the route would be notified of the proposed works and the duration of such works at least two weeks prior to undertaking the works. All notified receivers would be provided with a contact telephone number for any complaints/ updates associated with the proposed works. 30. All equipment would be well maintained in accordance with the manufacturer's specifications. 31. All plant would be fitted with appropriate exhaust systems to ensure compliance with pollution and noise emission standards. 32. All vehicles and equipment would be turned off and not left idling when not required for works uses. 33. Noise complaints would be recorded, including suitable identification/ description of the noise source (e.g. continual/ impulsive) and general location of the complaint. Any noise complaints would be investigated and actioned as required.
5.6	Traffic and access	34. Prepare a Traffic Control Plan that encompasses all movements to and from the site so as to manage construction vehicle movements. The Plan would encompass traffic movements on The Coast Road, Byron Bay Road, North Creek Road, Henderson Lane, Silkwood Road and Hutley Drive. 35. An Access Management Plan shall be prepared to manage internal site traffic and pedestrian movements to ensure the safety of workers and public. 36. In the unlikely event of a requirement to alter existing access to a site or close a road, sufficient and appropriate notification would be provided to the affected traffic users. 37. Regard to public safety would be maintained at all times. 38. Appropriate signage would be erected, and details would be confirmed by appropriate Ballina Shire Council personnel responsible for site safety during the Activity.
5.7	Air quality	39. Vegetation or other materials are not to be burnt on-site. 40. Vehicles transporting waste or other materials that may produce odours or dust would be covered during transportation.

No.	Impact	Environmental Safeguard
		41. Construction works would not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely. 42. Machinery and vehicles not in use during construction would be turned off and not left to unnecessarily run idle. 43. Vehicles, machinery and equipment would be maintained in accordance with manufacturer's specifications in order to meet the requirements of the Protection of the Environment Operations Act 1997 and associated regulation.
5.8	Socio-economic	44. Contractors/ workers would be mindful of the needs of the local community. 45. Any potentially impacted parties or landholders would be notified/ consulted prior to construction with a goal of minimising or eliminating any adverse impacts. 46. In accordance with the Work Health and Safety Act 2011, workers would be provided with appropriate safety clothing and equipment. Supervisory staff and any visitors to the work area would also be required to wear protective clothing. Works personnel would be provided with or expected to have protective equipment and appropriate training. 47. The materials and final finish of the proposed acoustic wall would be determined following further discussions with the owners of Lot 30 DP 787876.
5.9	Waste	48. Working areas would be maintained, kept free of rubbish and cleaned up at the end of each day. 49. Waste material would not be left on-site once the works have been completed. 50. Ensure the responsible environmental management of wastes that cannot be avoided and promote opportunities for the re-use of waste products where appropriate. 51. Waste would be disposed of at a licensed waste or recycling facility as appropriate.

7. Summary of Consideration of Environmental Factors

7.1 Clause 228 Checklist (NSW Legislation)

As part of its obligation under Part 5 Subdivision 2 (formerly section 111) of the EP&A Act, the determining authority is required to take into account, to the fullest extent possible, all matters likely to affect the environment. The determining 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. **Table 7.1** provides a summary of the key issues relevant to each factor and the key mitigation measures proposed.

Table 7.1 Clause 228 Checklist (NSW Legislation)

	Factor	*Impact*
a	**Any Environmental Impact on a Community**	
	The community would not be affected through declines in the local environment as a result of the Activity. Mitigation measures have been designed to reduce environmental impacts on the community to negligible levels (refer to **Section 5**).	Nil
b	**Any Transformation of a Locality**	
	The Activity would result in a noticeable change to the locality, particularly for residents of Hutley Drive, Silkwood Road and Ocean Breeze Drive. The transformation would not be significant for the wider community.	Medium
c	**Any Environmental Impact on the Ecosystems of the Locality**	
	Vegetation would be removed to allow for the proposed Activity. The impact of that vegetation removal is discussed in Section 5 of this REF. Extensive mitigation measures have been designed to reduce environmental impacts (refer to **Section 5**).	Minor
d	**Any Reduction of the Aesthetic, Recreational, Scientific or Other Environmental Quality or Value of a Locality**	
	It is expected that the reduction in aesthetic quality of the locality would be minor. No reduction in the quality of the environment would occur due to the mitigation measures detailed in **Section 5** of this REF. No significant changes of the locality are expected to occur.	Nil Nil
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**	
	The Activity would not impact the existing land uses. There would be no significant impacts to heritage, visual amenity or social significance and as such impacts are therefore considered to be negligible.	Minor
f	**Any Impact on the Habitat of Protected Fauna (Within the Meaning of the National Parks and Wildlife Act 1974)**	
	With effective implementation of the safeguards provided in **Section 5** of this REF, the Activity is not considered likely to have a significant negative impact on the habitat of any other protected fauna.	Nil

	Factor	*Impact*
g	**Any Endangering of any Species of Animal, Plant or Other Form of Life Whether Living on Land, in Water or in the Air**	
	With effective implementation of the safeguards provided in **Section 5** of this REF, the Activity is not considered likely to significantly endanger any species of animal, plant or other form of life.	Nil
h	**Any Long Term Effects on the Environment**	
	No negative long-term impacts would occur in the locality given the implementation of the proposed safeguards and measures in **Section 5** of this REF.	Nil
i	**Any Degradation of the Quality of the Environment**	
	Degradation of the quality of the environment is not expected. Given the safeguards in **Section 5** of this REF, any impacts are considered unlikely.	Nil
j	**Any Risk to the Safety of the Environment**	
	No negative long-term impacts would occur in the locality given the implementation of the proposed measures in **Section 5** of this REF.	Nil
k	**Any Reduction in the Range of Beneficial Uses of the Environment**	
	The Activity would not result in any reduction in the range of beneficial uses of the environment.	Nil
l	**Any Pollution of the Environment**	
	The Activity may adversely affect air quality during construction. The mitigation measures determined in **Section 5** would minimise the duration and impact. No reduction in the quality of the environment associated with water is expected due to the mitigation measures detailed in **Section 5** of this REF. Waste materials, fuel spills and particulate matter have the potential to cause pollution to the environment. However, given the proposed safeguards detailed in **Section 5** of this REF and all waste being disposed within an appropriate/ approved waste disposal facility, pollution to the environment would be minimised.	Minor Nil Minor
m	**Any Environmental Problems Associated with the Disposal of Waste**	
	Any wastes would be disposed of in a manner which would not damage or disturb any native flora or fauna or the physical environment. The disposal of such waste would be within a waste management facility in accordance with OEH approved methods of waste disposal. Safeguards detailed in **Section 5** of this REF would protect the environment from problems associated with waste disposal.	Nil
n	**Any Increased Demands on Resources (Natural or Otherwise) that are likely to Become in Short Supply**	
	The Activity does not create any demand for resources that are in short supply nor is it likely to result in an increased demand on any natural resources that are likely to become in short supply.	Nil
o	**Any Cumulative Environmental Effect with Other Existing or Likely Future Activities**	
	The proposed works are unlikely to have any significant impact on the environment, therefore would not significantly contribute to any cumulative impacts.	Negligible

7.2 Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth Legislation)

The EPBC Act protects/ regulates matters of national environmental significance (MNES), including:

- World heritage properties.
- National heritage places.
- Wetlands of international importance.
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, a referral is required to the Australian Government for proposed *'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'*. Database searches were completed encompassing a 10 km radius search area from the Activity (refer to Ecological Assessment at **Appendix B**). Search results following the site assessment are considered in **Table 7.2** and no significant impact would occur.

Table 7.2 EPBC Act Considerations

Matter	*Impact*
Any impact on a World Heritage property?	
No World Heritage properties occur within 10 km of the site.	Nil
Any impact on a National Heritage place?	
No National Heritage places occur within 10 km of the site.	Nil
Any impact on a wetland of international importance?	
No wetlands of international importance (occur within 10 km of the site.	Nil
Any impact on nationally threatened species and ecological communities?	
The vegetation present does not conform to the definition of any federally listed threatened ecological communities, and no federally listed threatened flora or fauna species were recorded. No listed threatened species or communities are likely to be significantly affected by the Activity.	Negligible
Any impact on a Nationally Important Wetland?	
The proposed route does not intersect areas of Nationally Important Wetland. Risks of impact to adjacent wetlands are to be managed via controls to reduce risk of sediment runoff and erosion as well as reduce risk of water quality impacts via pollution events. The wetlands are not likely to be significantly affected by the Activity.	Negligible
Any impact on Migratory species?	
Based on the minor nature of the works, no listed migratory species are likely to be significantly affected by the Activity (refer to **Section 5**).	Negligible
Any impact on a Commonwealth marine area?	
No Commonwealth marine areas would be affected.	Nil
Any impact on the Great Barrier Reef Marine Park?	

Matter	*Impact*
The Great Barrier Reef Marine Park is distant from the site.	Nil
Does the Proposal involve a nuclear action (including uranium mining)?	
The Activity does not involve a nuclear action.	Nil
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	
The Activity does not involve any impact on a water resource, in relation to coal seam gas development and large mining development.	Nil

8. Conclusion

The Activity aims to increase the connectivity of the road network for residential areas west of North Creek Road in Lennox Head. The construction of the proposed Hutley Drive northern extension would provide a more direct route to Byron Bay Road and would remove traffic from smaller local roads that cannot support the expected increase in traffic in the next five to ten years. This road will form part of a future second arterial road, connecting Lennox Head to Ballina.

The Activity is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed Activity. This has included consideration of critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. Mitigation measures as detailed in this REF would ameliorate potential impacts outlined within this report such as soil and water quality impacts.

The environmental impacts of the Activity are not likely to be significant and therefore it is not necessary for an Environmental Impact Statement to be prepared and approval to be sought for the Activity from the Minister for Planning under Division 5.1 of the EP&A Act. The Activity is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The Activity is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

9. Decision

9.1 Person who Prepared this REF

I certify to the best of my knowledge that:

I have completed this REF, and

The assessment meets the requirements of sections 5.5 to 5.7 of the EP&A Act, clause 228 of the EP&A Regulation and other relevant legislation and guidelines, and

The information contained in this REF is not materially misleading, and

My assessment has been adequately completed, and

My conclusion as to the likely environmental and community impact of the project is reasonable, and is likely to be ☒ **LOW** ☐ **MODERATE** ☐ **HIGH** *(check one)*, and

I am satisfied that, subject to the inclusion of the mitigation measures included in this REF, the project will not have a significant impact on the environment during both the construction and operation phases, and

An Environmental Impact Statement is not required, and

A Species Impact Statement is not required.

Signature:		***Date:***	07/02/2019
Name (print):	Megan Smith		
Position:	Environmental Planner		

10. QA and Sign Off

10.11 Determining officer (Public Authority)–who Verifies this REF

I certify to the best of my knowledge and on behalf of Ballina Shire Council that:

☐ Based on the completed REF and my knowledge of the project, the assessment has been adequately completed, the project has minor and predictable impacts, the conclusion as to the likely environmental impact of the project is reasonable and the project can proceed subject to the relevant control measures and conditions in this REF, any approval, license or permit.

☐ The project requires additional environmental assessment because:

there are HIGH environmental scores (rating equal to or greater than 10).

NOTE: A site visit may be required depending on the level of confidence and risk to the environment.

Signature:		***Date:***	
Name (print):			
Position:			
Agency:			

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Terms and Acronyms

AHIMS	Aboriginal Heritage Information Management System.
Biodiversity	First coined in 1988 as a contraction of biological diversity; diversity traditionally referring to species richness and species abundance. Biodiversity has been defined subsequently as encompassing biological variety at genetic, species and ecosystem scales (DASETT 1992). The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority, and is protected by the International Convention on Biological Diversity 1992.
BSC	Ballina Shire Council
CEMP	Construction Environmental Management Plan. An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
Conservation	The management of natural resources in a way that will benefit both present and future generations.
DoEE	Australian Government Department of the Environment and Energy.
DPI Fisheries	NSW Department of Primary Industries (Fisheries).
DPI Water	NSW Department of Industry—Water. Responsible for planning, policy development, and regulatory frameworks for regional water in NSW.
EIA	Environmental impact assessment.
EIS	Environmental Impact Statement (required by section 112 of the EP&A Act).
EMP	Environmental Management Plan.
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EP&A Regulation	Environmental Planning and Assessment Regulation 2000.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.

Ecologically Sustainable Development (ESD)	Ecologically sustainable development. Development which uses conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Endangered species	Those plant and animal species listed under Biodiversity Conservation Act 2016 or listed as endangered under Subdivision A of Division 1 of Part 13 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Environment	The physical, biological, cultural, economic and social characteristics of an area, region or site.
Environmental management	That part of the overall management system which includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy (Refer to related term Environmental Management System).
Flora	Plants
Fauna	Animals
Heritage (cultural heritage)	A term which encompasses Aboriginal and European sites and material remains (cultural resources).
FM Act	*Fisheries Management Act 1994* (NSW).
ISEPP	State Environmental Planning Policy (Infrastructure) 2007.
KTP	Key Threatening Process.
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area.
Monitor	The checking of impacts of an activity or an existing activity in order to improve or evaluate environmental management practices; To check the efficiency and effectiveness of the environmental impact assessment process; To determine if the requirements of environmental legislation and associated regulations are being met.
MNES	Matters of National environmental significance.
OEH	Office of Environment and Heritage.
POEO Act	*Protection of the Environment Operations Act 1997*.
Risk	Likelihood of a specific undesirable event occurring within a specified period

	or in specified circumstances. Listed as a frequency or probability.
REF	Review of Environmental Factors.
Terrestrial	Of or pertaining to the land as distinct from the water.
Threatened species	Animals or plants listed as endangered or vulnerable under the NSW *Biodiversity Conservation Act 2016* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Visibility	Measure of extent to which particular components of a development may be visible from surrounding areas.
Vulnerable species	Those plant and animal species listed under the Biodiversity Conservation Act 2016 or listed as vulnerable under Subdivision A of Division 1 of Part 13 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
WaterNSW	WaterNSW supplies and seeks to improve availability of water that is essential for water users and communities throughout NSW.
Weed	Naturalised, non-indigenous plant species which may be noxious weeds (or agriculture), environmental weeds or any other generally undesirable introduced species.

Copyright and Usage

Appendix A

Design Drawings

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT

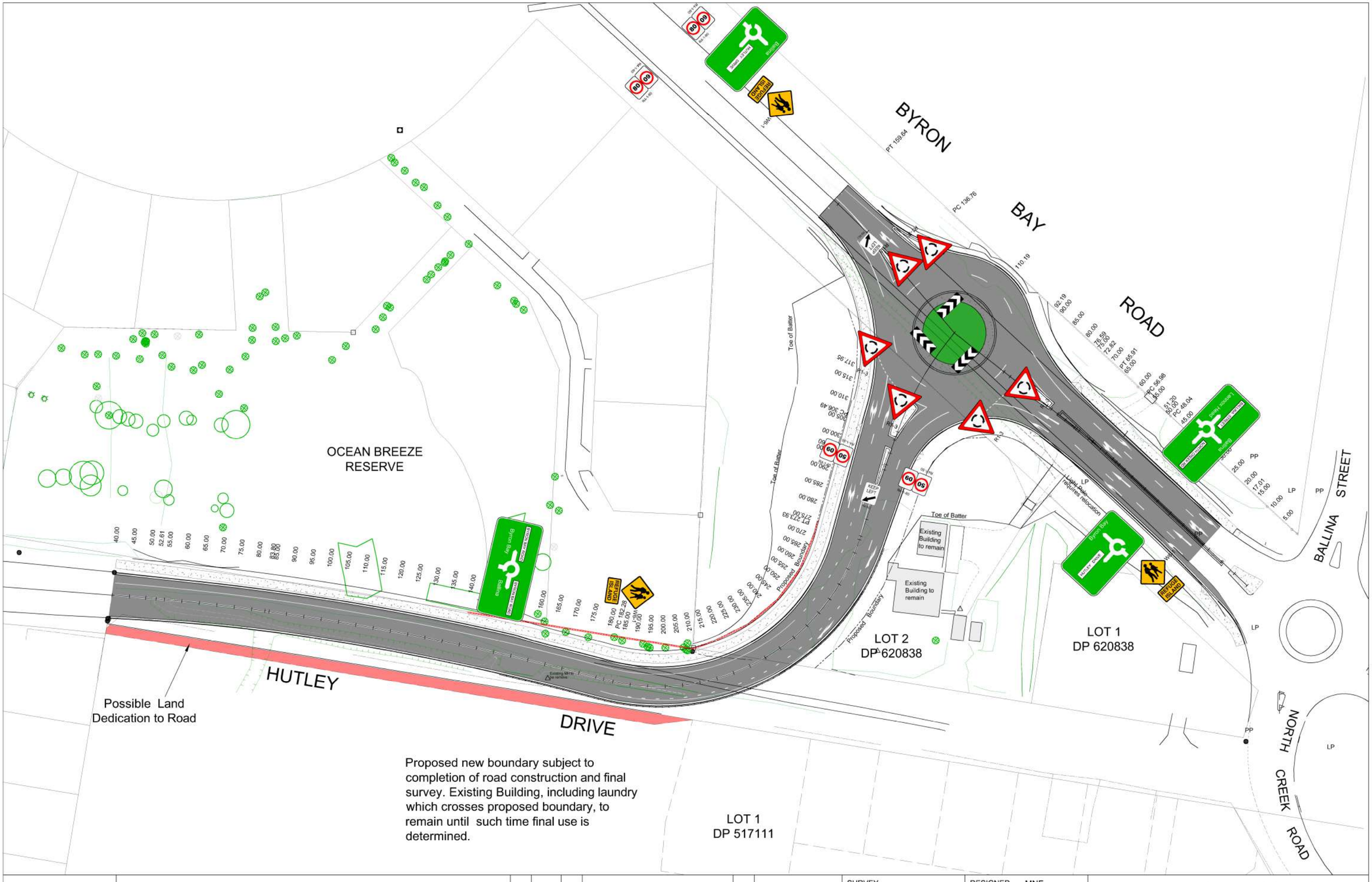
ISSUE B JANUARY 2019

DESIGN DRAWINGS

LOCALITY PLAN

DRAWING	SHEET	ISSUE	DATE	TITLE
SR31_049_03	1 OF 24	B	04/01/2019	Hutley Drive Northern Extension and Byron Bay Road Roundabout Signs and Linemarking
SR31_049_03	2 OF 24	B	04/01/2019	Hutley Drive Northern Extension and Byron Bay Road Roundabout Contour Plan
SR31_049_03	3 OF 24	B	04/01/2019	Hutley Drive Northern Extension and Byron Bay Road Roundabout Services
SR31_049_03	4 OF 24	B	04/01/2019	Hutley Drive Northern Extension Stormwater and Sewer Longsections
SR31_049_03	5 OF 24	B	04/01/2019	Hutley Drive Northern Extension Longsection Hutley Drive
SR31_049_03	6 OF 24	B	04/01/2019	Byron Bay Road Longsection
SR31_049_03	7 OF 24	B	04/01/2019	Typical Crossections
SR31_049_03	8 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 45 to 75
SR31_049_03	9 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 80 to 115
SR31_049_03	10 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 120 to 155
SR31_049_03	11 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 160 to 195
SR31_049_03	12 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 200 to 230
SR31_049_03	13 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections Ch 235 to 265
SR31_049_03	14 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 270 to 280
SR31_049_03	15 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections CH 285 to 295
SR31_049_03	16 OF 24	B	04/01/2019	Hutley Drive Northern Extension Cross Sections Ch300
SR31_049_03	17 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 20 to 30
SR31_049_03	18 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 35 to 45
SR31_049_03	19 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 50 to 60
SR31_049_03	20 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 65 to 75
SR31_049_03	21 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 80 to 90
SR31_049_03	22 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 95 to 105
SR31_049_03	23 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 120 to 130
SR31_049_03	24 OF 24	B	04/01/2019	Byron Bay Road Cross Sections CH 135 to 145

ballina shire council



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No.	Date	By	Change	X'd
			Amendments	

ballina shire council

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DATE 15/08/2018	DRAWN MNF
F.B. L.B.	CHECKED
DATUM AHD	APPROVED
DRAWING HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG	
SHEET 1 OF 24	

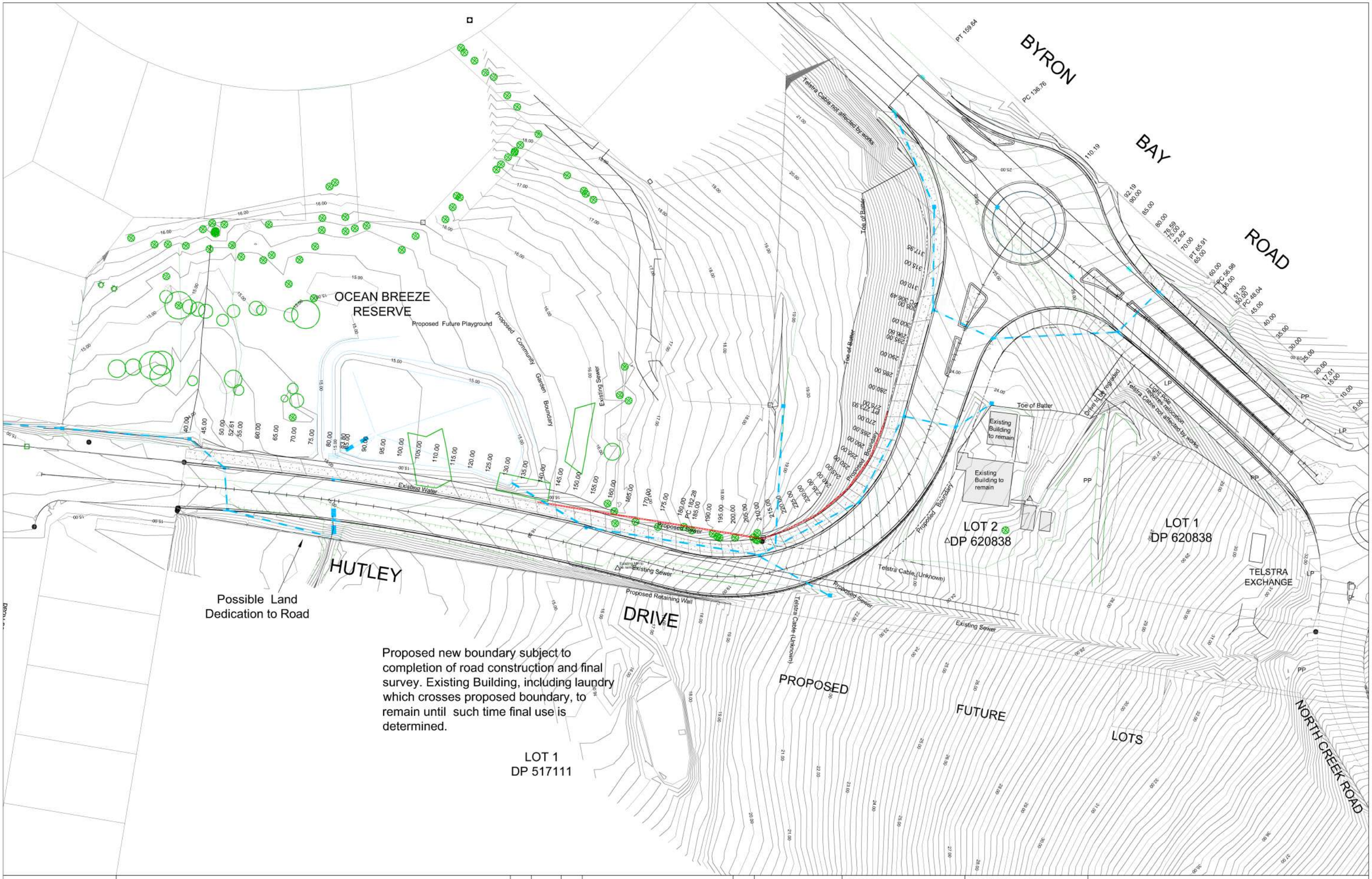
BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
SIGNS AND LINEMARKING PLAN

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL:

Plan No. SR31_049_03

A1



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ballina shire council

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DATE 15/08/2018	DRAWN MNF
F.B. L.B.	CHECKED
DATUM AHD	APPROVED
DRAWING HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG	
SHEET 2 OF 24	

BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
CONTOUR PLAN

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Plan No. SR31_049_03

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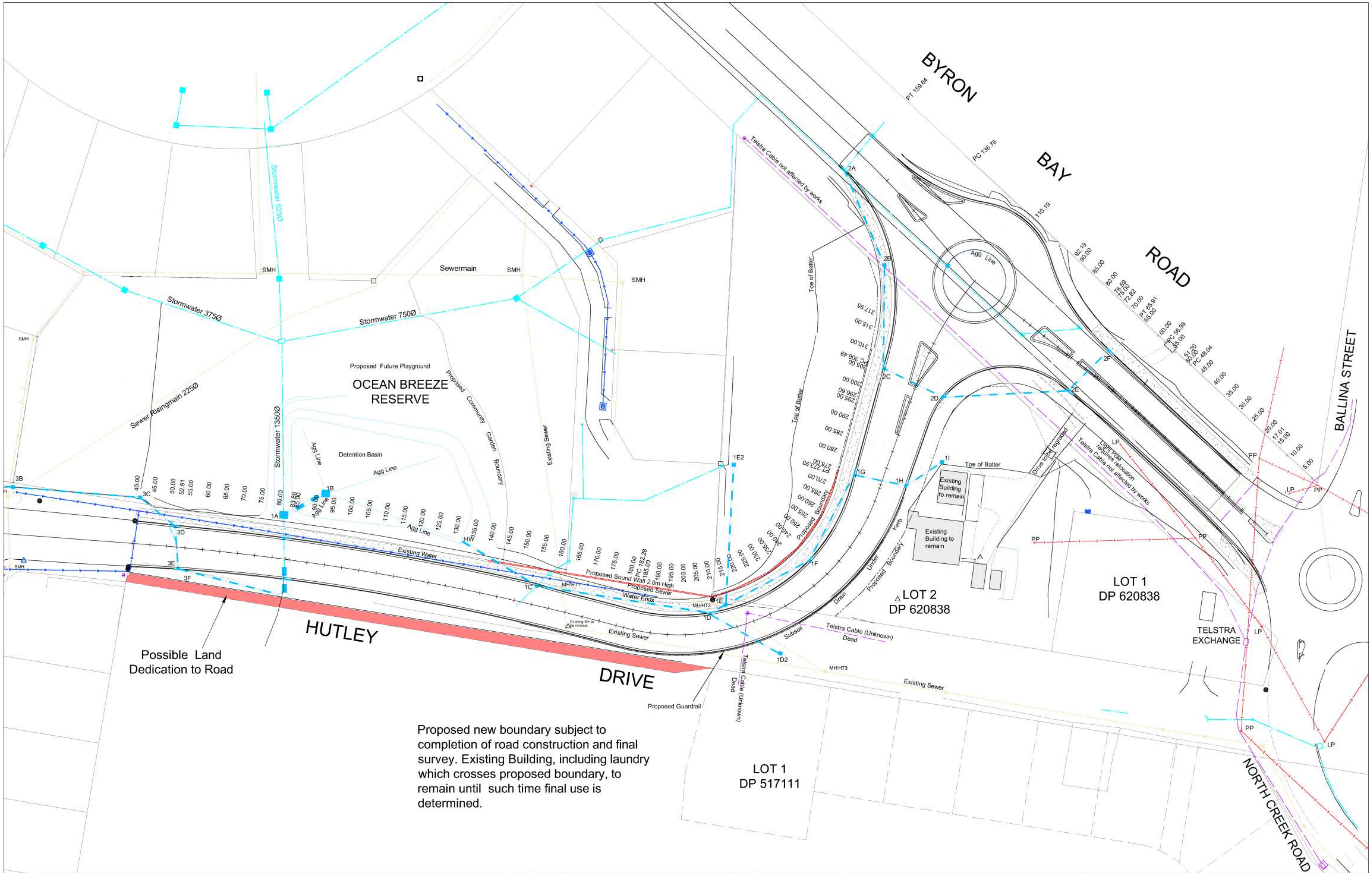

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SCALE (m)
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EXISTING STORMWATER
PROPOSED STORMWATER
EXISTING SEWER
EXISTING WATER
EXISTING TELSTRA
EXISTING ELECTRICITY
PROPOSED SOUND WALL
PROPOSED GUARDRAIL

No.	Date	By	Change	X'd
			Amendments	

ballina shire council

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		

SHEET 3 OF 24

BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
SERVICES PLAN

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL:

Plan No. SR31_049_03

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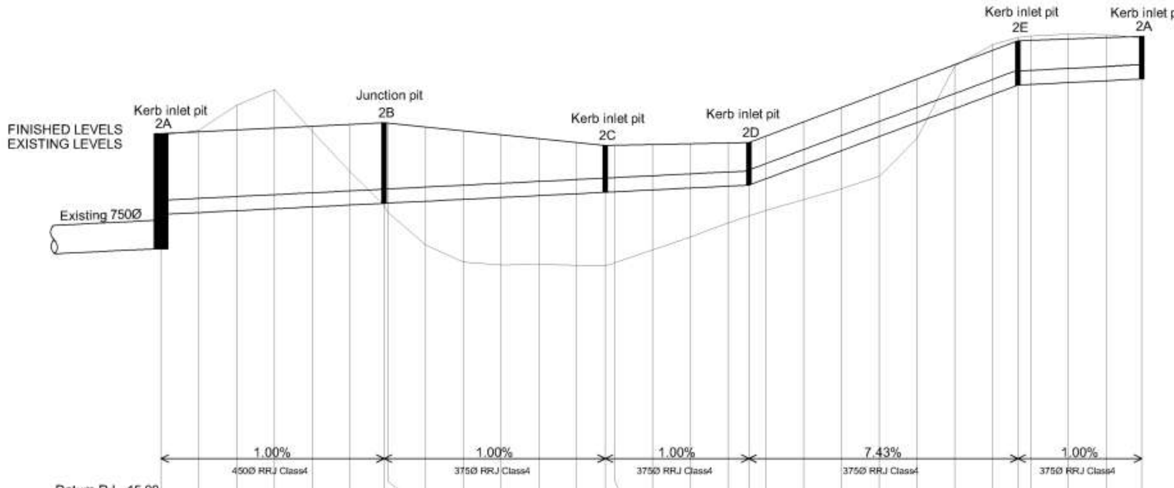

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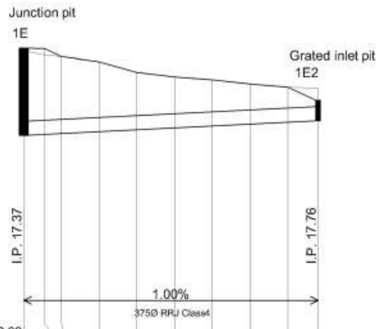
STORMWATER LINE 2



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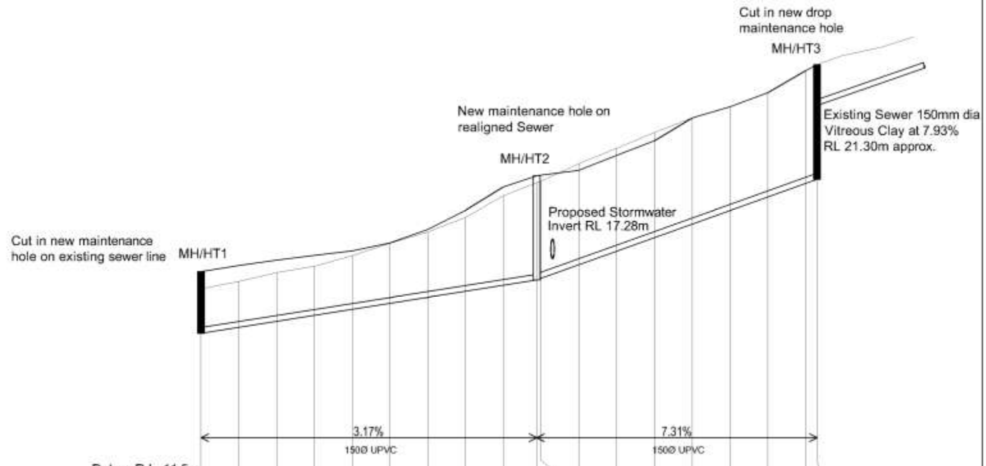
STORMWATER LINE 1E TO 1E2



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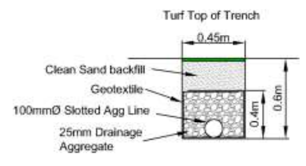
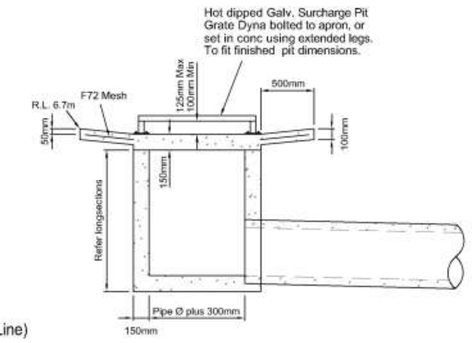
SEWER REALIGNMENT MH/HT1 to MH/HT3



TYPICAL SECTION SUB-SOIL DRAIN (Agg Line)



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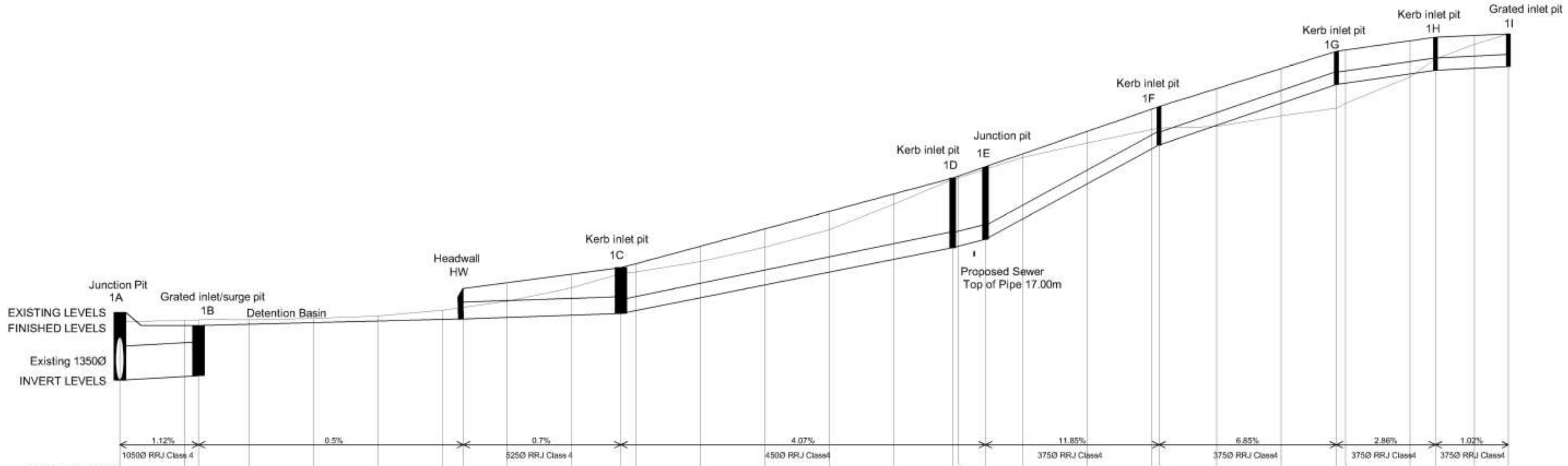

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70.00	15.84	14.90	15.30
60.00	15.99	14.95	15.45
70.00	16.27	15.02	15.86
77.67	16.49	15.07	16.30
80.00	16.61	15.16	16.36
90.00	17.16	15.56	16.68
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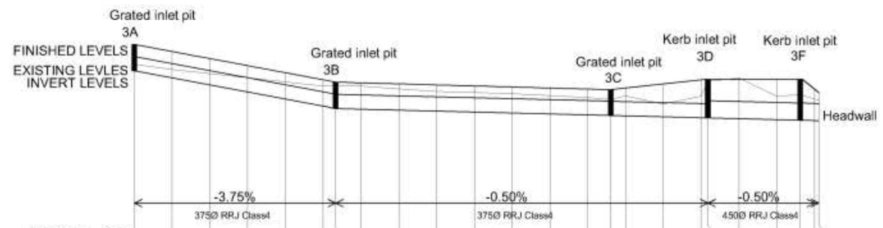
STORMWATER LINE 1



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45.00	14.10	13.41	13.92
50.00	14.07	13.38	13.89
55.00	14.04	13.36	13.84
60.00	14.02	13.33	13.79
63.03	14.00	13.32	13.74
65.00	14.04	13.31	13.83
70.00	14.15	13.28	13.62
75.00	14.26	13.26	13.83
75.90	14.27	13.26	14.22
80.00	14.27	13.23	14.31
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90.00	14.02	13.19	13.75
90.55	13.93	13.18	13.71

STORMWATER LINE 3

SCALE (m) 0 10 20 30 40 50

No.	Date	By	Change	X'd
Amendments				

ballina shire council

SURVEY	DESIGNED MNF
DATE 15/08/2018	DRAWN MNF
F.B. L.B.	CHECKED
DATUM AHD	APPROVED
DRAWING HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG	
SHEET 4 OF 24	

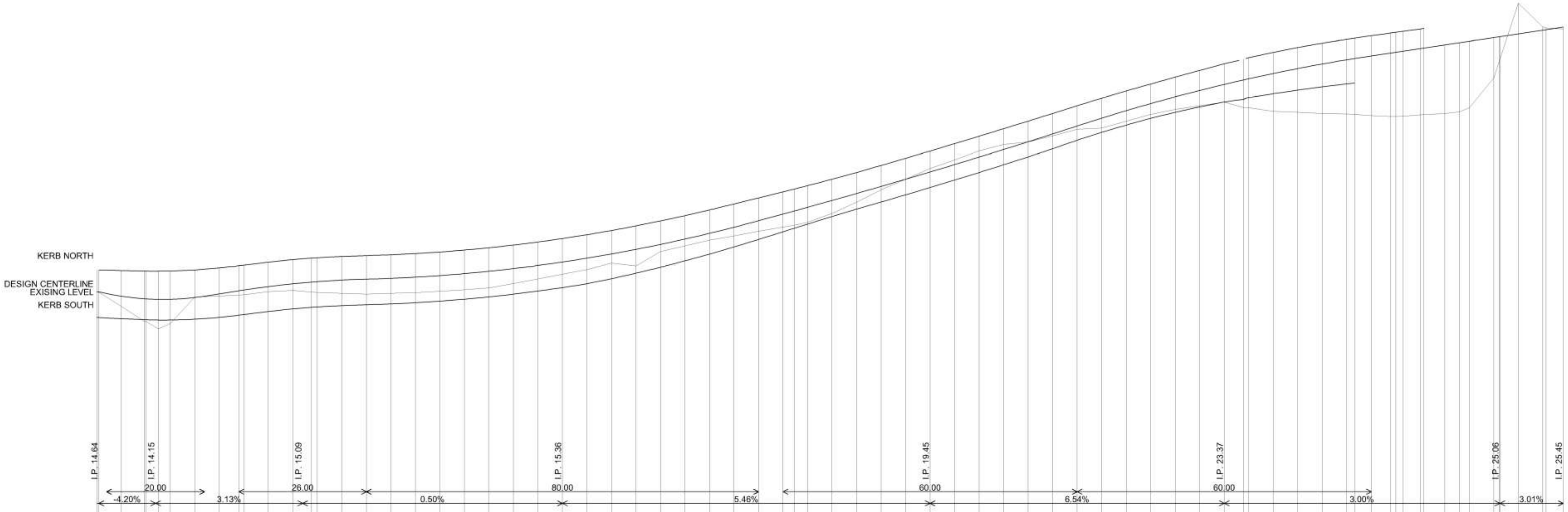
BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
STORMWATER LONGSECTIONS

