

# **Proposed Bentley Quarry** Submissions Report

R & S Contracting Pty Ltd 24 May 2022

→ The Power of Commitment

#### GHD Pty Ltd | ABN 39 008 488 373

230 Harbour Drive,
Coffs Harbour, New South Wales 2450, Australia
T +61 2 6650 5600 | F +61 2 9475 0725 | E cfsmail@ghd.com | ghd.com

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#### 1. Introduction

#### 1.1 Background

R & S Contracting Pty Ltd (R&S Contracting) proposes to construct and operate a hard rock quarry (Bentley Quarry) to extract up to 300,000 tonnes per annum and 2,000 tonnes per day over 30 years, with a total disturbance area of approximately 6.5 hectares (the project). Bentley Quarry will predominantly supply materials for use as fill and for road construction and maintenance.

#### Site overview

The site where the proposed quarry is located is approximately 212 hectares in area and sits on undulating pastureland. The site is approximately 14 kilometres west of Lismore.

The northern portion of the site has been cleared due to historical agricultural land uses, with scattered paddock trees remaining. Native vegetation exists on the higher slopes in the southern portion of the site.

The site is zoned RU1 Primary Production under *Richmond Valley Local Environmental Plan 2012*, as is the surrounding land.

The surrounding area is relatively sparsely populated. The closest residence, not related to the project, lies 650 m north of the site; however, it is currently not occupied. The closest existing occupied dwelling is located 1.25 km east of the Project site. An approved, but not constructed, dwelling is located approximately 450 m east of the site, which is associated with a proposed farm stay 550 m east of the site. Another proposed dwelling is located approximately 600 m west of the site.

#### **Overview of the Project**

The project generally involves:

- Progressive installation of environmental controls including erosion and sediment control measures, establishment of revegetation area and installation of nest boxes.
- Delineation of the site and stockpiling areas.
- Construction of fencing.
- Construction of a site office, weighbridge and car parking area.
- Crushing and screening of material to construct the access road and intersection.
- Construction of an access road and intersection with Bentley Road, including installation of signage.
- Importation of clean soil for landscape mounds to the east and west of the quarry.
- Vegetation clearance, soil stripping and stockpiling for use in landscape mounds.
- Expanded quarry operations, including blasting, crushing, screening, precoating and importing materials for blending.
- Close and rehabilitate the quarry.

#### **1.2** Purpose of this report

The purpose of this report is to review and respond to the submissions in respect to the proposed Bentley Quarry.

#### 1.3 Scope and limitations

This report: has been prepared by GHD for R & S Contracting Pty Ltd and may only be used and relied on by R & S Contracting Pty Ltd for the purpose agreed between GHD and R & S Contracting Pty Ltd as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than R & S Contracting Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

#### 2. Consultation summary

#### 2.1 Prior to lodging Development Application

#### 2.1.1 Agency consultation

Due to the comprehensive submissions received by relevant government agencies included in the Secretary's Environmental Assessment Requirements (SEARs) and the relatively straight forward nature of the proposal, additional consultation with agencies were not considered necessary. Several attempts were made to contact Transport for NSW to understand if they had any concerns given the proximity of the site to Bentley Road but a response was never received.

#### 2.1.2 Community consultation

The location of the quarry is relatively isolated, so large scale community consultation was considered unnecessary. GHD contacted the Beyond Bentley group and all neighbouring residents. A meeting was held on 18 March 2021 with the Beyond Bentley – Our Sustainable Future Inc group at the start of the EIS process to gain feedback from the community regarding the project. Some neighbours did not object to the project, while the Beyond Bentley – Our Sustainable Future Inc group opposition. Issues raised and how they were addressed was provided in the EIS.

An attempt at further consultation was made prior to the EIS being lodged but due to COVID restrictions, face-toface consultation was not possible. An online meeting was advertised but only one person registered and another indicated there would be many in the community who are unlikely to attend or would not be familiar with online meetings. It was therefore decided to lodge the EIS and undertake further community consultation during the exhibition period when COVID restrictions had hopefully eased.

#### 2.2 Public exhibition of EIS

Richmond Valley Council placed the development application for the Bentley Quarry proposal on exhibition, from 13 December 2021 to 1 February 2022. The minimum 28 day exhibition period was extended because it was over the Christmas holiday period. Hard copies of the EIS were made available for public review and comment at a number of locations in accordance with Council policy.

R&S Contracting provided an additional 12 hard copies of the EIS to ensure the relevant documentation was available to the community.

GHD held a survey on Facebook to determine the best date for the community to hold an information session during the exhibition period. The preferred date was 22 December 2021, so a public information session was held at the Casino RSM on this date. The information session was advertised on Facebook and IndyNR.com.

The information session was attended by 32 community members.

#### 3. Submissions

#### 3.1 Agency submissions

Richmond Valley Council issued the development application to the following Government agencies for comment:

- Department of Primary Industries (NSW DPI)
- Environment Protection Authority (EPA)
- WaterNSW
- Transport for NSW (TfNSW)
- Lismore City Council (LCC)
- Kyogle Council

A summary of each agency that provided a submission and the response is below.

#### 3.1.1 Department of Primary Industries

NSW Department of Primary Industries (DPI) acknowledged the Land Use Conflict Risk Assessment (LUCRA) addressed the potential impact of the proposal and while some were initially rated as high, following mitigation the land use conflicts were rated as low. They also noted the area is mapped as 'regionally significant farmland' under the Northern Rivers Farmland Protection Project and also mapped as Biophysical Strategic Agricultural land (BSAL). However they acknowledged the area to be impacted was small and that extractive industries are permitted with consent in the RU1 Primary Production zone and the adjacency of transport infrastructure and the quality of the rock resource also means that the site is highly favourable for quarrying activity.

NSW DPI therefore declared they had no objections to the proposed development.

Response: We support with the DPI submission.

#### 3.1.2 Environment Protection Authority

The Environment Protection Authority (EPA) have issued their General Terms of Approval but have outlined that prior to issuing an Environment Protection Licence (EPL) they would require further detail on the proposed management of imported waste. They also require a Soi and Water Management Plan, Environment Management Plan and Blast Management Plan.

**Response**: If the proposal is approved, additional information will be provided in regard to the importation of waste and its management in the Environment Management Plan. The Soil and Water Management Plan and Blast Management Plan will be incorporated into the Environment Management Plan.

The importation of waste concrete would not occur in the short-term, so it would only be virgin excavated natural material and excavated natural material that would be required initially, which should make management easier.

#### 3.1.3 WaterNSW

WaterNSW indicated the proposal was not subject to any water access licence exemptions and requested further information.

**Response**: GHD responded explaining that in our opinion the proposal is exempt, in accordance with Clause 7 of Schedule 4 of the *Water Management (General) Regulation 2018* because:

- The Water Impact Assessment (GHD 2021) indicates the water take up would be less than 3 megalitres (ML).
- If approved, the development would be a lawful quarrying activity.
- The water take up would be incidental to the main purpose of the activity and is not considered to be consumption, according to a WaterNSW FAQ document.

WaterNSW have since responded and have acknowledged the proposal is exempt from a water access licence but indicated it has not been demonstrated how the proposal is exempt from requiring a Work Approval under Section 90 of the Water Management Act and potentially a surface water access licence (WAL).

WaterNSW were subsequently contacted to clarify what further concerns they had and what additional information was required. Their concern was in relation to the basin being made larger than required for sediment and erosion control. It was explained that the additional water captured in the basin would be used for environmental purposes e.g., dust control, washing trucks so they don't track sediment onto Bentley Road. WaterNSW indicated that providing this use was approved by Council and EPA, it would be considered exempt according to Schedule 1 of the Water Management (General) Regulation 2018, and a Works Approval would not be required.

In relation to the surface water WAL, WaterNSW acknowledged that the property had sufficient harvestable rights to supply the necessary volume of water, if required.

A letter confirming this discussion has been issued to Council, it is assumed this will be forwarded to WaterNSW for review.

#### 3.1.4 Transport for NSW

Transport for NSW (TfNSW) supports the Traffic Impact Assessment recommendation to install Austroads channelised right turn and auxiliary left turn treatments at the quarry access.