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL: 1 : 100 @ A1

Plan No. SR31_049_03

A1



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49.67	+0.91	14.36	14.31	14.29	13.44
50.00	+0.91	14.35	14.30	14.29	13.44
52.61	+1.20	14.33	14.27	14.27	13.13
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60.00	-0.02	14.41	14.35	14.35	14.43
65.00	+0.09	14.56	14.50	14.51	14.47
69.00	+0.17	14.68			14.51
70.00	+0.19	14.71	14.66	14.66	14.52
75.00	+0.20	14.85	14.80	14.81	14.65
80.00	+0.27	14.97	14.91	14.92	14.69
83.80	+0.41	15.04			14.63
85.00	+0.43	15.05	15.00	15.01	14.62
90.00	+0.55	15.12	15.06	15.08	14.57
95.00	+0.61	15.16	15.10	15.11	14.54
100.00	+0.61	15.19	15.13	15.15	14.58
105.00	+0.63	15.24	15.18	15.19	14.60
110.00	+0.64	15.30	15.24	15.26	14.66
115.00	+0.65	15.38	15.32	15.34	14.73
120.00	+0.68	15.47	15.43	15.43	14.80
125.00	+0.61	15.58	15.54	15.54	14.98
130.00	+0.54	15.71	15.67	15.67	15.17
135.00	+0.50	15.85	15.81	15.81	15.36
140.00	+0.46	16.01	15.97	15.97	15.55
145.00	+0.38	16.18	16.14	16.17	15.80
150.00	+0.68	16.37	16.33	16.40	15.68
155.00	+0.29	16.57	16.53	16.64	16.28
160.00	+0.28	16.79	16.75	16.90	16.51
165.00	+0.28	17.02	16.98	17.17	16.75
170.00	+0.36	17.27	17.22	17.46	16.92
175.00		17.54			
175.00	+0.43	17.54	17.47	17.77	17.11
180.00		17.81			
180.00	+0.53	17.81	17.72	18.09	17.28
182.28	+0.58	17.94	17.83	18.23	17.35
185.00	+0.61	18.09	17.97	18.40	17.48
190.00	+0.53	18.37	18.23	18.71	17.84
195.00	+0.35	18.65	18.51	19.01	18.30
200.00	+0.13	18.94	18.80	19.30	18.81
205.00	-0.00	19.23	19.09	19.60	19.24
210.00	-0.14	19.53	19.39	19.89	19.67
215.00	-0.19	19.83	19.69	20.20	20.02
220.00	-0.26	20.14	19.99	20.51	20.40
225.00	-0.21	20.45	20.30	20.83	20.66
230.00	+0.00	20.77	20.61	21.15	20.76
235.00	+0.08	21.09	20.92	21.48	21.00
240.00		21.41			
240.00		21.41	21.24	21.83	
240.00	+0.14	21.41	21.24	21.83	21.28
245.00	+0.41	21.73	21.55	22.15	21.32
250.00	+0.43	22.04	21.84	22.45	21.61
255.00	+0.44	22.33	22.12	22.73	21.89
260.00	+0.51	22.60	22.41	22.97	22.09
265.00	+0.62	22.86	22.68	23.19	22.24
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275.00	+1.18	23.34	23.20	23.57	22.16
280.00	+1.55	23.56	23.42	23.73	22.01
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290.00	+2.03	23.94	23.79	24.01	21.92
295.00	+2.22	24.12	23.96	24.13	21.90
296.60	+2.28	24.17	24.00	24.17	21.89
300.00		24.27			
300.00	+2.43	24.27	24.10	24.26	21.84
303.93	+2.59	24.39	24.21	24.34	21.80
305.00	+2.62	24.42	24.24	24.38	21.80
306.49	+2.66	24.47	24.28	24.43	21.81
310.00	+2.70	24.57	24.38	24.53	21.87
310.74	+2.72	24.60	24.40	24.55	21.88
315.00	+2.81	24.72	24.68	24.68	21.92
317.95	+2.83	24.81	24.77	24.77	21.99
320.00	+2.72	24.87	24.83	24.83	22.15
325.00	+1.65	25.02	24.98	24.98	23.37
326.16	+0.98	25.06	25.02	25.02	24.08
326.22		25.06			
330.00	-1.26	25.17	25.13	25.13	26.43
335.00	-0.14	25.32	25.28	25.28	25.46
335.68	-0.07	25.34	25.30	25.30	25.42
339.15	+0.07	25.45	25.41	25.41	25.38

Scale Horizontal 1:500 Vertical 1:100

HUTLEY DRIVE

No.	Date	By	Change	X'd

Amendments

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		

SHEET 5 OF 24

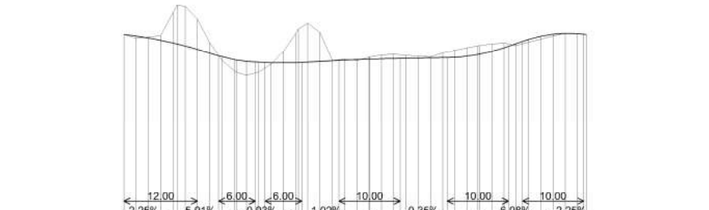
BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
HUTLEY DRIVE LONGSECTION

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL: 1 : 100 @ A1

Plan No. SR31_049_03

A1



Datum R.L. 19.00

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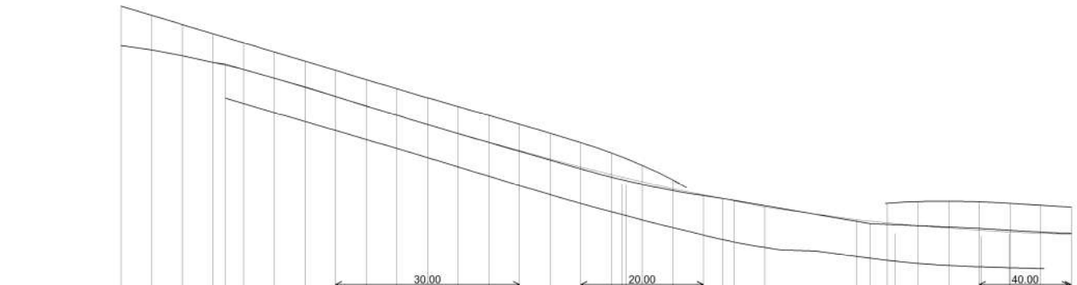
EXISTING LEVELS	25.92	25.79	25.84	25.88	26.63	26.87	26.84	26.42	25.66		25.07	24.73	24.68	24.60		24.69		24.96	24.94	26.10		26.28	25.99	25.06		25.11	25.07	25.18	25.18	25.07	25.23		25.24	25.21	25.19	25.32		25.40	25.48		25.55	25.61	25.64		25.56		25.66	25.77	25.87	25.96	25.94			25.92
CUT \ FILL	+0.00	+0.07	-0.03	-0.15	-0.99	-1.27	-1.29	-0.99	-0.34		+0.12	+0.37	+0.41	+0.45		+0.33		+0.04	-0.94	-1.10		-1.26	-0.95	-0.00		-0.03	+0.03	-0.07	-0.07	-0.13	-0.14		-0.10	-0.06	-0.05	-0.15		-0.22	-0.27		-0.28	-0.28	-0.24		+0.06		+0.09	+0.06	-0.01	+0.01			+0.00
DESIGN LEVELS	25.92	25.87	25.81	25.73	25.64	25.60	25.54	25.43	25.31		25.20	25.10	25.09	25.04		25.02		25.01	24.99	25.00		25.01	25.04	25.06		25.07	25.10	25.11	25.11	25.11	25.13		25.14	25.14	25.15	25.16		25.17	25.21		25.27	25.28	25.28		25.62		25.75	25.83	25.93	25.95	25.95			25.92

Scale Horizontal 1:500 Vertical 1:100

CENTRE ISLAND



Datum R.L. 20.00

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EXISTING LEVEL	30.91	30.77	30.58	30.36		30.13	29.84	29.55	29.24	28.93	28.63	28.33	28.05	27.76	27.48	27.21	26.95	26.70			26.47	26.24	26.04	25.85	25.85	25.64	25.23	25.03	25.13	25.03	25.03	24.95	24.89	24.89	24.82	24.79	24.79	24.76
CUT \FILL	-0.29	-0.13	-0.02	+0.06		+0.13	+0.14	+0.16	+0.15	+0.14	+0.14	+0.13	+0.12	+0.12	+0.11	+0.13	+0.14	+0.21			+0.38	+0.65																	
DESIGN CL	30.91	30.77	30.58	30.36		30.13	29.84	29.56	29.25	28.94	28.64	28.34	28.04	27.75	27.46	27.17	26.89	26.62	26.39	26.36	26.38	26.18	26.01	25.92	25.86	25.69	25.17	25.10	24.78	25.03	24.99	24.95	24.69	24.88	24.76	24.83	24.79
KERB LEFT	31.20	30.90	30.60	30.30		30.00	29.70	29.40	29.10	28.80	28.50	28.21	27.92	27.63	27.35	27.05	26.75	26.40			26.00	25.53							24.76	24.82	24.83	24.81	24.76	24.76	24.70	24.63
KERB RIGHT					30.20	30.02	29.73	29.43	29.14	28.85	28.55	28.26	27.95	27.65	27.34	27.05	26.76	26.49			26.22	25.97	25.73		25.51	25.33	25.03		24.90	24.80	24.74	24.69	24.67	24.64	

Scale Horizontal 1:500 Vertical 1:100

BYRON BAY ROAD

No.	Date	By	Change	X'd
			Amendments	

ballina shire council

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		

SHEET 6 OF 24

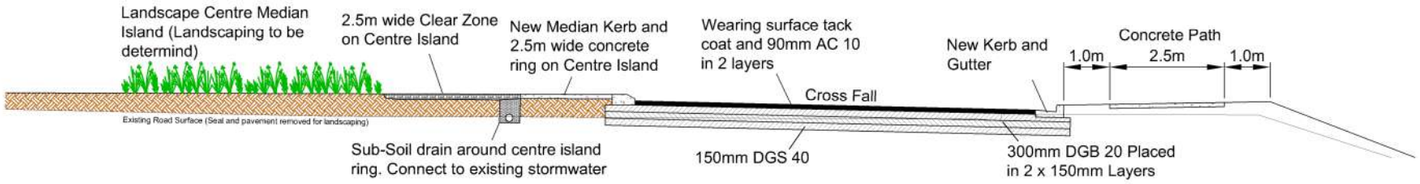
BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
BYRON BAY ROAD LONGSECTION

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL: 1 : 100 @ A1

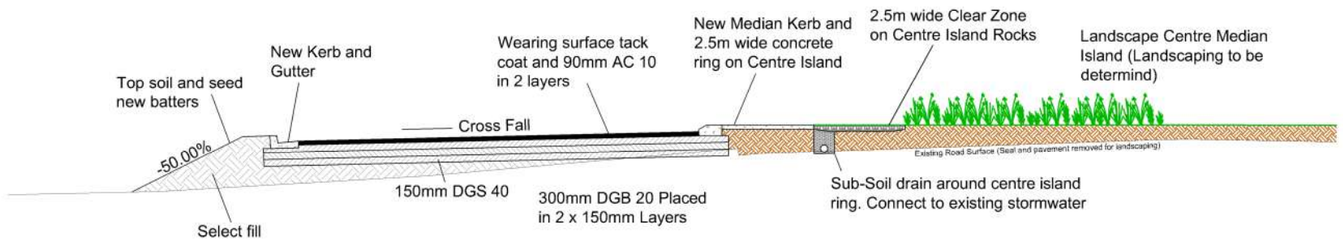
Plan No. SR31_049_03

A1



TYPICAL SECTION - ROUNDABOUT SOUTH

NOT TO SCALE



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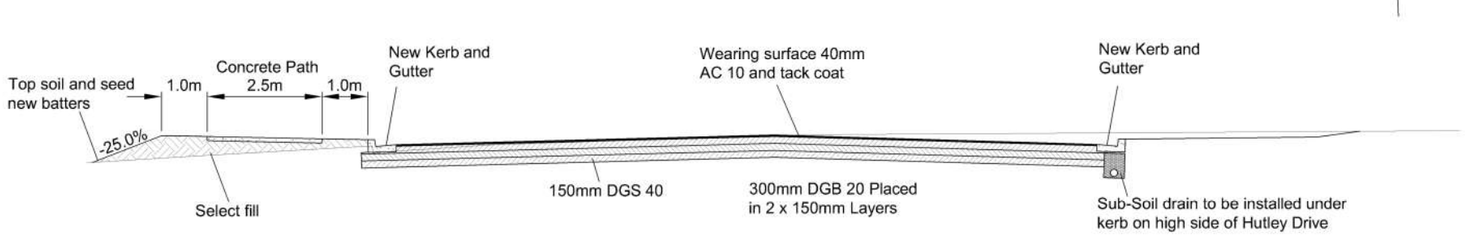
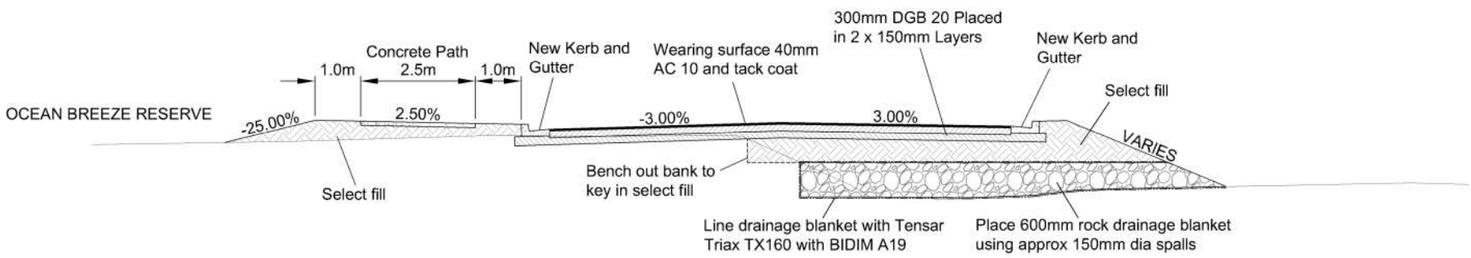


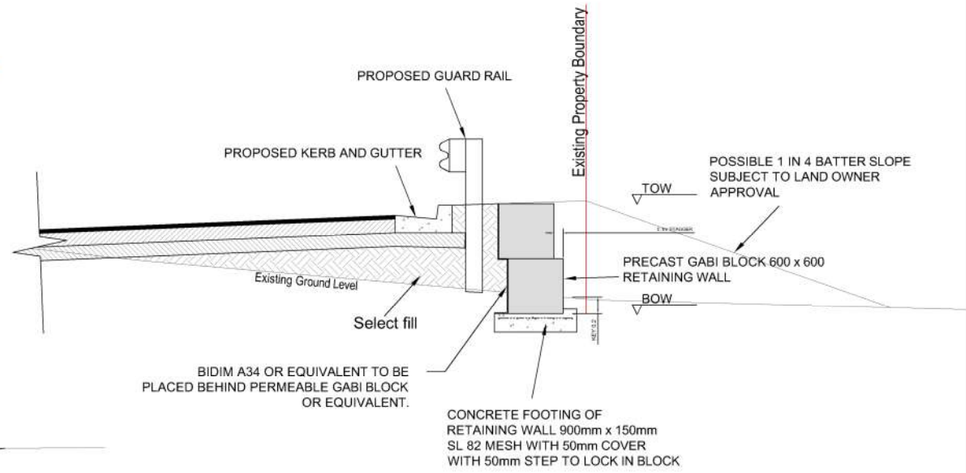
TYPICAL SECTION - APPROACHES

NOT TO SCALE



TYPICAL SECTION - HUTLEY DR OCEAN BREEZE RESERVE

NOT TO SCALE



TYPICAL SECTION - RETAINING WALL

NOT TO SCALE

No.	Date	By	Change	X'd
Amendments				

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		

SHEET 7 OF 24

BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
TYPICAL CROSSECTIONS

Scale HORIZONTAL: 1 : 100 @ A1
VERTICAL: 1 : 100 @ A1

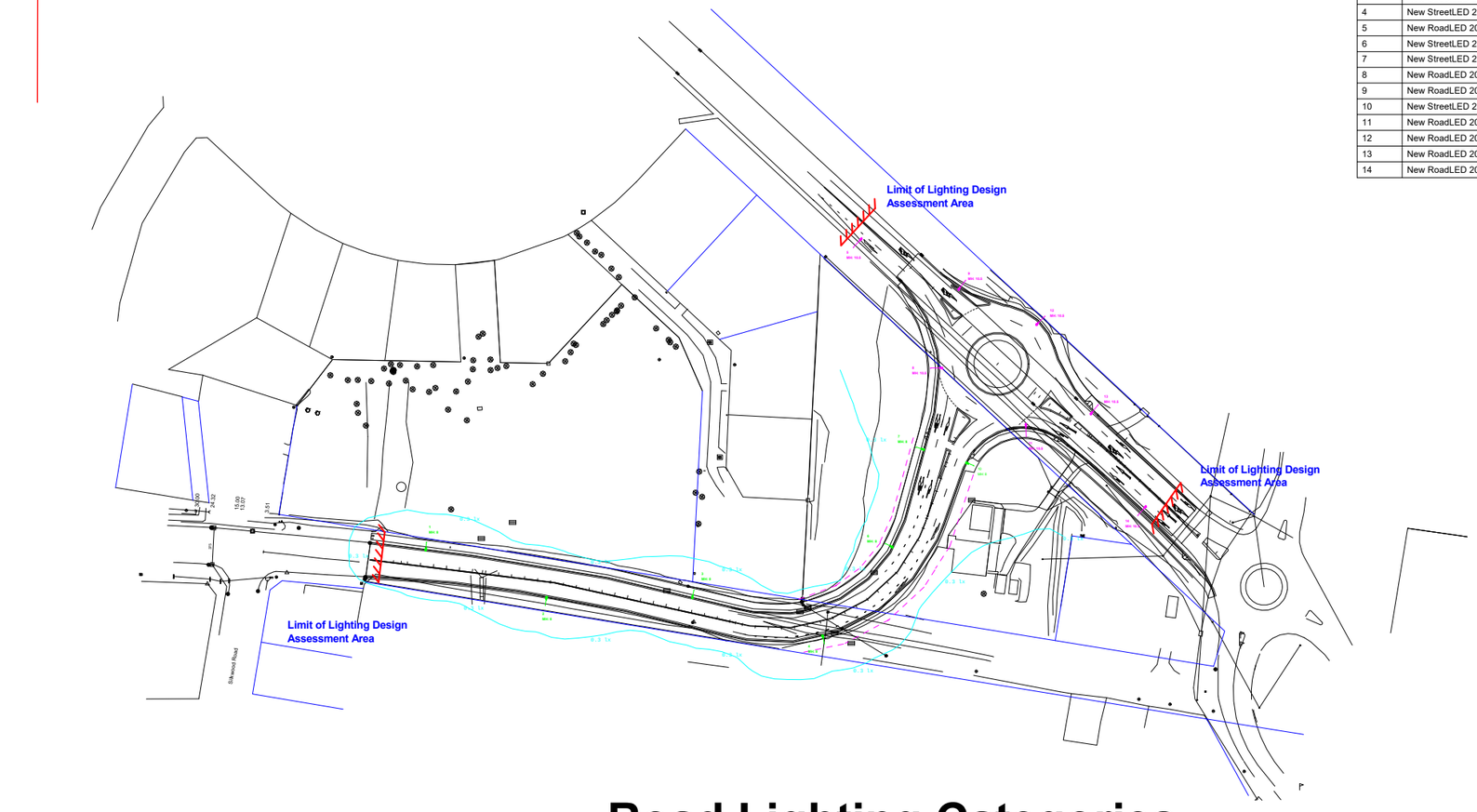
Plan No. SR31_049_03

A1

Numeric Summary								
Label	CalcType	Units	Avg	Max	Min	Max/Min	PtSpcLr	PtSpcTb
Isolux-1	Illuminance	Lux	0.52	18.3	0.0	N.A.	5	5
Eh_RAB_Carriageway	Illuminance	Lux	21.24	41.1	9.2	4.47	0.5	0.5
Eh_RAB_Surrounds	Illuminance	Lux	19.35	41.1	7.3	5.63	0.5	0.5

Luminaire Schedule							
Symbol	Qty	Label	Description	LLF	Lum. Lumens	Filename	O/R Length
	7	New RoadLED 200W LED	Install RoadLED 200W LED column mtd with 4.5m OR	0.800	25976	216199.ies	4.5
	7	New StreetLED 28w 4K LED (33W)	Install StreetLED 28w 4K LED (33W) Aero Column mtd wih 3m OR	0.800	3466	180262PH.IES	3

Luminaire Location Summary						
LumNo	Label	X	Y	Lum M.H.	Orient	Tilt Angle
1	New StreetLED 28w 4K LED (33W)	148.326	135.233	8	264.191	0
2	New StreetLED 28w 4K LED (33W)	193.613	111.315	8	80.024	0
3	New StreetLED 28w 4K LED (33W)	250.287	117.009	8	257.615	0
4	New StreetLED 28w 4K LED (33W)	299.968	96.669	8	103.254	0
5	New RoadLED 200W LED	311.08	247.538	10.5	47.32	0
6	New StreetLED 28w 4K LED (33W)	323.22	134.724	8	332.895	5
7	New StreetLED 28w 4K LED (33W)	334.965	171.43	8	341.822	5
8	New RoadLED 200W LED	340.448	201.549	10.5	359.768	5
9	New RoadLED 200W LED	353.867	235.024	10.5	232.568	5
10	New StreetLED 28w 4K LED (33W)	356.927	164.376	8	158.896	5
11	New RoadLED 200W LED	376.938	175.609	10.5	92.426	5
12	New RoadLED 200W LED	384.065	221.319	10.5	225.395	5
13	New RoadLED 200W LED	404.395	187.61	10.5	231.234	5
14	New RoadLED 200W LED	419.494	145.445	10.5	48.145	0



Y
X
0-0

0 25 50 75 100

Road Lighting Categories
- Byron Bay Road - 'V3'
- Hutley Drive - 'P3'

PRELIMINARY
DESIGN - B
(Not for Construction)

GERARD LIGHTING
Gerard Lighting I one business I one team I one focus

GERARD LIGHTING
96-112 Gow Street Padstow NSW 2211
Ph: 1300-799-300 Fax: 1300-732-808
ABN No 71 115 184 999

Project:
Hutley Drive Roundabout, Lennox Head, NSW.
AS/NZS 1158.1.1:2005 Lighting category 'V3'
AS/NZS 1158.3.1:2005 Lighting category 'P3'

Client:
Greg Don of
Preferred Energy Pty Ltd.

Rev:	Date:	Comment:
0	16/10/2018	Original Issue

Document No: 0192014_Preliminary B
Designer: RA
Scale: As Shown
Date: 16/10/2018
Page No: Page 1 of 1

Appendix B

Ecological Assessment

BLACKWOOD ECOLOGICAL SERVICES

Ecological Assessment
Proposed Hutley Drive Northern Extension

Lennox Head
A Report to Ballina Shire Council
December 2018

NOTE

Document Verification

Project Title:	Hutley Drive Northern Extension – Biodiversity Assessment	
Project Number:	1833	
Revision	Date	Author
Draft	20/11/18	Mark Free
Final	18/12/18	Mark Free

Blackwood Ecological Services
PO Box 336
BANGALOW NSW 2479
www.blackwoodecology.com.au

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

Blackwood Ecological Services has been engaged by Ballina Shire Council to complete a Biodiversity Assessment for the proposed extension of Hutley Drive from Silkwood Road north east to Byron Bay Road where a new roundabout intersection is to be constructed.

APPENDIX A shows the footprint of the proposed road extension and roundabout. **APPENDIX B** shows the footprint of the approved road extension.

Ballina Shire Council have previously granted approval for the extension of Hutley Drive in this location. This approved alignment involved construction of a road from Silkwood Road to the existing roundabout at the Byron Bay Road/North Creek Road intersection. GHD completed an REF and ecological assessment for this road alignment in 2013. Where appropriate, this assessment considers biodiversity impacts in the context of impacts associated with the existing approval.

1.2 Subject site

The Subject site refers to the area directly affected by the proposal. The Subject site for this study consists of land within and adjacent to the proposed road corridor. **FIGURE 1** shows the location of the site. **FIGURE 2** shows the area subject to the field survey.

1.3 Study area and proposed development

The Study area refers to the Subject site together with any additional areas which are likely to be affected by the proposal, either directly or indirectly. The Study area includes surrounding areas of vegetation adjacent to the route. The route extends east from Silkwood Road through an area of grassland and then along a section of road reserve where neighbouring houses have extended gardens and planted trees within the road reserve. The route then heads north through a patch of vegetation associated with a dwelling in this area before meeting Byron Bay Road. In this area an earthen mound along the southern side of Byron Bay Road has been planted out with native vegetation and landscape species for noise attenuation.

The western section of the road corridor is lower lying and stormwater is currently piped under the road reserve where it flows from the northern side into wet grassland and wetland south of the Hutley Road extension. This area has previously been identified as supporting areas of Freshwater wetland TEC as well as the Threatened species Hairy joint grass (*Arthraxon hispidus*). (Blackwood Ecology 2014).

2 FLORA

2.1 Introduction

This section discusses the methods used in the vegetation assessment and presents the results of the assessment. Relevant databases and reports were reviewed to identify records of locally occurring Threatened and Rare plant species, populations and communities. A site assessment was completed on the 14th of November 2018.

The objectives of the site assessment were:

- To identify vegetation communities and flora species present in the route.
- To complete targeted searches for significant flora species known from the locality and considered possible occurrences based on an assessment of site habitats.
- To identify potential impacts including vegetation removal and trimming likely as a result of the proposed works.

2.2 Database searches

2.2.1 NPWS Database search

A search of the NPWS Database revealed records of 20 Threatened flora species within 10km of the Subject site. These species are shown in **TABLE 1**.

TABLE 1
NPWS DATABASE RECORDS OF THREATENED FLORA SPECIES WITHIN 10 KM OF THE SUBJECT SITE

Botanical name	Common name	NSW Status
Acronychia littoralis	Scented Acronychia	E1
Archidendron hendersonii	White Lace Flower	V
Arthraxon hispidus	Hairy Jointgrass	V
Cryptocarya foetida	Stinking Cryptocarya	V
Davidsonia jerseyana	Davidson's Plum	E1
Davidsonia johnsonii	Smooth Davidson's Plum	E1
Diploglottis campbellii	Small-leaved Tamarind	E1
Diuris sp. aff. chrysantha	Byron Bay Diuris	E1
Endiandra muelleri subsp. bracteata	Green-leaved Rose Walnut	E1
Fontainea oraria	Coastal Fontainea	E4A
Gossia fragrantissima	Sweet Myrtle	E1
Macadamia tetraphylla	Rough-shelled Bush Nut	V
Niemeyera whitei	Rusty Plum, Plum Boxwood	V
Ochrosia moorei	Southern Ochrosia	E1
Owenia cepiodora	Onion Cedar	V
Pterostylis nigricans	Dark Greenhood	V
Senna acclinis	Rainforest Cassia	E1
Syzygium hodgkinsoniae	Red Lilly Pilly	V
Syzygium moorei	Durobby	V
Tinospora tinosporoides	Arrow-head Vine	V

KEY

E1 Endangered
E4A Critically endangered
V Vulnerable

2.2.2 Commonwealth EPBC Act (1999) Database search

A search of the Commonwealth EPBC Act (1999) Database revealed potential suitable habitat for a number of Threatened flora species within 5km of the Subject site. These species are shown in **TABLE 2**. The Commonwealth EPBC Act Protected Matters Report is included in full in **APPENDIX C**.

TABLE 2
COMMONWEALTH EPBC ACT (1999) DATABASE SEARCH RESULTS
THREATENED FLORA SPECIES WITH POTENTIAL HABITAT
WITHIN 5 KM RADIUS OF THE SUBJECT SITE

Botanical name	Common Name	Status
Acronychia littoralis	Scented acronychia	E
Allocasuarina defungens	Dwarf heath casuarina	E
Arthraxon hispidus	Hairy Jointgrass	V
Baloghia marmorata	Jointed baloghia	V
Bulbophyllum globuliforme	Miniature Moss-orchid	V
Cryptocarya foetida	Stinking cryptocarya	V
Cryptostylis hunteriana	Leafless Tongue-orchid	V
Davidsonia jerseyana	Davidson's Plum	E
Davidsonia johnsonii	Smooth Davidson's plum	E
Diploglottis campbellii	Small-leaved tamarind	E
Floydia praealta	Ball Nut	V
Fontainea oraria	Coastal fontainea	E
Gossia fragrantissima	Sweet Myrtle	E
Macadamia integrifolia	Macadamia Nut	V
Macadamia tetraphylla	Rough-shelled bush nut	V
Owenia cepiodora	Onionwood	V
Phaius australis	Lesser swamp orchid	E
Randia moorei	Spiny Gardenia	E
Syzygium hodgkinsoniae	Red Lilly Pilly	V
Syzygium moorei	Durobby	V
Thesium australe	Austral toadflax	V
EECs		
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia		CE
Lowland Rainforest of Subtropical Australia		CE

KEY
CE Critically Endangered
E Endangered
V Vulnerable

2.3 Site assessment

2.3.1 Existing vegetation

This section discusses individual trees and vegetation communities located within the Subject site and the ecological significance of these communities. A plant species list for the site is included as **APPENDIX D**.

The southern section of the road reserve consists of mown grassland with taller weedy grassland along the southern edge where the site borders an area of lower lying wetland to the south. This wetland area supports areas of *Freshwater wetland* TEC as well as the Threatened species Hairy joint grass (*Arthraxon hispidus*). A clump of trees at the end of the existing Hutley Drive includes Blackwood wattle, Flame tree, Brown kurrajong, Tuckeroo and Singapore daisy.

Plate 1 Vegetation along the southern edge of the road corridor. Wetland area further to the south

Vegetation within the area to be cleared (including for the road batter in this area) consists of grasses dominated by Setaria with Ragweed, Lantana, Coastal morning glory, Siratro, Farmer's friends, Blue billygoat weed, Crofton weed, Hairy commelina, Tobacco bush and Cape gooseberry. Vegetation closer to the wetland edge consists of a higher proportion of native species including Typha, Swamp hibiscus, Smartweed, Swamp water fern and and Batswing fern amongst the weeds.

Plate 2 Paper bark trees planted within the Ocean Breeze Reserve

An area within the Ocean Breeze Reserve has been planted out with Broad-leaved paperbark and Weeping paperbark trees that are currently about 2-3m tall. A stormwater surcharge basin is to be constructed in this part of the site to accept runoff from the road.

Plate 3 Planted landscape vegetation at the rear of dwellings accessed from Ocean Breeze Drive

Further to the east, some planted vegetation along the back of houses accessed from Ocean Breeze Drive will require removal. This vegetation includes two Swamp mahoganies, two Forest red gums, two Tuckeroos, a Silky oak, Lilly pilly, Riberry and a Syzygium "Cascade".

A dwelling is located on Lot 2 DP 620838 to the immediate north of the proposed road location in this part of the site. Vegetation to the south-western corner of this dwelling will be removed and includes a large Norfolk pine, planted Macadamia nut, Guava, Mulberry, Loquat and Crepe myrtle, Tuckeroo, Murraya, Camphor laurel, Umbrella tree, Winter senna, Ground asparagus, Guioa and various weeds.

Plate 4 Vegetation to the south-west of the dwelling on Lot 2 DP620838

Where the proposed Hutley Drive northern extension meets Byron Bay Road, vegetation has become well established on a noise attenuation mound along the southern side of Byron Bay Road. Vegetation on the mound in the area within the footprint of the proposed road extension includes three Swamp mahogany trees, three Broad-leaved paperbark, Coast banksia, Foambark, Bangalow palm, Guioa, Willow bottlebrush, Weeping bottlebrush, Blackwood wattle, Macaranga, Tea tree and various weeds and exotic garden plants.

East of the dwelling on Lot 2 DP620838, vegetation within the previously approved Hutley Drive footprint will be retained. This vegetation includes some larger established Tuckeroo, Guioa and Coast banksia trees, Umbrella tree, Camphor laurel, Cocos palm and various other weed species.

Plate 5 Vegetation on the noise attenuation mound along the southern side of Byron Bay Road

Plate 6 Vegetation along the previously approved route up to the North Creek Road intersection

2.3.2 Significant species and Threatened Ecological Communities

No Threatened (NSW Biodiversity Conservation Act 2016, Commonwealth EPBC Act 1999) flora species were recorded or are considered likely to occur. GHD (2013) did not record any Threatened flora species within the area subject to the northern extension. GHD (2013) acknowledged that adjoining land to the south contained areas of Freshwater wetland EEC and occurrences of Hairy joint grass.

Vegetation communities on the Subject site were compared with descriptions of vegetation communities listed as Threatened Ecological Communities under the NSW Biodiversity Conservation Act (2016) and the EPBC Act (1999). No TECs are considered to occur within the proposed road extension footprint.

3 FAUNA

3.1 Introduction

This section discusses the methods used in the fauna assessment and presents the results of the assessment. Relevant databases and reports were reviewed to identify records of locally occurring Threatened fauna species, populations and communities.

The fauna assessment consisted of:

- A review of relevant databases and literature.
- An assessment of site fauna habitats.

Site habitats were assessed in terms of their value for native fauna species. The site assessment was completed in conjunction with the flora assessment The assessment focused on identifying habitat features associated with Threatened species known from the locality. Particular attention was paid to habitat features such as:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places.
- Presence of hollow logs/debris and areas of dense leaf litter.
- The presence of Grey-headed Flying Fox camps
- The presence of preferred Koala food tree species.
- The presence of preferred Glossy black cockatoo feed trees.
- Condition, flow and water quality of drainage lines and bodies of water.
- Areas of dense vegetation.
- Presence of fruiting flora species and blossoming flora species, particularly winter-flowering species.
- Vegetation connectivity and proximity to neighbouring areas of vegetation.
- Presence of caves, hollow trees and/or man-made structures suitable as microchiropteran bat roost sites.

3.2 Database searches

3.2.1 NPWS Database search

A search of the NPWS Database revealed records of 33 Threatened fauna species (excluding marine species) within 10km of the Subject site. These species are shown in **TABLE 3**.

TABLE 3
NPWS DATABASE RECORDS OF THREATENED FAUNA SPECIES WITHIN 10 KM OF THE SUBJECT SITE

Scientific name	Common name	NSW Status
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V
Botaurus poiciloptilus	Australasian Bittern	E1
Carterornis leucotis	White-eared Monarch	V
Circus assimilis	Spotted Harrier	V
Crinia tinnula	Wallum Froglet	V
Dasyurus maculatus	Spotted-tailed Quoll	V
Ephippiorhynchus asiaticus	Black-necked Stork	E1
Grus rubicunda	Brolga	V

Scientific name	Common name	NSW Status
Gygis alba	White Tern	V
Haematopus fuliginosus	Sooty Oystercatcher	V
Haematopus longirostris	Pied Oystercatcher	E1
Haliaeetus leucogaster	White-bellied Sea-Eagle	V
Irediparra gallinacea	Comb-crested Jacana	V
Litoria aurea	Green and Golden Bell Frog	E1
Litoria olongburensis	Olongburra Frog	V
Miniopterus australis	Little Bentwing-bat	V
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V
Mormopterus norfolkensis	Eastern Freetail-bat	V
Myotis macropus	Southern Myotis	V
Nyctophilus bifax	Eastern Long-eared Bat	V
Pandion cristatus	Eastern Osprey	V
Pezoporus wallicus wallicus	Eastern Ground Parrot	V
Phascolarctos cinereus	Koala	V
Planigale maculata	Common Planigale	V
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V
Pteropus poliocephalus	Grey-headed Flying-fox	V
Ptilinopus regina	Rose-crowned Fruit-Dove	V
Scoteanax rueppellii	Greater Broad-nosed Bat	V
Sternula albifrons	Little Tern	E1
Syconycteris australis	Common Blossom-bat	V
Thersites mitchellae	Mitchell's Rainforest Snail	E1
Tyto longimembris	Eastern Grass Owl	V
Tyto novaehollandiae	Masked Owl	V

KEY
E1 Endangered
V Vulnerable

3.2.2 Commonwealth EPBC Act (1999) Database search

A search of the Commonwealth EPBC Act (1999) Database revealed potential suitable habitat for a number of Threatened fauna species within 5km of the Subject site. These species are shown in **TABLE 4**.

The Commonwealth EPBC Act Protected Matters Report is included in full in **APPENDIX B.**

TABLE 4
COMMONWEALTH EPBC ACT (1999) DATABASE RESULTS
THREATENED FAUNA SPECIES WITH POTENTIAL HABITAT
WITHIN 5KM OF THE SUBJECT SITE

Common Name	Scientific name	Status
Invertebrates		
Mitchell's Rainforest snail	*Thersites mitchellae*	CE
Birds		
Coxen's Fig-Parrot	*Cyclopsitta diophthalma coxeni*	E
Swift Parrot	*Lathamus discolor*	CE
Regent Honeyeater	*Xanthomyza phrygia*	CE
Australasian bittern	*Botaurus poiciloptilus*	E
Red Goshawk	*Erythrotriorchis radiatus*	V
White-bellied Storm-Petrel	*Fregetta grallaria grallaria*	V
Southern Giant-Petrel	*Macronectes giganteus*	E
Northern Giant-Petrel	*Macronectes halli*	V
Kermadec Petrel (western)	*Pterodroma neglecta neglecta*	V
Campbell Albatross	*Thalassarche melanophris impavida*	V
Australian Painted Snipe	*Rostratula australis*	E
Red knot	*Calidris canutus*	E
Curlew sandpiper	*Calidris ferruginea*	CE
Great knot	*Calidris tenuirostris*	CE
Greater Sand Plover	*Charadrius leschenaultii*	V
Lesser Sand Plover	*Charadrius mongolus*	E
Antipodean Albatross	*Diomedea antipodensis*	V
Gibson's Albatross	*Diomedea antipodensis gibsoni*	V
Southern Royal Albatross	*Diomedea epomophora*	V
Wandering Albatross	*Diomedea exulans*	V
Bar-tailed Godwit	*Limosa lapponica baueri*	V
Northern Siberian Bar-tailed Godwit	*Limosa lapponica menzbieri*	CE
Eastern curlew	*Numenius madagascariensis*	CE
Fairy Prion	*Pachyptila turtur subantarctica*	V
Sooty Albatross	*Phoebetria fusca*	V
Gould's Petrel	*Pterodroma leucoptera leucoptera*	E
Shy Albatross	*Thalassarche cauta cauta*	V
White-capped Albatross	*Thalassarche cauta steadi*	V
Chatham Albatross	*Thalassarche eremita*	E
Black-browed Albatross	*Thalassarche melanophris*	V
Salvin's Albatross	*Thalassarche salvini*	V
Black-breasted Button-quail	*Turnix melanogaster*	V
Mammals		
Large-eared Pied Bat	*Chalinolobus dwyeri*	V
Spotted-tailed Quoll	*Dasyurus maculatus*	E
Koala (combined populations of Qld, NSW & ACT)	*Phascolarctos cinereus*	V
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	V
New Holland mouse	*Pseudomys novaehollandiae*	V
Grey-headed Flying-fox	*Pteropus poliocephalus*	V
Water mouse	*Xeromys myoides*	V
Greater Glider	*Petauroides volans*	V
Amphibians		

Common Name	Scientific name	Status
Wallum Sedge Frog	*Litoria olongburensis*	V
Fish		
Black Rockcod	*Epinephelus daemelii*	V
Insects		
Pink Underwing Moth	*Phyllodes imperialis smithersi*	E

KEY

CE Critically endangered
E Endangered
V Vulnerable

3.3 Fauna assessment

3.3.1 Introduction

This section discusses fauna habitat types within the Subject site. It includes a discussion of the ecological significance of these habitats including the potential for threatened and significant fauna species to occur in the Study area.

3.3.2 Significant species

No Threatened (NSW BC Act 2016, EPBC Act 1999) fauna species were recorded during the site assessment. Koala feed tree species were searched for the presence of scats and scratches and no evidence of Koala use was recorded.

3.3.3 Fauna habitats

Land within the study corridor is of limited value as fauna habitat for fauna occurring in neighbouring habitats. Wetland areas to the south provide habitat for wetland species including frogs and migratory wetland birds. The area does not provide suitable habitat for the Wallum froglet.

3.3.4 Potential occurrence of Threatened fauna

Based upon this assessment no threatened fauna species are considered likely to have any degree of reliance on habitats within the area subject to the proposed development.

4 POTENTIAL IMPACTS AND AMELIORATION MEASURES

4.1 Introduction

This section discusses potential impacts associated with the proposed road extension. Impacts may potentially occur as a result of various site activities, including:

- Clearing of vegetation to allow for the road, batters and drainage system.
- Trimming of branches overhanging the route to allow for machinery access.
- Disturbance of adjacent areas of vegetation as a result of providing access, operating machinery, accidental damage etc.
- Transport of materials and personnel to the site and establishment of a compound site.
- Disturbance of soils within the Subject site, including increased potential for erosion and sedimentation.
- Short-term impacts associated with construction noise, vibration and activity.
- Accidental spill of fuel or chemicals.

Design plans in **APPENDIX A** show the road footprint.

4.2 Potential ecological impacts

4.2.1 Flora

4.2.1.1 Direct removal of vegetation

The proposed road extension requires the clearing of some vegetation along the road corridor as follows:

- Mown grassland within the western section of the road reserve consists of with taller weedy grassland along the southern edge where the site borders an area of lower lying wetland to the south. A clump of trees at the end of the existing Hutley Drive includes Blackwood wattle, Flame tree, Brown kurrajong, Tuckeroo and Singapore daisy (Approx 50m^2).
- An area within the Ocean Breeze Reserve that has been planted out with Broad-leaved paperbark and Weeping paperbark trees that are currently about 2-3m tall. A stormwater surcharge basin is to be constructed in this part of the site to accept runoff from the road (Approx 100m^2).
- Further to the east, some planted vegetation along the back of houses accessed from Ocean Breeze Drive will require removal. This vegetation includes two Swamp mahoganies, two Forest red gums, two Tuckeroos, a Silky oak, Lilly pilly, Riberry and a Syzygium "Cascade" (Approx 320m^2).
- A dwelling is located on Lot 2 DP 620838 to the immediate north of the proposed road location in this part of the site. Vegetation to the south-western corner of this dwelling will be removed and includes a large Norfolk pine, planted Macadamia nut, Guava, Mulberry, Loquat and Crepe myrtle, Tuckeroo, Murraya, Camphor laurel, Umbrella tree, Winter senna, Ground asparagus, Guioa and various weeds (Approx 270m^2).
- Vegetation on the noise attenuation mound where the proposed Hutley Drive northern extension meets Byron Bay consisting of three Swamp mahogany trees, three Broad-leaved paperbark, Coast banksia, Foambark, Bangalow palm, Guioa, Willow bottlebrush, Weeping bottlebrush, Blackwood wattle, Macaranga, Tea tree and various weeds and exotic garden plants (Approx 595m^2).

- Several regrowth Blackwood wattle on the northern side of Byron Bay Road will be removed where the roundabout will require widening of the road (Approx 30m^2).

Vegetation loss should be considered of the context of the previously approved Hutley Drive northern extension. The road alignment in the south-western section of the road reserve has not changed and vegetation loss in this area is consistent with that considered in the REF prepared by GHD (2013). North-east of the dwelling on Lot 2, vegetation along the existing road reserve leading to the Byron Bay Road/North Creek Road intersection will be retained (Approx 685m^2) whereas vegetation near the dwelling on Lot 2 and on the noise mound will be removed.

In comparison with the previously approved road extension, 1365m^2 of native vegetation will require removal with 685m^2 to be retained, leaving a net loss of 680m^2. Vegetation to be removed is not consistent with the description of any EEC and consists of relatively common native species, weeds and garden/orchard plantings.

4.2.1.2 Indirect physical effects on vegetation adjacent to the works area

There is some potential for retained trees adjacent to the clearance corridor to be affected by accidental damage from construction vehicles or by root zone impacts. The construction corridor is quite open and easily accessible and no areas of substantial retained native vegetation are likely to be affected.

4.2.1.3 Impacts on significant flora species

No significant flora species occur within the footprint of the proposed road extension. Hairy joint grass (HJG) has previously been recorded within wetland areas on the "Reservoir Hill" site to the south of the road corridor. No known or potential locations of HJG will be directly affected. There is some potential for the road to result in a change in hydrological conditions within the Reservoir Hill site that could have some impact on habitat values for this species. The road design incorporates a stormwater surcharge basin that will moderate flows into the northern part of the lower Reservoir Hill wetland area. It is unlikely that the proposed development will affect hydrological conditions in the area of known HJG habitat to the extent that the local population of HJG will be affected.

4.2.2 Fauna

4.2.2.1 Loss of fauna habitat

The proposed works would require the removal of up to 1365m^2 of vegetation consisting of native species, garden plantings and weeds. Fauna habitat to be lost is likely to be utilised by a very limited range of fauna species due to historic disturbance and the fragmented nature of surrounding vegetation.

4.2.2.2 Degradation of neighbouring areas of habitat

Areas of fauna habitat adjacent to the works area may be affected by accidental damage, sedimentation, introduction of weeds and other indirect effects.

4.2.2.3 Direct impacts on fauna

There is little potential for native fauna to be killed or injured as a result of tree removal activities or other construction works as trees to be removed are relatively small and do not provide tree hollows.

4.2.2.4 Impacts on corridor values

Within the Study area, fauna movement opportunities are provided by isolated trees and clumps of regrowth vegetation. The proposed works are unlikely to have any significant impact on fauna movement opportunities and would not sever any important wildlife corridors.

4.2.3 Aquatic habitats

4.2.3.1 Impacts on water quality and hydrology of adjacent Freshwater wetland

The disturbance of soils has some minor potential to affect water quality through sediment runoff although wetland areas are currently susceptible to sedimentation from previous agricultural practices on the Reservoir Hill site. There is also some slight potential for accidental spills and/or leaks from machinery to enter the wetland area.

There is some potential for the road to result in a change in hydrological conditions within the Reservoir Hill site that could have some impact on Freshwater wetland habitat. The road design incorporates a stormwater surcharge basin that will moderate flows into the northern part of the lower Reservoir Hill wetland area. It is unlikely that the proposed development will affect hydrological conditions in the area to the extent that the Freshwater wetland area will be affected.

4.3 Amelioration Measures

Based on the assessment of potential impacts, a number of mitigation measures are proposed to manage ecological impacts associated with the proposed works. These are discussed below:

- Trees are to be inspected for the presence of fauna prior to removal.
- Trimming of vegetation adjacent to the clearance corridor should be kept to a minimum where possible and is to be undertaken in accordance with Australian Standard AS4373-1996 *Pruning Amenity Trees*.
- Vegetation waste should be removed from site or mulched and reused where required.
- Disturbance of soils should be kept to a minimum and appropriate sediment and erosion controls established to prevent sediment laden run-off to adjacent areas.
- Machinery movements within the drip line of retained mature trees should be kept to a minimum. The parking of vehicles and the storage of excavated material is not to be undertaken within tree drip lines.
- All reasonable practical steps shall be undertaken to reduce noise and vibration from the site.
- No waste is to be left onsite at the completion of works.

4.4 Proposed offset works

The Ballina Shire Development Control Plan (2012) notes that where development is unable to be sited, designed and managed to avoid potential adverse impacts on natural areas (as identified on the Natural Areas and Habitat Map), a proposal to remove habitat may be considered. Council typically applies a compensatory planting ratio of 3:1, with a higher rate of compensatory planting required in some circumstances.

The proposed northern extension of Hutley Drive is not located within any areas of mapped Natural areas and Habitat or within the buffer of any such mapped areas.

As vegetation within the study corridor does include some native species, the net loss of 680m^2 of this vegetation should be compensated for by the implementation of vegetation restoration works including weed control and assisted natural regeneration throughout a minimum area of 680m^2 (an

offset ratio of 1:1). **APPENDIX E** shows the proposed compensatory offset area which involves an extension of the compensatory offset area for the recent Ross Lane and Coast Road works.

5 STATUTORY AND PLANNING ASSESSMENT

5.1 Introduction

This section includes assessments of the impacts of the Proposed development with regard to:

- The NSW Biodiversity Conservation Act 2016
- the Commonwealth Environment Protection and Biodiversity Conservation Act (1999).
- State Environmental Planning Policies (SEPP) No. 44 – Koala Habitat Protection, No. 14 (Coastal wetlands) and No. 26 (Littoral rainforests).

5.2 Biodiversity offset scheme (BOS) and Biodiversity assessment Method (BAM)

5.2.1 Introduction

The Biodiversity Offsets Scheme Threshold is a test used to determine when is necessary to engage an accredited assessor to apply the Biodiversity Assessment Method (the BAM) to assess the impacts of a proposal. It is used for local developments (development applications submitted to councils) and clearing that does not require development consent in urban areas and areas zoned for environmental conservation (under the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017).

The Biodiversity Conservation Regulation 2017 sets out threshold levels for when the Biodiversity Offsets Scheme will be triggered. The threshold has two elements:

- whether the amount of native vegetation being cleared exceeds a threshold area set out below
- whether the impacts occur on an area mapped on the Biodiversity Values map published by the Minister for the Environment.

If clearing and other impacts exceeds either trigger, the Biodiversity Offset Scheme applies to the proposed development including biodiversity impacts prescribed by clause 6.1 of the Biodiversity Regulation 2017.

5.2.2 Biodiversity offset scheme (BOS) Entry Test Report

The Biodiversity Offsets Scheme Entry Threshold Tool was accessed on 20th November 2018 following a site inspection. The BOSET map produced shows that:

- The site is located on land Excluded from the LLS Act.
- The site does not contain mapped Biodiversity Values.

The BOSET mapping is included as **FIGURE 3**. Based on the likely extent of native vegetation the Biodiversity Assessment Method (BAM) will not need to be applied.

Figure 3 Biodiversity Value mapping (Biodiversity Conservation Act 2016)

5.3 Commonwealth EPBC Act (1999)

5.3.1 Introduction

Under the environmental assessment provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of National Environmental Significance are subject to a rigorous assessment and approval process. An action includes a project, development, undertaking, activity, or series of activities. An action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

The Act identifies seven matters of national environmental significance:

- World Heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)

The EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DEH 2006) outline an assessment process, including detailed criteria, to assist in deciding whether or not referral to the Minister is required. These guidelines replace the EPBC Act Administrative Guidelines of July 2000.

No Commonwealth EPBC Act (1999) Threatened fauna or flora species were recorded or are considered likely to occur within or immediately adjacent to the proposed road extension.

Based upon this assessment and with the implementation of the amelioration measures discussed in this report, the proposed development is unlikely to result in a significant impact on any matters of National Environmental Significance (NES) as listed under the EPBC Act 1999.

5.4 Coastal Management SEPP Coastal Wetlands Littoral Rainforests

The Coastal Management SEPP consolidates existing SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection). The Coastal Management SEPP outlines a range of development controls that aim to help protect and manage our sensitive coastal environments, manage risks from coastal hazards, and support appropriate urban development. Development controls for the mapped coastal wetlands and littoral rainforests area aim to continue existing protections for these important ecological communities.

FIGURE 3 shows an extract of mapping from the Coastal Management SEPP. No areas mapped as Coastal wetland or Littoral rainforest occur within or adjacent to the Hutley Drive northern extension corridor and the site does not fall within the proximity area for any Coastal Wetlands or Littoral rainforests.

Figure 3 Coastal Management SEPP Mapping

5.5 Ballina Shire Koala Management Strategy

The Subject site is located outside of the planning area for the Ballina Shire Koala Management Strategy, which includes extensive areas in the western part of the Shire as well as a smaller area in East Ballina.

5.6 SEPP 44 Koala Habitat Protection

The SEPP 44 Koala Habitat Protection Policy aims to "encourage the proper conservation and management of area of natural vegetation that provide habitat for Koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline."

SEPP 44 consists of a series of questions to provide a basis for the assessment of lands as potential and/or core Koala habitat.

1. Does the policy apply?

Does the subject land occur in an LGA identified in Schedule 1?

The Subject site occurs in the Ballina LGA, which is listed under Schedule 1.

Is the landholding to which the DA applies greater than 1 hectare in area?

Yes.

2. Is the land potential Koala habitat?

Does the site contain areas of native vegetation where the trees of types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component?

No. A small number of relatively immature Forest red gum and Swamp mahogany trees occur but form less than 15% of the tree component.

3. Is there core Koala habitat on the subject land?

The site does not support core Koala habitat.

4. Is there a requirement for the preparation of a Plan of Management for identified core Koala habitat?

No.

6 SUMMARY AND CONCLUSIONS

Blackwood Ecological Services has been engaged by Ballina Shire Council to complete a Biodiversity Assessment for the proposed extension of Hutley Drive from Silkwood Road north east to Byron Bay Road where a new roundabout intersection is to be constructed. Ballina Shire Council have previously granted approval for the extension of Hutley Drive in this location. This approved alignment involved construction of a road from Silkwood Road to the existing roundabout at the Byron Bay Road/North Creek Road intersection. GHD completed an REF and ecological assessment for this road alignment in 2013. Where appropriate, this assessment considers biodiversity impacts in the context of impacts associated with the existing approval.

A site assessment was completed on the 14th of November 2018. The route extends east from Silkwood Road through an area of grassland and then along a section of road reserve where neighbouring houses have extended gardens and planted trees within the road reserve. The route then heads north through a patch of vegetation associated with a dwelling in this area before meeting Byron Bay Road. In this area an earthen mound along the southern side of Byron Bay Road has been planted out with native vegetation and landscape species for noise attenuation.

The western section of the road corridor is lower lying and stormwater is currently piped under the road reserve where it flows from the northern side into wet grassland and wetland south of the Hutley Road extension. This area has previously been identified as supporting areas of Freshwater wetland TEC as well as the Threatened species Hairy joint grass (*Arthraxon hispidus*). (Blackwood Ecology 2014).

A dwelling is located on Lot 2 DP 620838 to the immediate north of the proposed road location in this part of the site. Vegetation to the south-western corner of this dwelling will be removed and includes a large Norfolk pine, planted Macadamia nut, Guava, Mulberry, Loquat and Crepe myrtle, Tuckeroo, Murraya, Camphor laurel, Umbrella tree, Winter senna, Ground asparagus, Guioa and various weeds.

Where the proposed Hutley Drive northern extension meets Byron Bay Road, vegetation has become well established on a noise attenuation mound along the southern side of Byron Bay Road. Vegetation on the mound in the area within the footprint of the proposed road extension includes three Swamp mahogany trees, three Broad-leaved paperbark, Coast banksia, Foambark, Bangalow palm, Guioa, Willow bottlebrush, Weeping bottlebrush, Blackwood wattle, Macaranga, Tea tree and various weeds and exotic garden plants.

East of the dwelling on Lot 2 DP620838, vegetation within the previously approved Hutley Drive footprint will be retained. This vegetation includes some larger established Tuckeroo, Guioa and Coast banksia trees, Umbrella tree, Camphor laurel, Cocos palm and various other weed species.

No Threatened (NSW Biodiversity Conservation Act 2016, Commonwealth EPBC Act 1999) flora species were recorded or are considered likely to occur. GHD (2013) did not record any Threatened flora species within the area subject to the northern extension. Vegetation communities on the Subject site were compared with descriptions of vegetation communities listed as Threatened Ecological Communities under the NSW Biodiversity Conservation Act (2016) and the EPBC Act (1999). No TECs are considered to occur within the proposed road extension footprint.

No Threatened (NSW BC Act 2016, EPBC Act 1999) fauna species were recorded during the site assessment. Koala feed tree species were searched for the presence of scats and scratches and no evidence of Koala use was recorded. Land within the study corridor is of limited value as fauna habitat for fauna occurring in neighbouring habitats. Wetland areas to the south provide habitat for wetland species including frogs and migratory wetland birds. The area does not provide suitable habitat for the Wallum froglet. Based upon this assessment no threatened fauna species are considered likely to have any degree of reliance on habitats within the area subject to the proposed development.

The proposed road extension requires the clearing of patches of vegetation along the road corridor which contain some native species. Vegetation loss should be considered of the context of the previously approved Hutley Drive northern extension. The road alignment in the south-western section of the road reserve has not changed and vegetation loss in this area is consistent with that considered in the REF prepared by GHD (2013). North-east of the dwelling on Lot 2, vegetation along the existing road reserve leading to the Byron Bay Road/North Creek Road intersection will be retained (approx 685m^2) whereas vegetation near the dwelling on Lot 2 and on the noise mound will be removed.

In comparison with the previously approved road extension, 1365m^2 of native vegetation will require removal with 685m^2 to be retained, leaving a net loss of 680m^2. Vegetation to be removed is not consistent with the description of any EEC and consists of relatively common native species, weeds and garden/orchard plantings. As vegetation within the study corridor does include some native species, the net loss of 680m^2 of this vegetation should be compensated for by the implementation of vegetation restoration works including weed control and assisted natural regeneration throughout a minimum area of 680m^2 (an offset ratio of 1:1).

The Biodiversity Offsets Scheme Entry Threshold Tool was accessed on 20th November 2018 following a site inspection. The BOSET map produced shows that:

- The site is located on land Excluded from the LLS Act.
- The site does not contain mapped Biodiversity Values.

Based on the likely extent of native vegetation the Biodiversity Assessment Method (BAM) will not need to be applied. No Commonwealth EPBC Act (1999) Threatened fauna or flora species were recorded or are considered likely to occur within or immediately adjacent to the proposed road extension. Based upon this assessment and with the implementation of the amelioration measures discussed in this report, the proposed development is unlikely to result in a significant impact on any matters of National Environmental Significance (NES) as listed under the EPBC Act 1999.

No areas mapped as Coastal wetland or Littoral rainforest occur within or adjacent to the Hutley Drive northern extension corridor and the site does not fall within the proximity area for any Coastal Wetlands or Littoral rainforests. The Subject site is located outside of the planning area for the Ballina Shire Koala Management Strategy, which includes extensive areas in the western part of the Shire as well as a smaller area in East Ballina. The Subject site does not provide core Koala habitat as defined by SEPP 44.

7 REFERENCES

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Office of Environment and Heritage (2013). **Threatened species, populations and ecological communities**. http://www.environment.nsw.gov.au/threatenedspecies/index.htm

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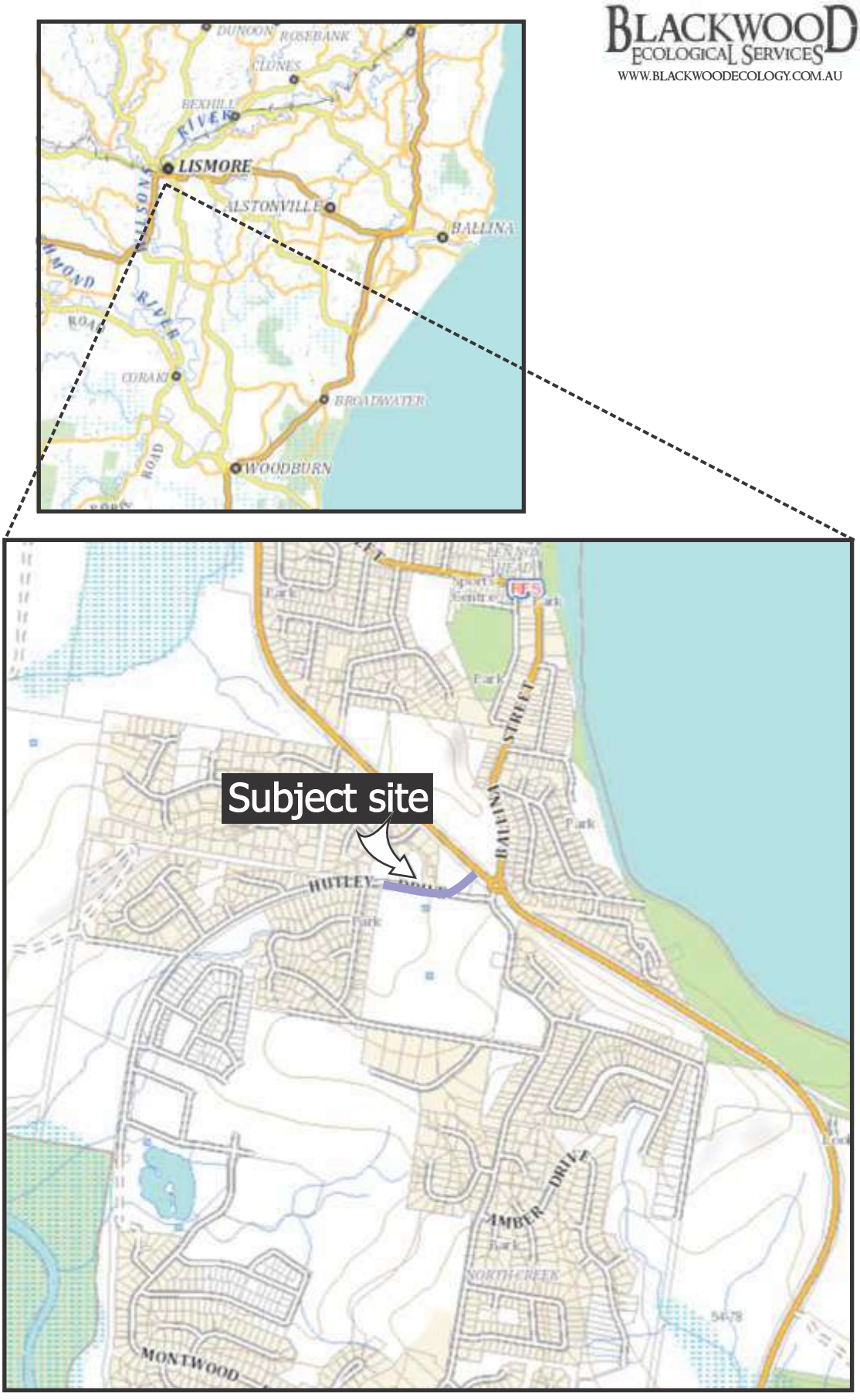
FIGURES

BLACKWOOD ECOLOGICAL SERVICES
WWW.BLACKWOODECOLOGY.COM.AU



Project
1833 Hutley Drive Northern Extension

Author & Date
MF Nov 18

Source
LPI SixMaps

Figure 1
Site location

0 Scale (metres) 50 100

N

BLACKWOOD ECOLOGICAL SERVICES
WWW.BLACKWOODECOLOGY.COM.AU

Project
1833 Hutley Drive Northern Extension

Author & Date
MF 29/11/2018

Source
Sixmaps

FIGURE 2
THE STUDY AREA

APPENDIX A
PROPOSED HUTLEY DRIVE NORTHERN EXTENSION

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT

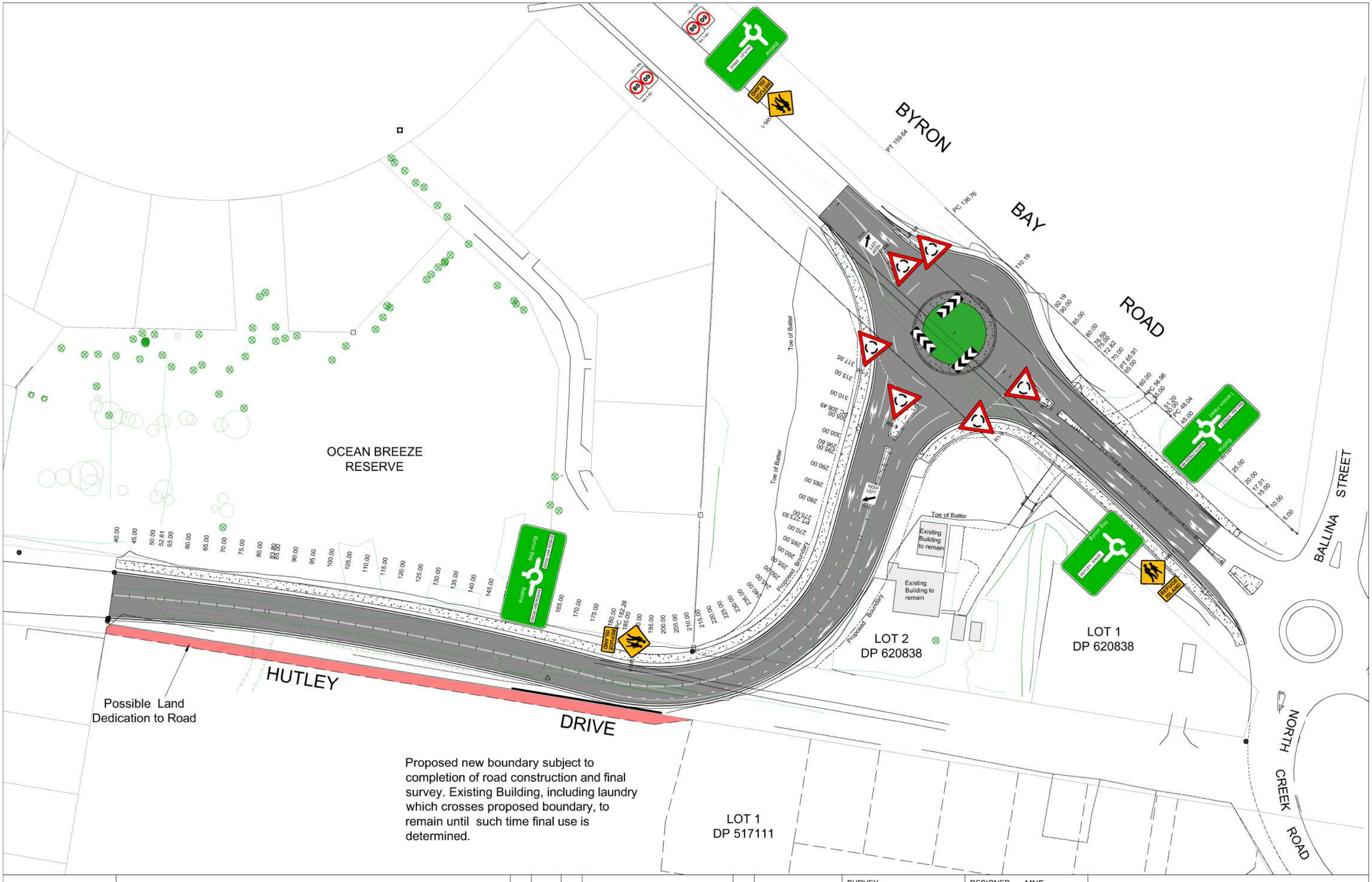
ISSUE A AUGUST 2018

PRELIMINARY DRAWINGS

DRAWING	SHEET	ISSUE	DATE	TITLE
SR31_049_03	1 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension and Byron Bay Road Roundabout Signs and Linemarking
SR31_049_03	2 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension and Byron Bay Road Roundabout Contour Plan
SR31_049_03	3 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension and Byron Bay Road Roundabout Services
SR31_049_03	4 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Longsections
SR31_049_03	5 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections
SR31_049_03	6 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections
SR31_049_03	7 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections
SR31_049_03	8 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections
SR31_049_03	9 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections
SR31_049_03	10 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections
SR31_049_03	11 OF	Preliminary	15/10/2018	Hutley Drive Northern Extension Cross Sections

LOCALITY PLAN

ballina shire council



No.	Date	By	Change	X'd
Amendments				

ballina shire council

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		
SHEET 1 OF			

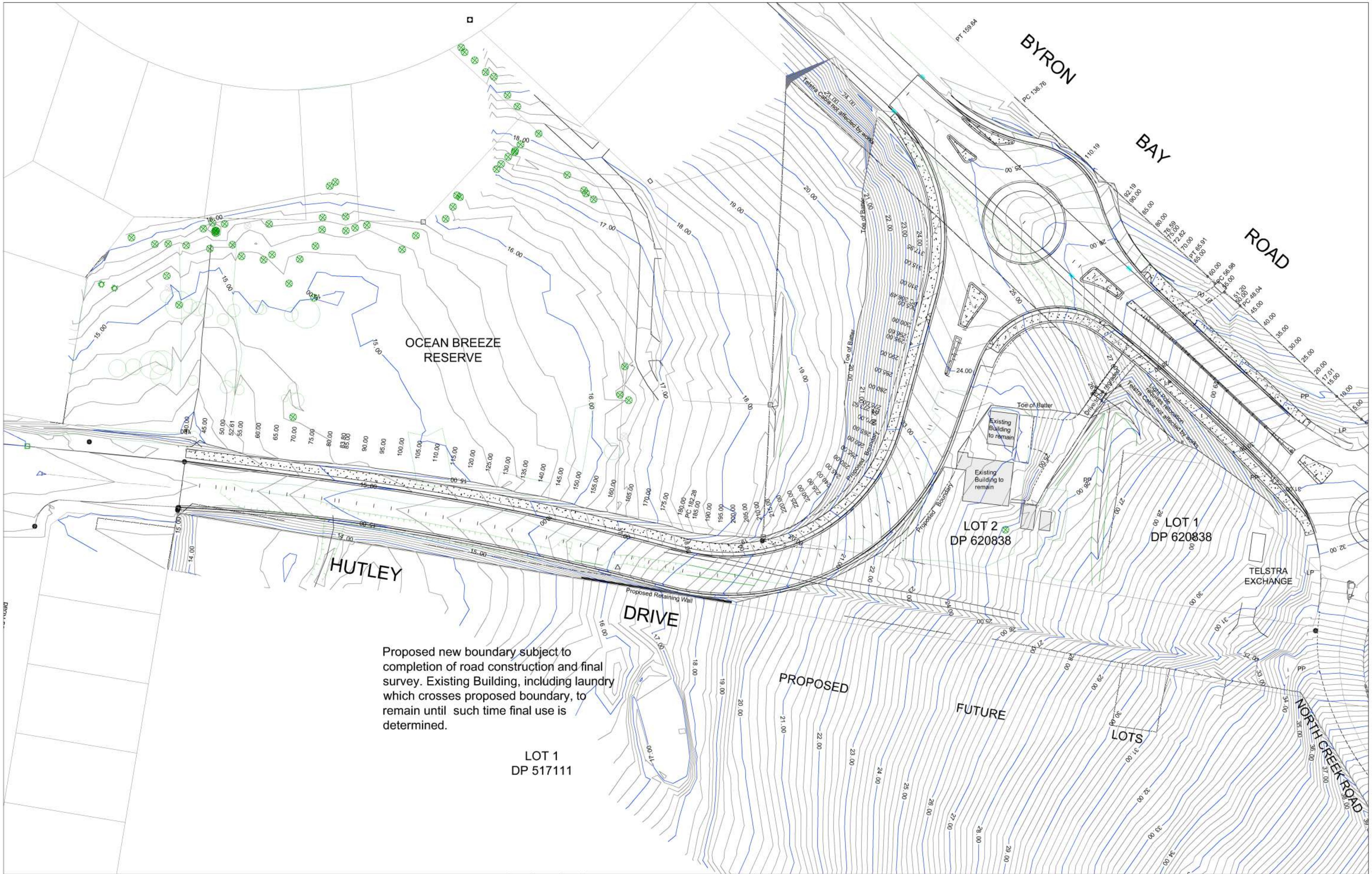
BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
SIGNS AND LINEMARKING PLAN

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL:

Plan No. SR31_049_03

A1



No.	Date	By	Change	X'd
Amendments				

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	

DRAWING HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG

SHEET 2 OF

ballina shire council

BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
CONTOUR PLAN

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL:

Plan No. SR31_049_03 A1

BYRON BAY ROAD

BALLINA STREET

OCEAN BREEZE RESERVE

HUTLEY DRIVE

NORTH CREEK ROAD

Possible Land Dedication to Road

LOT 1 DP 517111

LOT 2 DP 620838

LOT 1 DP 620838

TELSTRA EXCHANGE

Proposed new boundary subject to completion of road construction and final survey. Existing Building, including laundry which crosses proposed boundary, to remain until such time final use is determined.

Stormwater 525Ø

Stormwater 375Ø

Stormwater 750Ø

Stormwater 1350Ø

Sewermain

Sewer rising main 225Ø

Existing Sewer

Proposed Sewer

Telstra Cable not affected by works

Telstra Cable (Unknown)

Toe of Batter

Proposed Boundary

Existing Building to remain

Drive to be regraded

Light Pole relocation required

Existing Water

SMH

PP

LP

N

SCALE (m)

0 10 20 30 40 50

EXISTING STORMWATER
PROPOSED STORMWATER
EXISTING SEWER
EXISTING WATER
EXISTING TELSTRA
EXISTING ELECTRICITY

No.	Date	By	Change	X'd

Amendments

ballina shire council

SURVEY		DESIGNED	MNF
DATE	15/08/2018	DRAWN	MNF
F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		
SHEET 3 OF			

BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
SERVICES PLAN

Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL:

Plan No. SR31_049_03

A1

APPENDIX B
APPROVED HUTLEY DRIVE NORTHERN EXTENSION

Figure 2 Area of proposed activity (source: Ballina Shire Council)

APPENDIX C
EPBC PROTECTED MATTERS DATABASE SEARCH RESULTS

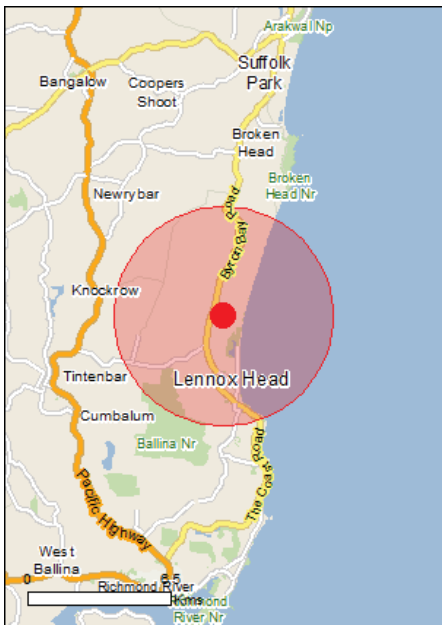
EPBC Act Protected Matters Report

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.

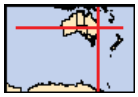
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 29/11/18 16:11:18



Coordinates
Buffer: 5.0Km



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:	3
Listed Threatened Species:	83
Listed Migratory Species:	73

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	105
Whales and Other Cetaceans:	12
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:	1
Regional Forest Agreements:	1
Invasive Species:	36
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 likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour 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 likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat known to 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		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to 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 known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known 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

Name	Status	Type of Presence
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area
Other		
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat known to occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat may 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 known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
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 likely to 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
Elaeocarpus williamsianus Hairy Quandong [8956]	Endangered	Species or species habitat may occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat likely to occur within area
Floydia praealta Ball Nut, Possum Nut, Big Nut, Beefwood [15762]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Fontainea oraria Coastal Fontainea [24038]	Endangered	Species or species habitat likely to occur within area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	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 known 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 likely to occur within area
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat likely to 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 known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may 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
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
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 likely to 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 known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa incana Wandering Tattler [831]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

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 known to 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
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known 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
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may 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
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to 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 known to occur within area

Name	Threatened	Type of Presence
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney		Species or species

Name	Threatened	Type of Presence
Seahorse [66240]		habitat likely to occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Reptiles		
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Ballina	NSW

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
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

Name	Status	Type of Presence
		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, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.77017 153.5882

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX D
FLORA SPECIES LIST

Hutley Drive Northern Extension
Flora species list

Notes:

BOLD Threatened species

BC-V Species listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016*

EPBC-V Species listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

* Introduced species

Where uncertainty exists due to the unavailability of reproductive material, the taxon is preceded by a question mark, or plants are identified to genus level only. Botanical nomenclature follows G.J. Harden (ed) (1990-2002) Flora of New South Wales, UNSW Press, except where recent changes have occurred.

Grouping and Family	Botanical Name	Common Name
Ferns and Fern Allies		
Blechnaceae	*Blechnum indicum*	Swamp water fern
Davalliaceae	*Nephrolepis cordifolia**	Fishbone fern
Gymnosperms		
Araucariaceae	*Araucaria heterophylla**	Norfolk pine
Monocotyledons		
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow palm
	*Syagrus romanzoffiana**	Cocos palm
Asparagaceae	*Asparagus aethiopicus**	Ground asparagus fern
Commelinaceae	*Commelina cyanea*	Native commelina
Flagellariaceae	*Flagellaria indica*	Whip vine
Poaceae	*Paspalum dilatatum**	Paspalum
	*Paspalum urvillei**	Giant paspalum
	*Pennisetum purpureum**	Barner grass
	Phragmites australis	Phragmites
Typhaceae	*Typha orientalis*	Broad-leaved cumbungi
Dicotyledons		
Acanthaceae	*Hypoestes phyllostachya**	Pink polkadot plant
Araliaceae	*Schefflera actinophylla**	Umbrella tree
Asteraceae	*Ageratina adenophora**	Crofton weed
	*Ageratum houstonianum**	Blue billygoat weed
	*Ambrosia artemisiifolia**	Annual ragweed
	*Bidens pilosa**	Cobblers pegs
	Conyza sp.*	Fleabane
	*Onopordum acanthium**	Scotch thistle
	*Sphagneticola trilobata**	Singapore daisy
Caesalpinioideae	*Senna pendula* var. *glabrata**	Senna
Convolvulaceae	*Ipomoea cairica**	Coastal morning glory
Ochnaceae	*Ochna serrulata**	Ochna
Euphorbiaceae	*Macaranga tanarius*	Macaranga
Fabaceae	*Pueraria lobate**	Kudzu

Grouping and Family	Botanical Name	Common Name
Lauraceae	*Cinnamomum camphora**	Camphor laurel
Lythraceae	*Lagerstroemia indica**	Crepe myrtle
Malvaceae	*Eriobotrya japonica**	Loquat
	Hibiscus diversifolius	Swamp hibiscus
Menispermaceae	*Stephania japonica* var. *discolor*	Snake vine
Mimosaceae	*Acacia melanoxylon*	Blackwood wattle
Moraceae	*Maclura cochinchinensis*	Cockspur
	*Morus alba**	Mulberry
Myrtaceae	*Acmena smithii*	Lilly pilly
	Callistemon salignus	Willow bottlebrush
	Callistemon viminalis	Weeping bottlebrush
	Eucalyptus robusta	Swamp mahogany
	Eucalyptus tereticornis	Forest red gum
	*Leptospermum laevigatum**	Coastal teatree
	Melaleuca quinquenervia	Broad-leaved paperbark
	*Psidium guajava**	Common guava
	Syzygium luehmannii	Riberry
	Syzygium sp. "Cascade"*	Landscape Lilly pilly
Nyctaginaceae	*Bougainvillea sp.**	Bougainvillea
Passifloraceae	*Passiflora subpeltata**	White passionflower
Polygonaceae	*Persicaria* sp.	Smartweed
	*Rumex brownii**	Swamp Dock
Proteaceae	*Banksia integrifolia subsp. integrifolia*	Coast banksia
	Grevillea robusta	Silky oak
	Macadamia integrifolia	Macadamia nut
Rosaceae	*Rubus hillii*	Molucca bramble
Rutaceae	*Murraya paniculata**	Mock orange
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
	Guioa semiglauca	Guioa
	Jagera pseudorhus	Foambark
Solanaceae	*Solanum mauritianum**	Wild tobacco tree
Sterculiaceae	*Brachychiton acerifolius*	Flame tree
	Commersonia bartramia	Brown kurrajong
Thymelaeaceae	*Wikstroemia indica*	Wikstromeia
Ulmaceae	*Trema tomentosa* var. *aspera*	Native peach
Verbenaceae	*Duranta repens*	Duranta
Verbenaceae	*Lantana camara**	Lantana

APPENDIX E
PROPOSED COMPENSATORY OFFSET AREA

Legend

- Target Littoral Rainforset Area
- Target Wetland Area

Point (ID)	Easting	Northing
1	558437.63	6813630.41
2	558469.2	6813651.79
3	558521.28	6813575.87
4	558533.75	6813584.59
5	558585.24	6813498.03
6	558555.72	6813482.28

Compensation area amended as per EIS addendum (3 Nov - Rev 2) to account for local landmarks and more accurately define the wetland/littoral rainforest target areas.

Hutley Drive North Compensation Area

Widen Compensation area for Ross Lane and the Coast Road by 4.0m with the length being 190m for a total area of 760m²

Location of existing poly irrigation main (approx)

Existing Slashed Bdy 39m

Existing Fence Line 34m

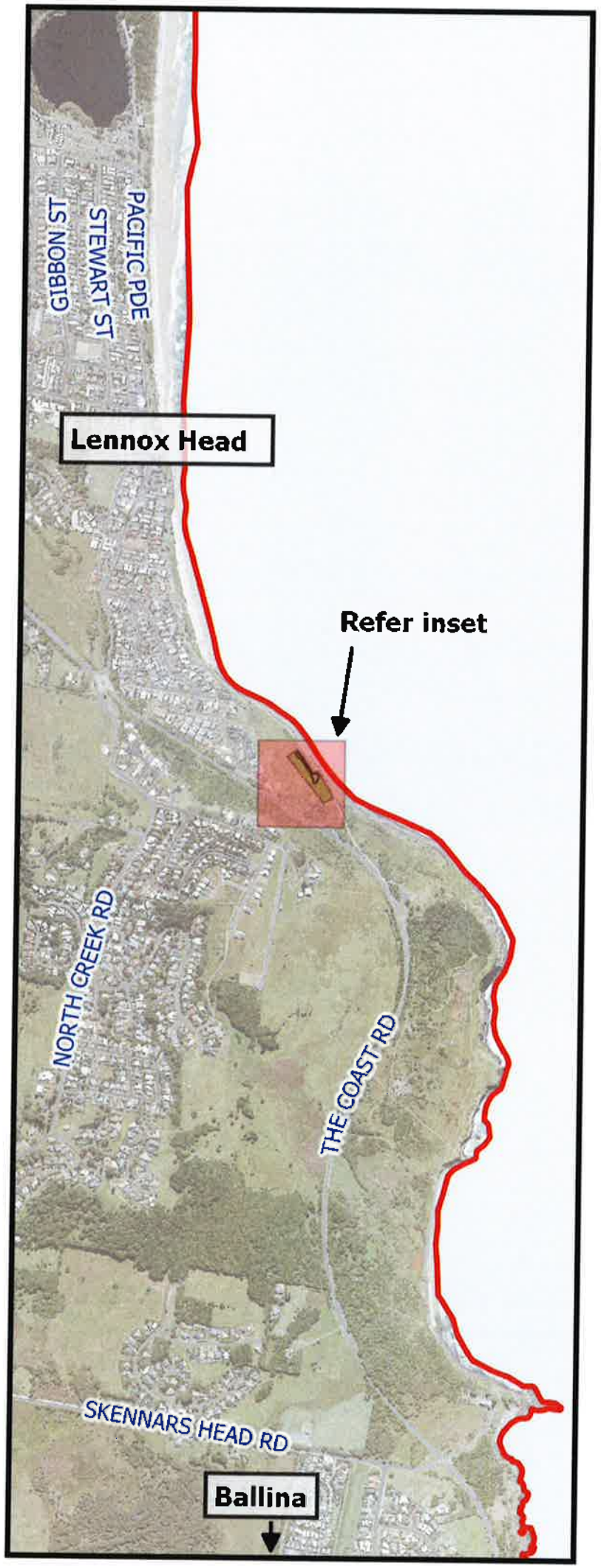
Target Wetland Area

Target Littoral Rainforest Area

THE COAST RD

0 500 1000 1500 m

Compensatory Offset Area (Ross Lane and The Coast Road)



Appendix C

Heritage Search Results

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Hutley Drive

Client Service ID : 382425

Ballina Shire Council

Date: 13 November 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 Lot : 2, DP:DP620838 with a Buffer of 200 meters, conducted by Malcolm Fox on 13 November 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:

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

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

Search Results

49 results found.