TfNSW recommended a Traffic Management Plan (TMP) be prepared and implemented addressing the construction, operation and decommission phases of the proposed development. It was recommended that the TMP be supported by a Driver Code of Conduct, including but not necessarily limited to,

- A map of the primary haulage route/s highlighting critical locations.
- An induction process for vehicle operators and regular toolbox meetings.
- Procedures for travel through residential areas, school zones and/or bus route/s.
- Evidence of consultation with relevant bus service providers where applicable.
- A complaint resolution and disciplinary procedure.
- Community consultation measures proposed for peak extraction periods.
- Work, health and safety requirements under the Work Health and Safety Regulation 2017.

**Response**: A TMP and Driver Code of Conduct would be prepared and implemented, in accordance with the above requirements, if the proposal is approved.

#### 3.1.5 Lismore City Council

Due to the LCC boundary being relatively close to the site, LCC highlights that RVC should consider impacts on all effected properties not just those within the RVC LGA. It also requests that LCC receive 55% of all contributions collected from the operations to be used to maintain the roads in the LCC LGA.

**Response**: The EIS has assessed the impact on all adjacent sensitive receivers, regardless of LGA. In regard to how contributions are distributed, that will be a matter for RVC to decide. R&S Contracting have indicated they would enter an agreement with LCC, so they receive a fair proportion of the contributions, providing it was done in consultation with RVC. R&S Contracting does not want to be in a position where they are paying full contributions to RVC and also paying contributions to LCC.

#### 3.1.6 Kyogle Council

Kyogle Council requested a traffic impact study and options report for upgrades to Bentley Road on the two curves immediately east of Alcocks Bridge.

**Response**: This is considered unreasonable. Alcocks Bridge is 12.5 km west of the quarry. It is estimated that at peak production the quarry would contribute an additional 3% traffic movements to Bentley Road. It is estimated that 10% of the total traffic movements from the quarry would travel west, so only an additional 0.3% of traffic using the bridge, at peak production, would be a result of the proposed quarry. Bentley Road is a regional road, which is regularly used by heavy vehicles. An additional 0.3% of traffic does not justify the upgrade of Bentley Road which is currently used by heavy vehicles.

#### 3.2 Public submissions

A total of 231 unique submissions were received, which also included a petition with 120 signatures. The majority of submissions raised concerns in relation to the proposal, while six submissions supported the proposal. Submissions were received from members of the Bentley community, people from Kyogle and Lismore who use Bentley Road and others from outside the area. It was noted that a number of people submitted multiple submissions.

The Beyond Bentley – Our Sustainable Future Inc group (made up of about 40 locals) have made a detailed submission and appear to have had a great influence on other submissions, with many of them referring to the issues raised by the group. This was possibly due to the active campaign the group have been coordinating, including signage along Bentley Road, Facebook campaigns, door knocking, petitions at local events, letter box drops and numerous media releases.

The submissions were reviewed and summarised into key issues, using a reference number assigned to each submission. This clearly showed which issues were of most concern to the community. The main issues identified within these submissions were:

- Traffic safety
- Road condition
- Land use conflict
- Landscape impact
- Groundwater impacts
- Noise impacts on recently approved dwelling at Lot 10 DP 1065523
- Noise impacts on livestock
- Health impacts
- Limited social benefit
- Property values

The above issues are discussed in more detail in Section 4. Detailed responses are also provided in relation to all issues raised in Appendix A.

While only six submissions in support of the proposal were received, this is not unexpected because people who support or are oblivious to the proposal rarely make submissions. R&S Contracting have reported there is support within the community, which is indicated by over 600 "likes" on their Facebook page. Further indications of support are the number of local customers the current operations have, which exceeds 400, with 50 being from Bentley.

Due to the number of objections, R&S Contracting contacted some community members who have signed a petition and provided letters of support, see Appendix B. As illustrated by Figure 3.1, many local residents, including immediate neighbours support the proposal (note not all signatories are shown because the figure concentrates on those close to the site). While not official submissions, this does indicate that there is support for the proposal within the local Bentley community.





#### 4. Key issues

The key issues raised in the community submissions are summarised and addressed below.

#### 4.1 Traffic safety

The submissions raised concerns that the increase in truck numbers on Bentley Road will create safety issues, especially for school buses, cyclists, pedestrians, rail trail crossing and horse riders.

**Response**: The increase in traffic at the maximum rate of production proposed would result in a 3% increase in traffic. This is considered relatively low and within the typical hourly capacity of a regional road. During periods of "typical" extraction, expected to be 100,000 tonnes per year or a third of the maximum extraction rate, the increase would be closer to 1%.

All drivers will need to obey the road rules, further minimising the safety risk. Truck movements are typically restricted to the inter-peak period to minimise disruption to the local road network during peak hours. It is expected restrictions will also be enforced on truck movements during school hours.

#### 4.2 Road condition

The submissions raise concerns about the increased truck movements deteriorating the road condition.

**Response**: As above, the increase in traffic at the maximum rate of production proposed would be 3%. During periods of "typical" extraction, which is expected to be 100,000 tonnes per year or a third of the maximum extraction rate, the increase would be closer to 1%. A 1-3% increase in traffic numbers is not expected to cause a noticeable deterioration of the roads, even if they are trucks.

Regardless, if approved, the operations would need to pay a contribution to RVC and as explained above, possibly LCC, for the maintenance of the road.

#### 4.3 Land use conflict

The submissions suggest the quarry would conflict with neighbouring land uses, especially the agri-tourism and regenerative farming in the area. Some submissions also indicate the LUCRA is inadequate.

Response: A revised LUCRA has been prepared to address this issue, refer to Appendix C.

#### 4.4 Landscape impact

The concern is the proposed quarry will alter the landscape and impact on the surrounding rural character of the area and its significance.

**Response**: The EIS has considered the visual impacts and provided a concept rehabilitation plan. With the proposed earth bund there would be limited views of the quarry during operation, so the impact on the surrounding character is expected to be minimal.

While the quarry would create a void at the site, once operations cease it is proposed to extensively plant the benches, which would screen the exposed surface of the site from view. The remainder of the site would be returned to pasture as it currently is, so there would be minimal impact on the surrounding environment or rural character of the area.

It is also highlighted that it has been well documented that the site and the area directly to the north of Bentley Road have been used as a quarry since the 1960s, so there is already a substantial change to the natural topography of the area. A benefit of the current proposal is that the visual impacts will be mitigated and the site rehabilitated at the end of its life, unlike the current situation.

#### 4.5 Groundwater impacts

There is concern that the proposed quarry will impact groundwater in the area and the assessment is insufficient.

**Response**: A groundwater assessment was completed which indicated the inflow rate would be 0.23ML/year and the radius of influence (groundwater drawdown) would extend only a few metres from the centre of the quarry and not to any adjacent properties. This conclusion was based on information from monitoring a well installed on site. The groundwater assessment acknowledged, even if the hydraulic conductivity was an order of magnitude higher than calculated, the inflow would increase to 0.85 ML/year and the radius of influence would only increase by 9 metres. To provide some perspective, a neighbouring property has an irrigation licence for 250 ML/year.

As groundwater is not expected to be intercepted until Stages 3 and 4, it has been recommended groundwater monitoring be undertaken during Stages 1 and 2 to confirm the predictions, which would provide another level of certainty.

### 4.6 Noise, vibration and dust impacts on recently approved dwelling at Lot 10 DP 1065523

Concerns have been raised about impacts on the recently approved dwelling at Lot 10 DP 1065523. A farm stay is also proposed at this property.

**Response**: We were not made aware of this dwelling by the community or RVC prior to submitting the development application but it has since been assessed in a revised Noise Impact Assessment (Appendix D) and a revised Air Impact Assessment (Appendix E).

#### 4.7 Noise impacts on livestock

Some submissions highlight that the EIS does not assess the impact of noise on landowners and livestock while on their land.

**Response**: To clarify, the concern does not relate to dwellings, which have been addressed in the Noise Impact Assessment. It relates to owners and their livestock anywhere on their land. There is no appropriate method or criteria to calculate or estimate noise impacts on livestock or fauna. However, research has shown that animals will readily adapt to reasonable levels of continuous sound, such as white noise and miscellaneous sounds. Further comments in relation to noise impacts on fauna are provided in the Ecology Assessment (Appendix G).

In relation to the impact on landowners, the Noise Impact Assessment was undertaken in accordance with the relevant policy, Noise Policy for Industry (NSW EPA, 2017), which requires the consideration of impacts at noise sensitive receivers only (i.e. a physical building or gathering spot such as a campground or identified recreational area). Open spaces such as paddocks, fields, empty lots, etc., do not fall under a sensitive receiver in accordance with the Noise Policy for Industry (NSW EPA, 2017) unless designated a sporting field or other recreational area.

#### 4.8 Health impacts

The impact of the proposal on the health and wellbeing of the community was raised as a concern.

**Response**: The criteria used in the assessments are conservatively based on health impacts, so if the impacts are within the relative criteria, the health impacts are expected to be minimal.

#### 4.9 Limited social benefit

Some in the community are concerned that the proposal will have a range of impacts and limited wider social benefit.

**Response**: Environmental impacts have been identified and addressed in the EIS and through this report. In relation to social benefit, the existing Bentley Quarry already provides a range of valuable services to the local community and this is expected to continue if the proposal is approved. The benefits include:

- A high quality local resource for road construction and other infrastructure projects.
- Employment of up to 5 locals.
- Sponsorship of a local speedway car, football team and Casino rodeo.
- Donations of gravel to the Casino Pony Club and Bentley Preschool.
- Provision of rocks to Manifold Public School to upgrade the playground.
- Provision of firewood to the local Preschool.
- Use of truck and tractor for delivery of hay and to help clean up during the recent flood disaster
- Plans to assist the dairy in Bentley to upgrade their road.
- Buying most products and services locally, including tyres, fuel, oil, grease, truck and machinery parts
- Using local contractors.
- An intent to provide materials for the proposed local rail trail, which R&S Contracting are keen to see established.
- Providing material for maintenance of local roads.

Ultimately, the applicants live in Bentley, have built their 'forever home' on the same property as the proposed quarry and are heavily invested in the local community, with kids at the local school/preschool and volunteering their time as treasurer of the Pony Club. They genuinely do not want to negatively impact the community and intend to contribute to the community in any way they can.

#### 4.10 Property values

There is a concern from some within the community that the proposal will reduce property values.

**Response**: Impacts on property values is not specifically identified as a matter for consideration under the *Environmental Planning and Assessment Act, 1979*, however, as shown by the environmental assessments for the proposed quarry, the economic impact of the proposal and specifically the impact on adjoining properties is considered to be minimal and within the relevant criteria, so it is expected the impact on property values would also be minimal. Extractive industries are a permissible use in the RU1 zone, so when living adjacent to an RU1 zoned property there is always the possibility of a rural industry including extractive industry or any other form of permissible use being established. This possibility would be considered in the value of the property, even if a quarry did not exist previously. In this circumstance, there is a long history of quarrying on both sides of Bentley Road in the location, so it is not unreasonable to expect an extractive industry to be re-established and it is assumed this possibility would already be reflected in the property prices.

# 5. Additional assessments and proposed project amendments

#### 5.1 Additional assessments

To address some of the issues raised by the submissions, a number of the technical assessments have been updated and some additional assessments prepared, these include:

- Noise Impact Assessment update (Appendix D)
- Air Impact Assessment update (Appendix E)
- LUCRA update (Appendix C)
- Visual images update (Appendix F)
- Biodiversity Assessment update (Appendix G)
- Bushfire Assessment (Appendix H)
- Contamination Assessment (Appendix I)
- Wastewater Assessment (Appendix J)

#### 5.2 Project amendments

As a result of the review of submissions, a number of amendments are proposed in response. Some of the amendments are considered essential, while others will be further assessed by RVC:

- Noise wall at the entrance, if R9 is constructed, refer to Appendix D
- Noise and visual screen on the northern side of the quarry, if R2 is occupied, refer to Appendix D
- Relocation of the proposed offset area, refer to Appendix G
- Providing a variety of nest boxes for bats and arboreal mammals, refer to Appendix G
- Restricting traffic speeds within the quarry to 50km/hr, refer to Appendix G
- Incorporating a toilet and wastewater system at the quarry, refer to Appendix J.

# Appendices

## Appendix A Public submissions summary and response

Category	Sub category	Issue	Submission id	Response
Proposal	Setback	The quarry and site office are within the requried 20m setback	001, 002	The site office is 21.8m from the norhtern boundary
Proposal	Farm shed	The existing farm shed should be included in the assessemnt	001, 002	owned by R&S Contracting, as it is currently. No ex
Proposal	Construction timeframe	No details of the construction timeframe are provided	001, 002	If approved, construction would commence as soor complete. All other construction activities i.e, estab expected to be completed at the same time as the
Proposal	CIV	The CIV has been done by the proponent who is not suitably qualified	001, 002	R & S Contracting have 15 years experience in cor They regularly provide quotes for road works and h proposed changes to the guarry, so it is considered
Proposal	Toilet	Need an accessible toilet compliant with AS1428.1	001, 002, 004	As the site/operation is not suitable for a person wit
Proposal	Insufficient details	Insufficient detail is provided on the proposal or plans	001, 002	The level of informaton provided is consistent with developments, however further details are provided the proposal is approved, in management plans, de
Proposal	Fuel truck	Refueling by a mobile fuel truck is not practical	001, 004	A number of quarries of similar size operate by usin and what is proposed.
Proposal	Generator	The use of a generator has not been assessed	001, 099	A generator is not proposed or required. Electricity that stage electricity will be extended to the site, as
Proposal	Hours of operation	No description of what works are involved in the start up or shut down	001, 003, 005, 033, 099	Start up and shut down activities would include wor opening gates, etc. No machinery would be turned
Proposal	Servicing	Servicing of machinery offsite is not realistic	001, 005, 033. 185	As mentioned in Section 3.6.5, all scheduled servic machinery need minor repairs on site due to break avoid oil/fuel leaks. Any major repairs would be cor
Proposal	Power	The EIS claims there would not be any utilities required initially but does not provide detail on when they will be required	003, 005, 033, 099	Section 3.6.7 explains power will be extended from a weighbridge is installed.
Proposal	Wastewater	Relying on the septic tank approved for the shed is not within the proposal site	001, 003, 099	It is now proposed to have a toilet and wastewater provided early May.
Proposal	Site area	The shed and toilet are proposed to be used but not part of the impact area and is not approved as a commercial use	001	The shed was not included in the impact area beca the site office. The shed will therefore only be used
Proposal	Existing use rights	The current operation does not have existing use rights	'001, 002, 003, 004, 074, 085, 099, 167, 173, 196, 200, 208, 209, 243, 247	While it is acknowledged there is concern about the application is in relation to the proposed operations
Proposal	Demand	The EIS does not provide evidence there is demand for the material 001, 002, 003, 004, 005, 025, 033, 099, 134, 138, 141, 152, 166, 167, 185, 230, 243, 247		0, As mentioned in the EIS, the contacts established tonnes per annum, with periods (eg floods) when g
Proposal	Demand	The EIS does not consider surrounding existing quarries in the region that have capacity to provide materials and employment into the future	001, 002, 003, 005, 006, 010, 012, 017, 020, 022, 025, 026, 028, 033, 040, 04 044, 055, 076, 085, 099, 101,141, 166, 184, 200, 230, 243, 247	1, It is understood there are other quarries in the regic products produced by Bentley Quarry. A map show batching plants has been referred to in some subm shows there are quarries located closer to the three proposed quarry is conveniently located to all three materials is expected to be road construction and p batching plants in Lismore are sourcing their mater This suggests some of the existing operations do n Quarry may be able to satisfy that demand with les
Proposal	Rehabilitation detail	Limited detail on the rehabilitation is provided	001, 002, 003, 005 ,033, 040, 041, 099	As explained in the EIS, as the final shape of the que once this is known. However a list of objectives for This is consistent with other similar developments.
Proposal	Rehabilitation funding	The proposed 5 cents per tonne allowance for rehabilitation is insufficient and should be required at the commencement of the operations, not linked to the volume extracted.	001, 003, 099	Five cents per tonne is considered sufficient becauses shaping and topsoiling the benches and then planti \$2,000 per day, that would leave \$43,300 for planti fills with water it is less than a hectare that will require about 1 plant every 2m2, which is considered more that wind the fund linked to the tonnes expression.
				quarry will expand beyond Stage 1, so enforcing th unreasonable. Possibly a bond prior to commencin
Proposal	CIV	Capital investment value is limited to site establishment and insufficien	t 003, 099, 136, 137	The CIV was increased following discussions with 0 established there is very little capital investment red be used permanently, with the larger more expensi- needs basis.
Proposal	Washing	No allowance for washing aggregates used to supply for concrete	001, 004	It is not proposed to wash aggregates or operate a
Planning	Plans and policies	Relevant plans, policies and regulations not satisfacorily addresed	001, 002	Secdtion 4 of the EIS addresses the most relevant the concerns raised in relation to contamination. In resources are essential for development and maint proposed quarry provides access to these resource with the aims and objectives of these plans.
Planning	EP&A Act	Does not address objects of the EP&A Act	001, 002, 004, 247	The objects of the Act are addressed in Section 8.5
IPlanning	ISEARs	Leads to address the SEARS	1136	How the SEARs are addressed is detailed in Table