Alstonville Post Office 86 Main St	Alstonville, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Ballina Courthouse River St	Ballina, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Ballina Nature Reserve (1977 boundary) Ross Lane	Lennox Head, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Ballina Post Office River St	Ballina, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Ballina Post Office Group River St	Ballina, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Brockley Scrub No 2 Bruxner Hwy	Wollongbar, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Broken Head and Adjacent Areas	Broken Head, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Brundah Including Garden, Fence, Adjacent Footpaths, Norfolk Isl 37 Norton St	Ballina, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Buckombil Scrub Meerschaum Vale - Bagotville Rd	Wardell, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)

CBC Bank (former) 92A Main Street	Alstonville, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Coolgardie Scrub Coolgardie Rd	Wardell, NSW, Australia	(Identified Place) Register of the National Estate (Non-statutory archive)
Dalwood Scrub Tregeagle - Meerschaum Vale Rd	Alstonville, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Davis Scrub Nature Reserve Beesons Rd	Rous Mill, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Duck Creek Scrub	Alstonville, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Duck Creek Scrub Extended Area	Alstonville, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Federal Hotel 77 Main St	Alstonville, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Government Officials Residence	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
House 13 Perry St	Alstonville, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
House Including Fence 54 Richmond St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)

House Including Front Fence 54 Swift St	Ballina, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Indigenous Place	Ballina, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Indigenous Place	Ballina, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Lennox Head, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Kellin Falls Scrub	Tintenbar, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Lennox Head Coastal Area	Lennox Head, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Lennox Head Littoral Rainforest Coast Rd	Lennox Head, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Lumley Park Scrub Bugden Ave	Alstonville, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Maguires Creek Scrub Johnstons Rd	Alstonville, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Meerschaum Vale Scrub Justilius Rd	Wardell, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)

National Bank 3 Sinclair St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
National Bank Group Richmond St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Police Station 1 Cedar St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Police Station Including Former Courthouse 32 Main St	Alstonville, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Richmond River (Casino to Broadwater)	Coraki, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Richmond River Lighthouse Harbourview St	Ballina, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Richmond River Lighthouse Harbourview St	Ballina, NSW, Australia	(Ineligible Place) Commonwealth Heritage List
Royal Hotel 59 Richmond St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Shaws Bay Hotel Compton Dr	Ballina, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
St Barnabas Anglican Church 24 Richmond St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
St Bartholomews Anglican Church 6 The Avenue	Alstonville, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)

St Patricks Catholic Church Group Richmond St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
St Patricks Catholic Church Including the Tower 50 Richmond St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
St Patricks Presbytery 9 Sinclair St	Wardell, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Tuckean Nature Reserve Proposal	Wardell, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Uralba Nature Reserve Forest Rd	Alstonville, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Uralba Scrub Forest Rd	Alstonville, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Victoria Park Nature Reserve Victoria Park Rd	Meerschaum Vale, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Willowbank Scrub Pearces Creek Rd	Alstonville, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)
Wollongbar Scrub Bruxner Hwy	Wollongbar, NSW, Australia	(Interim List) Register of the National Estate (Non-statutory archive)

Report Produced: Thu Dec 20 15:24:51 2018

Office of Environment & Heritage

Home > Topics > Heritage places and items > Search for heritage

Search for NSW heritage

Return to search page where you can refine/broaden your search.

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search returned 1 record.

Aboriginal place name	Local government area	Local Aboriginal Land Council	Latitude	Longitude	Gazettal date and page numbers	Comments
East Ballina (Angels Beach)	Ballina	Jali			07/27/2012 p. 3590-3591	This is a culturally sensitive site. Exact location is not public information. East Ballina Aboriginal Place acknowledges and commemorates the 1853-54 massacre of Bundjalung people associated with the area.

Section 2. Items listed under the NSW Heritage Act.

Your search returned 2 records.

Item name	Address	Suburb	LGA	SHR
Brundah	37 Norton Street	Ballina	Ballina	00194
High Conservation Value Old Growth forest	15 Local Government Areas	Upper North East NSW	Multiple LGAs	01487

Section 3. Items listed by Local Government and State Agencies.

Your search returned 99 records.

Item name	Address	Suburb	LGA	Information source
Aboriginal Site	Emigrant Creek	Alstonville	Ballina	SGOV
Alstonville Police Station	2 Perry Street	Alstonville	Ballina	SGOV
Alstonville Post Office (former)	86 Main St	Alstonville	Ballina	LGOV
Alstonville Showground Memorial Gates	22-40 Commercial Road	Alstonville	Ballina	LGOV
Alstonville Tropical Fruit Research Station	Bruxner Highway	Alstonville	Ballina	SGOV
Alstonville Tropical Fruit Research Station	Bruxner Highway	Alstonville	Ballina	LGOV
Anglican Church palms	38 - 42 Norton Street	Ballina	Ballina	LGOV
Ballina Council Chambers (inc. Norfolk Is Pine trees, Mayoral chair and setting)	42 Cherry Street	Ballina	Ballina	LGOV
Ballina Court House	16-22 River Street	Ballina	Ballina	LGOV
Ballina Courthouse and Post Office (Former)	22-24 River Street	Ballina	Ballina	SGOV
Ballina Fire Station	60 Crane Street	Ballina	Ballina	LGOV
Ballina High School Buildings (1931)	37-44 Swift Street	Ballina	Ballina	LGOV
Ballina High School Buildings (1950)	37-44 Swift Street	Ballina	Ballina	LGOV
Ballina Lighthouse	Harbourview Street	East Ballina	Ballina	LGOV
Ballina Post Office (former)	24 River Street	Ballina	Ballina	LGOV
Ballina Public School (1882 school building)	Martin Street	Ballina	Ballina	LGOV
Ballina Public School (1913 double storey infants building)	Martin Street	Ballina	Ballina	LGOV
Ballina Trophy guns	Pacific Highway (old Council depot site)	Ballina	Ballina	LGOV
Ballina Uniting Church (timber and brick)	52 Cherry Street	Ballina	Ballina	LGOV
Bellington		Alstonville	Ballina	LGOV

	191 Ballina Road			
Big Scrub Rainforest Remnant Alstonville	Bruxner Highway	Alstonville	Ballina	SGOV
Brundah	37 Norton Street	Ballina	Ballina	LGOV
Bulwinkel Park and Pool	Bruxner Highway	Alstonville	Ballina	LGOV
Catholic Precinct	Richmond Street	Wardell	Ballina	LGOV
CBC Bank (former)	92A Main Street	Alstonville	Ballina	LGOV
CBC Bank (former)	176 River Street	Ballina	Ballina	LGOV
Cemetery	Bruxner Highway	Alstonville	Ballina	LGOV
Crawford House	10 Wardell Road	Alstonville	Ballina	LGOV
Croquet Clubhouse	Pearces Creek Road (Lumley Park)	Alstonville	Ballina	LGOV
CWA Hall	Captain Cook Park River Street	Ballina	Ballina	LGOV
Dry Stone Wall - Wall C	North Creek Road	Skennars Head	Ballina	LGOV
Dry Stone Wall (wall known as 'wall d')	North Creek Road (Tara Downs)	Lennox Head	Ballina	LGOV
Dry Stone Walls (walls known as 'wall a' and 'wall b' on former Henderson Farm)	Hutley Drive	Lennox Head	Ballina	LGOV
East Ballina Cemetery (and heath surrounds)	Pine Avenue	East Ballina	Ballina	LGOV
Elizabeth Ann Brown Park	Daley Street	Alstonville	Ballina	LGOV
Federal Hotel	77 Main Street	Alstonville	Ballina	LGOV
Federation Bungalow	10 Carrington Street	Ballina	Ballina	LGOV
Federation House	54 Swift Street	Ballina	Ballina	LGOV
Fenwick House	3 Brighton Street	East Ballina	Ballina	LGOV
Fenwick House	Compton Drive	Ballina	Ballina	GAZ

Fernleigh Public School (historic school room)	451 Fernleigh Road	Fernleigh	Ballina	LGOV
Fig Tree	Sinclair Street	Wardell	Ballina	LGOV
Fig Trees	Richmond Street road reserve	Wardell	Ballina	LGOV
Former Butter/Norco/Peanut Factory	5 Lismore Road	Alstonville	Ballina	LGOV
Former East Ballina (Shaw's Bay) Ambulance Station	Hill Street	East Ballina	Ballina	LGOV
Former Post Office (now residence)	929 Wardell Road	Meerschaum Vale	Ballina	LGOV
Former Shaw's Bay camp site laundry building	Hill Street	East Ballina	Ballina	LGOV
Four Workmen's Cottages	Bruxner Highway	Wollongbar	Ballina	SGOV
Henderson Family Graves (gravesites and headstones)	126 Justelius Road	Meerschaum Vale	Ballina	LGOV
Historic Henderson Farm Group	Hutley Drive/Henderson Lane	Lennox Head	Ballina	LGOV
Historic Mile Marker (concrete)	Main Street	Alstonville	Ballina	LGOV
Historic Norfolk Island Pines	North Creek Road	Lennox Head	Ballina	LGOV
Historic Shaw's Bay Precinct		East Ballina	Ballina	LGOV
House - 301 Bruxner Highway, Wollongbar	301 Bruxner Highway	Wollongbar	Ballina	SGOV
Late Victorian House	49 Main Street	Alstonville	Ballina	LGOV
Laurel Hill	32 Smith Lane	Wollongbar	Ballina	LGOV
Lennox Head War Honour Roll (moveable item housed at Lennox Head Com Cent)	Park Lane	Lennox Head	Ballina	LGOV
Meerschaum Vale Public Hall (including Honour Roll)	1 Marom Creek Road	Meerschaum Vale	Ballina	LGOV
Memorial to First Settlers	Daley Street	Alstonville	Ballina	LGOV
Monument to HMAS Lismore	Compton Drive	East Ballina	Ballina	LGOV
MV Florrie Passenger Vessel and Tug (moveable heritage item)	Regatta Avenue	Ballina	Ballina	LGOV
		Wardell	Ballina	LGOV

National Bank (former)	3 Sinclair Street			
Norfolk Island Pines	Hutley Drive	Lennox Head	Ballina	LGOV
North Coast Ladies College	25 Norton Street	Ballina	Ballina	LGOV
Old Show Shed	Bruxner Highway	Wollongbar	Ballina	SGOV
Old Wardell Ferry approaches	Bridge Drive	Wardell	Ballina	LGOV
Paddy Bugden Memorial	Bugden Avenue	Alstonville	Ballina	LGOV
Pimlico Hall (including Honour Roll)	580 Pimlico Raod	Pimlico	Ballina	LGOV
Pioneer Cemetery	Hill Street	Ballina	Ballina	LGOV
Police Station	2 Perry Street	Alstonville	Ballina	LGOV
Police Station	1 Cedar Street	Wardell	Ballina	LGOV
PV Richmond Boat (moveable heritage item)	Regatta Avenue	Ballina	Ballina	LGOV
Registers, Dreadnought Farm Scheme Memorabilia, and Photographs	Bruxner Highway	Wollongbar	Ballina	SGOV
Richmond River Lighthouse		Ballina Head	Ballina	GAZ
Rous General Cemetery	Rous Cemetery Road	Rous	Ballina	LGOV
Rous Public School (school room)	248 Rous Mill Road	Rous	Ballina	LGOV
Royal Hotel	59 Richmond Street	Wardell	Ballina	LGOV
RSL Sub Branch Hall (inc collection of moveable heritage items housed in hall)	13 Bugden Avenue	Alstonville	Ballina	LGOV
Saint Andrew's Presbyterian Church (former)	Bugden Avenue	Alstonville	Ballina	LGOV
Saint Bartholomew's Anglican Church (stone)	6 The Avenue	Alstonville	Ballina	LGOV
Saint Bartholomew's Anglican Church Manse	3 The Avenue	Alstonville	Ballina	LGOV
Saint Thomas' Anglican Church (former)	936 Wardell Road	Meerschaum Vale	Ballina	LGOV
Saw Miller's Cottage	3 Green Street	Alstonville	Ballina	LGOV
		Alstonville	Ballina	LGOV

Severn Lodge	184 Ballina Road			
Shaw's Bay ship wreck sites	Compton Drive	East Ballina	Ballina	LGOV
St Bartholomews Anglican Church (timber)	1 The Avenue	Alstonville	Ballina	LGOV
St Stephen's Presbyterian Church	54 Crane Street	Ballina	Ballina	LGOV
Tintenbar General Cemetery	Hill Street	Tintenbar	Ballina	LGOV
Tintenbar Shire Council Chambers (former)	Bruxner Highway	Alstonville	Ballina	LGOV
Tramlines across River Drive (multiple locations)	River Drive	Empire Vale	Ballina	LGOV
Wardell and District War Memorial Hall (including Honour Roll)	49 Richmond Street	Wardell	Ballina	LGOV
Wardell General Cemetery (inc gravesites, headstones and traditional plantings)	Cemetery Road	Wardell	Ballina	LGOV
Wardell Police Station and Official Residence	1 Cedar Street, Corner Bath Street	Wardell	Ballina	SGOV
Wardell Post Office	26 Bridge Street	Wardell	Ballina	LGOV
Wigmore Hall	Swift Street	Ballina	Ballina	LGOV
Wollongbar Agricultural Institute	Bruxner Highway	Wollongbar	Ballina	SGOV
Wollongbar Rainforest Remnant	Bruxner Highway	Wollongbar	Ballina	SGOV
WWI Honour Roll (moveable heritage item)	Cherry Street	Ballina	Ballina	LGOV
WWI memorial tree plantings	Crane Street	Ballina	Ballina	LGOV

There was a total of 102 records matching your search criteria.

Key:
LGA = Local Government Area
GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.
Note: While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.

Appendix D

Geotechnical Investigation

REPORT ON

GEOTECHNICAL INVESTIGATION

FOR

PROPOSED EXTENSION OF

HUTLEY DRIVE, LENNOX HEAD

PREPARED FOR

BALLINA SHIRE COUNCIL

PROJECT REF: **GI 4378-A**

20 DECEMBER 2018

DRILLING ENVIRONMENTAL GEOTECHNICAL

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OFFICE: Unit 3 / 42 Machinery Drive
Tweed Heads South NSW 2486
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Tweed Heads South NSW 2486

TABLE OF CONTENTS

1. INTRODUCTION

This report details the results of a geotechnical investigation for the proposed extension to Hutley Drive, Lennox Head. Geotech Investigations Pty Ltd (GI) was commissioned by Ballina Shire Council to complete this investigation. Details of the proposed road have not been provided at this stage.

2. OBJECTIVES AND AGREED SCOPE OF SERVICE

The geotechnical investigation was to determine information regarding the subsurface conditions and how this influences the design of the new structures / roads and infrastructure etc. The investigation and report involved:-

- Subsurface conditions, including groundwater;
- Earthworks, suitability of existing fill for re-use,
- Indicative presence of Acid Sulfate Soils; and
- Indicative pavement subgrade parameters for design by others.

The investigation comprised the drilling and sampling of five boreholes to varying depths, with laboratory testing, followed by engineering assessment and reporting.

3. SITE LOCATION AND DESCRIPTION

The subject site is located between Hutley Drive to the west and North Creek Road to the east, near the intersection with The Coast Road. This 330 m section of Hutley Drive is unformed, with a gentle gradient in a westerly direction.

Figure 1: View of subject site

4. GEOTECHNICAL CONDITIONS

4.1 Regional Geology

Geology mapping by Geological Survey of NSW indicates the site is underlain by tertiary aged Lismore Basalt, part of the Lamington Volcanics, which typically comprises "Basalt".

Subsurface conditions were anticipated to comprise localised fill over possibly alluvial clays then residual clays and weathered basalt.

4.2 Field Work Methodology

Fieldwork was undertaken on the 29th of November 2018, and comprised the drilling and sampling of five boreholes, designated BH 1 to BH 5 using a vehicle mounted drill rig at accessible locations employing spiral flight auguring techniques to the termination depths between 2 m and 3.5 m. The approximate locations of the boreholes are shown on Site Plan S01 attached in Appendix A.

This investigation has been carried out generally in accordance with AS 1726 – 2017[1] in terms of soil description. The fieldwork was carried out by experienced geotechnical personnel who positioned and logged the materials encountered in the boreholes. At the completion of drilling, the boreholes were backfilled loosely with drill spoil.

4.3 Field Work Results

The results of the fieldwork are detailed on the Engineering Logs attached in Appendix B, along with explanatory notes. Table 1 below provides a summary of these conditions.

Table 1: Summary of Subsurface Materials

Borehole Location I.D.	"Uncontrolled" FILL	Alluvium - Firm to Stiff CLAY	Residual – Stiff to very stiff Sandy CLAY	Weathered BASALT	Groundwater
BH 1	0 m to 1.7 m	1.7 m to 2.2 m	NE	NE	1.3 m
BH 2	0 m to 1.6 m	1.6 m to 2 m	NE	NE	1.3 m
BH 3	0 m to 1.3 m	1.3 m to 2 m	NE	NE	1.3 m
BH 4	NE	NE	0 m to 2.8 m	NE	NE
BH 5	NE	NE	0 m to 2.6 m	2.6 m to 3.5 m	NE

It should be noted that groundwater is affected by various influences and will vary over time.

[1] Australian Standard AS 1726-2017 *'Geotechnical site investigations'*, Standards Australia

4.4 Laboratory Results

Disturbed samples were collected during the fieldwork and were subjected to the following laboratory testing suite:-

- Four day soaked California bearing ratio (CBR);
- Chromium reducible sulphur tests (assess presence of acid sulphate soils);
- Atterberg Limits; and
- Particle size distribution.

The detailed laboratory report sheets are attached in Appendix B and summarised in Table 2 below.

Table 2: Summary of Laboratory Testing

Test I.D.	Depth (m)	MDD	OMC / FM	CBR	LL	PI	LS / S	ASS
BH 1	0.0-0.5	1.56	27.1 /	7	-	-	-	-
BH 1	0.5-1.0	-	-	-	-	-	-	169
BH 1	1.0-1.5	-	-	-	-	-	-	98
BH 1	2.0	-	-	-	85	51	30.5 / -	-
BH 2	0.0-0.5	-	-	-	-	-	-	45
BH 2	0.0-1.0	1.61	35.9 / 33.2	5	44	19	12.0 / 1.5	-
BH 2	0.5-1.0	-	-	-	-	-	-	134
BH 2	1.5-2.0	-	-	-	-	-	-	96
BH 2	2.0	-	-	-	48	20	15.5 / -	-
BH 3	0.0-0.5	-	-	-	-	-	-	70
BH 3	0.3-1.0	1.56	35.6 / 41.0	2.5	50	22	11.0 / 2.0	-
BH 3	1.0-1.5	-	-	-	-	-	-	107
BH 3	1.5	-	-	-	60	31	10.0 / -	-
BH 4	0-1.0	1.55	37.3 / 36.1	3	58	19	11.0 / 1.5	-
BH 5	1.0	-	-	-	60	21	12.0 / -	-

Notes: MDD – Maximum Dry Density (t/m^3) OMC/FM – Optimum Moisture Content (%) / Field Moisture (%)
CBR – California Bearing Ratio (%) LL – Liquid Limit (%)
PI – Plasticity Index (%) LS / S – Linear Shrinkage (%) / Swell (%)
ASS – Acid Sulfate Soils Net Acidity (mol/H+) - No test completed

Particle size distribution was completed on only one sample, from borehole BH 1 at 0 m to 0.5 m depth, and confirmed the material is a Sandy CLAY.

5. INTERPRETATION OF RESULTS

5.1 Proposed Development

It is understood the works will involve the extension of Hutley Drive from near Silkwood Road to either the intersection with North Creek Road, Byron Bay Road and The Coast Road.

Details of the road construction are not known, however are expected to comprise minimal earthworks to produce the road platform and associated drainage.

5.2 Possible Constraints of Subsurface Conditions to the Project

The results of the investigations indicate poorly compacted and variable predominantly clayey fill towards the western portion of the alignment up to 1.7 m depth, over alluvial clays. The fill material was often very wet to saturated and noted as having organic matter within BH 2. Towards the eastern, more elevated portion of the alignment, conditions generally comprised residual clays with weathered basalt.

No significant thickness of 'soft soil' that would likely cause significant long-term settlements were identified in the natural geology.

These conditions suggest that some ground improvements should be considered to support the new road pavement, likely to involve partial or complete removal and replacement of existing "uncontrolled" fill. Partial removal will likely require a bridging layer, whereas complete removal and replacement with 'controlled' fill would provide a more predictable performance of the road pavement.

5.3 Earthworks

The Northern Rivers Local Government Development and Design Construction Manuals should be used in the design of all new pavements. The following guidelines have been provided to assist the design engineer, however ultimately the specification of earthworks must be carried out by the civil engineers to achieve their design intent.

Generally, all earthworks are to be carried out in accordance with AS 3798 – 2007[2]. The following earthworks procedures can be used as a preliminary guide to support slab-on-ground and pavements:-

- The pavement areas, and areas to accept new fill, should be prepared by removing any existing "uncontrolled" fill, loose debris, soils that are wet, or contain vegetation or deleterious materials.
- It is expected that the some selected existing filled gravel and clayey materials could be re-used for fill, depending upon the performance requirements, moisture control and

[2] Australian Standard AS 3798-2007 *'Guidelines on earthworks for residential and commercial developments'*, Standards Australia

conditioning, and ensuring any oversize particles are removed. In general the majority of the fill is of poor quality and some areas contain high organic content and silts which would not be suitable for re-use.

- Following removal of fill materials and site clearing, the exposed subgrade should be test rolled using a 12 tonne roller (or similar), loaded water truck or dump truck to determine the presence of any soft spots, which should be excavated out and replaced with compacted select fill. The surface should be tyned to 0.2 m depth, moisture conditioned and then compacted. New fill material should be placed in layers not exceeding 200 mm loose thickness, or less depending on compaction equipment.
- Structural fill for earthworks should comprise select granular material and be uniformly compacted to 98% Standard MDD (or higher if required for pavement subgrade), with moisture content within 2% wet or dry of OMC for cohesive material. Layer thickness depends on the compaction equipment, however 200 mm to 250 mm loose layer thickness is generally considered suitable for most mechanical compaction equipment. Where backfill for service trenches is carried out, the above layer thickness applies however if vibrating plates are used, the layers are to be placed in 100mm loose thickness.
- Field testing must be carried out to confirm the standard of compaction achieved and the moisture content during the construction. The test frequency and extent of testing is to be carried out as per AS 3798, Section 8.0 and compaction testing is to be carried out by a NATA accredited laboratory.
- The placement of fill material to support building loads and pavements must be placed and compacted under 'Level 1' full-time geotechnical inspections and testing.

It is expected that the existing clayey soils will be susceptible to softening due to increase in moisture content, such as following rainfall, etc. Therefore, areas exposed to the elements should be minimised, and a layer of compacted select granular fill should be considered to improve traffickability, especially in access and egress areas.

5.4 Indicative Pavement Parameters

The results of CBR testing from the collected samples resulted in CBR values of the existing fill of 5% and 7%, whereas the residual clay resulted in 2.5% and 3%. These values are considered typical for these materials.

For preliminary pavement design purposes, based on experience in the area with similar materials, a typical design CBR of 2% to 3% should be adopted for these materials at 100 % standard compaction. Confirmatory pavement design parameters must be confirmed during construction, as it will depend on the nature of the subgrade materials.

It is expected that the clay subgrades will exhibit poor subsurface drainage, and it is recommended that subsoil drains be installed early in the works, particularly where pavements adjoin landscaped areas or other water sources.

5.5 Acid Sulfate Soils

The results of limited testing indicate potential sulphidic acidity (SCr) of between 2 and 31 mol (H+/t) and existing acidity (TAA) was measured at 40 and 159 mol (H+/t), and confirms the action criteria for disturbance of fine grained soils has been exceeded. Therefore, the disturbance of soils must be further assessed and managed to limit the potential for environmental harm.

5.6 General Comments

The above information and calculations are based on existing site soils and assumes moisture conditions within site soils vary due to seasonal effects only. If abnormal moisture conditions occur (due to drying by tree root action, or wetting by leaking pipes, water ponding, etc.), significantly greater movements are considered possible.

During periods of high rainfall, concentrated surface water runoff or ponding may occur on the site. Suitable drainage and diversion of all runoff into the stormwater articulation systems to prevent water ponding is necessary prior, during and after the construction of any proposed development.

6. LIMITS OF INVESTIGATION

This report has been written with the express intent of providing subsurface information for design purposes, or as otherwise directed by the client and/or other members of the consulting team. Sub-surface conditions relevant to construction works should be assessed by contractors who can make interpretation of the factual data provided as engineering logs and test results, and perform any additional tests as necessary for their own purposes.

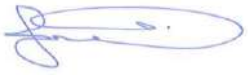
There are always some variations in sub-surface conditions across a site that cannot be defined even by exhaustive investigation. Hence, it is unlikely that the measurements and values obtained from sampling and testing during the investigation will represent the extremes of conditions which exist within the site. Should conditions exposed at the site during excavation vary significantly from the interpretation provided in this report, based on the project specific factors cited in the introductory scope of the report, GI must be informed and have the opportunity to review any of the findings of this report.

If you should require any further information or clarification, please do not hesitate to contact this office.

Yours faithfully

For and on behalf of

Geotech Investigations Pty Ltd



James Walle *RPEQ (15701), RPEng (Civil), BEng (Civil)*

Senior Geotechnical Engineer

APPENDIX A

SITE PLAN S01

LOCALITY IMAGE

Locality Image courtesy of
Google Earth & NSW Globe

SITE IMAGE

GEOTECH INVESTIGATIONS PTY LTD
Unit 3 / 42 Machinery Drive
PO Box 6885
Tweed Heads South NSW 2486
PH: 0755 233 979
FAX: 0755 233 981
EMAIL: admin@geotechinvestigations.com
WEB: www.geotechinvestigations.com

CLIENT: BALLINA SHIRE COUNCIL

PROJECT: PROPOSED ROAD AT HUTLEY DRIVE, LENNOX HEAD

DRAWING REF: S01: SITE PLAN

LEGEND:
Borehole and Dynamic Cone Penetrometer Location

Site Image provided by Client

APPROXIMATE NORTH

NORTH

DATE: 29.11.2018

OUR REF / JOB No.: GI 4378-a sp

DRAWN BY: DJB

Drawing not to scale.
Printed dimensions only.

APPENDIX B

ENGINEERING LOG – BOREHOLE PROFILES BH 1 TO BH 5
GEOTECHNICAL REPORT STANDARD NOTES

GEOTECH INVESTIGATIONS PTY LTD

Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	N:		E:	

CLIENT: BALLINA SHIRE COUNCIL	**BOREHOLE I.D. :** BH 1
PROJECT: HUTLEY DRIVE, LENNOX HEAD	**JOB No.:** GI 4378-a
EQUIPMENT TYPE: GT-10 **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD		0		(GP) Sandy GRAVEL: Fine to coarse sand and gravel, With silt, Dry to moist, Pale orange/brown	D			FILL
		0.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine to medium gravel, Dry to moist ($w>w_p$), Dark grey with dark orange/ brown mottling	St			
		1.0		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine to medium gravel, Very moist ($w>w_p$), Dark grey with dark orange/ brown mottling	F			FILL ?
	▼	1.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine to coarse gravel and cobbles, Very moist ($w>w_p$), Dark grey with dark orange/brown mottling	S - F			FILL ?
		2.0		(CH) CLAY: High plasticity, Trace of fine sand, Moist ($w>w_p$), Grey/ green with dark orange/brown mottling	St			ALLUVIUM
		2.5						
		3.0						
		3.5						
		4.0						

BH 1 TERMINATED AT 2.2m – TUNGSTEN CARBIDE REFUSAL ON LAYER OF COBBLES AND GRAVEL

METHOD		WEATHERING	
AD	Auger Drilling	EW	Extremely
C	Casing	HW	Highly
MS	Mud Support	DW	Distinctly
NMLC	Rock Coring	MW	Moderately
RR	Rock Roller	SW	Slightly
TC	Tri Cone	F	Fresh
WB	Wash Bore		

WATER	
▼	Water Level
►	Water Seepage

CONSISTENCY / DENSITY / ROCK STRENGTH			
VS	Very Soft	D	Dense
S	Soft	VD	Very Dense
F	Firm	Fb	Friable
St	Stiff	ELw	Extremely Low
VSt	Very Stiff	VLw	Very Low
Hd	Hard	Lw	Low
VL	Very Loose	M	Medium
L	Loose	H	High
MD	Medium Dense	VH	Very High

SAMPLES / TESTS	
U( )	Undisturbed (size in mm)
D	Disturbed
BS	Bulk Sample
DCP	Dynamic Cone Penetrometer
SPT	Standard Penetrometer Test
N	Number of blows for SPT / 300mm
VS	Vane Shear
A	Acid Sulfate Sample
PP	Pocket Penetrometer (kPa)

Logged By:	DAW	**Date:**	29/11/18	**Checked By:**	JW	**Date:**	20/12/18

GEOTECH INVESTIGATIONS PTY LTD

Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	N:		E:	

CLIENT: BALLINA SHIRE COUNCIL	**BOREHOLE I.D. :** BH 2
PROJECT: HUTLEY DRIVE, LENNOX HEAD	**JOB No.:** GI 4378-a
EQUIPMENT TYPE: GT-10 **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD		0.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand and gravel, With silt, Dry to moist ($w<w_p$), Red/brown	F - St			FILL
	▼	1.0		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine to medium gravel and silt, Moist to very moist ($w>w_p$), Dark grey and dark orange/brown	S - F			Decomposed Organics throughout
		1.5						
		2.0		(CH) Sandy CLAY: High plasticity, Fine to coarse sand and gravel, With silt, Very moist ($w>w_p$), Dark grey with orange/brown mottling	F - St			ALLUVIUM
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						

BH 2 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION DUE TO LAYER OF COBBLES AND GRAVEL

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
C	Casing	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
RR	Rock Roller	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
TC	Tri Cone	F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WB	Wash Bore			VL	Very Loose	M	Medium	VS	Vane Shear
WATER				L	Loose	H	High	A	Acid Sulfate Sample
▼	Water Level			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
►	Water Seepage								

Logged By: DAW	**Date:** 29/11/18	**Checked By:** JW	**Date:** 20/12/18

GEOTECH INVESTIGATIONS PTY LTD

Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	N:		E:	

CLIENT: BALLINA SHIRE COUNCIL	**BOREHOLE I.D. :** BH 3
PROJECT: HUTLEY DRIVE, LENNOX HEAD	**JOB No.:** GI 4378-a
EQUIPMENT TYPE: GT-10 **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD		0.25		(OH) ORGANICS: With silt, Dry to moist, Dark grey				FILL
	▼	0.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine gravel, Moist ($w>w_p$), Grey with dark orange/brown mottling	F - St			
		1.0						
		1.5		(CH) Sandy CLAY: High plasticity, Fine sand, Moist to very moist ($w>w_p$), Grey				ALLUVIUM
		2.0		(CH) Sandy CLAY: High plasticity, Fine sand, With fine to coarse gravel, Moist to very moist ($w>w_p$), Grey				
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						

BH 3 TERMINATED AT 2.0m – LIMIT OF INVESTIGATION DUE TO LAYER OF COBBLES AND GRAVEL

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
C	Casing	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
RR	Rock Roller	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
TC	Tri Cone	F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WB	Wash Bore			VL	Very Loose	M	Medium	VS	Vane Shear
WATER				L	Loose	H	High	A	Acid Sulfate Sample
▼	Water Level			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
►	Water Seepage								

Logged By:	DAW	**Date:**	29/11/18	**Checked By:**	JW	**Date:**	20/12/18

GEOTECH INVESTIGATIONS PTY LTD

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ENGINEERING LOG – BOREHOLE PROFILE

GPS:	N:		E:	

CLIENT: BALLINA SHIRE COUNCIL	**BOREHOLE I.D. :** BH 4
PROJECT: HUTLEY DRIVE, LENNOX HEAD	**JOB No.:** GI 4378-a
EQUIPMENT TYPE: GT-10 **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD		0.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine to medium gravel and silt, Trace of cobbles, Dry to moist ($w<w_p$), Dark grey/brown	St - VSt			RESIDUAL
		1.0		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine gravel and silt, Dry to moist ($w<w_p$), Dark orange with grey mottling	VSt			
		1.5						
		2.0		(CH) Sandy CLAY: High plasticity, Fine sand, With silt, Dry to moist ($w<w_p$), Grey, red/brown and orange mottled				
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						

BH 4 TERMINATED AT 2.8m – LIMIT OF INVESTIGATION

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
C	Casing	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
RR	Rock Roller	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
TC	Tri Cone	F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WB	Wash Bore			VL	Very Loose	M	Medium	VS	Vane Shear
WATER				L	Loose	H	High	A	Acid Sulfate Sample
▼	Water Level			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
►	Water Seepage								

Logged By: DAW	**Date:** 29/11/18	**Checked By:** JW	**Date:** 20/12/18

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ENGINEERING LOG – BOREHOLE PROFILE

GPS:	N:		E:	

CLIENT: BALLINA SHIRE COUNCIL	**BOREHOLE I.D. :** BH 5
PROJECT: HUTLEY DRIVE, LENNOX HEAD	**JOB No.:** GI 4378-a
EQUIPMENT TYPE: GT-10 **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD		0.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine gravel and silt, Dry to moist ($w<w_p$), Red/brown	F - St			FILL
		1.0		(CH) Sandy CLAY: High plasticity, Fine sand, With silt, Dry to moist ($w>w_p$), Red and grey/brown mottled	St - VSt			RESIDUAL
		1.5		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With silt, Trace of fine to medium gravel, Dry to moist ($w>w_p$), Orange/ brown with red and orange mottling	St			
	▼	2.0		(CH) Sandy CLAY: High plasticity, Fine to coarse sand, With fine gravel and silt, Moist ($w>w_p$), Grey with orange mottling	St			
	►	2.5						
		3.0		(HW) BASALT: Fine to coarse grained, Grey and orange/brown	VLw			
		3.5						
		4.0						
		4.5						

BH 5 TERMINATED AT 3.5m – LIMIT OF INVESTIGATION

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
C	Casing	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
RR	Rock Roller	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
TC	Tri Cone	F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WB	Wash Bore			VL	Very Loose	M	Medium	VS	Vane Shear
WATER				L	Loose	H	High	A	Acid Sulfate Sample
▼	Water Level			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
►	Water Seepage								

Logged By:	DAW	**Date:**	29/11/18	**Checked By:**	JW	**Date:**	20/12/18

SCOPE These standard notes may be of assistance when understanding terms and recommendations given in this report. These notes are for general conditions and not all terms given may be of concern to the report attached. The descriptive terms adopted by Geotech Investigations Pty Ltd are given below and are largely consistent with Australian Standards AS1726-1993 'Geotechnical Site Investigations'.

CLIENT can be described and is limited to the financier of this geotechnical investigation.

LEGALITY and privacy of this document is based on communication between Geotech Investigations Pty Ltd and the client. Unless indicated otherwise the report was prepared specifically for the client involved and for the purposes indicated by the client. Use by any other party for any purpose, or by the client for a different purpose, will result in recommendations becoming invalid and Geotech Investigations Pty Ltd will hold no responsibility for problems which may arise.

GEOTECHNICAL REPORTS are predominantly derived using professional estimates determined from the results of fieldwork, in-situ and laboratory testing and experience from previous investigations in the area, from which geotechnical engineers then formulate an opinion about overall subsurface conditions. The client must be made aware that the investigations are undertaken to ensure minimal site impact using test-pits or small diameter boreholes and soil conditions on-site may vary from those encountered during the investigation.

CLIENTS RESPONSIBILITY to notify this office should there be adjustments in proposed structure/location or inconsistencies with material descriptions given in this report and those encountered on site. Geotech Investigations Pty Ltd is able to provide a range of services from on-site inspections to full project supervision to confirm recommendations given in the report.

CSIRO Publication BTF 18 'Foundation Maintenance and Footing Performance: A Homeowner's Guide' explains how to adequately maintain drainage during and post construction which lies as the responsibility of the client. Suitable drainage ensures recommendations given in this report remain valid.

INVESTIGATION METHODS adopted by Geotech Investigations Pty Ltd are designed to incorporate individual project-specific factors to obtain information on the physical properties of soil and rock around a site to design earthworks and foundations for proposed structures. The following methods of investigation currently adopted by this company are summarised below:-

HAND AUGER – investigations enable field work to be undertaken where access is limited. The materials must have sufficient cohesion to stand unsupported in an unlined borehole and there must be no large cobbles boulders or other obstructions which would prevent rotation of the auger.

TEST-PITS – investigations are carried out with an excavator or backhoe, allowing a visual inspection of sub-surface material in-situ and from samples removed. The limit of investigation is restricted by the reach of the excavator or backhoe.

CONTINUOUS SPIRAL FLIGHT AUGERING TECHNIQUES – investigations are advanced by pushing a 100mm diameter spiral into the sub-surface and withdrawing it at regular intervals to allow sampling or testing as it emerges.

WASH BORING – investigations are advanced by removing the loosened soil from the borehole by a stream of water or drilling mud issuing from the lower end of the wash pipe which is worked up and down or rotated by hand in the borehole. The water or mud carries the soil up the borehole where it overflows at ground level where the soil in suspension is allowed to settle in a pond or tank and the fluid is re-circulated or discharged to waste as required.

NON-CORE ROTARY DRILLING – investigations are advanced using a rotary bit with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from feel and rate of penetration.

ROTARY MUD DRILLING – is carried out as above using mud as support and circulating fluid for the borehole drilling. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling.

CONTINUOUS CORE DRILLING – investigations are carried out in rock material, specimens of rock in the form of cylindrical cores are recovered from the drill holes by the means of core barrel. The core barrel is provided at its lower end with a detachable core bit which carries industrial diamond chips in a matrix of metal. Rotation of the barrel by means of the drill rods causes the core bit to cut an annulus in the rock, the cuttings being washed to the surface by a stream of pumped down the hollow drill rods.

TESTING METHODS adopted by Geotech Investigations Pty Ltd to determine soil properties include but not limited to the following:-

U50 – Undisturbed samples are obtained by inserting a 50mm diameter thin-walled steel tube into the material and withdrawing with a sample of the soil in a moderately undisturbed condition.

PP – Pocket Penetrometer tests are commonly used on thin walled tube samples of cohesive soils to evaluate consistency and approximate unconfined compressive strength of saturated cohesive soils. They may also be used for the same purpose in freshly excavated trenches.

VS – Vane Shear test are commonly used in-situ or on thin walled tube samples of cohesive soils by introducing the vane into the material where the measurement of the undrained shear strength is required. Then the vane is rotated and the torsional force required to cause shearing is calculated.

DCP – Dynamic Cone Penetrometer tests are commonly used in-situ to measure the strength attributes of penetrability and compaction of sub-surface materials.

SPT – Standard Penetration Tests are commonly used to determine the density of granular deposits but are occasionally used in cohesive material as a means of determining strength and also of obtaining a relatively unmixed sample. Samples and results are obtained by driving a 50mm diameter split tube through blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. Blow counts are recorded for 150mm intervals with the sum of the number of blows required for the second and third 150mm of penetration is termed the "standard penetration resistance" or the "N-value".

GEOLOGICAL ORIGINS of sub-surface material plays a considerable role in the development of engineering parameters and have been summarised as follows:-

FILL – materials are man made deposits, which may be significantly more variable between test locations than naturally occurring soils.

RESIDUAL – soils are present in a region because of weathering over the geological time scale.

COLLUVIAL – soils have been deposited recently, on the geological time scale, as soils being transported slowly down slope due to gravitational creep.

ALLUVIAL – soils have been deposited recently, on the geological time scale, as water borne materials.

AEOLIAN – soils have been deposited recently, on the geological time scale, as wind borne materials.