which is in excess of the 20m requirement.

t is only proposed to use the shed for the storage of trucks and equipment (pansion, modifcation or change of use to the approved shed is proposed.

n as possible, with the road works expected to take about 3 months to lishing bunds, sealing the internal road, establishing the site office, are road works.

nstruction works and has been operating Bentley Quarry for about 4 years. have a detailed knowledge of the costs associated with implementing the d they are appropriately qualified.

th a disability, under AS1428.1 accessible facilities are not required

the level of detail required by Council and that provided for similar I in this response to submissions. Further details will also be provided, if etailed designs, etc

ng a fuel truck, so while it may not be the most efficient option, it is practical

is not required for the operation until the weighbridge is installed and at soutlined in the EIS.

rkers arriving on site, doing HSE checks, planning the days activities, on or any significant noise generating activities occur.

cing will occur offsite, however there may be times where plant and down. If repairs are required these would be done in a controlled manner to mpleted offsite.

within the site once the extraction exceeds 100,000 tonnes per annum and

disposal system within the quarry site. A wastewater assessment will be

use no changes are proposed. As indicated, a toilet will now be provided at to store R&S Contracting trucks, as it is now.

e validity of the existing use rights relied on for the existing operation, the and does not rely on the existing use rights.

via the existing operations have indicated demand would be about 100,000 reater volumes would be needed.

on but the existing operations have shown there is a demand for the ving the locaiton of the proposed quarry in relation to other quarries and uissions to demonstate the proposed quarry is not necessary. While this e main towns than the proposed operation, it also demonstrates the e towns and over 20km from any other quarry. The primary market for the property/farm access, not batching plants, however it has been reported the ial from near Ballina, which is significantly further than the proposed quarry. tot produce material suitable for the batching plants and therefore Bentley s impact than hauling material from Ballina.

uarry is unknown, it is proposed to provided details of the rehabilitation any rehabilitation are provided, along with a concept rehabilitation plan.

se the rehabilitiation only requires some minor earthworks associated with ing with tubstock. Assuming it would take 2 weeks for the earthworks at ing. At \$10 per planted plant that is over 4,000 plants and assuming the pit uire planting (the remainder of the site will be returned to pasture). This is than sufficient

extracted, this is considered appropriate because there is no certainty the ne full cost of the rehabilitation at the commencement of operation would be ng of each stage would be a suitable compromise..

Council to reflect the market value in accordance with PS13-002. Once quired. R&S Contracting already own most of the machinery proposed to ve amchinery eg crushers, screen, pre-coating plant to be hired on an as

#### wash plant.

legislation and a contamination assessment is being prepared to address relation to the plans not addressed in the EIS, extractive industry enance of infrastrucuture and as shown by the detailed assessments, the es with minimal impact. It is therefore considered the proposal is consistent

5 of the EIS 5.1 of the EIS

Consultation	Insufficient	The community consultation was insufficient	001, 002, 003, 005, 033, 044, 054, 099, 136, 183, 197, 243, 247	All immediate neighbours to the north, east and wes south was not contacted because they were over a to impact them. Two of the neighbours organised 15 group clearly expressed their concerns about the pr community made it clear no proposal for a quarry w reinforced their concerns about the proposal via fac media releases to update the community during this In resposne to the community's concerns, the level were sufficiently considered. Dust and visual impact the relative isolation of the site. Geotechnical/road s in more detail following the consultation.
				completion of the technical assessments. Unfortuna middle of the Delta COVID19 outbreak, so it was dii attempted to organise a vitual meeting via the Beyo person indicated interest in attending. As it was unk the EIS and hold the community information session restrictions made it difficult to hold further meetings understanding of the community's concerns followir articles.
Consultation	Public exhibition	Public exhibition period was inadequate	001	The public exhibition period is managed by Council
Land	Landscape	The EIS does not consider how the quarry will disfigure the land and impact the surrounding agricultural environment/ rural character of the area and its cultural significance	001, 005, 014, 015, 023, 026, 029, 030, 033, 034, 036, 054, 062, 083, 091, 113 115, 129, 135, 136, 138, 145, 153, 154, 165, 170, 171, 172, 175, 178, 185, 189 191, 192, 194, 198, 201, 202, 203, 206, 208, 211, 213, 214, 215, 217, 219, 228 232, 233, 236, 239, 240, 241, 242, 243, 245, 246, 247, 248	, The EIS has considered the visual impacts and pro- the proposed earth bund there would be limited view, the site, once operations cease it is proposed to ex- screen the exposed surface of the site from view, so character.
				It is also highlighted that it has been well document been used as a quarry since the 1960s, so there is benefit of the current proposal is that the visual imp the current situation.
Land	d Industrilisation The development of the quarry will set precedent for future industrial developments in the region '001, 012, 015, 021, 025, 033, 040, 041, 043, 051, 055, 074, 087, 103, 104, 110, 142, 148, 164, 196, 211, 233, 243, 247		The quarry will not result in the industrialisation of the zone are permitted. Extractive industries are a permitted the land use.	
Land	Area of land impacted	The impact is greater than the 1% claimed in the EIS	001, 003, 099	The reference to 1% impact is to the long term impa the assumption that the historical quarrying activitie agriculture, so the proposal may increase the area of property is 212 hectares in size, so the 2.5 hectares little over 1% as mentioend in the EIS.
Land	Reginally significant farmland	It is regionally significant farmland	001, 004	The EIS acknowledges the site is mapped as region and the indirect impact to agricuture is minimal. NS' objections, acknowledging the impact is relatively so is adjacent to an arterial road network and the resor
Land	Bentley Road stability	The proposal may impact on the stability of the Bentley Road cutting	001	A detailed geotechnical report assessed the potenti cutting. Based on the recommendations of the asse proposed and a benched wall design adopted. The actual road, which reduces the stabliity risk to Bentl
Land	Regionally significant resource	It is not recognised as regionally significant resource	001	The site is not currently identified as a regionally sig Statement: Beyond 20:20 Vision but this does not n it was identified, this does not exclude any other typ need to consider its impact on the operation. This is
Land	Agricultural impacts	The proposal would impact the agri-tourism and agricultural land use	001	The LUCRA assessment and air, noise, traffic, and with the proposal are largely contained on the site of potential impacts on agri-tourism or agriculture are
Land	Contamination	The EIS does not satisfacorly address contamination risk	001, 002, 003, 004, 099	A detailed contamination assessment is being prep
Land	Sparsely populated         The area is not sparsely populated         001		001	The area is rural in nature and has a large minium l only one unoccupied house within 1km of the site (a dwellings), it is considered a reasonable statement.
Water	Water quality Water quality runoff has been insufficiently considered, especially in relation to bitumen precoated materials and spills		001, 002, 003, 004, 006, 010, 012, 015, 017, 020, 025, 040, 041, 099, 232	It is proposed to manage water runoff from the site Volume 2e Mines and quarries (Landcom, 2004). In cleaned up immediately. The precoated materials w of time. If some materials remain on site for a length water discharged from site will need to be tested for water will need to be treated or disposed at a suitab in Bentley Quarry's interest to prevent any water fro water management employed at the site would be i
Water	Inadequate supply	The EIS claims a deficit of 1ML/year and this would be addressed by construction of additional dams but no detail is provided	001, 003, 038, 099, 141, 203	Any additional water resources, if required, would b from on site dams, which have a maximum harvesta

st were contacted at the outset of the EIS process. The neighbour to the kilometre away and seperated by a hill, so the proposal was not expected 5 additional local residents to attend a meeting on site. At this meeting the roposal. The option of reducing the volume or scale was discussed but the volud be acceptable. Following this meeting the community group sebook, letters from their solicitor and media releases. GHD also issued s time.