SOIL DESCRIPTION is based on an assessment of disturbed samples, as recovered from boreholes and excavations, and from undisturbed materials. Soil descriptions adopted by Geotech Investigations Pty Ltd are largely consistent with AS 1726-2017 '*Geotechnical Site Investigation'.* Soil types are described according to the predominating particle size and behaviour, qualified by the grading of other particles present on the following bases detailed in Table 1.

COHESIVE SOILS ability to hold moisture known as its liquid limit is the state of a soil when it goes from a solid state to a liquid state described in Table 2

TABLE 1

Soil Classification	Particle Size
Clay	< 0.002 mm
Silt	0.002 – 0.06 mm
Sand	0.06 – 2.00 mm
Gravel	2.00 – 60.0 mm

TABLE 2

Descriptive Type	Range of Liquid Limit %
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50

Furthermore to soil description cohesive soils are described on their strength (assessed in conjunction with penetration tests) and liquid limit. Non-cohesive soil strengths are described by their density index. With descriptions for cohesive and non-cohesive soils summarised in Table 3.

TABLE 3

COHESIVE SOILS		NON-COHESIVE SOILS	
Term	**Undrained Shear Strength kPa**	**Term**	**Density Index %**
Very soft	≤ 12	Very Loose	≤15
Soft	> 12 ≤25	Loose	> 15 ≤35
Firm	> 25 ≤50	Medium Dense	> 35 ≤65
Stiff	> 50 ≤100	Dense	> 65 ≤85
Very Stiff	> 100 ≤200	Very Dense	> 85
Hard	> 200		

Description of terms used to describe material portion are summarised in Table 4.

TABLE 4

COARSE GRAINIED SOILS		FINE GRAINED SOILS	
% Fines	**Modifier**	**% Coarse**	**Modifier**
≤ 5	Omit or 'trace'	≤ 15	Omit or 'trace'
> 5 ≤12	Describe as 'with'	> 15 ≤30	Describe as 'with'
> 12	Prefix soil as 'silty/clayey'	> 30	Prefix soil as 'sandy/gravelly'

ROCK DESCRIPTIONS are determined from disturbed samples or specimens collected during field investigations. A rocks presence of defects and the effects of weathering are likely to have a great influence on engineering behaviour.

Rock Material Weathering Classification is summarised in Table 5.

TABLE 5

Term	Symbol	Definition
Residual Soils	-	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to decomposition of weathering products in pores
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh rock	FR	Rock shows no signs of decomposition or staining

Rock Material Strength Classification is summarised in Table 6.

TABLE 6

Term	Symbol	Point load index (MPa) I_s50	Field guide to strength
Extremely Low	EL	≤0.03	Easily remoulded by hand to a material with soil properties
Very Low	VL	>0.03 ≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3cm thick can be broken by finger pressure
Low	L	>0.1 ≤0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling
Medium	M	>0.3 ≤1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty
High	H	>1.0 ≤3.0	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer
Very High	VH	>3.0 ≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer
Extremely High	EH	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer

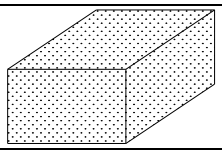
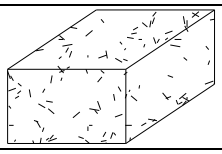
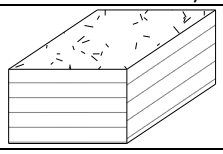
Rock Material Defect Shapes are summarised in Table 7.

TABLE 7

Term	Description
Planar	The defect does not vary in orientation.
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps.
Irregular	The defect has many sharp changes of orientation
Smooth	The defect has a flat even finish
Rough	The defect has a irregular disoriented finish

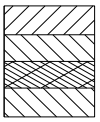
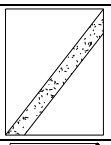
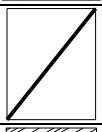
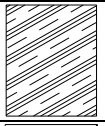
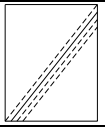
Rock Material Texture and Fabric are summarised in Table 8.

TABLE 8

Geological Description	Massive		Layered (Bedded foliate cleaved)
Diagram			
Fabric Type	Effectively homogenous and isotropic. Bulky or equi-dimensional grains uniformly distributed	Effectively homogeneous and isotropic. Elongated	Effective homogeneous with planar anisotropy. Elongated or tabular grains or pores in a layered arrangement

Rock Material Defect Type is summarised in Table 9

TABLE 9

Term	Definition	Diagram
Bedding	Signifying existence of beds or laminate. Planes dividing sedimentary rocks of the same or different lithology. Structure occurring in granite and similar rocks evident in a tendency to split more or less horizontally to the land surface	
Cross Bedding	Also called cross-lamination or false bedding. The structure commonly present in granular sedimentary rocks, which consists of tabular, irregularly lenticular or wedge-shaped bodies lying essentially parallel to the general stratification and which them selves show pronounced lamination structure in which the laminae are steeply inclined to the general bedding.	
Crushed Seam	A fracture at a more or less acute angle to applied force generally with some pulverized material along its surface	
Joint	A fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.	
Parting	A small joint in rock or a layered rock where the tendency of crystals to separate along certain planes that are not true cleavage planes.	
Sheared Zone	A fracture that results from stresses which tend to shear one part of a specimen past the adjacent part	

APPENDIX C

LABORATORY TEST REPORTS

BORDER-TEK PTY LTD

GEOTECHNICAL TESTING SERVICES

Border-Tek Pty Ltd ● ABN 35 154 498 156

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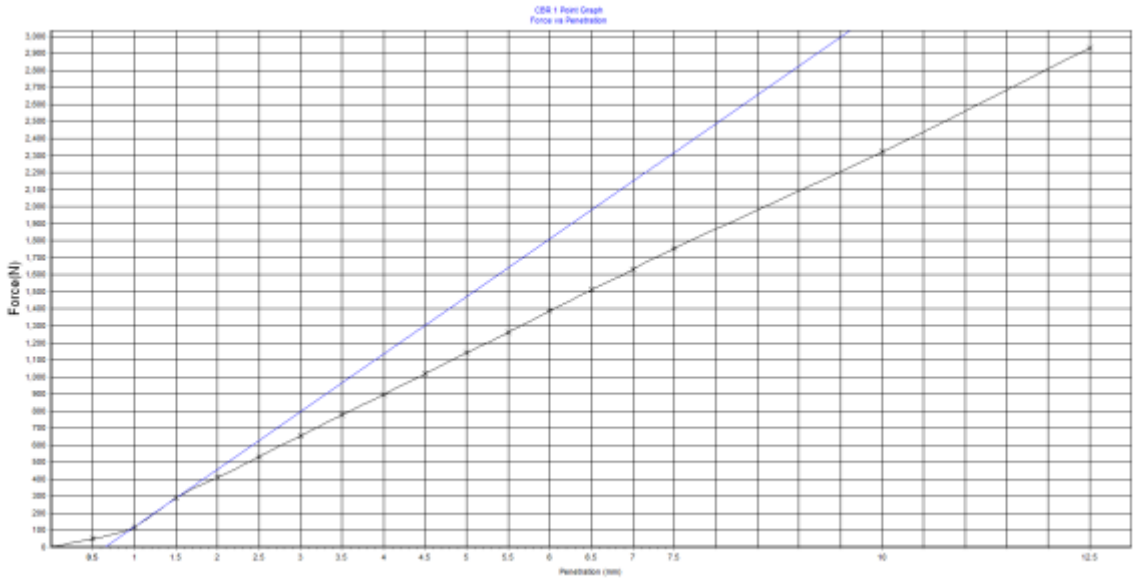
California Bearing Ratio Report (1 Point)

Client:	**Geotech Investigations Pty Ltd**	Report Number:	**K8588/1**
Client address:	**PO Box 6885 Tweed Heads South NSW 2486**		
Job Number:	**BTK 284**	Report Date:	**17/12/2018**
Project:	**Hutley Drive**	Order Number:	
Location	**Lennox Head**	**Page 1 of 1**	
Lab No:	**117358**	Sample Location	
Date Sampled:	**29/11/2018**	Borehole #1	
Date Tested:	**14/12/2018**	0.0 - 0.5m Below	
Sampled By:	**Dean Wedge**	Existing Surface Level	
Sample Method:	**As Received**		
Site Selection :	**Geotech Inv.**	Test Method :	AS1289.6.1.1,2.1.1
For Use As:	**-**	Lot Number:	**-**
Remarks:	**-**	Item Number :	**-**



Maximum Dry Density - MDD (t/m³) :	**1.58**	Duration of Curing (days/hours)	**2d/0h**
Optimum Moisture Content - OMC (%) :	**27.1**	Method of Plasticity Determinatin	**Visual / Tactile**
Compactive Effort :	**Standard**	Density Ratio after Soak (%) :	**100**
Nominated % Maximum Dry Density Compaction :	**100**	Field Moisture Content (%) :	**2.6**
Nominated % Optimum Moisture Content Compaction :	**100**	Moisture Content (Top) after Penetration (%) :	**31.2**
Achieved Dry Density before Soak (t/m³) :	**1.597**	Optional Moisture Content (Remainder) after Penetration (%) :	**30.7**
Achieved Percentage of Maximum Dry Density (%) :	**101**	Bearing Ratio 2.5mm (%) :	**5**
Achieved Moisture Content (%) :	**27.0**	Bearing Ratio 5.0mm (%) :	**7**
Achieved Percentage of Optimum Moisture Content (%) :	**100**	Minimum Specified CBR Value (%) :	**-**
Test Condition (Soaked/Unsoaked) / Soaking Period (Days) :	**Soaked / 4 days**	**CBR Value (%) :**	**7**
Swell (%) / Surcharge (kg):	**1.0/4.5kg**	+19mm Material (%) 0	Oversize replacement material used (%) Nil
Soil Description :	Sandy CLAY		

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Authorised Signatory
Daniel French

BORDER-TEK PTY LTD

GEOTECHNICAL TESTING SERVICES

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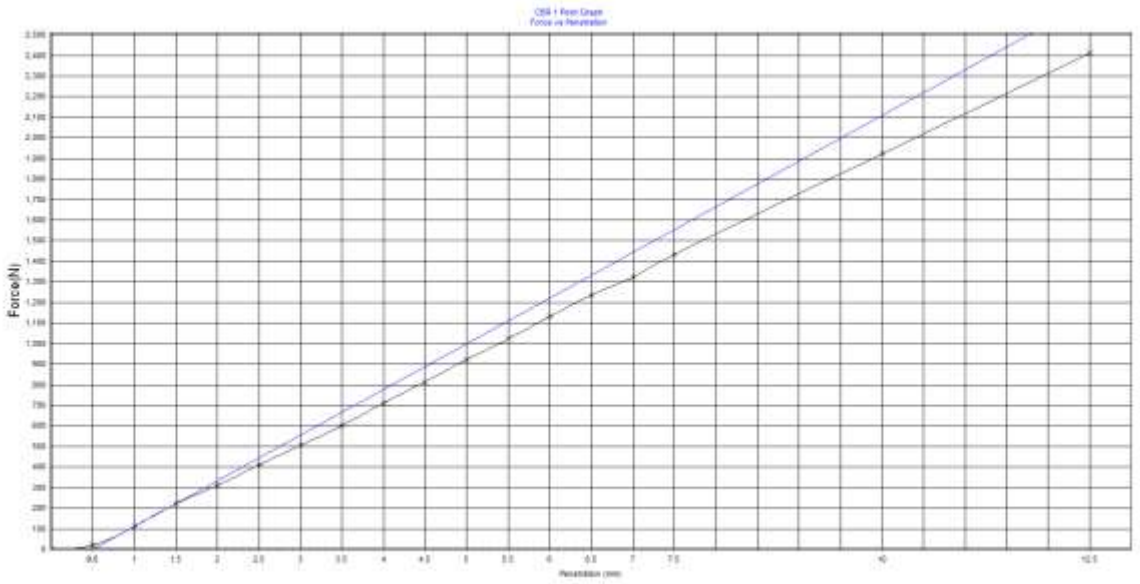
California Bearing Ratio Report (1 Point)

Client:	**Geotech Investigations Pty Ltd**	Report Number:	**K8589/1**
Client address:	**PO Box 6885 Tweed Heads South NSW 2486**		
Job Number:	**BTK 284**	Report Date:	**17/12/2018**
Project:	**Hutley Drive**	Order Number:	
Location	**Lennox Heads**	**Page 1 of 1**	
Lab No:	**117359**	Sample Location	
Date Sampled:	**29/11/2018**	Borehole #2	
Date Tested:	**14/12/2018**	0.0 - 1.0m Below	
Sampled By:	**Dean Wedge**	Existing Surface Level	
Sample Method:	**As Received**		
Site Selection :	**Geotech Inv.**	Test Method :	AS1289.6.1.1,2.1.1
For Use As:	**-**	Lot Number:	**-**
Remarks:	**-**	Item Number :	**-**



Maximum Dry Density - MDD (t/m³) :	**1.61**	Duration of Curing (days/hours)	**2d/0h**
Optimum Moisture Content - OMC (%) :	**35.9**	Method of Plasticity Determination	**Visual/Tactile**
Compactive Effort :	**Standard**	Density Ratio after Soak (%) :	**100**
Nominated % Maximum Dry Density Compaction :	**100**	Field Moisture Content (%) :	**33.2**
Nominated % Optimum Moisture Content Compaction :	**100**	Moisture Content (Top) after Penetration (%) :	**40.8**
Achieved Dry Density before Soak (t/m³) :	**1.601**	Optional Moisture Content (Remainder) after Penetration (%) :	**39.4**
Achieved Percentage of Maximum Dry Density (%) :	**99**	Bearing Ratio 2.5mm (%) :	**4**
Achieved Moisture Content (%) :	**35.8**	Bearing Ratio 5.0mm (%) :	**5**
Achieved Percentage of Optimum Moisture Content (%) :	**100**	Minimum Specified CBR Value (%) :	**-**
Test Condition (Soaked/Unsoaked) / Soaking Period (Days) :	**Soaked / 4 days**	**CBR Value (%) :**	**5**
Swell (%) / Surcharge (kg):	**1.5/4.5kg**	+19mm Material (%) 0	Oversize replacement material used (%) Nil
Soil Description :	Silty CLAY		

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N.A.T.A. Accreditation No. 2851.

Authorised Signatory
Daniel French

BORDER-TEK PTY LTD

GEOTECHNICAL TESTING SERVICES

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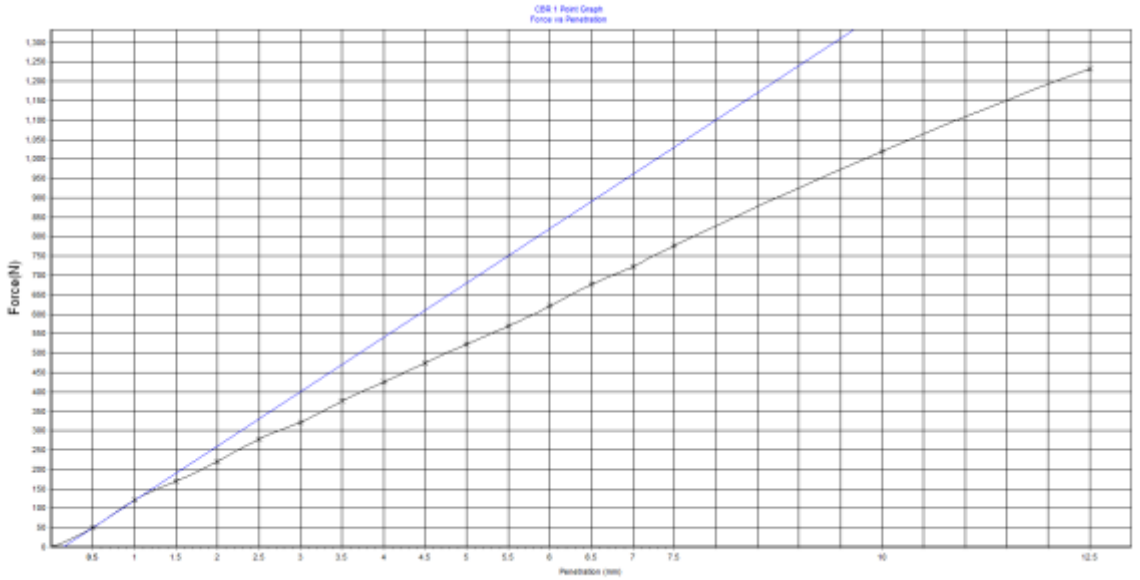
California Bearing Ratio Report (1 Point)

Client:	**Geotech Investigations Pty Ltd**	Report Number:	**K8590/1**
Client address:	**PO Box 6885 Tweed Heads South NSW 2486**		
Job Number:	**BTK 284**	Report Date:	**17/12/2018**
Project:	**Hutley Drive**	Order Number:	
Location	**Lennox Heads**	**Page 1 of 1**	
Lab No:	**117360**	Sample Location	
Date Sampled:	**29/11/2018**	Boorehole #3	
Date Tested:	**14/12/2018**	0.3 - 1.0m Below	
Sampled By:	**Dean Wedge**	Existing Surface Level	
Sample Method:	**As Received**		
Site Selection :	**Border-Tek Pty Ltd**	Test Method :	AS1289.6.1.1,2.1.1
For Use As:	**-**	Lot Number:	**-**
Remarks:	**-**	Item Number :	**-**



Maximum Dry Density - MDD (t/m³) :	**1.56**	Duration of Curing (days/hours)		**2d/0h**	
Optimum Moisture Content - OMC (%) :	**35.6**	Method of Plasticity Determination		**Visual/Tactile**	
Compactive Effort :	**Standard**	Density Ratio after Soak (%) :		**100**	
Nominated % Maximum Dry Density Compaction :	**100**	Field Moisture Content (%) :		**41.0**	
Nominated % Optimum Moisture Content Compaction :	**100**	Moisture Content (Top) after Penetration (%) :		**41.2**	
Achieved Dry Density before Soak (t/m³) :	**1.553**	Optional Moisture Content (Remainder) after Penetration (%) :		**39.3**	
Achieved Percentage of Maximum Dry Density (%) :	**100**	Bearing Ratio 2.5mm (%) :		**2**	
Achieved Moisture Content (%) :	**35.6**	Bearing Ratio 5.0mm (%) :		**2.5**	
Achieved Percentage of Optimum Moisture Content (%) :	**100**	Minimum Specified CBR Value (%) :		**-**	
Test Condition (Soaked/Unsoaked) / Soaking Period (Days) :	**Soaked / 4 days**	**CBR Value (%) :**		**2.5**	
Swell (%) / Surcharge (kg):	**2.0/4.5kg**	+19mm Material (%)	0	Oversize replacement material used (%)	Nil
Soil Description :	Silty CLAY				

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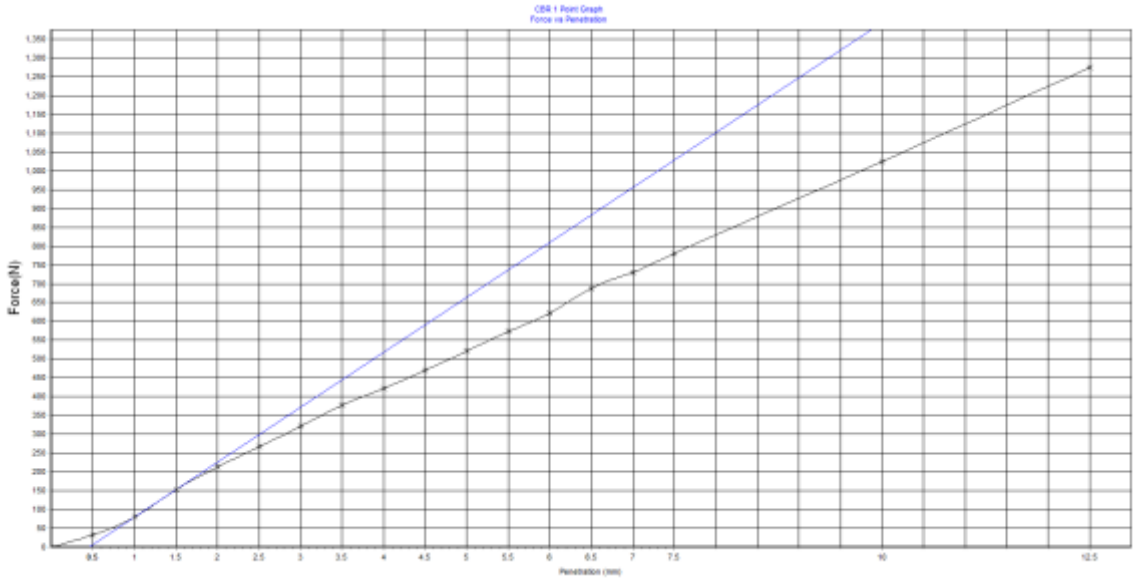
California Bearing Ratio Report (1 Point)

Client:	**Geotech Investigations Pty Ltd**	Report Number:	**K8591/1**
Client address:	**PO Box 6885 Tweed Heads South NSW 2486**		
Job Number:	**BTK 284**	Report Date:	**17/12/2018**
Project:	**Hutley Drive**	Order Number:	
Location	**Lennox Head**	**Page 1 of 1**	
Lab No:	**117361**	Sample Location	
Date Sampled:	**29/11/2018**	Borehole #4	
Date Tested:	**14/12/2018**	0.0 - 1.0m Below	
Sampled By:	**Dean Wedge**	Existing Surface Level	
Sample Method:	**As Received**		
Site Selection :	**Geotech Inv.**	Test Method :	AS1289.6.1.1,2.1.1
For Use As:	**-**	Lot Number:	**-**
Remarks:	**-**	Item Number :	**-**



Maximum Dry Density - MDD (t/m³) :	**1.55**	Duration of Curing (days/hours)	**2d/0h**
Optimum Moisture Content - OMC (%) :	**37.3**	Method of Plasticity Determination	**Visual/Tactile**
Compactive Effort :	**Standard**	Density Ratio after Soak (%) :	**100**
Nominated % Maximum Dry Density Compaction :	**100**	Field Moisture Content (%) :	**36.1**
Nominated % Optimum Moisture Content Compaction :	**100**	Moisture Content (Top) after Penetration (%) :	**43.4**
Achieved Dry Density before Soak (t/m³) :	**1.549**	Optional Moisture Content (Remainder) after Penetration (%) :	**42.1**
Achieved Percentage of Maximum Dry Density (%) :	**100**	Bearing Ratio 2.5mm (%) :	**2.5**
Achieved Moisture Content (%) :	**37.2**	Bearing Ratio 5.0mm (%) :	**3**
Achieved Percentage of Optimum Moisture Content (%) :	**100**	Minimum Specified CBR Value (%) :	**-**
Test Condition (Soaked/Unsoaked) / Soaking Period (Days) :	**Soaked / 4 days**	**CBR Value (%) :**	**3**
Swell (%) / Surcharge (kg):	**1.5/4.5kg**	+19mm Material (%) 0	replacement material used (%) Nil
Soil Description :	Silty CLAY		

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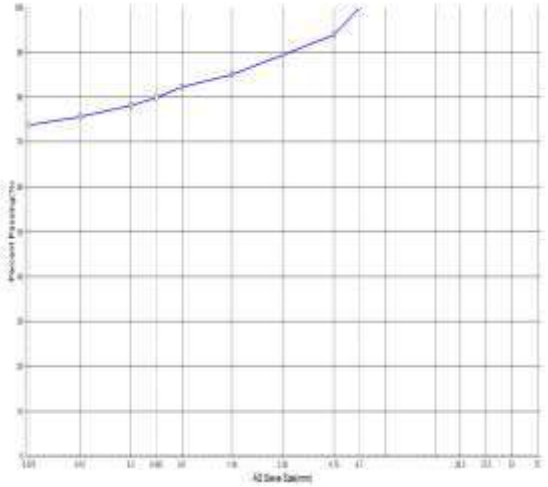
Particle Size Distribution Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8592/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117358**			Sample Location	
Date Sampled:	**29/11/2018**			Borehole #1	
Date Tested:	**13/12/2018**			0.0 - 0.5m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	**-**			Spec Number:	MC
		A.S. Sieve Sizes	Specification Minimum	Percent Passing	Specification Maximum
Test Method:	**AS1289.3.6.1**				
		6.7mm		**100**	
		4.75mm		**94**	
		2.36mm		**89**	
		1.18mm		**85**	
		0.600mm		**82**	
		0.425mm		**80**	
		0.300mm		**78**	
		0.150mm		**75**	
		0.075 mm		**74**	

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GEOTECHNICAL TESTING SERVICES

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Email: info@bordertek.com.au

Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8593/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117359**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Borehole #2	
Date Tested:	**13/12/2018**		Neither	0.0 - 1.0m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**44**	
Plastic Limit (%)		**AS1289.3.2.1**		**25**	
Plastic Index		**AS1289.3.3.1**		**19**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**12.0**	

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Daniel French

RP907-4

BORDER-TEK PTY LTD

GEOTECHNICAL TESTING SERVICES

Border-Tek Pty Ltd ● ABN 35 154 498 156

Office & Laboratory

Address: Unit 11, 21 Enterprise Avenue,
Tweed Heads South, NSW, 2486
Postal: PO Box 6340, Tweed Heads South, NSW, 2486
Phone: 0755 246 199
Email: info@bordertek.com.au

Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8594/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117360**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Boorehole #3	
Date Tested:	**13/12/2018**		Curling	0.3 - 1.0m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**50**	
Plastic Limit (%)		**AS1289.3.2.1**		**28**	
Plastic Index		**AS1289.3.3.1**		**22**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**11.0**	

Accredited for compliance with ISO/IEC 17025 - Testing.
N.A.T.A. Accreditation No. 2851.

Authorised Signatory
Daniel French

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Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8595/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117361**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Borehole #4	
Date Tested:	**13/12/2018**		Curling	0.0 - 1.0m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**58**	
Plastic Limit (%)		**AS1289.3.2.1**		**39**	
Plastic Index		**AS1289.3.3.1**		**19**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**11.0**	

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Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8596/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117362**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Borehole #1	
Date Tested:	**13/12/2018**		Neither	2.0m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**85**	
Plastic Limit (%)		**AS1289.3.2.1**		**34**	
Plastic Index		**AS1289.3.3.1**		**51**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**30.5**	

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Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8597/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117363**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Borehole #2	
Date Tested:	**13/12/2018**		Neither	2.0m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**48**	
Plastic Limit (%)		**AS1289.3.2.1**		**28**	
Plastic Index		**AS1289.3.3.1**		**20**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**15.5**	

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Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8598/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**17/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117364**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Borehole #3	
Date Tested:	**13/12/2018**		Neither	1.5m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**60**	
Plastic Limit (%)		**AS1289.3.2.1**		**29**	
Plastic Index		**AS1289.3.3.1**		**31**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**16.0**	

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Atterberg Limits Report

Client:	**Geotech Investigations Pty Ltd**			Report Number:	**K8599/1**
Client Address:	**PO Box 6885 Tweed Heads South NSW 2486**				
Job Number:	**BTK 284**			Report Date:	**18/12/2018**
Project:	**Hutley Drive**			Order Number:	**-**
Location	**Lennox Head**			**Page 1 of 1**	
Lab No:	**117365**	Sample History :	Air Dried	Sample Location	
Date Sampled:	**29/11/2018**	LS Comments :		Borehole #5	
Date Tested:	**13/12/2018**		Neither	1.0m Below	
Sampled By:	**Dean Wedge**			Existing Surface Level	
Sample Method:	**As Received**				
Material Source:	**-**			Spec Description:	Material Classification
For Use As:	**-**			Lot Number:	-
Remarks:	-			Spec Number:	MC

Plasticity Tests		Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)		**AS1289.3.1.2**		**60**	
Plastic Limit (%)		**AS1289.3.2.1**		**39**	
Plastic Index		**AS1289.3.3.1**		**21**	
Linear Shrinkage (%)		**AS1289.3.4.1**		**12.0**	

Accredited for compliance with ISO/IEC 17025 - Testing.
N.A.T.A. Accreditation No. 2851.

Authorised Signatory
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RP907-4

MAZLAB Pty Ltd
Environmental Testing, Sampling and Drilling (Vibracore)
ABN 90 151 684 436 ACN 151 684 436

U1/ 33 MACHINERY DR., TWEED HEADS SOUTH, 2486
PO BOX 6879 TWEED HEADS SOUTH, 2486
PHONE: (07) 55239922
EMAIL: mazlab@bigpond.com

Client: Geotech Investigations **Project:** Hutley Dr., Lennox Head (GI 4378-a)

Mazlab Job No: GTI 3015 **Date:** 7/12/2018

LABORATORY TEST RESULTS
Certificate of Test Results – ASS Screenings

Sample No.	Client I.D	Soil Description (truncated)	Reaction to H_2O_2	Reaction to HCL	pHf	pHfox
44523	BH1-0.0-0.5	Sandy GRAVEL(GP) pale orange/brown	Low	Nil	4.8	3.4
44524	BH1-0.5-1.0	Sandy CLAY(CH) dark grey with dark orange brown mottling	High	Nil	5.5	2.5
44525	BH1-1.0-1.5	Sandy CLAY(CH) dark grey with dark orange brown mottling	V/High	Nil	5.7	3.0
44526	BH1-1.5-2.0	CLAY(CH) grey/green with dark orange brown mottling	High	Nil	5.7	3.9
44527	BH2-0.0-0.5	Sandy CLAY(CH) red brown	High	Nil	6.4	5.0
44528	BH2-0.5-1.0	Sandy CLAY(CH) dark grey with dark orange brown mottling	V/High	Nil	5.2	1.9
44529	BH2-1.0-1.5	Sandy CLAY(CH) dark grey with dark orange brown mottling	V/High	Nil	5.8	2.3
44530	BH2-1.5-2.0	Sandy CLAY(CH) dark grey with dark orange brown mottling	V/High	Nil	5.9	2.5
44531	BH3-0.0-0.5	Sandy CLAY(CH grey with dark orange brown mottling	Medium	Nil	6.0	2.6
44532	BH3-0.5-1.0	Sandy CLAY(CH grey with dark orange brown mottling	Medium	Nil	5.3	3.8
44533	BH3-1.0-1.5	Sandy CLAY(CH grey	Medium	Nil	5.3	3.0
44534	BH3-1.5-2.0	Sandy CLAY(CH grey	Medium	Nil	5.5	3.4

Checked By: 

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

MAZLAB Pty Ltd
Environmental Testing, Sampling and Drilling (Vibracore)
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PO BOX 6879 TWEED HEADS SOUTH MC., 2486
PHONE: (07) 55239922 FAX: (07) 55239822
EMAIL: mazlab@bigpond.com

Client: Geotech Investigations **Project:** Hutley Dr., Lennox Head (GI 4378-a)

Mazlab Job No: GTI 2015 **Date:** 14/12/2018

LABORATORY TEST RESULTS
Certificate of Test Results – Chromium Reducible Sulphur

Sample No.	Client I.D	Soil Description (truncated)	pH KCL	SCr mol (H+/t) %S	TAA mol (H+/t)	SNAS %S	ANC mol (H+/t) NA= Scr< action limit	Net Acidity mol (H+/t)	Liming Rate (Kg/ dry/ t)
44524	BH1-0.5-1.0	Sandy CLAY(CH) dark grey with dark orange brown mottling	4.0	10 0.02%	159	<0.02%	-	169	13.1
44525	BH1-1.0-1.5	Sandy CLAY(CH) dark grey with dark orange brown mottling	4.1	6 0.01%	92	<0.02%	-	98	7.6
44527	BH2-0.0-0.5	Sandy CLAY(CH) red brown	5.2	5 0.01%	40	-	-	45	3.5
44528	BH2-0.5-1.0	Sandy CLAY(CH) dark grey with dark orange brown mottling	4.5	6 0.01%	128	-	-	134	10.4
44530	BH2-1.5-2.0	Sandy CLAY(CH) dark grey with dark orange brown mottling	4.4	31 0.05%	65	<0.02%	-	96	7.4
44531	BH3-0.0-0.5	Sandy CLAY(CH grey with dark orange brown mottling	4.4	3 <0.01%	67	<0.02%	-	70	5.4
44533	BH3-1.0-1.5	Sandy CLAY(CH grey	4.3	22 0.04%	85	<0.02%	-	107	8.3

Checked By: _____

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

Appendix E

Contaminated Land Search Results

NSW GOVERNMENT | Department of Primary Industries

Cattle dip site locator

This search retrieved 88 dip sites.

For more information about each dip site, click on the name below.

Dip name	Road
ALSTONVILLE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTM2OCZhbGw9MQ%3D%3D)	SHOWGI
ASHLEY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjcyJmFsbD0x)	COOKS L
BACK CHANNEL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTMzNyZhbGw9MQ%3D%3D)	BACK CHANNE ROAD
BAGOTS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjc1JmFsbD0x)	BAGOTV ROAD
BAGOTVILLE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjc0JmFsbD0x)	OLD BAGOTV
BALLINA (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTM3NCZhbGw9MQ%3D%3D)	CANAL R
BARTLETTS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjc2JmFsbD0x)	BARTLE LANE
BEWERS HILL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjczJmFsbD0x)	BRUXNE HIGHWA
BILLABONG (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODI3JmFsbD0x)	BSH/TCH PACIFIC
BROOKLET (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODQ0JmFsbD0x)	FRIDAY H ROAD
CAMPBELL SPRAY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTEzNiZhbGw9MQ%3D%3D)	
CHINKS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODE4JmFsbD0x)	TCK WESTBR LANE
COLLIERS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTQ0MSZhbGw9MQ%3D%3D)	OWENS I
COOLIE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODI5JmFsbD0x)	COOLGA ROAD

COOLIE (OLD) (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTcyOSZhbGw9MQ%3D%3D)	COOLGA ROAD
CORAL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODM1JmFsbD0x)	HENDER LANE
CTRS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTcxNCZhbGw9MQ%3D%3D)	PEARCE RES STA
CTRS NO3 (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTA4OCZhbGw9MQ%3D%3D)	PEARCE RES STA
CUMBALUM (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODAxJmFsbD0x)	INGHAM ROAD
DALWOOD (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjc3JmFsbD0x)	DALWOO ROAD
DILLONS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODEzJmFsbD0x)	DILLONS LANE/GA ROAD
DUCK CREEK SPRAY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTEzOCZhbGw9MQ%3D%3D)	
EAST BALLINA (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTM0OSZhbGw9MQ%3D%3D)	LEE STR
EDGAROI (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODI2JmFsbD0x)	TEVEN & STOKER
EMPIRE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTQ3NiZhbGw9MQ%3D%3D)	MOYLAN LANE -C/
EMPIRE VALE (ZAMIA) (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTQ3NSZhbGw9MQ%3D%3D)	EMPIRE ROAD
FERNANCE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTQ4NCZhbGw9MQ%3D%3D)	PERRYS
FERNLEIGH (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODA4JmFsbD0x)	TCK OFF FERNLEI
FRIDAY HUT (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODA1JmFsbD0x)	FRIDAY H ROAD

FRIDAY HUT (OLD) (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTgwNiZhbGw9MQ%3D%3D)	FRIDAY H ROAD
GARDIES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODA2JmFsbD0x)	COOLGA ROAD
GIRO (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODMxJmFsbD0x)	HOUGHL ROAD
GLEN VALLEY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjgwJmFsbD0x)	MAROM ROAD
HAWKWOOD (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODEwJmFsbD0x)	TEVEN R
HOWARDS CREEK (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODExJmFsbD0x)	HOWARI ROAD
IVYLYN (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjgxJmFsbD0x)	ROUSMI ROAD
KEITH HALL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTM1OCZhbGw9MQ%3D%3D)	KEITH H LANE
KNOCKROW (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODQ1JmFsbD0x)	PACIFIC HIGHWA
LARKINS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjg2JmFsbD0x)	MAROM ROAD
LAUREL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODAwJmFsbD0x)	PACIFIC HIGHWA
LEESONS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODAyJmFsbD0x)	WHITES
LOVES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNzk5JmFsbD0x)	BALLINA LENNOX
LUMLEYS LANE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjgzJmFsbD0x)	LUMLEY
LYNWOOD (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjg1JmFsbD0x)	WARDEL ROAD
MARTINS LANE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODQyJmFsbD0x)	MARTIN
MCLEANS RIDGES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjcxJmFsbD0x)	MCLEAN RIDGES

MEANEYS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNzk4JmFsbD0x)	TARA DO ROAD
MONS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTU2MyZhbGw9MQ%3D%3D)	TCK OFF WALSHS
MT JOY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODQwJmFsbD0x)	FERNLEI ROAD
NANCYS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjkwJmFsbD0x)	THURGA LANE
NEVET (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODE0JmFsbD0x)	TEVEN R
NEW NEWRYBAR (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODMwJmFsbD0x)	PACIFIC HIGHWA
NEWRYBAR (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTE1NiZhbGw9MQ%3D%3D)	PACIFIC HIGHWA
NORTH CREEK (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODIxJmFsbD0x)	NORTH C ROAD
NUTREE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODE2JmFsbD0x)	URALBA
PAULS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNzE1JmFsbD0x)	EYEARS HUMPTY
PEARCES CREEK SPRAY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTMwMCZhbGw9MQ%3D%3D)	
PERRYS HILL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODEyJmFsbD0x)	TEAKWO DRIVE
PICCADILLY HILL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODQ3JmFsbD0x)	PICCADI HILL RO/
PIMLICO (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODA3JmFsbD0x)	PIMLICO
PRIDDLES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODA5JmFsbD0x)	HOUGHL CREEK R
QUINLANS SPRAY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTI2MyZhbGw9MQ%3D%3D)	
ROSS LANE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODIyJmFsbD0x)	ROSS LA

ROUS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjg4JmFsbD0x)	ELLIS RC
ROUS MILL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjkyJmFsbD0x)	DALWOC ROAD
SANDY FLAT (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODA0JmFsbD0x)	SANDY F ROAD
SKINNERS CREEK (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODMyJmFsbD0x)	PACIFIC HIGHWA
SNEATHS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjkxJmFsbD0x)	SNEATH
SNEESBYS LANE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTcxOCZhbGw9MQ%3D%3D)	SNEESB LANE
SOUTH BALLINA (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTYzMCZhbGw9MQ%3D%3D)	STH BAL BEACH F
SPOORS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODM2JmFsbD0x)	FIG TREE DRIVE
TAMBO (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODI0JmFsbD0x)	NORTH T ROAD
TEVEN (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODIzJmFsbD0x)	TCK OFF ELTHAM
TINTENBAR (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODAzJmFsbD0x)	FRIDAY H ROAD
TRIMBLES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNzA3JmFsbD0x)	TOOHEY ROAD
TUCKOMBIL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODE1JmFsbD0x)	TEVEN R
UPPER TEVEN (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODI4JmFsbD0x)	ELTHAM TEVEN R
URALBA (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODE3JmFsbD0x)	T/CK LOVEGR LANE
VALLEY GROVE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODIwJmFsbD0x)	GAP ROA
WARDELL (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTMyMiZhbGw9MQ%3D%3D)	BATH ST

WATSONS LANE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTMxMCZhbGw9MQ%3D%3D)	OLD BYR BAY ROA
WATSONS LANE (OLD) (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTY5OSZhbGw9MQ%3D%3D)	OLD BYR BAY ROA
WHITES SPRAY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTMwOCZhbGw9MQ%3D%3D)	
WILLOWBANK (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGODE5JmFsbD0x)	SNEATH
WOLLONGBAR (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjk1JmFsbD0x)	LINDENI ROAD
WOOLLEYS NO 2 SPRAY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGMTI0NiZhbGw9MQ%3D%3D)	
YOUNGMAN CREEK (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjk2JmFsbD0x)	MAROM ROAD
ZEUS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZidGMuZHBpLm5zdy5nb3YuYXUlMkZEaXAlMkZEZXRhaWxzJTJGNjk3JmFsbD0x)	BAGOTV ROAD

Find dip sites

Dip name

Road

Town/Locality

Council ---select all---

Search

The information contained in this web page is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Industry& Investment NSW or the user's independent adviser.

Home Contaminated land Record of notices

Search results

Your search for:LGA: Ballina Shire Council

Matched 6 notices relating to 3 sites.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
LENNOX HEAD	13 Fig Tree Hill DRIVE	Spoors Dip	1 former
MCLEANS RIDGES	McLeans Ridges ROAD	Dip 5157 Ridges	1 former
WEST BALLINA	Pacific HIGHWAY	Caltex Big Prawn Service Station	4 former

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9 January 2019

Appendix F

Road Traffic Noise Impact Assessment

CRGACOUSTICS

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CRG Acoustics Pty Ltd
ACN 151 847 255 ABN 11 708 556 182

Hutley Drive Extension
Lennox Head

ROAD TRAFFIC
NOISE IMPACT ASSESSMENT

Prepared For

Ballina Shire Council

20 December 2018

crgref: 18122 report rev.1

1.0 INTRODUCTION

This report is in response to a request by Ballina Shire Council for a road traffic noise impact assessment of the proposed extension of Hutley Drive to Byron Bay Road at Lennox Head.