of detail provided for a number of the assessments to ensure the impacts ts were originally just going to be based on a desktop assessment due to stability was not going to be assessed in detail. All of these were assessed

s indicated further consultaiton would be undertaken following the ately, when the technical assessments were completed NSW was in the fficult to organise a meeting within the health restrictions at the time. We ond Bentley facebook page. The post recieved over 100 views but only 1 known when the health restrictions would ease, it was decided to submit n following submission, which were done. Although not ideal, COVID with the community and we believed we had a reasonably good ng the initial consultation and subsequent facebook posts and media

#### and has been undertaken in accordance with Council's policies.

ovided a concept rehabilitaiton plan. The visual impacts indicate that with ws of the quarry during operation. While the quarry would create a void at ttensively plant out the benches on the walls of the quarry, which would to there would be minimal impact on the surrounding environment or rural

ted that the site and the area directly to the north of Bentley Road have already a substantial change to the natural topography of the area. A pacts will be mitigated and the site rehabilitated at the end of its life, unlike

he area becasue the land is zoned RU1 and only land uses permitted in permissible use in the zone and therefore considered to be consistent with

act on the ability for the land to be used for agriculture. This was based on as have already impacted the ability of 1 hectare of the site to be used for not suitalbe for agricultural activities in the future by 2.5 hectares. The s that would be impacted by the proposal is 1.18% of the property area or a

nally significant farmland but explains the direct impact is relatively minor W Agriculture have reviewed the proposal and have not raised any mall in area. Extractive industries are a permitted use in the zone. The site urce is highly suitable for road and infrastructure projects.

ial impacts of the proposed quarry on the stability of the Bentley Road assment, the quarry has been relocated further from the road than originally are is also a wide road reserve between the propoery boundary and the ley Road further.

gnificant extractive resource in the RVC Local Strategic Planning nean additional extractive resources can not be identified and developed. If be of development in the area, it just means any future development will s addressed further below.

visual assessments have all demonstrated that the impacts associated of the proposal and those that are not are within the relevant criteria, so the considered to be minimal.

ared.

lot size and as such can be regarded as being sparsely populated. There is excluding the applicant's house and the 2 proposed, but not built,

in accordance with Managing Urban Stormwater Soils and Construction – n relation to hydrocarbon impacts, during operations, any spills will be would be made to order, so they will not be stockpiled on site for any length h of time, they will be covered to prevent leachate runoff. Additionally, any r oil and grease prior to discharge. If any oil or grease is detected, the oly licenced facility. Disposing contaminated water is expensive, so it will be om being contaminated with hydrocarbons. Further details in regard to the included in a management plan, if the proposal is approved.

be from legal sources. Either from water imported to site via water trucks or able right of 24.6ML, well in excess of the potential 1ML shortfall.

Water	Modelling	The modelling uses averages which mean it does not adequately account for extreme events	001	The modelling does not use averages. Section 5.4 st
				Average results are presented in Section 5.4.3 for pu
				Section 5.4.4 considers water security based on the
				Section 5.4.5 considers off-site discharges and explice Section 5.4.3. It is not clear from the submission whice modelling have been used to assess the project in ac
				discharges).
Water	Groundwater quantity	Insufficient assessment of likely impacts to groundwater quantity on	001, 003, 004, 005, 006, 008, 010, 012, 015, 016, 017, 020, 021, 022, 026, 028	A groundwater assessment was completed which inc
			102, 103, 104, 104, 104, 1043, 1050, 1051, 1050, 107, 1073, 1074, 1087, 1080, 1089, 1092, 1099 102, 103, 104, 108, 136, 148, 178, 179, 192, 197, 202, 203, 209, 232, 238, 243 247	I groundwater drawdown) would extend a few meters based on information from monitoring a well installed hydraulic conductivity was an order of magnitude hig radius of influence would only increase by 9m. To pro for 250 ML/year. As groundwater is not expected to be intercepted unt undertaken during Stages 1 and 2 to confirm the pred
Water	Groundwater quality	Potential impacts on groundwater from precoat operations and spills	001, 002, 003, 006, 008, 010, 012, 015, 020, 033, 040, 041, 043, 050, 057, 099 136, 197, 232	It is considered unlikely that the proposed operations potential contamination and appropriate management
Noise	Lot 10 DP1065523	The EIS has not considered the impact on the approved dwelling and proposed farm stay at Lot 10 DP1065523	001, 003, 004, 005, 033, 099, 166, 209	Please refer to the updated Noise Impact Assessmer
Noise	Unoccupied dwelling	The noise assessment dismisses the exceedance at R2 because it is unoccupied	001, 002, 003, 004, 005, 033, 099	The exceedance is considered acceptable because i and the owner has provided a letter confirming they a The revised Noise Impact Assessment discusses mit
Noise	Traffic noise	Traffic noise not considered	005, 012, 033, 042, 043, 045, 051, 054, 056, 058, 073, 074, 136, 141, 157, 171	Traffic noise is considered in the noise impact asses
Noise	Guidelines	Is reference to United States EPA's Intermittent Traffic Noise guidelines relevant	003, 099	Yes it is. Typically traffic noise is calculated using the Kingdom), however this is only meant for continuous intermittent, with a maximum of 1 movement every 10 times. The United States EPA Intermittent Traffic Noi impacts from intermittent traffic, which has been dete at Bentley Quarry.
Noise	Stage 3 and 4	Impacts from Stages 3 and 4 not assessed	001	The noise report outlines why Stages 3 and 4 were n case noise impacts as all equipment is situated at a h during Stages 3 and 4, the noise impacts expected w
Noise	Machinery noise	The EIS has not considered the impact of noise generated from machinery operation to landowners and any livestock on surrounding land	005, 006, 010, 012, 017, 020, 027, 033, 037, 043, 051, 058, 069, 076, 087, 093 098, 102, 103, 104, 136, 138, 141, 142, 145, 148, 149, 150, 154, 157, 159, 162 163, 164, 166, 167, 168, 169, 173, 192, 195, 198, 200, 209, 215, 219, 220, 225 239, 241, 242	To clarify, the concern does not relate to dwellings, w owners and their livestock anywhere on their land. Th impacts on livestock or fauna. However, research ha sound, such as white noise and miscellaneous sound in the ecology assessment. In relation to the impact on landowners, the Noise Im and standards, which requires the consideration of in gathering spot such as a campground or identified re do not fall under a sensitive receiver in accordance w other recreational area (NSW EPA, 2017).
Noise	Methodology	The assessment methodology is inadequate	001	In relation to the impact on landowners, the Noise Im and standards, which requires the consideration of in gathering spot such as a campground or identified re are not deemed a sensitive receiver in accordance w other recreational area (NSW EPA, 2017).
Vibration	Notification	The proposed mitigation only requires residential receivers within 1km to be notified but some property owners who do not have a residence within 1km would not be notified	001	Please refer to the updated Noise Impact Assessmer
Vibration	Dwelling and proposed farm stay Lot 10 DP1065523	at The EIS has not considered the impact on the approved dwelling and proposed farm stay at Lot 10 DP1065523	001, 003, 004, 005, 099, 033, 209	Please refer to the updated Noise Impact Assessmer during the assessment period. The updated Noise Im
Vibration	Structural assessment	A structural integrity assessment of nearby dwellings should be 001 required prior to operations commencing		Calculated MIC quantities to comply with overpressu vibration criteria. Since the limiting criteria is for overp monitoring finds vibration levels approaching 5 mm/s
Vibration	Impact to the road	Blasting may impact Bentley Road	003, 099	A blasting assessment has been undertaken and fou Bentley Road. In addition, a monitoring program has blasting activities to ensure all sensitive locations are made for future blasts.
Air	Dwelling and proposed farm stay Lot 10 DP1065523	at The EIS has not considered the impact on the approved dwelling and proposed farm stay at Lot 10 DP1065523	001, 003, 004, 005, 025, 033, 099, 138, 195, 197, 209	This will be addressed in the Air Impact Assessment
Air		I he EIS has not considered the impact of ongoing dust production from crushing and blasting on the health and productivity of nearby crops	1005, 013, 014, 015, 033, 037, 040, 045, 051, 076, 078, 087, 093, 102, 103, 104 108, 142, 143, 148, 149, 150, 154, 162, 164, 167, 195, 197, 207, 219, 225, 229 239, 241	I his will be addressed in the Air Impact Assessment
Air	Methodology	The assessment methodology is inadequate	001	This will be addressed in the Air Impact Assessment
Air	Truck numbers	The assessment assumes 3 trucks per hour when 7 are proposed	001	This will be addressed in the Air Impact Assessment
Air	Odours	No assessment of odours from pre-coast operations	001	This will be addressed in the Air Impact Assessment

states that the model simulated the full range of historical rainfall extending

purpose of characterising the average annual water balance.

e full range of droughts observed in the historical rainfall record.

licitly acknowledges the limitations of the average results represented in hich specific 'extreme' event has not been considered. The results of the accordance with relevant guidelines (specifically DECC (2008) for off-site

ndicated the inflow rate would be 0.23ML/year and the radius of influence rs from the centre of the pit and not to any adjacent properties. This was ed on site. The groundwater assessment acknowledged, even if the igher than calculated, the inflow would increase to 0.85 ML/year and the provide some perspective, a neighbouring property has an irrigation licence

intil Stages 3 and 4, it has been recommended groundwater monitoring be redictions.

ns would impact groundwater quality because of the limited sources of ent eg cleaning up spills, controlling runoff from pre coated materials, etc

ent

e it is unoccupied. The exceedance is minor during the worst case scenario v accept the minor exceedance.

nitigation measures to alleviate the noise impact at R2.

essment and is shown to comply with the relevant criteria

he CoRTN algorithm (which is an algorithm developed in the United us traffic flow. The traffic during the operation of Bentley Quarry will be 10 minutes during peak hour, and even fewer movements during other loise Guideline outlines a calculation which is used to determine noise etermined to be the best suited mathematical formula for the traffic situation

not assessed. It was determined that Stages 1 and 2 would result in worst a higher elevation. Since equipment would be much lower on the pit floor would be lower than those estimated for Stage 1 and 2 operations.

which has been addressed in the Noise Impact Assessment. It relates to There is no appropriate method or criteria to calculate or estimate noise nas shown that animals will readily adapt to reasonable levels of continuous nds. Further comments in relation to noise impacts on fauna are provided

Impact Assessment was undertaken in accordance with all relevant policies impacts at noise sensitive receivers only (i.e. a physical building or recreational area). Open spaces such as paddocks, fields, empty lots, etc. with the Noise Policy for Industry unless designated a sporting field or

Impact Assessment was undertaken in accordance with all relevant policies impacts at noise sensitive receivers only (i.e. a physical building or recreational area). Open spaces such as paddocks, fields, empty lots, etc with the Noise Policy for Industry unless designated a sporting field or

ent for proposed notification protocol.

ent. GHD was not made aware of this new approved dwelling or farm stay Impact Assessment has included these new dwellings.

sure criteria are significantly lower than what is needed to comply with erpressure, structural assessments for dwellings is not warranted unless /s at the closest dwellings.

ound blasting can occur without resulting in any structural damage of as been recommended to record peak particle velocities for the first several re within criteria and to allow for changes to the blasting program to be