Ballina Shire Council has requested the assessment to predict road traffic noise impacts from the Hutley Drive extension and provide mitigation measures to reduce the impacts on the four residential properties to the west of the project. Council has advised that the property / building directly to the east is owned by Council and the final use for this residual land is yet to be determined.

This report is a revision to a previous assessment (CRGref: 18122 report dated November 2018) as Ballina Shire Council has advised that upon more recent analysis the percentage of heavy vehicles for the Hutley Drive extension can be reduced from 10% down to 3% as previous traffic data was collected during construction works of surrounding subdivisions. Further, the posted speed limit will be reduced from 60 km/hr to 50 km/hr. The reduced percentage of heavy vehicles and reduced posted speed limit have resulted in and approximate road traffic noise reduction of 2.6 dB(A) at the assessed receiver locations.

We note that it is ultimately Ballina Shire Council that will decide how best to manage road traffic noise emissions from the Hutley Drive extension in light of other considerations such a residential amenity, urban design impacts, cost of construction and ongoing maintenance; given that CRG Acoustics cannot provide discussion on the other planning constraints.

2.0 SITE & DEVELOPMENT DESCRIPTION

Hutley Drive extension is intended to be constructed between years 2019 and 2020 and will connect the existing Hutley Drive section to Byron Bay Road. For site location refer to Appendix A.

The proposed Hutley Drive extension is predicted to carry in the order of approximately 10,000 vehicles per day by year 2036 with 3% being heavy vehicles. The speed limit on Hutley Drive extension is planned at 50 km/hr. The configuration of the road is generally a single lane in each direction, undivided carriageway, except for the northern entry to Byron Bay Road which will be two lanes in each direction. The intersection to Byron Bay Road is planned as a new roundabout. Refer to Appendix B for the proposed road plan.

Road traffic noise from the Hutley Drive extension has been assessed in accordance with the *"NSW Road Noise Policy"* (RNP).

The nearest noise sensitive receivers to the road extension (as requested to be assessed by Council) are dwellings to the immediate west being Numbers 3, 5, 7 and 9 Ocean Breeze Drive.

As noted previously, the dwelling to the immediate east of the road extension (i.e. No. 9 Byron Bay Road) is owned by Council and falls within the same parcel of land as the road extension (being Lot 2 on DP620838). The dwelling is therefore deemed to be non-noise sensitive. Application of the house for residential purposes in the future (i.e. after construction of the road extension) would be at the discretion of Council.

3.0 AMBIENT NOISE SURVEY

3.1 Instrumentation

The following equipment was used to record ambient noise levels at the subject site.

- Rion NC 73 Calibrator; and
- Rion NL 21 Environmental Noise Loggers.

All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory.

3.2 Unattended Road Traffic Noise Measurement Methodology

Loggers were located at three locations across the subject site. The loggers were located in free-field locations with the microphones approximately 1.4m above ground. The loggers were located at 30m (Northern Logger Location), 50m (Central Logger Location) and 120m (Southern Logger Location) from the nearest lane of Byron Bay Road (i.e. generally the main contributing noise source of ambient conditions). Refer to Figure 1 in Appendix A for the logger locations.

The loggers were set to record noise statistics in 15 minute blocks continually between Thursday 13/09/2018 and Thursday 20/09/2018.

Road traffic noise levels were conducted generally in accordance with Australian Standard AS2702 - 1984 *"Acoustics - Methods for the measurement of road traffic noise*".

The operation of the sound level logging equipment was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Weather conditions during the monitoring period were obtained from the Bureau of Meteorology website from the Ballina weather station. Weather conditions were generally fine (except for 6mm of rain on Monday 17/09 which did not affect the measured levels), a temperature range between 7 and 26ºC, a relative humidity range between 55 and 80%.

3.3 Unattended Road Traffic Noise Measurement Results

Table 1 below presents the measured ambient noise levels from the logger locations. Graphical presentation of the measured noise levels from the logger are presented in the Appendix C.

Northern Logger: 30m from the Nearest Lane of Byron Bay Road

Traffic Noise	Time Period	Measured Levels dB(A)				
		17/09/2018	18/09/2018	19/09/2018	20/09/2018	Average
$L_{10\ 18hr}$	6am to Midnight	57	56	57	58	57
$L_{eq\ 24hr}$	7am to 7am	54	53	54	54	54
$L_{eq\ 15hr}$	7am to 10pm	55	55	55	55	55
$L_{eq\ 9hr}$	10pm to 7am	50	50	49	50	50

Central Logger: 50m from the Nearest Lane of Byron Bay Road

Traffic Noise	Time Period	Measured Levels dB(A)				
		17/09/2018	18/09/2018	19/09/2018	20/09/2018	Average
$L_{10\ 18hr}$	6am to Midnight	51	52	54	53	53
$L_{eq\ 24hr}$	7am to 7am	50	50	52	50	51
$L_{eq\ 15hr}$	7am to 10pm	52	52	53	52	52
$L_{eq\ 9hr}$	10pm to 7am	46	45	47	47	46

Southern Logger: 120m from the Nearest Lane of Byron Bay Road

Traffic Noise	Time Period	Measured Levels dB(A)				
		17/09/2018	18/09/2018	19/09/2018	20/09/2018	Average
$L_{10\ 18hr}$	6am to Midnight	48	49	51	50	49
$L_{eq\ 24hr}$	7am to 7am	47	47	50	47	47
$L_{eq\ 15hr}$	7am to 10pm	48	48	51	48	48
$L_{eq\ 9hr}$	10pm to 7am	47	45	45	44	45

Table 1: Measured ambient noise levels at the logger locations.

It is noted that data collected on Wednesday 19/09/18 at the southern logger may have been Affected by extraneous noise, as they are between 2 - 3 dB above the other weekday measured levels (refer to Table 1 above for the $L_{10\ 18hr}$, $L_{eq\ 24hr}$ and $L_{eq\ 15hr}$). For this reason the Wednesday data has been excluded from the averaged results for the southern logger.

Road traffic noise on Friday 14/09/2018 has also been excluded from Table 1 for all logger locations due to extraneous noise/s at around Midday affecting all logger locations (refer to the graphical presentations in Appendix C).

4.0 NOISE CRITERION

The following noise criterion as presented within Tables 3 and 6 of the *"NSW Road Noise Policy"* for new roads (Hutley Drive extension) impacting existing residences.

It is noted that Hutley Road is considered to be a sub-arterial road given that it provides access to local streets along Hutley Drive to Byron Bay Road (i.e. Byron Bay Road is considered an arterial road).

Table 3 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub-arterial roads 3. Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)

Table 6 Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.– 7 a.m.)
Freeway/arterial/ sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,\ (15\ hour)}$ + 12 dB (external)	Existing traffic $L_{Aeq,\ (9\ hour)}$ + 12 dB (external)

5.0 PREDICTED TRAFFIC NOISE IMPACTS

The year 2036 traffic volume of 10,000 vehicles per day, 3% heavy vehicles, for the Hutley Drive extension was obtained from Ballina Shire Council.

To calculate the L_{Aeq} 24hr, 15hr, 9hr and 1hr levels (daytime and night-time periods), we have applied the measured levels from the northern logger location (Refer to Table 1 of Section 3) given that it is nearest Byron Bay Road (measured at approximately 30m from the nearest lane of Byron Bay Road) and would best represent existing traffic noise levels for a local sub-arterial / arterial road.

Road traffic noise modelling was conducted using PEN3D, which is based upon the *"CoRTN"* (Control of Road Traffic Noise) method produced by the UK Department of Transport 1988. As the Hutley Drive extension is yet to be constructed, model verification was unable to be undertaken. From previous work conducted in NSW the PEN3D model is generally within the allowable 2 dB deviation of the measured road traffic noise levels.

Based upon the year 2036 traffic volumes presented above, the PEN3D model predicts the following façade corrected traffic noise levels as presented in Tables 2, 3, 4 and 5. Noise contours has been provided in Figures 5.1, 5.2, 5.3 and 5.4.

The predicted levels provided in each Table / Figure explore the range of reasonable and practicable acoustic treatment scenarios that could be applied within the Hutley Drive extension road corridor to mitigate road noise impacts at the surrounding noise sensitive receivers.

The following describes the acoustic treatments scenarios assessed within each Table / Figure:

Scenario 1 - Table 2 / Figure 5.1: Predicted road traffic noise impact with no acoustic treatments. The road has a posted speed limit of 50 km/hr and a Dense Graded Asphalt (DGA) road surface.

Scenario 2 - Table 3 / Figure 5.2: Predicted road traffic noise impact with a 1.8m high acoustic barrier scenario. The road has a posted speed limit of 50 km/hr and a Dense Graded Asphalt (DGA) road surface.

Scenario 3 - Table 4 / Figure 5.3: Predicted road traffic noise impact with a 2.3m high acoustic barrier scenario (which achieves compliance with the criterion at the four assessed dwellings). The road has a posted speed limit of 50 km/hr and a Dense Graded Asphalt (DGA) road surface.

Scenario 3 - Table 5 / Figure 5.4: Predicted road traffic noise impact with a 2.0m high acoustic barrier scenario (which achieves compliance with the criterion at the four assessed dwellings). Modelling also assumes Open Graded Asphalt (OGA) OR Stone Mastic Asphalt (SMA) road surface, hence application of a minus 1 dB correction was applied to the road noise model.

For acoustic barrier details refer to Sketch No.1 in Appendix A (1.8m barrier solution), Sketch No.2 (2.3m acoustic barrier solution) and Sketch No.3 (2.0m barrier solution with OGA / SMA road surface).

The following parameters were also used in the PEN3D model scenarios for Hutley Drive extension:

- 2.5 dB(A) façade correction for building façade predictions.
- Year 2036 road traffic volumes presented.
- 3% of the daily traffic volumes assumed to be heavy vehicles.
- ARRB correction for Australian conditions of -1.7 dB at façade and -0.7 dB free-field.
- Minus (-) 3 dB adjustment to the model to determine the $L_{Aeq\ 24hr}$ from the $L_{A10\ 18hr.}$
- L_{Aeq} 15hr and 9hr levels based on the measured differences from the northern logger location nearest Byron Bay Road (outlined in Table 1 of Section 3).
- Road grade and finished ground levels of residential lots soured from Ballina Shire Council as 3D dxf AutoCAD file.
- Ground level façade receiver height of 1.8m above ground level.
- Ground level recreation receiver height of 1.5m above ground level.
- For location of the assessed noise sensitive receivers refer to Figure 1 in Appendix A.
- For PEN3D calculation results refer to Appendix C.

In relation to the predicted road traffic noise impacts under the no acoustic barrier scenario (refer to Table 2 and Figure 5.1), comparing the predicted impacts with the existing measured levels, the southern dwelling (No. 9 Ocean Breeze Drive) has road traffic noise levels at 14 dB above existing measured levels (i.e. compared to the southern logger data in Table 1 of Section 3). Given that the *"Relative Increase"* criteria (Table 6 of the NSW Road Noise Policy) only allows for a 12 dB increase acoustic treatments should be considered for this receiver. Therefore, additional acoustic treatment scenarios have been provided for the dwelling at No. 9 Ocean Breeze Drive.

As noted in Section 2, the dwelling to the immediate east of the road extension is owned by Council and is therefore deemed to be non-noise sensitive. Application of the house for residential purposes after construction of the road extension would be at the discretion of Council.

NO ACOUSTIC BARRIERS CONSTRUCTED (50 km/hr)

Dwelling No.	Predicted Year 2036 Road Traffic Noise Imapcts dB(A)			Exceedances of Criteria	
	$L_{Aeq\,(24hr)}$	$L_{Aeq\,(15hr)}$	$L_{Aeq\,(9hr)}$	Daytime	Night-time
Ground Floor Building Façade Receivers (Façade Corrected)					
No.3	51	52	47	-3.5	-3.5
No.5	51	52	47	-3.0	-3.0
No.7	55	56	51	0.6	0.6
No.9	63	64	59	8.5	8.5
Ground Floor Outdoor Recreation Receivers (Free-field)					
No.3	50	51	46	-4.9	-4.9
No.5	51	52	47	-3.5	-3.5
No.7	52	53	48	-2.6	-2.6
No.9	57	58	53	2.3	2.3
Adopted External Noise Criterion		**55**	**50**		

Table 2: Scenario 1 - Predicted traffic noise levels from Hutley Drive extension (no barrier treatments).

$L_{Aeq\ 24hr}$

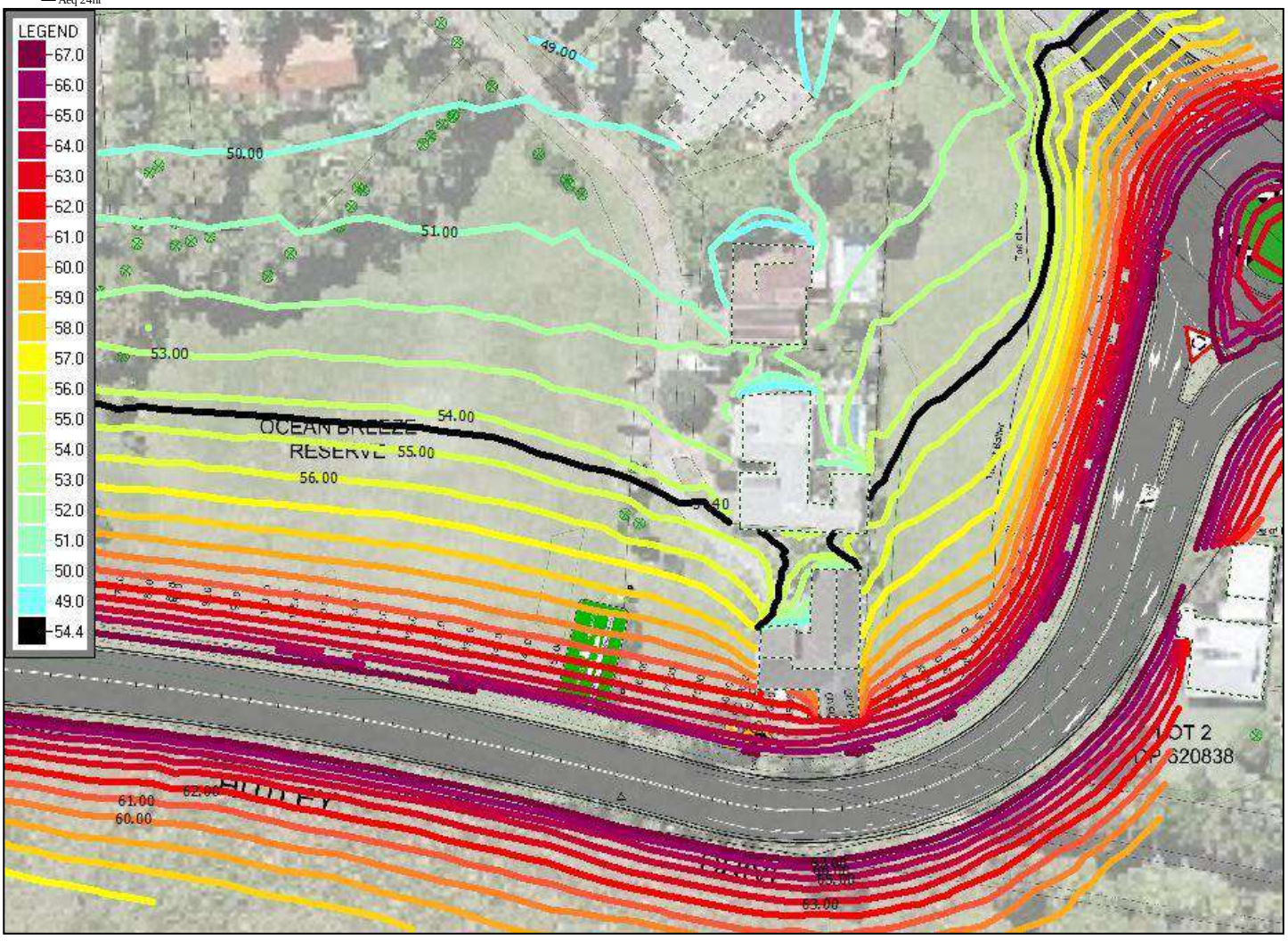


Figure 5.1: No Barrier Treatment, Scenario 1 – 1.8m Receiver Height, Façade Corrected Noise Contours ($L_{Aeq\ 24hr}$ Levels).

1.8m HIGH ACOUSTIC BARRIER CONSTRUCTED (50 km/hr)

Dwelling No.	Predicted Year 2036 Road Traffic Noise Imapcts dB(A)			Exceedances of Criteria	
	$L_{Aeq\ (24hr)}$	$L_{Aeq\ (15hr)}$	$L_{Aeq\ (9hr)}$	Daytime	Night-time
Ground Floor Building Façade Receivers (Façade Corrected)					
No.3	50	51	46	-4.4	-4.4
No.5	50	51	46	-4.3	-4.3
No.7	52	53	48	-2.7	-2.7
No.9	56	57	52	1.5	1.5
Ground Floor Outdoor Recreation Receivers (Free-field)					
No.3	49	50	45	-5.8	-5.8
No.5	50	51	46	-4.8	-4.8
No.7	50	51	46	-4.5	-4.5
No.9	53	54	49	-1.7	-1.7
Adopted External Noise Criterion		**55**	**50**		

Table 3: Scenario 2 - Predicted traffic noise levels from Hutley Drive extension (1.8m high acoustic barrier).

$L_{Aeq\ 24hr}$

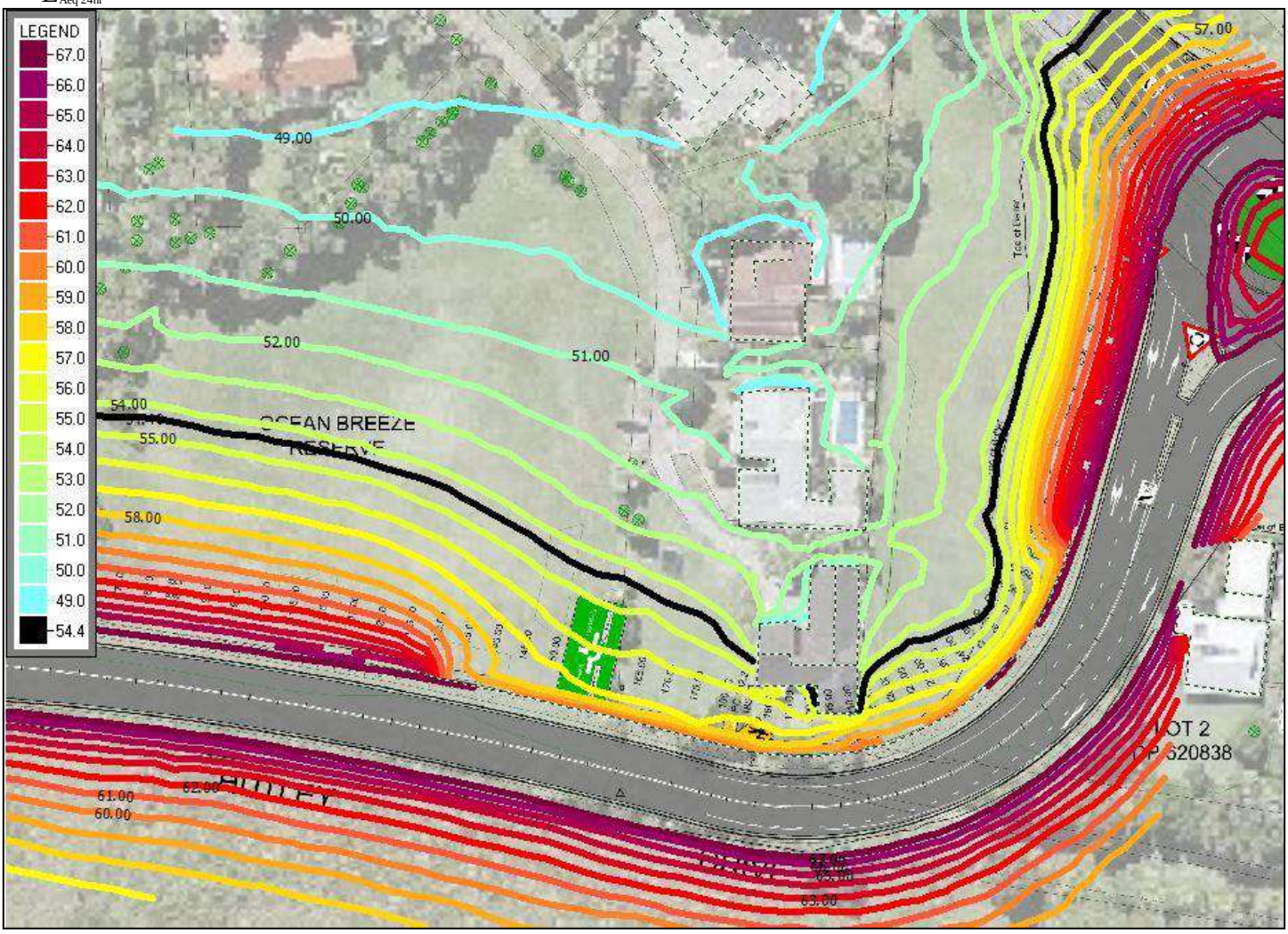


Figure 5.2: 1.8m High Acoustic Barrier, Scenario 2 – 1.8m Receiver Height, Façade Corrected Noise Contours ($L_{Aeq\ 24hr}$ Levels).

2.3m HIGH ACOUSTIC BARRIER CONSTRUCTED (50 km/hr)

Dwelling No.	Predicted Year 2036 Road Traffic Noise Imapcts dB(A)			Exceedances of Criteria	
	$L_{Aeq\,(24hr)}$	$L_{Aeq\,(15hr)}$	$L_{Aeq\,(9hr)}$	Daytime	Night-time
Ground Floor Building Façade Receivers (Façade Corrected)					
No.3	50	51	46	-4.6	-4.6
No.5	50	51	46	-4.6	-4.6
No.7	51	52	47	-3.2	-3.2
No.9	54	55	50	-0.1	-0.1
Ground Floor Outdoor Recreation Receivers (Free-field)					
No.3	48	49	44	-6.0	-6.0
No.5	49	50	45	-5.0	-5.0
No.7	50	51	46	-4.8	-4.8
No.9	52	53	48	-2.5	-2.5
Adopted External Noise Criterion		**55**	**50**		

Table 4: Scenario 3 - Predicted traffic noise levels from Hutley Drive extension (2.3m high acoustic barrier).

$L_{Aeq\,24hr}$

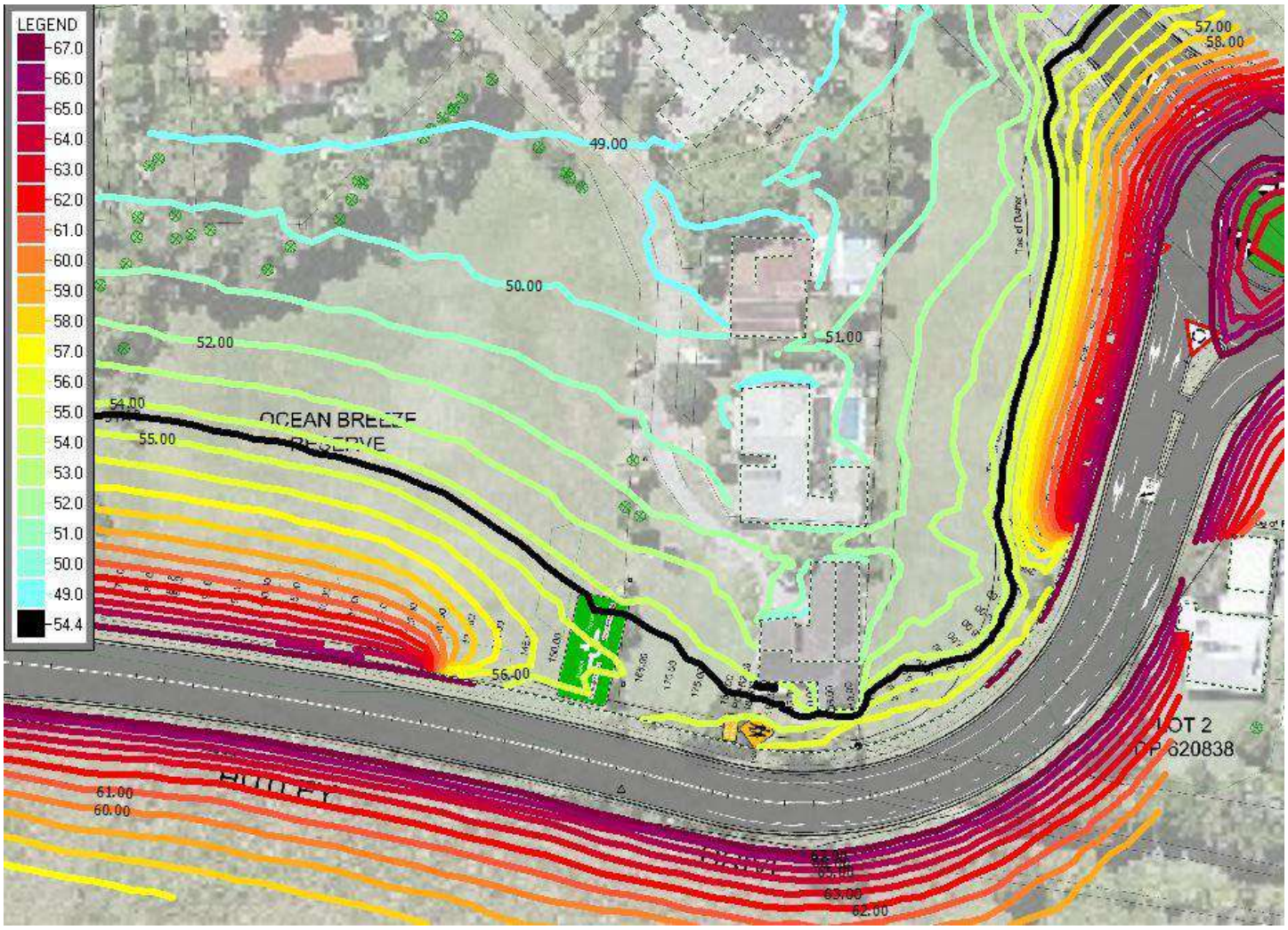


Figure 5.3: 2.3m High Acoustic Barrier, Scenario 3 – 1.8m Receiver Height, Façade Corrected Noise Contours ($L_{Aeq\,24hr}$ Levels).

2.0m HIGH ACOUSTIC BARRIER CONSTRUCTED WITH OGA / SMA SURFACE (50 km/hr)

Dwelling No.	Predicted Year 2036 Road Traffic Noise Imapcts dB(A)			Exceedances of Criteria	
	$L_{Aeq\,(24hr)}$	$L_{Aeq\,(15hr)}$	$L_{Aeq\,(9hr)}$	Daytime	Night-time
Ground Floor Building Façade Receivers (Façade Corrected)					
No.3	49	50	45	-5.5	-5.5
No.5	49	50	45	-5.4	-5.4
No.7	51	52	47	-3.9	-3.9
No.9	54	55	50	-0.2	-0.2
Ground Floor Outdoor Recreation Receivers (Free-field)					
No.3	48	49	44	-6.9	-6.9
No.5	49	50	45	-5.9	-5.9
No.7	49	50	45	-5.6	-5.6
No.9	51	52	47	-3.0	-3.0
Adopted External Noise Criterion		**55**	**50**		

Table 5: Scenario 4 - Predicted traffic noise levels from Hutley Drive extension (2.0m high acoustic barrier OGA / SMA).

$L_{Aeq\,24hr}$

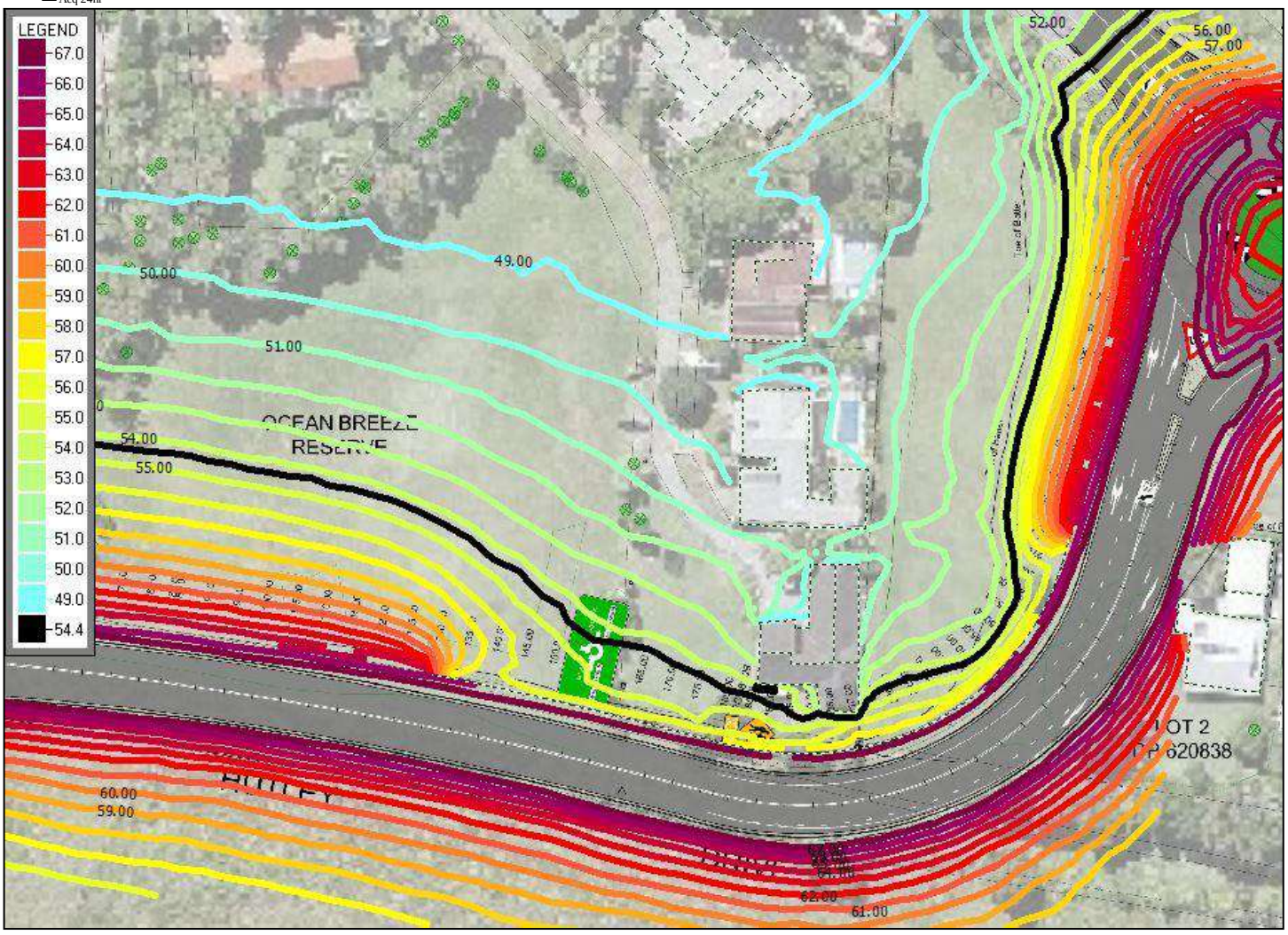


Figure 5.4: 2.0m High Acoustic Barrier OGA / SMA, Scenario 4 – 1.8m Receiver Height, Façade Corrected Noise Contours ($L_{Aeq\,24hr}$ Levels).

6.0 DISCUSSION and CONCLUSIONS

Ballina Shire Council has requested the assessment of the proposed Hutley Drive extension to predict road traffic noise impacts in year 2036 and provide mitigation measures to reduce the impacts on the four residential properties to the west of the project (being Nos. 3, 5, 7 and 9 Ocean Breeze Drive).

This report provides road traffic noise modelling to assist Ballina Shire Council in making an informed decision on which acoustic treatments should be incorporated to mitigate road traffic noise from the Hutley Road extension.

Road traffic noise modelling conducted in Section 5 has assessed four acoustic treatment scenarios which are as follows:

1. No acoustic barrier treatment (i.e. base scenario).
2. Construction of a 1.8m high acoustic barrier.
3. Construction of a 2.3m high acoustic barrier (compliance with the criterion at all dwellings).
4. Construction of a 2.0m high acoustic barrier (compliance with the criterion at all dwellings) with a road surface of either Open Graded Asphalt (OGA) or Stone Mastic Asphalt (SMA).

With regards to predicted road traffic noise impacts under the no acoustic barrier scenario, the predicted impact at the southern dwelling (No. 9 Ocean Breeze Drive) is 14 dB above existing measured levels (i.e. compared to the southern logger data). Given that the *"Relative Increase"* criteria (Table 6 of the NSW Road Noise Policy) only allows for a 12 dB increase, acoustic treatments should be considered for this receiver to mitigate road traffic noise impacts. Therefore, the additional acoustic treatment scenarios have been provided.

In relation to the additional acoustic treatment scenarios, the NSW Road Traffic Noise Policy states the following with regards to determining reasonable measures to mitigating road traffic noise:

> *"Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the abatement measure. To make such a judgement, consideration may be given to:*
>
> *noise impacts:*
> *– existing and future levels of noise, and projected changes in noise levels*
> *– the level of amenity before a road or land use project was initiated, e.g. number of people affected or annoyed*
> *– any noise criteria for associated land use development e.g. internal noise goals for certain rooms*
> *– the amount by which the criteria are exceeded*

 noise mitigation benefits:
– the amount of noise reduction expected including the cumulative effect of proposed abatement measures; ideally, a noise wall/mound should be able to reduce noise levels by at least 5 decibels
– the potential ability of the abatement measure to reduce noise during both construction and operational stages of the project
- the number of people protected

 cost effectiveness of noise mitigation:
– the total cost of mitigation measures, taking into account the physical attributes of the site, e.g. topography, geology, and the cost variation to the project given the expected benefit
– noise mitigation costs compared with total project costs, taking into account capital and maintenance costs
– operational and maintenance costs borne by the community, e.g. running air conditioners or mechanical ventilation

 community views:
– engagement with affected land users when deciding about urban design and aesthetic considerations and other impacts of noise abatement measures
– the views of all affected land users, not just those making complaints, determined through early community consultation
– measures with the most support from the affected community." (Section 3.3.2).

Based upon the predicted road traffic noise impacts for the assessed four acoustic treatment scenarios we present the following commentary:

- From external building façade noise predictions presented in Tables 2, 3, 4 and 5 (Figures 5.1, 5.2, 5.3 and 5.4), road traffic noise is predicted to exceed the external noise criterion of 55 dB(A) $L_{eq\ 15hr}$ and 50 dB(A) $L_{eq\ 9hr}$ at the dwelling at No. 9 Ocean Breeze Drive by 8.5 dB and at No. 7 Ocean Breeze Drive by 0.6 dB. Predicted impacts at the northern two dwellings (i.e. Nos. 3 and 5 Ocean Breeze Drive) are predicted to comply with the criterion without acoustical treatments.

- Construction of a 1.8m high acoustic barrier at No. 9 Ocean Breeze Drive is predicted to provide a noise reduction of approximately 7 dB compared to the no barrier scenario (with a predicted 1.5 dB exceedance of the criterion). A 2.3m high barrier (or 2.0m barrier with OGA / SMA road surface) are predicted to provide 8.6 dB noise reductions compared to the no barrier scenario (to achieve compliance with the criterion). Therefore, construction a 2.3m high barrier (or 2.0m barrier with OGA / SMA road surface) are predicted to provide an additional 1.6 dB noise reduction over the 1.8m high acoustic barrier scenario.

- Based upon the predicted road traffic noise impacts at No. 7 Ocean Breeze Drive, the 0.6 dB noise exceedance under the no barrier scenario is expected to be mitigated by all of the proposed acoustic barrier scenarios.

- It is generally considered that the average person cannot typically detect a 3 dB variation in sound pressure level; with a 5 dB variation being clearly detectable. A 10 dB variation is generally considered to be a perceived halving / doubling in sound pressure level. The 1.8m high barrier scenario would therefore provide a perceivable noise reduction at No. 9 Ocean Breeze Drive compared to the no acoustic barrier scenario (7 dB reduction); with the 2.3m high barrier (or 2.0m barrier with OGA / SMA road surface) providing almost a perceivable halving in road traffic noise (8.6 dB reduction).

- The 2.3m high acoustic barrier (or 2.0m barrier with OGA / SMA road surface) would unlikely provide a perceivable noise difference in road traffic noise levels compared to the 1.8m high acoustic barrier scenario at No. 9 Ocean Breeze Drive (an additional 1.5 dB reduction in road traffic noise).

- The noise exceedance predicted at No. 7 Ocean Breeze Drive is 0.6 dB (no acoustic barrier scenario) would unlikely be detectable to the human ear.

Should the 1.8m high, 2.0m high or 2.3m high acoustic barriers be constructed, for detailed barrier design engineering guidelines and material selection refer to the NSW RTA's QA Specification R271 "*Design and Construction of Noise Walls"* and the NSW RTA's *"Noise Wall Design Guideline"*.

Ultimately it is Ballina Shire Council that will decide how best to manage road traffic noise emissions from Hutley Drive extension in light of other considerations such a residential amenity, urban design impacts, cost of construction and ongoing maintenance, given that CRG Acoustics cannot provide discussion on the other planning constraints. The current NSW Road Traffic Noise Policy provides guidance on how to decide upon reasonable measures to mitigating road traffic noise (refer to Section 3.3 of the document), which should assist Ballina Shire Council in their final decision.

Report Reviewed By:

JAY CARTER BSc
Director

Report Compiled by:

Matthew Lopez BEng
Consultant

APPENDIX A

Subject Site Location and Acoustic Barrier Sketches

Figure No. 1: Subject Site, Noise Measurement Locations and Assessed Dwelling Receivers (Google Earth with the NSW GLOBE Overlay).

Sketch No. 1: Road Extension Layout and 1.8m High Acoustic Barrier Scenario (Not to Scale).

1.8m High Barrier Details			
Chainage (m)	Ground R.L. (m)	Top of Barrier R.L. (m)	Overall Barrier Height (m)
130	15.7	17.50	1.80
135	15.9	17.70	1.80
140	16.0	17.80	1.80
145	16.2	18.00	1.80
150	16.4	18.20	1.80
155	16.6	18.40	1.80
160	16.8	18.60	1.80
165	17.1	18.90	1.80
170	17.3	19.10	1.80
175	17.6	19.40	1.80
180	17.8	19.60	1.80
185	18.1	19.90	1.80
190	18.3	20.10	1.80
195	18.6	20.40	1.80
200	18.9	20.70	1.80
205	19.2	21.00	1.80
210	19.5	21.30	1.80
215	19.8	21.60	1.80
220	20.1	21.90	1.80
225	20.4	22.20	1.80
230	20.7	22.50	1.80
235	21.0	22.80	1.80
240	21.3	23.10	1.80
245	21.6	23.40	1.80
250	21.9	23.70	1.80
255	22.2	24.00	1.80
260	22.5	24.30	1.80
265	22.8	24.60	1.80
270	23.0	24.80	1.80
275	23.3	25.10	1.80

ACOUSTIC TREATMENT LEGEND

Recommended 1.8m high barrier constructed above the top of the embankment to achieve the top of barrier R.L. shown above in the sketch.

Barriers are to be constructed free of gaps and holes. For detailed barrier design engineering guidelines and material selection refer to the NSW RTA's QA Specification R271 *"Design and Construction of Noise Walls"* and the NSW RTA's *"Noise Wall Design Guideline"*.

Sketch No. 2: Road Extension Layout and 2.3m High Acoustic Barrier Scenario (Not to Scale).

2.3m High Barrier Details			
Chainage (m)	Ground R.L. (m)	Top of Barrier R.L. (m)	Overall Barrier Height (m)
130	15.7	18.00	2.30
135	15.9	18.20	2.30
140	16.0	18.30	2.30
145	16.2	18.50	2.30
150	16.4	18.70	2.30
155	16.6	18.90	2.30
160	16.8	19.10	2.30
165	17.1	19.40	2.30
170	17.3	19.60	2.30
175	17.6	19.90	2.30
180	17.8	20.10	2.30
185	18.1	20.40	2.30
190	18.3	20.60	2.30
195	18.6	20.90	2.30
200	18.9	21.20	2.30
205	19.2	21.50	2.30
210	19.5	21.80	2.30
215	19.8	22.10	2.30
220	20.1	22.40	2.30
225	20.4	22.70	2.30
230	20.7	23.00	2.30
235	21.0	23.30	2.30
240	21.3	23.60	2.30
245	21.6	23.90	2.30
250	21.9	24.20	2.30
255	22.2	24.50	2.30
260	22.5	24.80	2.30
265	22.8	25.10	2.30
270	23.0	25.30	2.30
275	23.3	25.60	2.30

ACOUSTIC TREATMENT LEGEND

Recommended 2.3m high barrier constructed above the top of the embankment to achieve the top of barrier R.L. shown above in the sketch.