nt addendum

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A :	VP. 16 196 -				
Air Biodiversity	Visibility	Dust impacts from crushing and blasting on driving visibility	001 004	I his will be addressed in the Air Impact Assessment addendum	
biodiversity	Cleaning	2016			
Biodiversity	Indirect impacts	Inadequate consideration of indirect impacts associated with noise, dust and road kill	001	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Vegetation type	Coastal Flood plain Forest of the NSW North Coast should be considered	001	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Methodology	Survey inadequate	001	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Area assessed	The assessment should include contiguous vegetation, including the	001, 004	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Haulage routes	Haulage routes impact not considered	001	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Offset inadequate	The proposed offset is inadequate and inappropriate	001	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Biosecurity	Biosecurity is a risk not addressed in the EIS	001.004	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Hairyjoint grass	Surveys not appropriate for Hairyjoint grass	001	This will be addressed in the Biodiversity Assessment addendum	
Biodiversity	Impact outside direct impact area	The EIS fails to consider long term impacts on flora and fauna outside of the immediate development footprint, particularly the forested area	'001, 002, 004, 005, 014, 015, 022, 028, 030, 033, 043, 049, 053, 055, 109, 116, 122, 136, 147, 149, 150, 166, 175, 186, 187, 190, 202, 204, 214, 221, 240 243, 247	This will be addressed in the Biodiversity Assessment addendum ,	
Traffic	Truck movements	Truck movements associated with imported materials are not considered	003, 005, 006, 010, 017, 020, 033, 099, 226, 228, 238, 242, 243, 247	As mentioned in Section 3.5.2 the proposed maximum truck movements includes movements associated with importing materials and those using the weighbridge but not hauling materials	
Traffic	Truck movements	Traffic movements will be more than proposed	003, 005, 006, 010, 017, 020, 033, 099, 226, 228, 238, 245, 246, 247, 248	It is proposed and it is anticipated the conditions will limit the maximum number of trucks movements to 140 per day	
Traffic	Sunset and sunrise	Impact of sunset and sunrise in the location of the inersection/access	001	While it is appreciated sunset and sunrise may affect visibility at times at the intersection, it is expected the length of time	
		not considered		when this maybe a problem will be limited and as the quarry will only be operating during daylight hours, there will be limited, any, vehicles entering or exiting the site at these times.	
Traffic	Intersection	The proposed intersection is inadequate	001	Turn warrants have been assessed based on existing and proposed volumes with the appropriate turn treatments adopted.	
Traffic	Safety	The increased truck number will create a safety issue, espcialy for school buses, cyclists, pedestrians, rail tral crossings and horse riders	001, 005, 006, 007, 010, 011, 012, 013, 014, 015, 016, 017, 020, 021, 022, 023 024, 025, 026, 027, 028, 030, 031, 032, 033, 036, 037, 038, 039, 040, 042, 043 044, 045, 046, 049, 050, 051, 053, 054, 055, 057, 058, 059, 061, 065, 066, 067 068, 069, 073, 077, 078, 079, 081, 082, 083, 085, 086, 087, 088, 089, 090, 091 092, 093, 094, 095, 096, 097, 098, 098, 099, 101, 102, 103, 104, 106, 107, 108 110, 111, 112, 113, 115, 116, 117, 124, 127, 128, 129, 133, 134, 135, 136, 138 142, 143, 144, 145, 147, 148, 150, 151, 152, 153, 155, 160, 161, 162, 164, 165 166, 167, 168, 169, 170, 171, 172, 177, 180, 181, 182, 183, 185, 187, 188, 189 190, 191, 193, 194, 195, 196, 197, 198, 200, 201, 202, 205, 206, 210, 211, 212 214, 218, 219, 220, 224, 225, 226, 228, 230, 231, 232, 233, 236, 238, 242, 245 247, 248, 250	The increase in traffic at the maximum rate proposed would result in a 3% increase in traffic. This is considered relatively low, and within the typical hourly capacity of a regional road. All drivers will need to obey the road rules, further minimising the safety risk. Truck movements are typically restricted to the inter-peak period to minimise disruption to the local road network during peak hours.	
Traffic	Old data	The 2006 and 2014 data used is dated and inadequate	001	The most recent datasets of 2009 and 2014 were obtained from the road authority. Growth in the historic volumes were applied to estimate volumes at the project horizons to establish baseline traffic, with construction and operational volumes applied in addition. Traffic count surveys would have to be commissioned to gather existing traffic volumes.	
Traffic	Road condition	Existent deterioration of roads will worsen due to truck movements	001, 005, 006, 010, 011, 012, 014, 015, 017, 018, 020, 021, 023, 025, 026, 027 030, 031, 032, 033, 038, 040, 041, 042, 043, 044, 045, 046, 049, 050, 051, 053 054, 055, 056, 058, 059, 065, 066, 068, 069, 076, 077, 082, 083, 088, 089, 090 092, 093, 096, 097, 098, 101, 103, 105, 108, 110, 111, 112, 115, 117, 124, 125 126, 127, 128, 134, 135, 142, 143, 144, 145, 147, 151, 152, 154, 156, 160, 161 162, 164, 165, 166, 167, 168, 169, 170, 171, 172, 177, 183, 184, 185, 186, 190 191, 193, 195, 196, 197, 200, 201, 203, 206, 210, 212, 219, 225, 226, 228, 230 231, 232, 236, 238, 239, 241, 243, 247, 250	<ul> <li>, 027, The increase in traffic at the maximum rate of production proposed would be 3%. During periods of "typical" extraction, , 053, expected to be 100,000 tonnes per year or a third of the maximum extraction rate, the increase would be closer to 1%.</li> <li>, 090, 3% increase in traffic numbers is not expected to cause a noticeable deterioration of the roads, even if they are trucks.</li> <li>, 125, 161, Regardless, if approved, the operations would need to pay a contribution to RVC and as explained above, possibly LC4, 190, the maintenance of the road.</li> <li>, 230, 230, 230, 230, 230, 230, 230, 230</li></ul>	
Traffic	Existing conditions	Concerns regarding increased truck movements on existing road network including intersection of Naughtons Gap Road and Bungabbe Road close to the quarry entrance as it has poor visibility and no pull off lanes	001, 004, 005, 006, 010, 011, 012, 015, 016, 017, 020, 025, 027, 030, 031, 032 033, 036, 038, 040, 041, 042, 043, 051, 053, 089, 095, 110, 112, 117, 128, 134 136, 142, 159, 160, 162, 163, 164, 165, 166, 168, 169, 170, 172, 175, 176, 191 193, 195, 197, 200, 201, 206, 210, 212, 226, 228, 231, 232, 238, 243, 247, 250	132, Sight distances and turning requirements from the Bentley Quarry intersection have been reviewed. The Naughtons Gap (34, Road is considered beyond the minimum sight distance measurements to the west, and Bungabee Road is within the sight (191, distance measurements to the east. Turn lane requirements at the side road intersections visibility from these sites are (250) outside of the project scope.	
Traffic	Lismore LGA roads	The impact of the Quarry on the ratepayers of Lismore regarding the maintenance of the roads in the LGA	001, 002, 044, 048, 128	Lismore City Council has made a submission and contacted R&S Contracting directly to raise this issue. The respose to both has been R&S Contracting have indicated they would enter an agreement with LCC, so they receive a fair proportion of the contributions, providing it was done in consultation with RVC. R&S Contracting does not want to be in a position where they are paying full contributions to RVC and also paying contributions to LCC.	
Visual	Visual images	The site office, haul road and entrance will be in view of traffic on Bentley Road and not shown on visual images	001, 003, 099	The visual images will be updated to show these features and the proposed noise wall at the entrance	
Visual	Above view	View from above not considered	001	The view from above is not normally considered during a visual assessment unless it was a view experienced by a significant number of senstive recievers, such as a flight path or hot air ballooning area.	
Visual	View from north and west	View from the north and west have not been considered, including R4 and the approved dwelling on Lot 10 DP1065523	001, 002, 003, 004, 099	Views from the north are limited, other than from the paddock of the property immediately north of Bentley Road, where it is unlikely anyone will be exposed to the view for any length of time. Further north, there is a dwelling approximately 1.8km north which can see the quarry site but it is a small part of the horizon. The railway which will form part of the rail trail is approximately 1.3km north but at an elevation approximately 30m below the level of the quarry, so due to the topography, is unlikely to have views of the quarry. Regardless, if deemed necessary by Council, a vegetated earth bund could be placed along the northern side of the quarry to further screen the view.	
				From the west, views may be possible from the adjacent property but they will be obscured by the proposed earth bunds, similar with the proposed R4. The view from R4 would be further obscured by the trees between the two locations.	
Visual	Landscape mounds	No timeframe for constructing the landscpe mounds/bunds	001	Section 3.3 Site establishment, explains the landscape mounds/earth bunds will be constructed during the establishment phase of the site.	