Barriers are to be constructed free of gaps and holes. For detailed barrier design engineering guidelines and material selection refer to the NSW RTA's QA Specification R271 "*Design and Construction of Noise Walls"* and the NSW RTA's *"Noise Wall Design Guideline"*.

Sketch No. 3: Road Extension Layout and 2.0m High Acoustic Barrier with OGA or SMA Road Surface Scenario (Not to Scale).

2.0m High Barrier Details			
Chainage (m)	Ground R.L. (m)	Top of Barrier R.L. (m)	Overall Barrier Height (m)
130	15.7	17.70	2.00
135	15.9	17.90	2.00
140	16.0	18.00	2.00
145	16.2	18.20	2.00
150	16.4	18.40	2.00
155	16.6	18.60	2.00
160	16.8	18.80	2.00
165	17.1	19.10	2.00
170	17.3	19.30	2.00
175	17.6	19.60	2.00
180	17.8	19.80	2.00
185	18.1	20.10	2.00
190	18.3	20.30	2.00
195	18.6	20.60	2.00
200	18.9	20.90	2.00
205	19.2	21.20	2.00
210	19.5	21.50	2.00
215	19.8	21.80	2.00
220	20.1	22.10	2.00
225	20.4	22.40	2.00
230	20.7	22.70	2.00
235	21.0	23.00	2.00
240	21.3	23.30	2.00
245	21.6	23.60	2.00
250	21.9	23.90	2.00
255	22.2	24.20	2.00
260	22.5	24.50	2.00
265	22.8	24.80	2.00
270	23.0	25.00	2.00
275	23.3	25.30	2.00

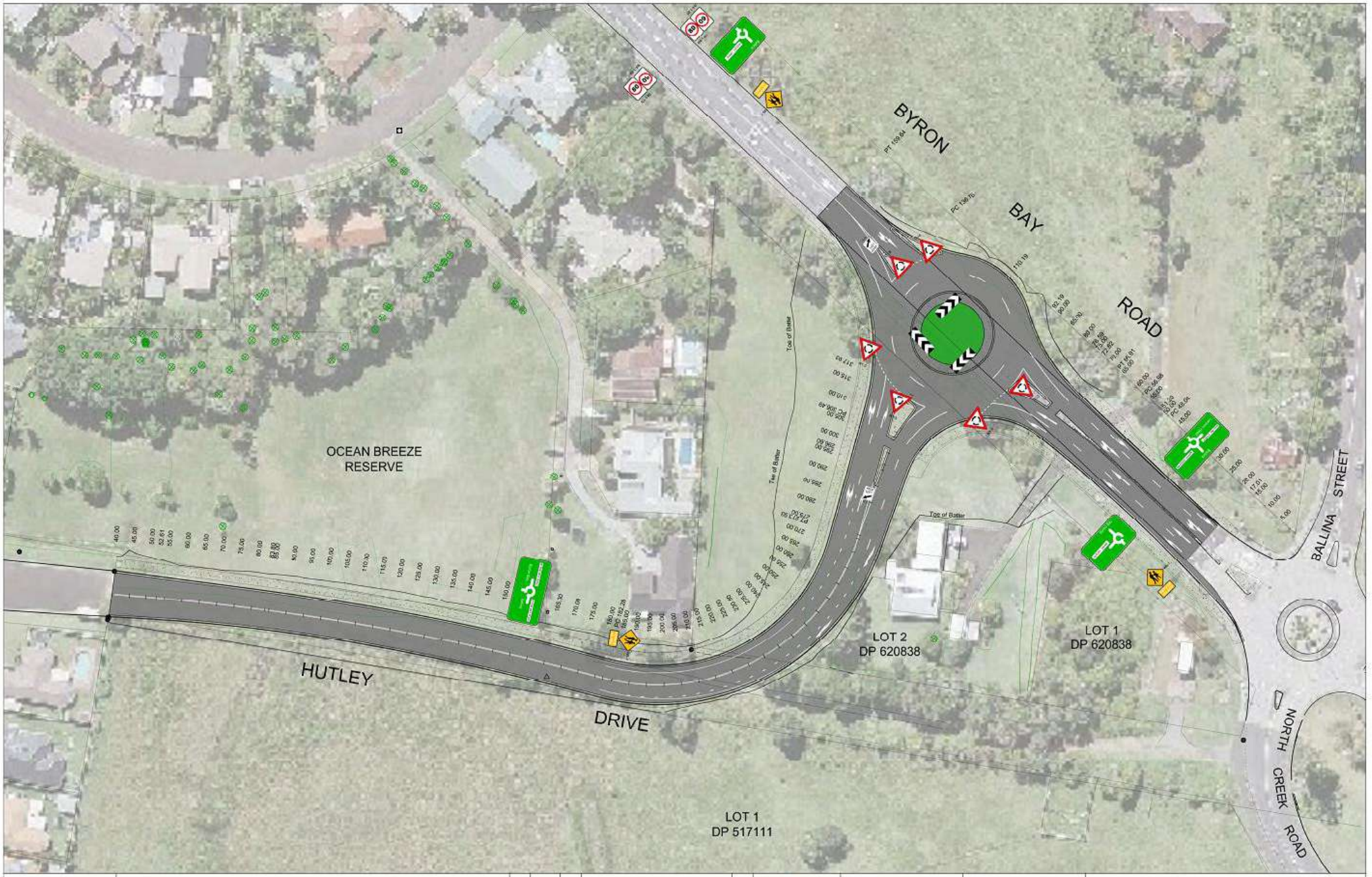
ACOUSTIC TREATMENT LEGEND

Recommended 2.0m high barrier constructed above the top of the embankment to achieve the top of barrier R.L. shown above in the sketch.

Barriers are to be constructed free of gaps and holes. For detailed barrier design engineering guidelines and material selection refer to the NSW RTA's QA Specification R271 *"Design and Construction of Noise Walls"* and the NSW RTA's *"Noise Wall Design Guideline"*.

APPENDIX B

Road Plans



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No.	Date	By	Change	X'd
Amendments				

ballina shire council

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F.B.	L.B.	CHECKED	
DATUM	AHD	APPROVED	
DRAWING	HUTLEY DRIVE BYRON BAY ROAD ROUNDABOUT AUG 2018 V2.DWG		
SHEET 1 OF			

BALLINA SHIRE COUNCIL

HUTLEY DRIVE NORTHERN EXTENSION
BYRON BAY ROAD ROUNDABOUT
SIGNS AND LINEMARKING PLAN

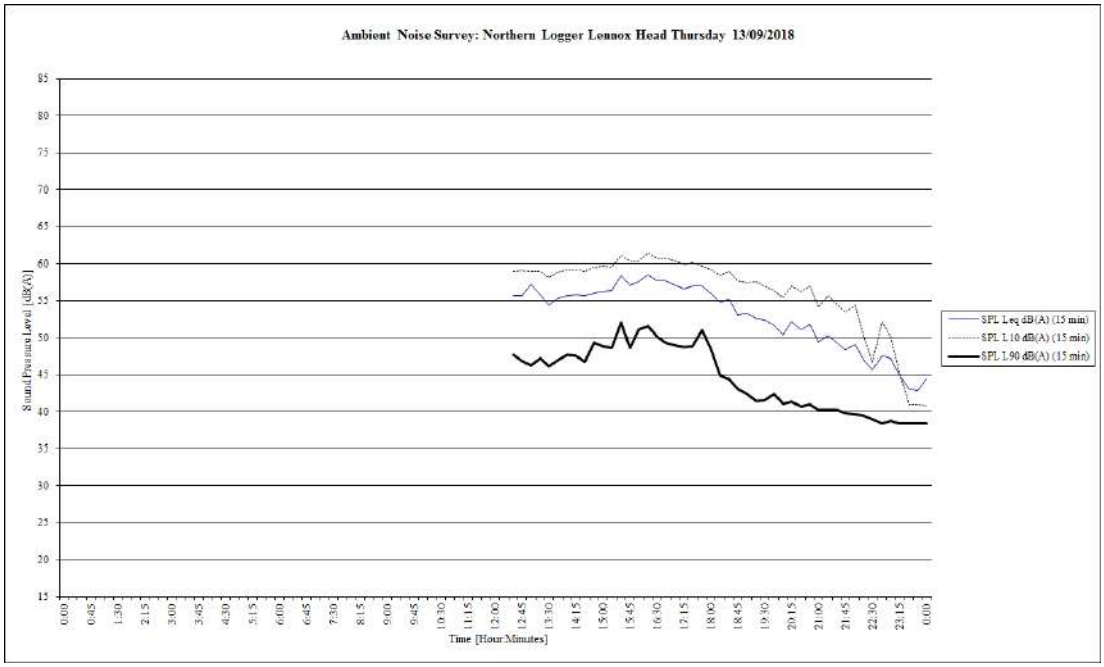
Scale HORIZONTAL: 1 : 500 @ A1
VERTICAL:

Plan No. XXX

A1

APPENDIX C

Measurement Results and Model Calculations / Predictions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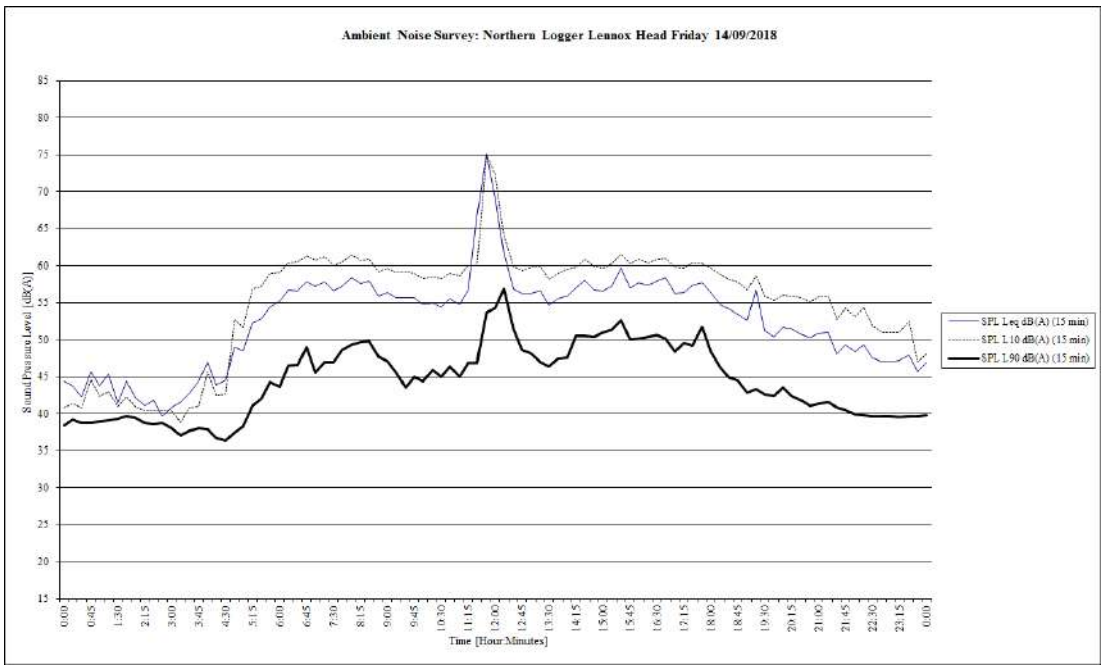
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SPL L90 dB(A) (15 min)


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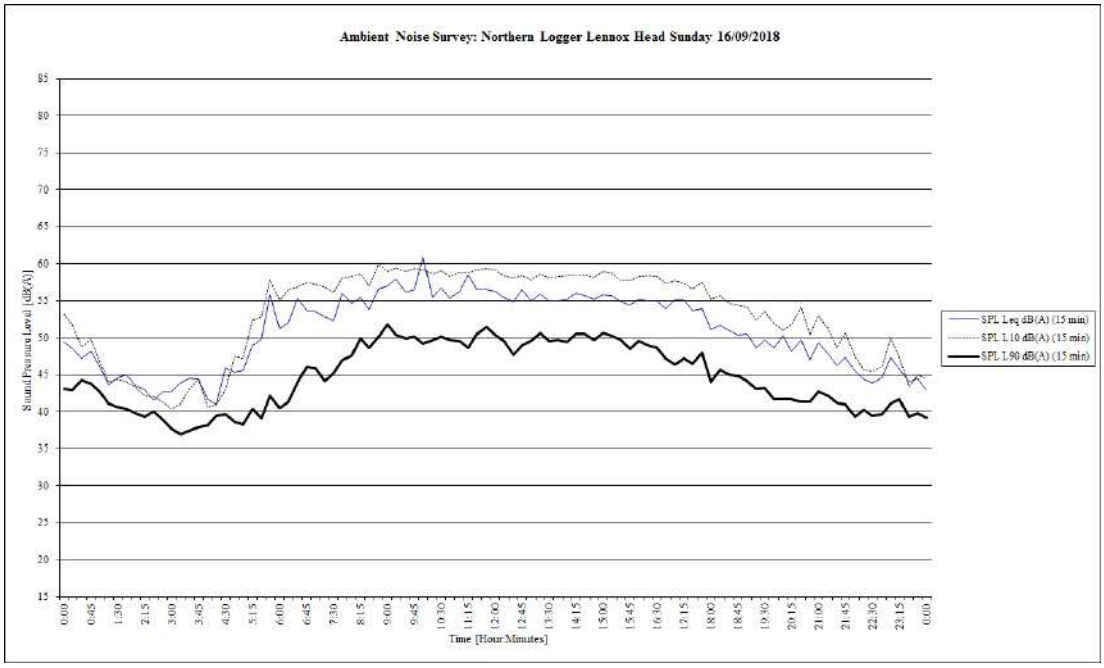
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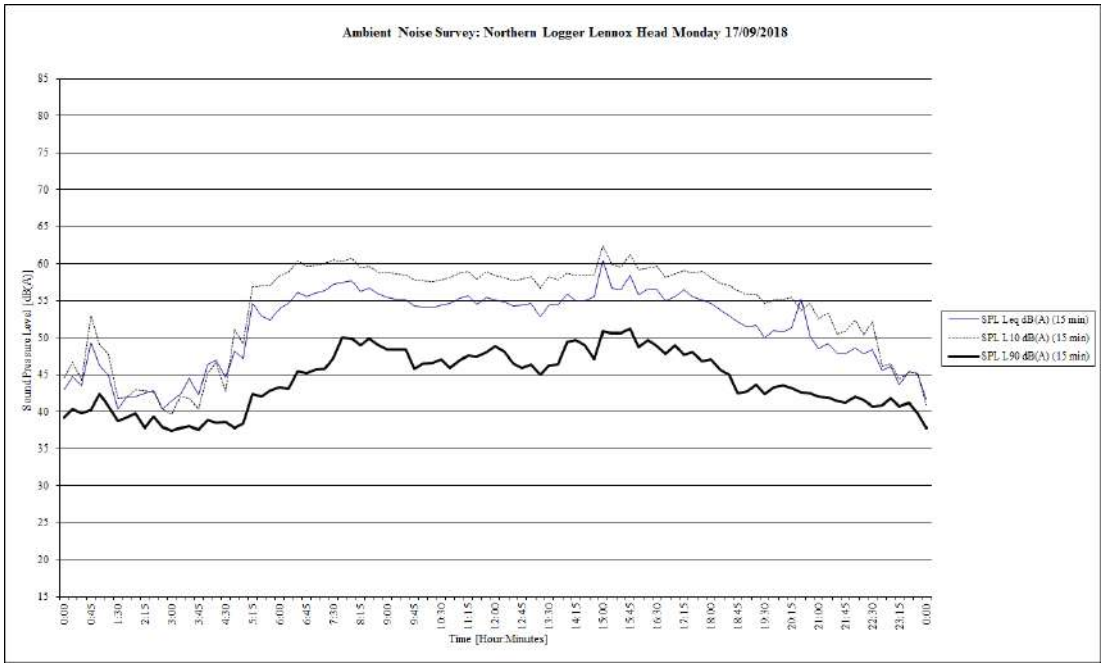
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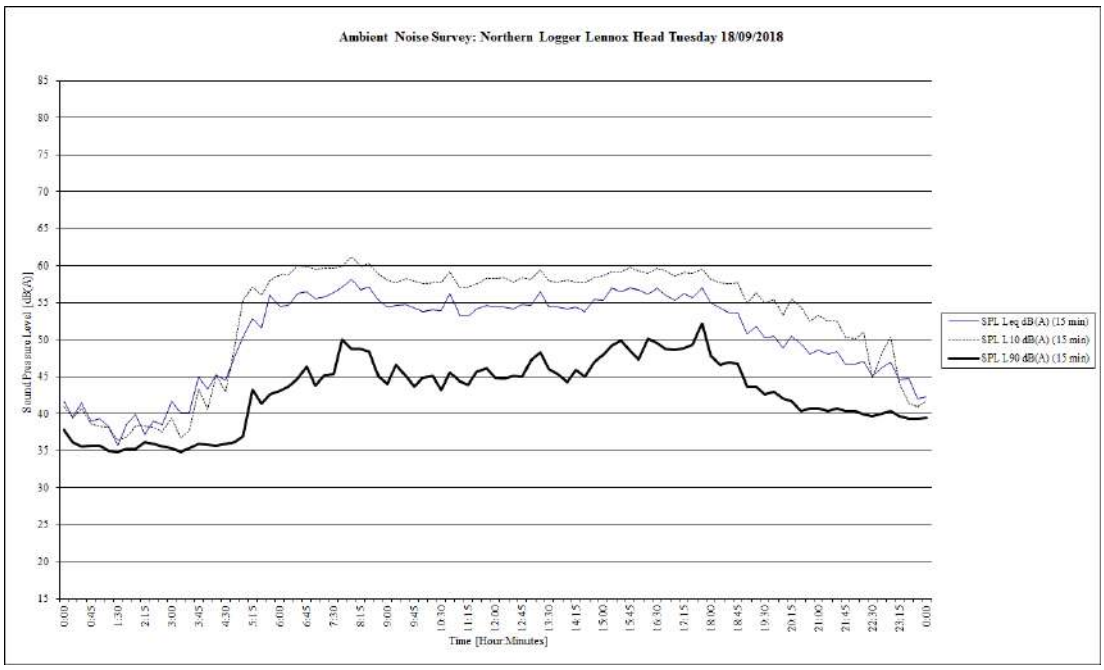
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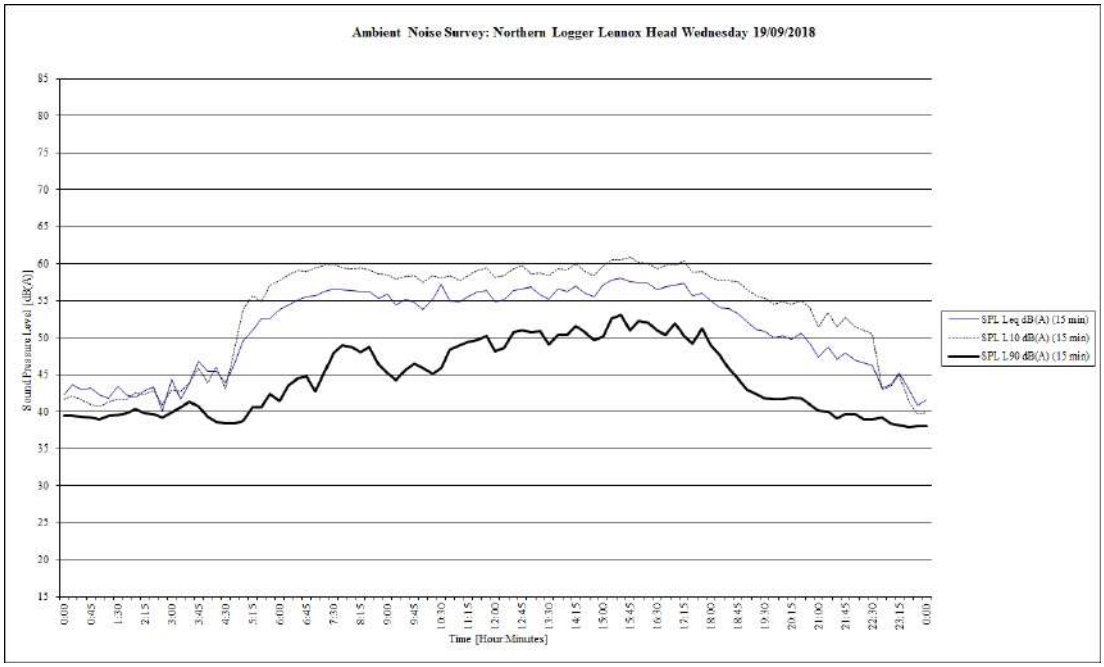
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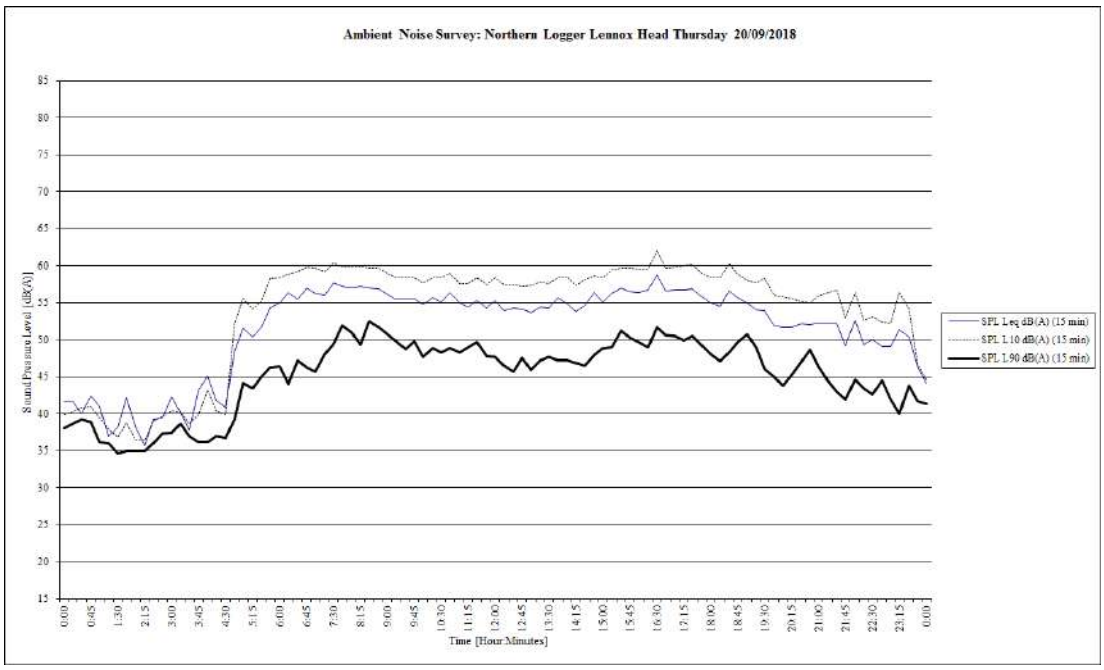
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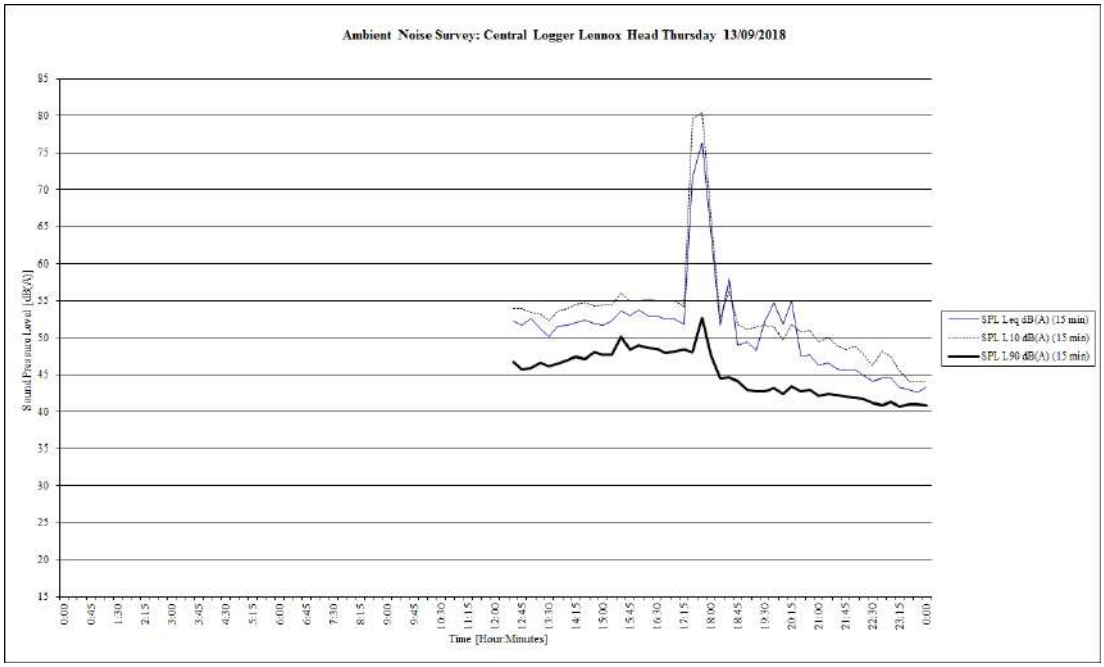
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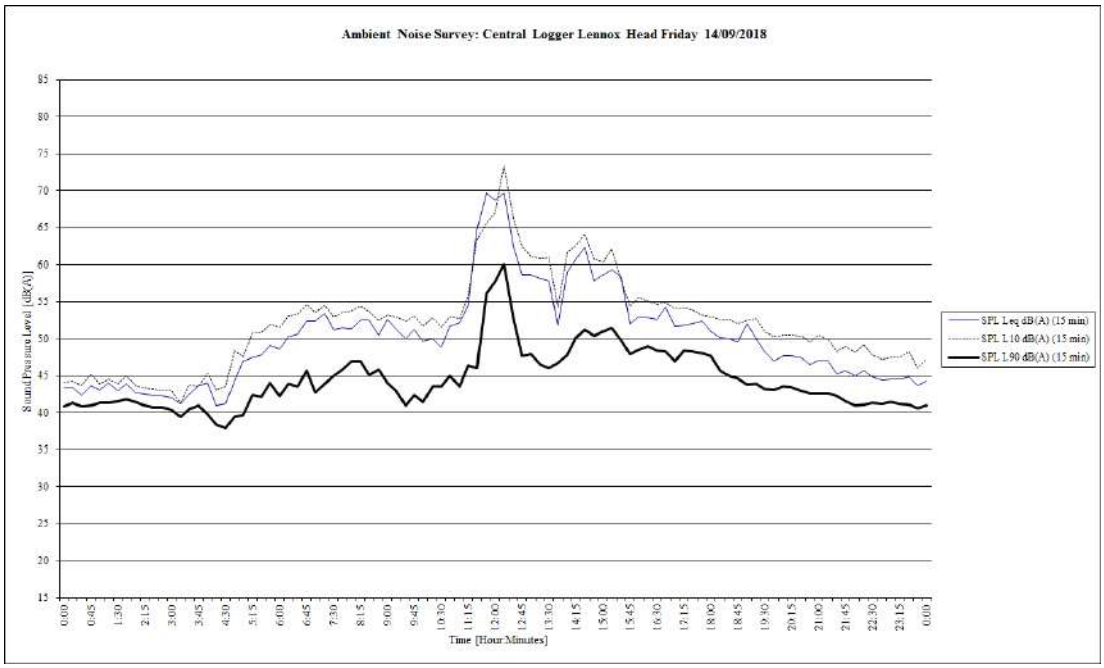
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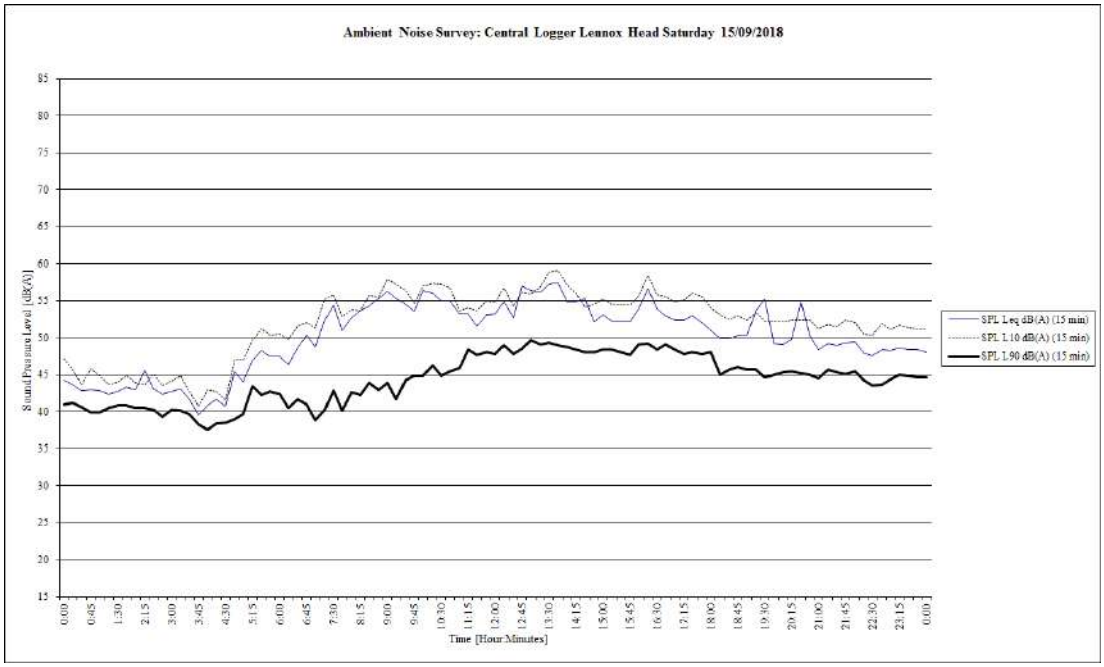
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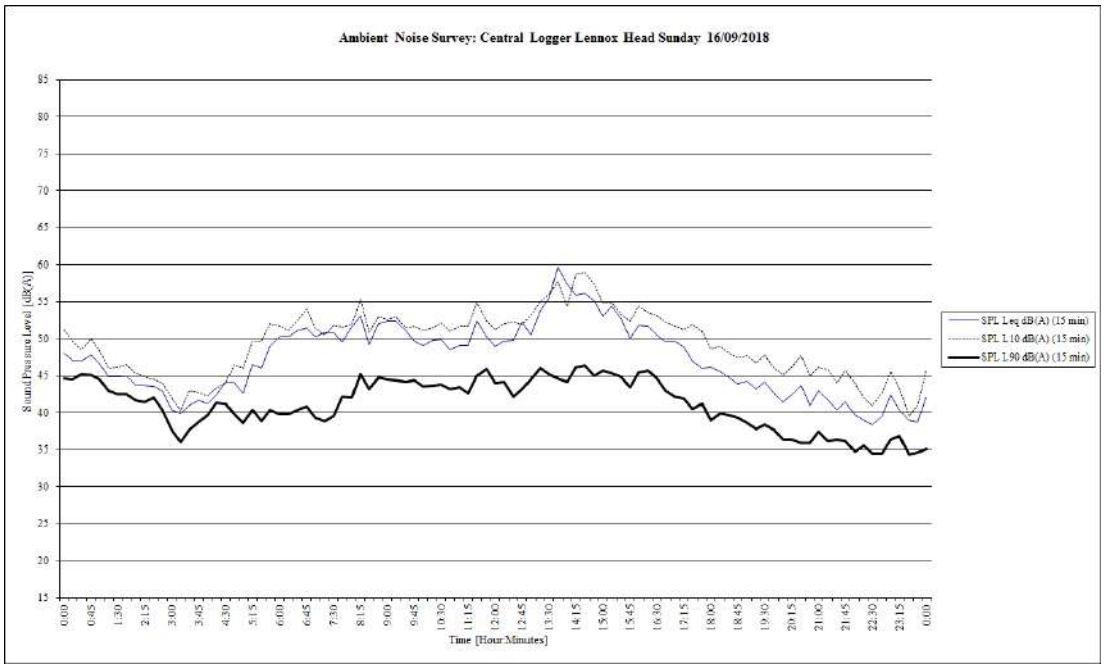
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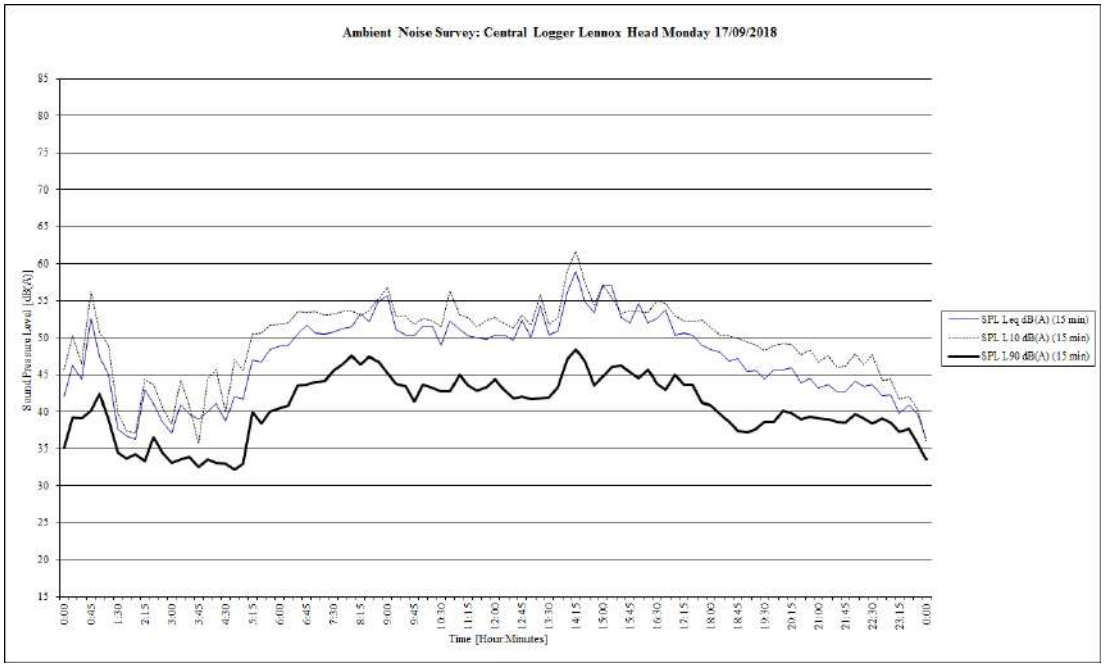
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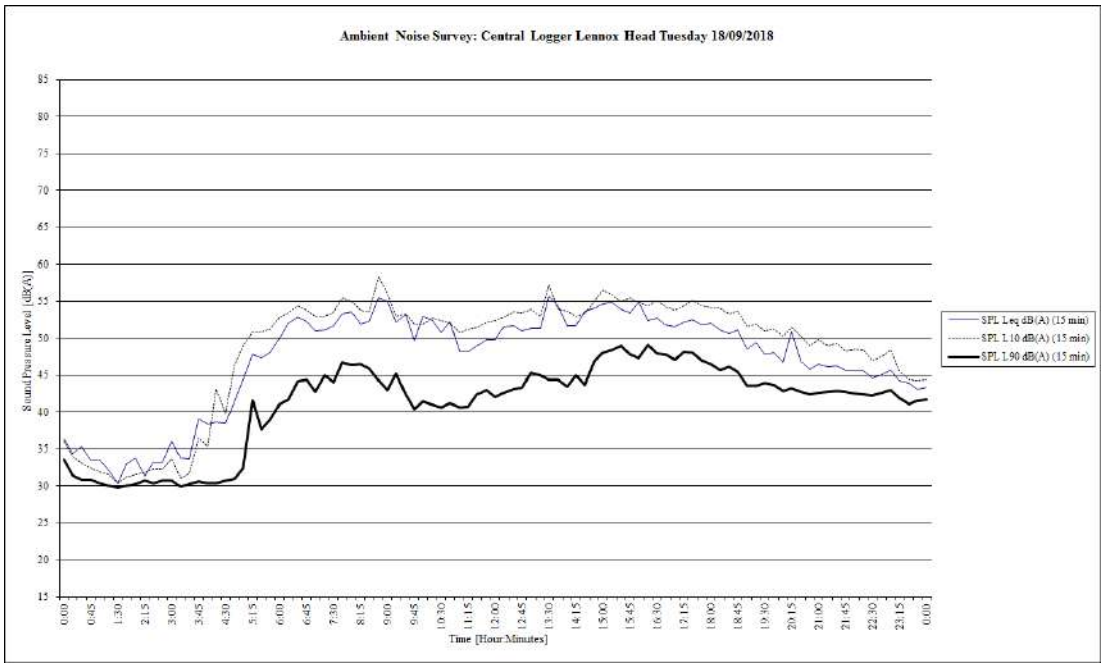
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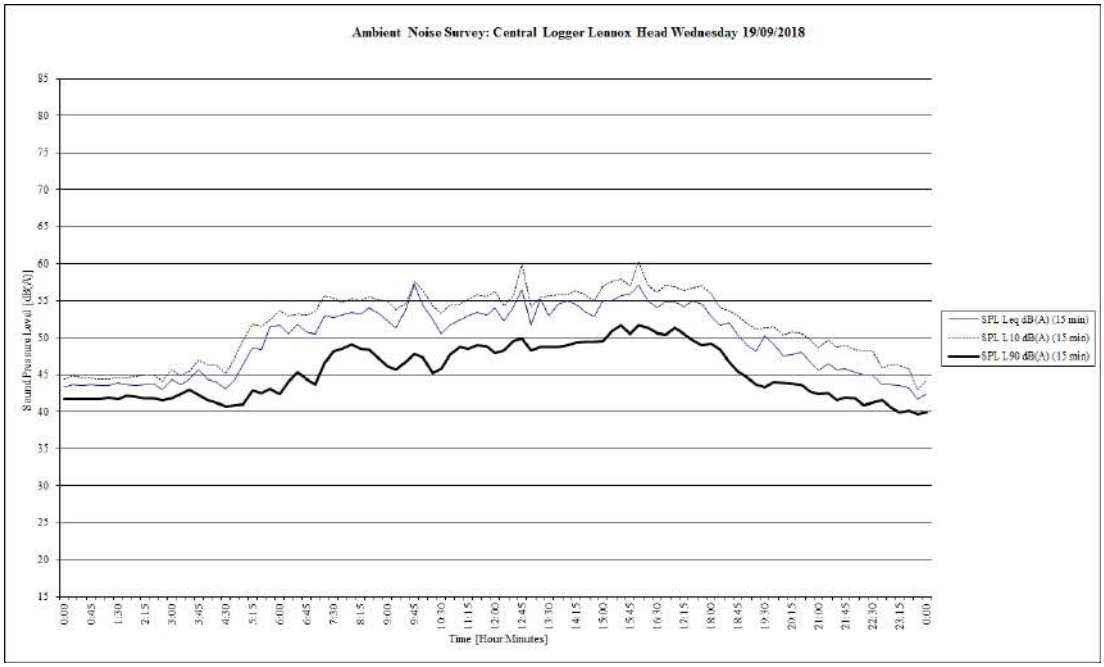
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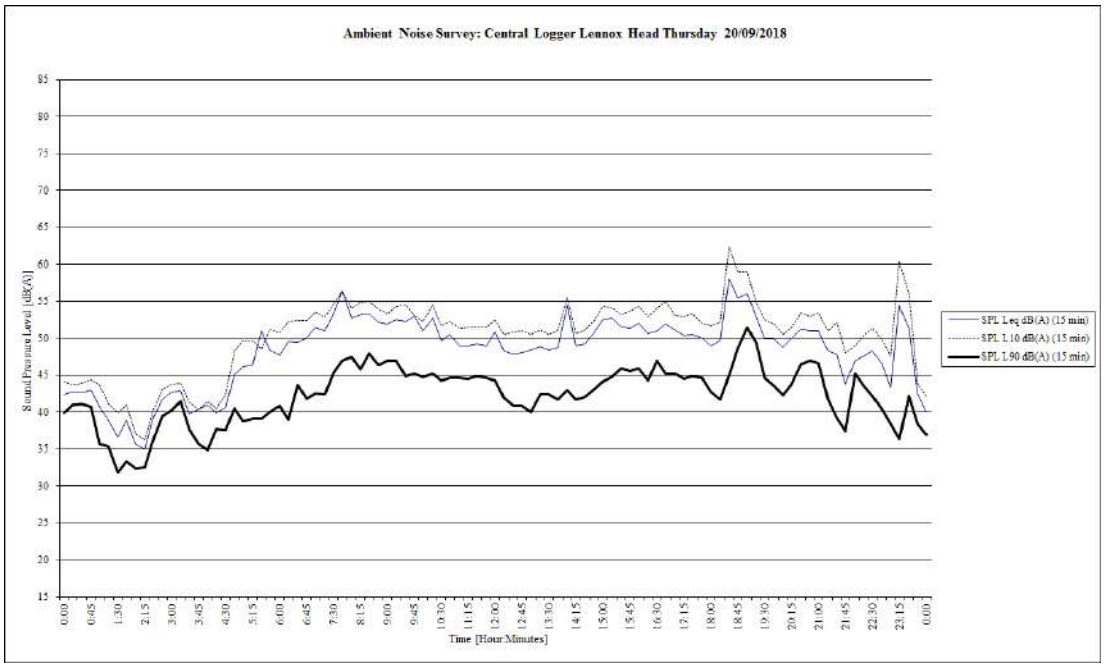
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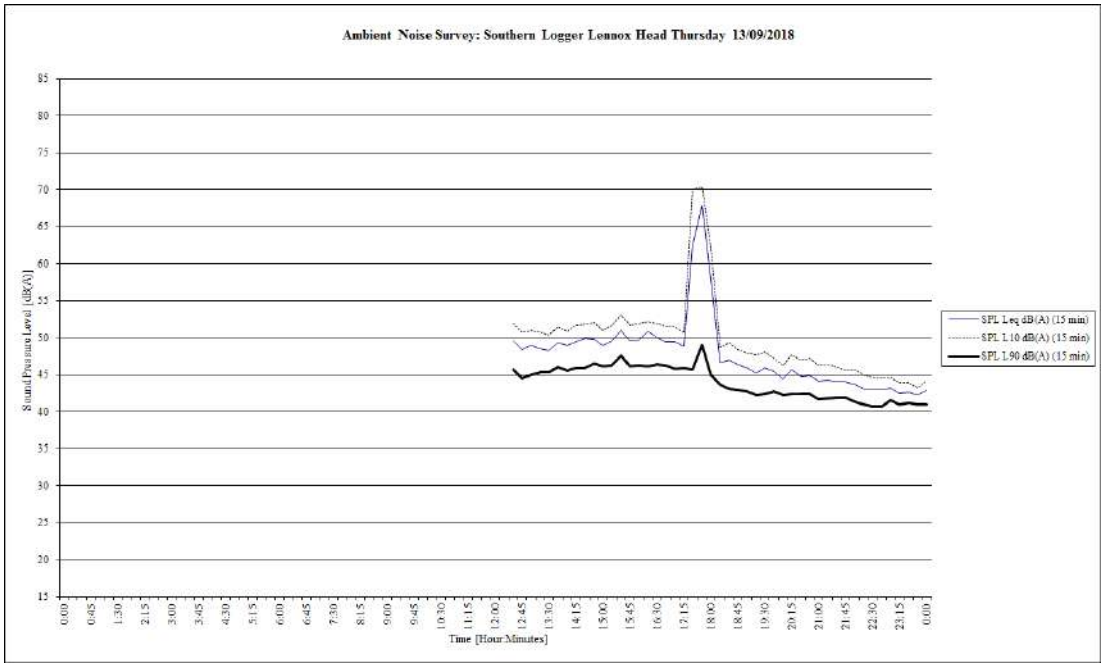
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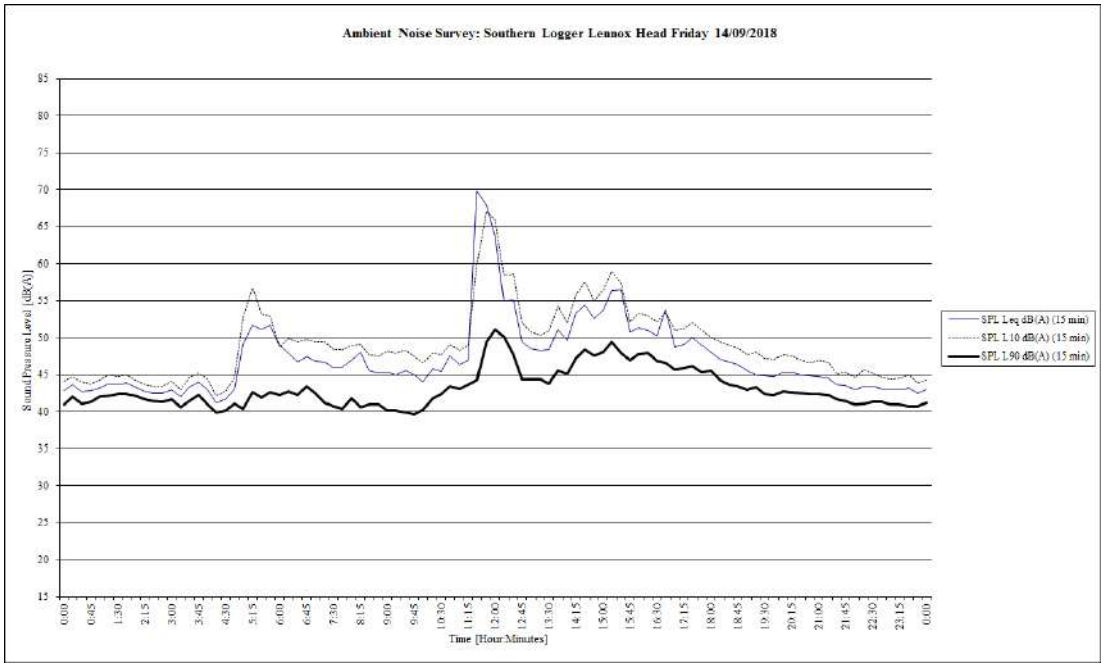
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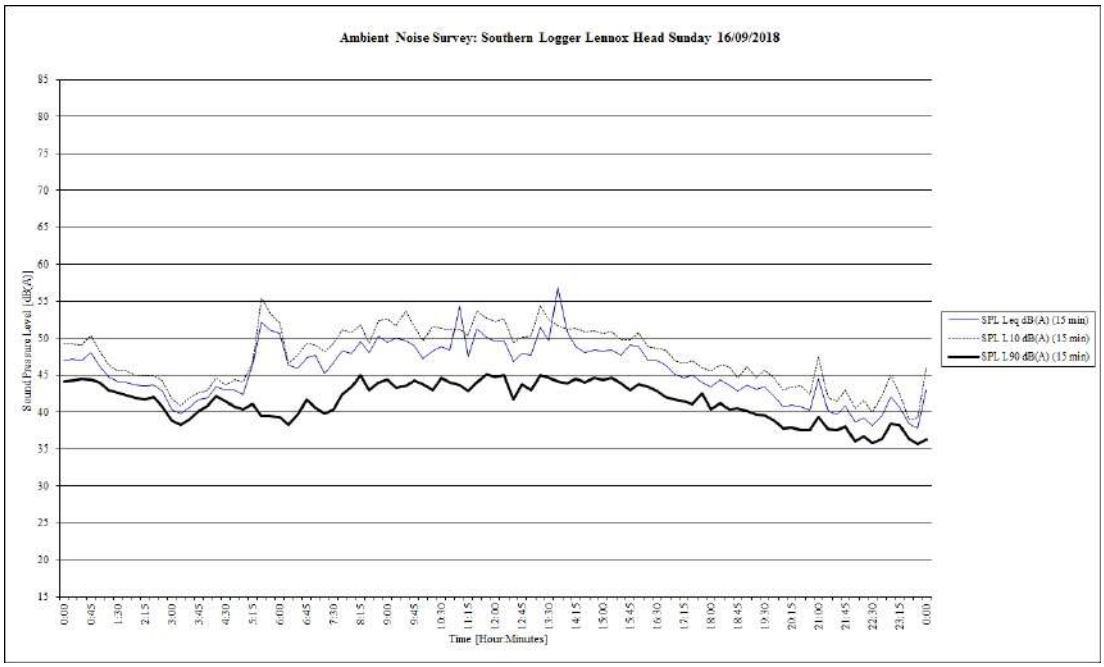
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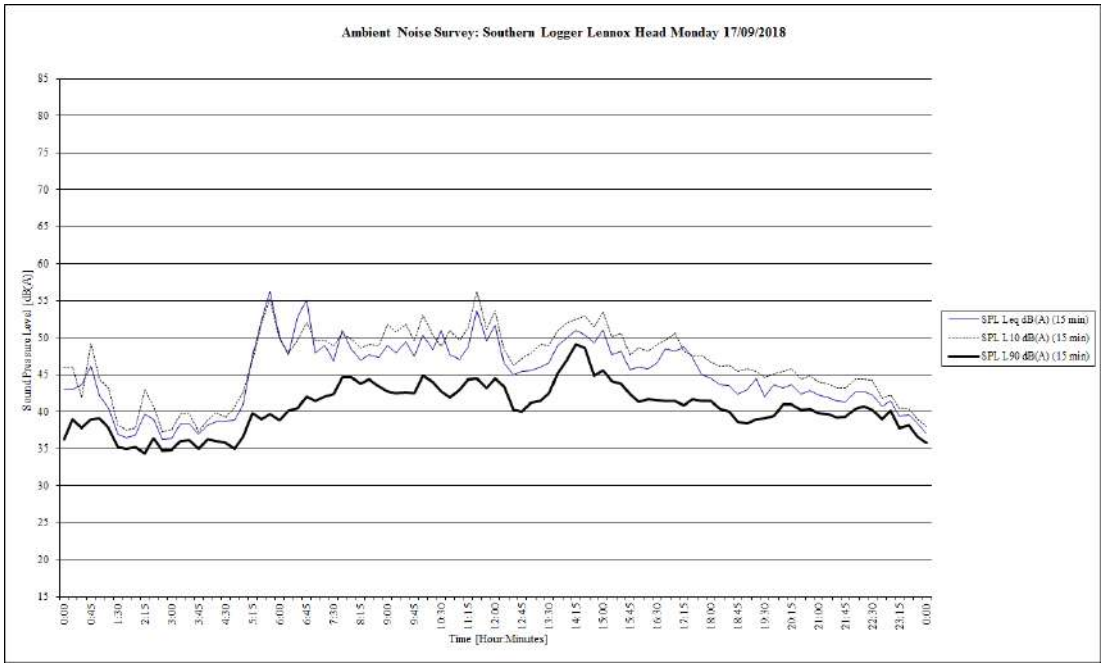
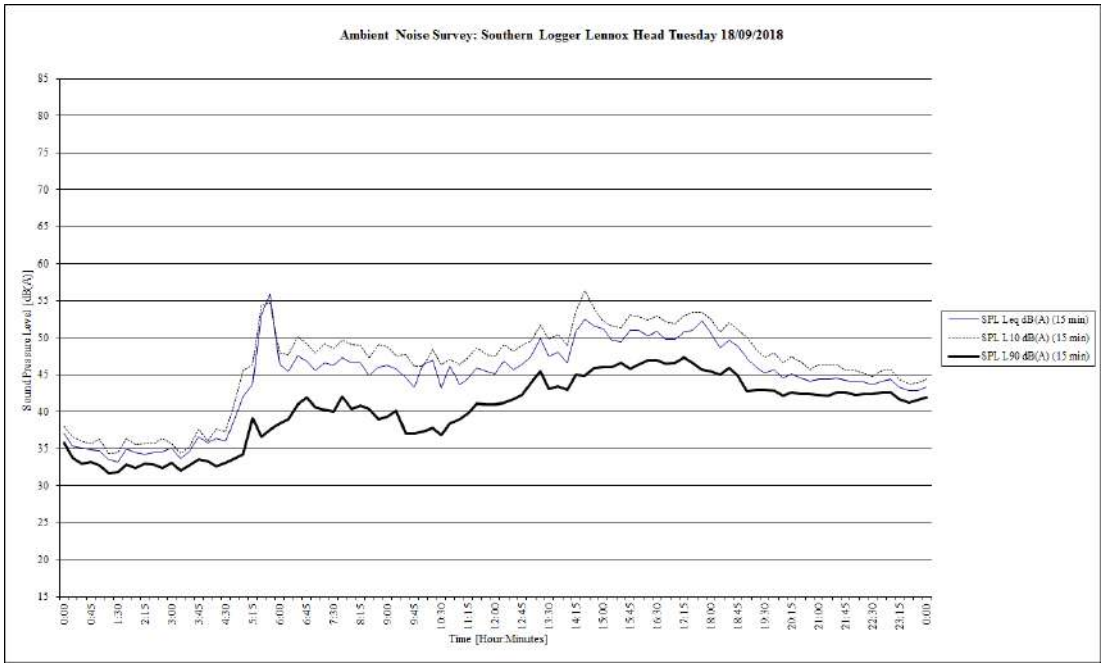
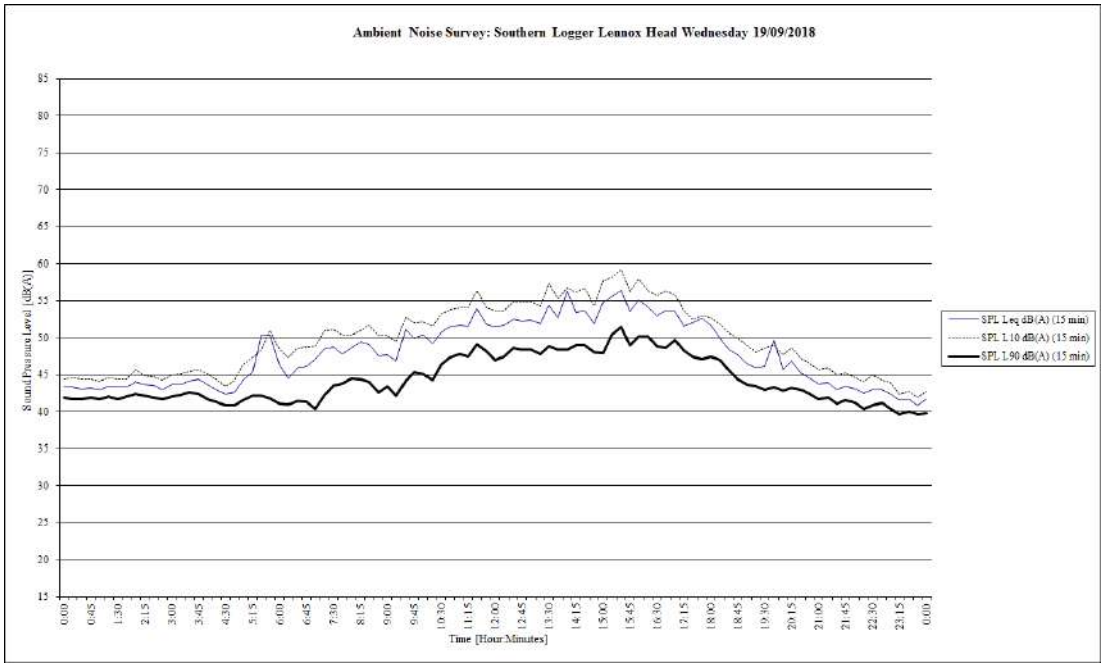
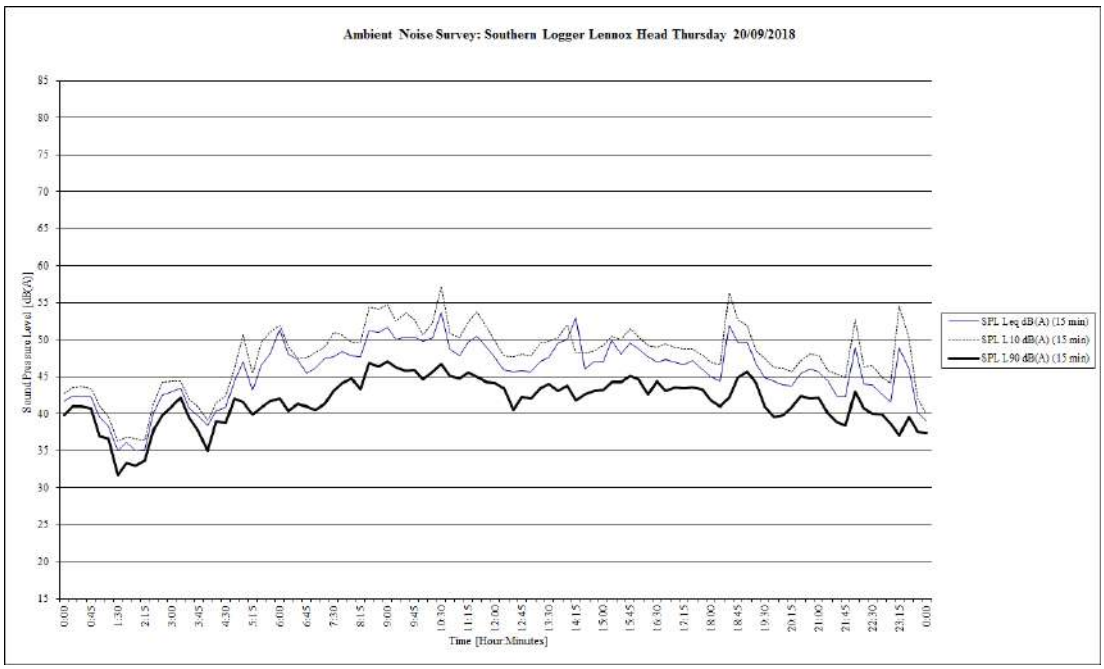
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)


Ambient Noise Survey: Southern Logger Lennox Head Monday 17/09/2018
Sound Pressure Level [dB(A)]
Time [Hour:Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)


Ambient Noise Survey: Southern Logger Lennox Head Tuesday 18/09/2018
Sound Pressure Level [dB(A)]
Time [Hour:Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)


Ambient Noise Survey: Southern Logger Lennox Head Wednesday 19/09/2018
Sound Pressure Level [dB(A)]
Time [Hour:Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)


Ambient Noise Survey: Southern Logger Lennox Head Thursday 20/09/2018
Sound Pressure Level [dB(A)]
Time [Hour:Minutes]
SPL Leq dB(A) (15 min)
SPL L10 dB(A) (15 min)
SPL L90 dB(A) (15 min)

ALL FAÇADE CORRECTED LEVELS

NO BARRIER
Pen3D2000 V 1.10.0
Project Code:18122a
Project Description:Noise assessment of Hutley St Extension
File:C:\Users\Matty\Desktop\18122a_no barrier.PEN
File Description:Data file covering no barrier

Wednesday 19 Dec, 2018 at 10:15:02
CoRTN Calculations
All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Leq(24hour) (dB(A))
No 3 build	557646.5	6813963.8	1.8	50.9
No 5 build	557652.4	6813929	1.8	51.4
No 7 build	557663.1	6813896.5	1.8	55
No 9 build	557660.9	6813863.1	1.8	62.9
No. 3 rec	557655.8	6813957	1.5	51
No. 5 rec	557661.4	6813932.5	1.5	52.4
No. 7 rec	557661.8	6813913.3	1.5	53.3
No. 9 rec	557632.5	6813880.1	1.5	58.2

1.8m HIGH ACOUSTIC BARRIER
Pen3D2000 V 1.10.0
Project Code:18122a
Project Description:Noise assessment of Hutley St Extension
File:C:\Users\Matty\Desktop\18122a_1.8m barrier.PEN
File Description:Data file covering 1.8m barrier

Wednesday 19 Dec, 2018 at 10:30:19
CoRTN Calculations
All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Leq(24hour) (dB(A))
No 3 build	557646.5	6813963.8	1.8	50
No 5 build	557652.4	6813929	1.8	50.1
No 7 build	557663.1	6813896.5	1.8	51.7
No 9 build	557660.9	6813863.1	1.8	55.9
No. 3 rec	557655.8	6813957	1.5	50.1
No. 5 rec	557661.4	6813932.5	1.5	51.1
No. 7 rec	557661.8	6813913.3	1.5	51.4
No. 9 rec	557632.5	6813880.1	1.5	54.2

2.3m HIGH ACOUSTIC BARRIER
POINT CALCULATIONS
Pen3D2000 V 1.10.0
Project Code:18122a
Project Description:Noise assessment of Hutley St Extension
File:C:\Users\Matty\Desktop\18122a_2.3m barrier.PEN
File Description:Data file covering 2.3m barrier

Wednesday 19 Dec, 2018 at 11:29:27
CoRTN Calculations
All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Leq(24hour) (dB(A))
No 3 build	557646.5	6813963.8	1.8	49.8
No 5 build	557652.4	6813929	1.8	49.8
No 7 build	557663.1	6813896.5	1.8	51.2
No 9 build	557660.9	6813863.1	1.8	54.3
No. 3 rec	557655.8	6813957	1.5	49.9
No. 5 rec	557661.4	6813932.5	1.5	50.9
No. 7 rec	557661.8	6813913.3	1.5	51.1
No. 9 rec	557632.5	6813880.1	1.5	53.4

2.0m HIGH ACOUSTIC BARRIER with SMA or OGA ROAD SURFACE
POINT CALCULATIONS
Pen3D2000 V 1.10.0
Project Code:18122a
Project Description:Noise assessment of Hutley St Extension
File:C:\Users\Matty\Desktop\18122a_2.0m barrier OGA.PEN
File Description:Data file covering 2m oga

Wednesday 19 Dec, 2018 at 11:06:58
CoRTN Calculations
All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Leq(24hour) (dB(A))
No 3 build	557646.5	6813963.8	1.8	48.9
No 5 build	557652.4	6813929	1.8	49
No 7 build	557663.1	6813896.5	1.8	50.5
No 9 build	557660.9	6813863.1	1.8	54.2
No. 3 rec	557655.8	6813957	1.5	49
No. 5 rec	557661.4	6813932.5	1.5	50
No. 7 rec	557661.8	6813913.3	1.5	50.3
No. 9 rec	557632.5	6813880.1	1.5	52.9

Appendix G

Intersection Analysis

Proposed Hutley Drive/Byron Bay Road Roundabout, Intersection Analysis – 2036+ Predicted Traffic Volumes

1. Background

It is proposed to extend Hutley Drive north to intersect with Byron Bay Road approximately 85 m west of the existing Byron Bay Rd/Ballina St/Coast Rd/Nth Ck Rd roundabout. The proposed configuration of the intersection is a two circulating lane roundabout, see copy of plan below.

An intersection analysis has been conducted using SIDRA Inttersection software to determine the performance of the proposed roundabout in peak am and pm hours in the year 2036. This year has been used as it is the planning horizon year used in Council's strategic modelling of the road network based on adopted strategic land use predictions.

2. Flow Splits

Flow splits have been predicted for 2036+ volumes with an am bias for vehicles exiting Hutley Drive and a pm bias of vehicles entering Hutley Drive to coincide with predicted commuter behaviour. See Appendix A for input flow splits into the SIDRA model.

3. Intersection Modelling

The am and pm peak flows were analysed using SIDRA Intersections software, see Appendix B for SIDRA Movement Summaries.

The proposed intersection performs well within capacity in both am and pm peak periods with Level of Service (LOS) A for all movements. Maximum queue length is 4.6 vehicles or 33.3m in the pm peak for eastbound and westbound vehicles on Byron Bay Road and ample storage is available on Byron Bay Road to accommodate queues without affecting the adjacent roundabout to the east. Degree of saturation of the intersection (Volume/Capacity) is 0.513 in the 2036 pm peak hour and 0.352 in the 2036 am peak hour.

4. Conclusion

The proposed intersection will perform satisfactorily and will have more than sufficient capacity to accommodate predicted traffic volume growth up to and beyond the year 2036.

Patrick Knight, (BE, M Transport, M Traffic, MBA)

Ballina Shire Traffic Engineer

27 November 2018

APPENDIX A - PREDICTED INPUT FLOW SPLITS

Table 1. Byron Bar Rd, Hutley Dr New Roundabout
2036+ Predicted Flow Splits
2014 Modelling for 2036+

Hutley DR		Left	Right	**EB**	**WB**	**Total**							
Daily (both ways)	5,310												
av pk	531							BB Rd St	414			465	BB Rd St
av pk one way	266	40%	60%					BB Rd R	46			82	BB Rd L
		106	159					EB	460	106	159		
am tide	130%							WB		Hutley L	Hutley R		
am pk hr		138	207					Total		NB	SB	Total	
pm tide	70%											-	
pm pk		74	112										

BB Rd from West		Right	Straight	**NB**	**SB**	**Total**			**am peak**				
Daily (both ways)	9199												
av pk	920												
av pk one way	460	10%	90%							NCRd R	NCRd St		
		46	414										
am tide	70%							BB Rd St	290			326	BB Rd St
am pk hr		32	290					BB Rd R	32			57	BB Rd L
pm tide	130%							EB	322	138	207		
pm pk		60	538					WB	138	Hutley L	Hutley R		

BB Rd from East		Left	Straight	**NB**	**SB**	**Total**							
Daily (both ways)	10,942												
av pk	1,094	547	547						**pm peak**				
av pk one way	547	15%	85%										
		82	465										
am tide	70%												
am pk hr		57	326										
pm tide	130%							BB Rd St	538			605	BB Rd St
pm pk		107	605					BB Rd R	60			107	BB Rd L
								EB	598	74	112		
										Hutley L	Hutley R		

APPENDIX B – SIDRA MOVEMENT SUMMARIES

MOVEMENT SUMMARY

Site: 1 [36+am]

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hutley Dr											
1	L2	145	3.0	0.352	6.5	LOS A	2.4	17.2	0.62	0.71	39.9
3	R2	218	0.0	0.352	11.3	LOS A	2.4	17.2	0.62	0.71	45.4
Approach		363	1.2	0.352	9.4	LOS A	2.4	17.2	0.62	0.71	43.4
East: Byron Bay Rd East											
4	L2	60	3.0	0.268	4.1	LOS A	1.8	13.1	0.17	0.40	48.3
5	T1	343	3.0	0.268	4.3	LOS A	1.8	13.1	0.17	0.40	36.7
Approach		403	3.0	0.268	4.3	LOS A	1.8	13.1	0.17	0.40	38.4
West: Byron Bay Rd West											
11	T1	305	0.0	0.296	5.6	LOS A	2.2	15.2	0.53	0.55	45.2
12	R2	34	3.0	0.296	10.3	LOS A	2.2	15.2	0.53	0.55	44.4
Approach		339	0.3	0.296	6.1	LOS A	2.2	15.2	0.53	0.55	45.1
All Vehicles		1105	1.6	0.352	6.5	LOS A	2.4	17.2	0.43	0.55	42.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [36+pm]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hutley Dr											
1	L2	78	3.0	0.250	8.6	LOS A	1.7	11.9	0.76	0.80	37.4
3	R2	118	0.0	0.250	13.4	LOS A	1.7	11.9	0.76	0.80	42.9
Approach		196	1.2	0.250	11.5	LOS A	1.7	11.9	0.76	0.80	40.9
East: Byron Bay Rd East											
4	L2	113	3.0	0.513	4.3	LOS A	4.6	33.3	0.33	0.43	47.0
5	T1	637	3.0	0.513	4.6	LOS A	4.6	33.3	0.33	0.43	35.8
Approach		749	3.0	0.513	4.6	LOS A	4.6	33.3	0.33	0.43	37.5
West: Byron Bay Rd West											
11	T1	566	0.0	0.469	5.1	LOS A	4.5	31.6	0.49	0.49	45.6
12	R2	63	3.0	0.469	9.7	LOS A	4.5	31.6	0.49	0.49	44.8
Approach		629	0.3	0.469	5.6	LOS A	4.5	31.6	0.49	0.49	45.5
All Vehicles		1575	1.7	0.513	5.8	LOS A	4.6	33.3	0.45	0.50	40.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix H

Hydraulic Capacity Assessment

BALLINA SHIRE COUNCIL – FILE NOTE

Subject: Hutley Drive Extension (North) - Stormwater Design
Date: 23/1/2018
Author: Alistair Weallans
Trim Container:
Copy to: File

This hydraulic capacity assessment report has been prepared by Ballina Shire Council to support the design of the Northern extension of Hutley Drive including the provision of a new roundabout at the point of intersection with Byron Bay Road, Lennox Head. The road extension which commences at the current northern end of Hutley Drive and continues to Byron Bay road is part of Ballina Shire Council's Roads Contribution Plan.

The objective of this report is to:

- Construct a DRAINS model of the drainage system to be investigated;
- Assess the capacity of the existing piped stormwater drainage system, and
- Design augmentation as required to achieve a capacity equivalent to current standards.

DRAINS Modelling

The advantages of having a computer model of a piped drainage network are:

- Hydraulic performance can be assessed, and included with other characteristics of components in GIS databases.
- Problem locations can be identified, and remedial actions investigated.
- The model provides a basis for designing new works that link with the existing system, and for assessing cumulative impacts of a number of augmentation projects.

Design Criteria - Conveyance

The objective of this report is to demonstrate the new stormwater infrastructure associated with the construction of the road extension meets the criteria of the Ballina Shire Council Standards for Development (2016). The key criteria applicable to this project have been validated is summarized below:

Minor System Criteria

- Pipe system capacity to 5 year ARI minimum
- Storm water inlet capacity to ensure maximum flow width along gutters of 2m

Major System Criteria – 100 year ARI

- Overland flow paths provided for up to 100 year ARI minimum
- Maximum depth of 0.2m
- Maximum depth * Velocity Factor of 0.4m^2/s

The drainage system associated with this project is proposed to connect into the existing storm water reticulation network which services Byron Bay Road that drains into Council's trunk drainage network via Lot 1 DP517111. The DRAINS network model includes the existing downstream network such to ensure the existing network has adequate capacity with the augmentation. The network model extends to the culvert headwall(-28.803321,153.583016) immediately downstream of the Meadows detention basin which discharges into an existing unnamed open drain that is located to the west of and runs parallel with Hutley Drive.

The hydrograph method has been adopted to assess whether the post development scenario will result in any increase in overland flow severity for a number of key locations when compared to the pre development scenario.

Model Inputs

The drainage network has been modelled using the *DRAINS* software package for four scenarios:

1. Existing network for Lennox Head catchment D31 utilising existing unformalised detention within the Reservoir Hill Site Lot 1 DP517111;
2. Existing network for Lennox Head Catchment D31 utilising the anticipated natural detention that will be available within Lot 1 DP517111 post development of that Lot;
3. Design Conditions with road extension and roundabout upgrade utilising existing detention available in Lot 1 DP517111;
4. Design Conditions with road extension and roundabout upgrade utilising the anticipated natural detention that will be available within Lot 1 DP517111 post development of that Lot; and

The inputs for the *DRAINS* model have been based upon the following available data:

- Geometric attributes from BSC GIS database;
- Land survey undertaken by BSC;
- Aerial Laser Survey (ALS) data from 2010;
- Field observations of flow paths including crests and sags to delineate catchments areas;
- BSC IFD and temporal patterns from ARR –Vol 2 (1987)

The extent of the model covers the Lennox Head D31 asset region. The *DRAINS* model network for exiting case is shown in Figure 1.

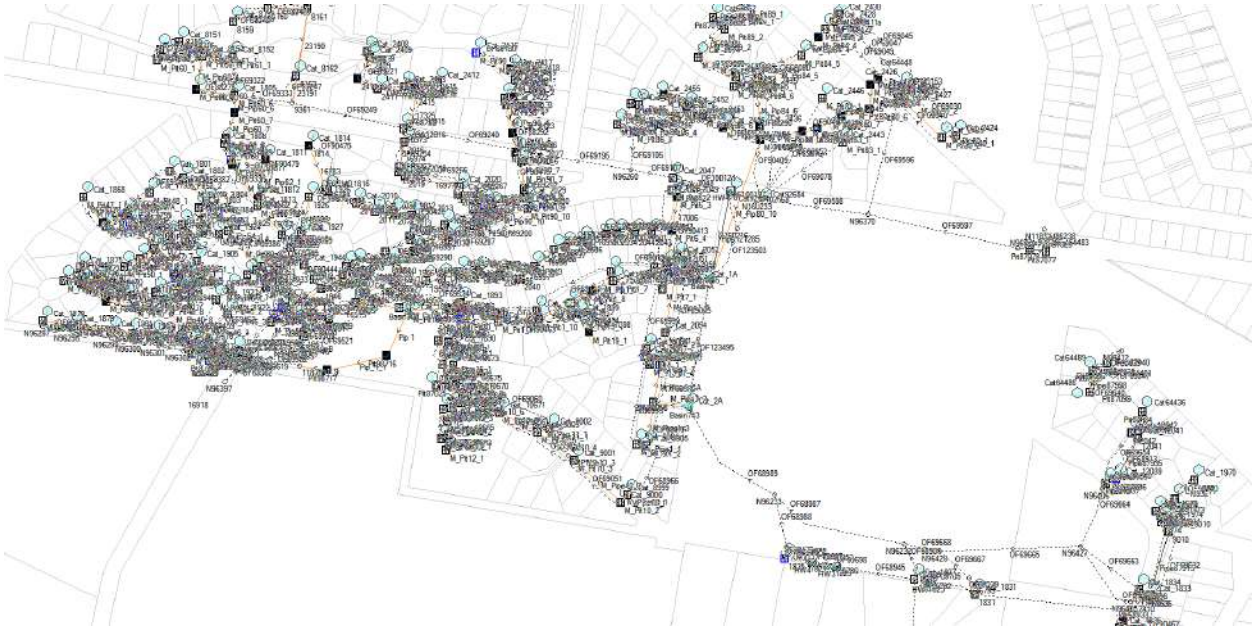


Figure 1: - Existing DRAINS Network Model for Lennox Head – Asset region D31

Figure 2 shows the sub-catchment areas break up with the GIS data used in building the existing DRAINS network. This formed the base case for the stormwater drainage design and was modified to include the new drainage infrastructure associated with the road extension and new roundabout and was used undertake hydraulic validation of the new infrastructure and assess the impact on downstream existing networks.

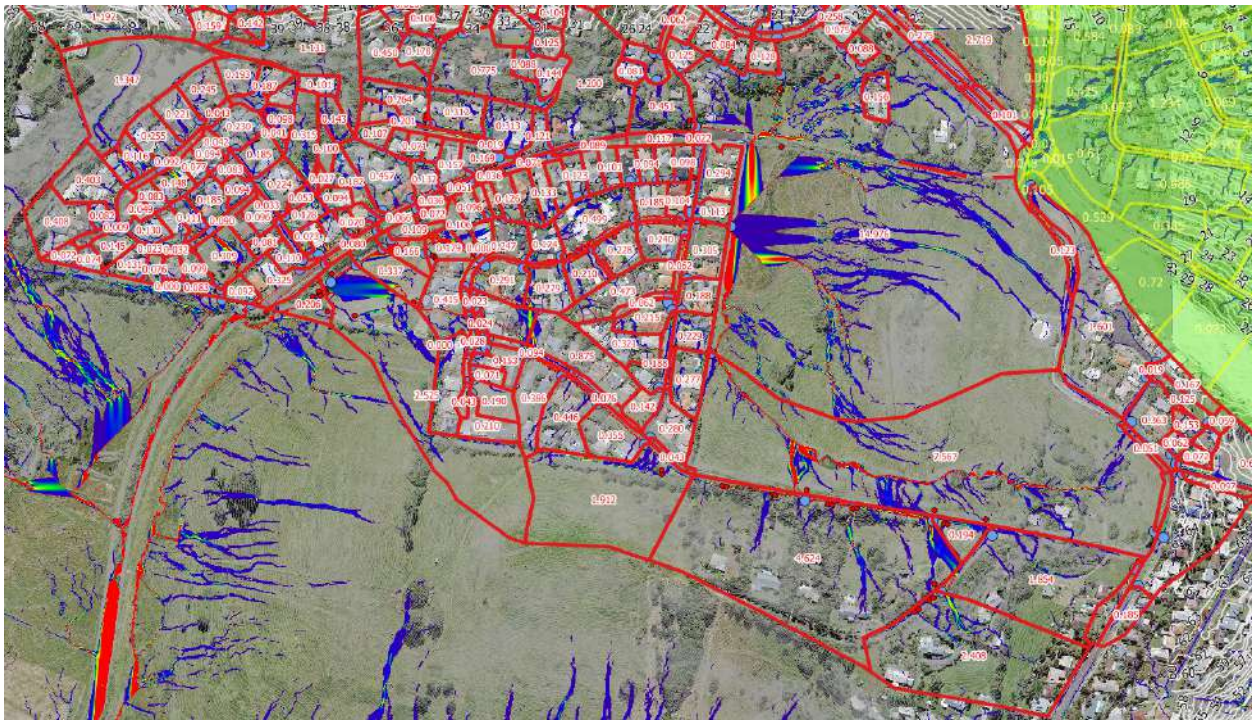


Figure 2: Catchment Delineation and Data input for Existing case DRAINS model

The area of interests is the central trunk drainage line of this catchment extending from the new roundabout through the culvert outlet located at -28.803321,153.583016.

Results of Modelling

Modelling involved examining the 20, 30, 60, 120, 180 and 270 minute storm durations for the 5, 20 and 100 year ARI events.

Existing Case

Within the trunk drainage system there is existing unformalised detention located within a private Lot (Lot 1 DP517111). Stormwater that cannot flow through the 1950mm pipe on the western boundary of this lot will pond which has the effect of attenuating peak flows. Modeling of the existing stormwater infrastructure has been undertaken for two different scenarios:

- Assuming existing detention within Lot DP517111 can be utilised;
- Assuming a reduced detention volume that will be available on this lot based on conservative assumptions surrounding the low lying existing flow paths and wetland that will be required to be retained irrespective of future development that may occur on Lot 1 DP517111

Proposed Case

The two scenarios discussed above were also assessed for the post development case using altered catchments based upon the Hutley Drive road extension design. Increases in peak stormwater flows resulting from the additional impervious area were attenuated through a detention basin of at least 275m^3

Pre to Post-development Comparison

The 2 hour storm duration was found to be the worst case. To compare the impact of the development on the existing system a number of points were selected within the trunk drainage line, these points are as follows:

- Cross Section A: The sum of all peak flows that drain from the altered catchments to the north into Lot 1 DP 517111 (-28.803321,153.583016)
- Overland Flow Path 1: peak overland flows that occur within Council Lot 73 DP16473(-28.803321,153.583016)
- Overland Flow Path 2: peak overland flows that occur within a section Kell Mather Drive (-28.803321,153.583016)
- Overland Flow Path 3: peak overland flows that occur within a section Kell Mather Drive(-28.803321,153.583016)
- Overland Flow Path 4: peak overland flows that occur within a section Kell Mather Drive(-28.803321,153.583016)
- Overland Flow Path 5: peak overland flows that occur at the point at which drains Kell Mather Drive overflows to the Meadows Detention Basin (-28.803321,153.583016)
- Basin Outflow: Outflow from the Meadows Detention Basin (-28.803321,153.583016)

The pre and post development comparison of these above selected points is shown below in table 1.

		Existing Scenario (No development of Lot 1 DP 517111)						Future Scenario (Post Development Lot 1 DP 517111)					
		Pre-development			Post-development			Pre-development			Post -Development		
		100 ARI	20 ARI	5 ARI	100 ARI	20 ARI	5 ARI	100 ARI	20 ARI	5 ARI	100 ARI	20 ARI	5 ARI
Cross Section A	Vol	7.3	5.8	2.9	7.1	5.8	2.9	7.3	5.8	2.9	7.1	5.8	2.9
OF1	Vol	0	0	0	0	0	0	0	0	0	0	0	0
OF2	Vol	0.15	0.11	0.07	0.15	0.11	0.07	0.15	0.11	0.07	0.15	0.11	0.07
	Depth	0.1	0.1	0.08	0.1	0.1	0.08	0.1	0.1	0.08	0.1	0.1	0.08
	V*D	0.14	0.12	0.09	0.14	0.12	0.09	0.14	0.12	0.09	0.14	0.12	0.09
OF3	Vol	0.7	0.5	0.2	0.7	0.5	0.2	0.7	0.5	0.2	0.7	0.5	0.2
	Depth	0.19	0.17	0.1	0.19	0.17	0.1	0.19	0.17	0.13	0.19	0.17	0.13
	V*D	0.27	0.22	0.2	0.27	0.22	0.2	0.26	0.22	0.16	0.27	0.22	0.16
OF4	Vol	3.6	1.5	0.4	3.6	1.5	0.4	4	1.6	0.4	4	1.4	0.4
	Depth	0.24	0	0.09	0.24	0.16	0.09	0.25	0.16	0.09	0.252	0.16	0.09
	V*D	0.21	0.11	0.04	0.21	0.11	0.04	0.22	0.11	0.04	0.22	0.11	0.04
OF5	Vol	4.3	1.9	0.3	4.4	1.9	0.3	4.7	1.9	0.3	4.8	1.9	0.3
	Depth	0.19	0.14	0.08	0.19	0.14	0.08	0.19	0.14	0.08	0.197	0.14	0.08
	V*D	0.31	0.18	0.06	0.31	0.18	0.06	0.32	0.18	0.06	0.33	0.18	0.06
Basin B outflow	Vol	13	10.4	6.8	13	10.1	6.2	13.3	10.5	6.8	13.3	10.3	6.2

Table 1: Comparison of Drains outputs for different development scenarios at selected points.

Table 1 indicates that the development generally has a none-worsening impact on the downstream trunk drainage network. It is acknowledged that for the 100 year ARI event ‘overland flow path 5’ experiences a minor increase in peak flows. However, the depth and depth*velocity factor of this flow path remains below the maximum allowed under the Northern Rivers Local Government Guidelines.

Alistair Weallans
Engineer Infrastructure Planning