Waste	Imported waste	Insufficient detail is provided on how waste from imported materials with be managed	III 001, 003, 004, 012, 015, 099, 185, 243, 247	Management measures are outlined in Section 7.9. Management Plan to be developed, if the proposal
Waste	Imported waste	The reliance on staff to detect contaminated waste is not acceptable and the steel reinforcement is not addressed	001	Management measures are outlined in Section 7.9 Management Plan to be developed, if the proposal
Heritage	Native title claim	A Native Title Claim on adjacent Crown land	001	The proposal does not extend onto Crown land. Re development application.
Heritage	Area of assessment	The LALC assessment should cover the whole property	001, 002, 004	The LALC assessed the area to be impacted by the necessary as the proposal only applies to part of th be limited to the existing use, not as a toilet for the
Heritage	Buildings	Disputed Plains Homestead and Blue Fattoria Farms-stay not adequately addressed	001	The historical Disputed Plains Homestead and Blue impacted. Due to the proximty of the Disputed Plain to commencing operations could be undertaken.
Heritage	Bentley Blockade	The Bentley Blockade has not been considered but considered to be o cultural significance	of 001	The Bentley Blockade was a significant milestone f proposal on the property. The proposal is not cons the Blockade or is associated with it or the CSG pro-
Hazards	Bushfire	Busfire is not addressed	001, 002, 004	A bushfire hazard assessment has now been prepa
Socio economic	Limited benefit	The proposal will benefit few people but impact on neighbours and tourism opportunities for the area	001, 004, 005, 006, 010, 012, 013, 014, 015, 016, 017, 018, 020, 022, 023, 025 027, 028, 031, 033, 034, 042, 043, 044, 046, 049, 051, 053, 054, 054, 056, 057 060, 064, 065, 073, 076, 077, 085, 087, 089, 092, 094, 103, 108, 111, 115, 116 124, 135, 136, 138, 142, 145, 148, 153, 160, 163, 168, 169, 171, 176, 178, 182 189, 200, 202, 214, 215, 226, 228, 230, 232, 236, 239, 240, 241, 243, 245, 246 247, 248, 249	<ul> <li>5. In relation to social benefit, the existing Bentley Qu</li> <li>7. and this is expected to increase if the proposal is a</li> <li>5. A high quality local resource for road construction</li> <li>2. —Employment of up to 5 locals</li> <li>6. —Sponsorship of a local speedway car, football tear</li> <li>—Have given the Casino Pony Club and Bentley Pre</li> <li>—Provision of rocks to Manifold Public School to up</li> <li>—Provision of firewood for the local Preschool</li> <li>—Donation of truck and tractor for delivery of hay ar</li> <li>—Have plans to assist the dairy in Bentley to upgrad</li> <li>—Buy most products and services locally, including</li> <li>—Use local contractors</li> <li>—Intent to provide materials for the proposed rail tra</li> <li>—Provide material for maintenance of local roads</li> <li>Ultimately, the applicants live in Bentley, have built heavily invested in the local community, with kids a genuinely do not want to negatively impact the community</li> </ul>
Socio economic	Public interest	The development is not in the public interest	001, 002, 003, 005, 006, 010, 011, 012, 014, 015, 017, 018, 020, 021, 023, 025 026, 027, 030, 031, 032, 033, 040, 041, 042, 043, 044, 049, 051, 053, 054, 055 056, 058, 059, 068, 085, 097, 099, 136, 140, 146, 160, 166, 171, 174, 183, 184 197, 198, 214, 215, 216, 220, 224, 226, 230, 232, 234, 235, 243, 247	5, While it is acknowldeged the proposal will not have construction and infrastructure projects in a conver environmental assessments prepared combined wi submissions, demonstrates that many of the issues assessment of the development application should and would be managed rather than based on the n
Socio economic	Buffer zone	Concern regarding sterilisation of land within the 1000m buffer zone associated with quarries	001, 003, 005, 033, 043, 044, 051, 099, 226, 243, 247	This will be addressed in the LUCRA addendum
Socio economic	Inadequate assessment	Social impact and LUCRA assessments are inadequate	001, 002, 004	This will be addressed in the LUCRA addendum
Socio economic	Amenity/Land use conflict	Impact on community character/identity and rural amenity	'001, 003, 004, 005, 006, 008, 010, 011, 012, 013, 014, 015, 016, 017, 020, 021, 022, 023, 024, 025, 028, 029, 030, 032, 033, 034, 036, 037, 038, 040, 04' 042, 043, 044, 045, 046, 049, 050, 051, 053, 054, 055, 056, 057, 058, 061, 062 064, 065, 066, 067, 068, 069, 073, '074, 076, 077, 079, 085, 086, 087, 088, 089, 091, 094, 099, 101, 102, 103, 104, 105, 106, 107, 108, 111, 113, 114, 114 116, 117, 123, 124, 127, 128, 129, 130, 131, 134, 135, 136, 142, 143, 145, 144 153, 154, 156, 157, 160, 163, 166, 167, 168, 169, 171, 176, 178, 180, 182, 185 186, 189, 191, 196, 200, 202, 203, 206, 214, 215, 226, 228, 230, 232, 235, 236 239, 240, 241, 243, 245, 246, 247, 248	This will be addressed in the LUCRA addendum , 5, 5, 5, 5, 5, 5, 5, 5, 5,
Socio economic	Consideration of tourism	No consideration for impacts on/compatibility with the growth of the tourism industry in the vicinity and sustainable agricultural practices	001, 005, 006, 010, 012, 013, 014, 015, 016, 017, 018, 020, 022, 023, 025, 027 028, 031, 033, 034, 042, 044, 045, 046, 049, 050, 051, 053, 054, 056, 057, 060 064, 065, 073, 085, 087, 089, 092, 094, 102, 103, 104, 108, 124, 136, 148, 154 160, 163, 168, 169, 171, 178, 189, 200, 202, 214, 220, 226, 230, 232, 239, 240 241, 243, 245, 246, 247, 248	7, This will be addressed in the LUCRA addendum ), I, ),
Socio economic	Health	Impacts on the health and wellbeing of community	001, 004, 005, 006, 010, 012, 013, 014, 015, 016, 017, 020, 021, 033, 037, 040 041, 042, 043, 044, 045, 051, 054, 055, 057, 058, 068, 093, 095, 108, 110, 137 136, 142, 145, 146, 154, 160, 164, 173, 183, 186, 200, 202, 207, 214, 220, 226 229, 232, 239, 240, 241, 243, 247	), The criteria used in the assessments are conserva , criteria, the health impacts are expected to be mini δ,
Socio economic	Property	Negative impact on local property and crop values (including property devaluations)	001, 005, 006, 008, 010, 012, 013, 014, 015, 016, 017, 020, 021, 022, 023, 024 028, 029, 030, 032, 034, 036, 040, 041, 042, 043, 044, 045, 046, 050, 051, 055 054, 055, 056, 057, 058, 061, 062, 064, 067, 068, 069, 074, 076, 078, 086, 097 093, 096, 108, 117, 133, 142, 147, 164, 167, 171, 175, 196, 197, 198, 200, 202 220, 226, 228, 230, 232, 239, 240, 241, 243, 245, 246, 247, 248	It is difficult to predict the impact of the proposal on adjoinging properties is minimal and within the rele minimal. Extractive industries are a permissible use statistical industries are a permissible use of submitting the possibility of an extractive industry or be considered in the value of the property, even if a of quarrying on both sides of Bentley Road in the lo established and it is assumed this possibility would
Cumulative impacts	Cumulative impact	Cumulative impacts not sufficiently considered	001, 003, 099	At the time of submission, no other development produced welling and tourism development are proposed to cumulative impact with the proposal.

.3 and Section 3.4.5 and these will be expanded on in the Environmental is approved

.3 and Section 3.4.5 and these will be expanded on in the Environmental is approved

mediation of the road reserve is being dealt with via a separate

e proposed development. Assessing the whole property is not considered ne property. In relation to the proposed use of the shed, as clarified, this will operations, so assessment of this area is also not required.

e Fattoria Farms-stay have been considered and are not expacted to be ns Homestead, if Council considers it necessary, a dilapidation survey prior

or the area and community action, however this was in relation to a CSG idered to have any impact on the legacy of the Bentley Blockade, the site of oposal.

ared for the proposal.

arry already provides a range of valuable services to the local community pproved. The benefits include:

n and Casino rodeo eschool loads of gravel grade the playground

nd to help clean up during the recent flood disaster de their road

tyres, fuel, oil, grease, truck and machinery parts

ail, which they are keen to see established

their 'forever home' on the same property as the proposed quarry and are t the local school/preschool and being treasurer of the Pony Club. They munity and intend to contribute to the community in anyway they can.

widespread public support, the provision of suitable materials for road nient location with limited impacts is in the public interest. The ith the clarifications and further information provided in response to the s identified are either unfounded or within acceptable limits. Council's be based on how potential environmental impacts have been mitigated umber of objections received.

tively based on health impacts, so if the impacts are within the relative mal.

property values, however, as shown by the assessments the impact on vant criteria, so it is expected the impact on property values would also be e in the RU1 zone, so when living adjacent to an RU1 zoned property there any other form of permissible use being established. This possibility would a quarry did not exist previously. In this circumstance, there is a long history pocation, so it is not unreasonable to expect an extractive industry to be realready be reflected in the property prices.

roposals were identified in the area. A subdivision to the west and a the north east but these are not expected to result in a significant

Other	Comment	Submitter is not supportive of development	009, 019, 035, 047, 052, 063, 080, 084, 100, 100, 119, 120, 132, 137, 139, 158 199, 222, 223, 227, 237, 244	A petition with 120 signatures simply expressed the response to the other more detailed submissions w
Other	Petition	Signatures of over 120 individuals opposed to the proposal	013	A petition with 120 signatures objection to the properties objection to the other more detailed submissions w
Other	Climate change	Climate change impact is not considered	001	Greenhouse gases (GHG) impacts are addressed i relatively minor, with two thirds associated with tran operations have similar GHG emissins during opera haulage. A large part of the cost associated with su nearest quarry with suitable product wins the job to emissions per tonne. It is therefore assumed that G emissions than material sourced from another locat
Other	Precautionary principle	The precautionary principle should be applied to the impacts on climate change	e 001, 002, 004	A range of environmental assessments have been methodologies and relevant statutory and agency re impacts of the development and the required mitiga postponing measures to prevent environment degree
Other	Sustainability	The proposal is not considered to be sustainable	001	As mentioned above, a range of environmental ass with accepted scientific methodologies and relevan impacts that are within current criteria, so the impac because they are extracting a finite resource but the infrstructure.
Other	Mitigation measures	There is no detail in regards to recommended management and monitoring requirements. Language used is vague and not conclusive (e.g. should, may, etc). It is requestedthat an independent agency be responsible for ensuring compliance and handling complaints	001, 136	At this stage of the development process, the mitig- result in adverse environmental impacts. If approve agencies will be incorportated in to the consent con management plans will also provide detail on exact In regards to an independent agency being respons under the POEO Act, EPA will be the regulatory ag management requirements, including complaints.
Other	Flyrock	There is no recognition of the risk of fly rock	001	Flyrock may result from the blast but it is considerer proposed to close Bentley Road during blasts. Deta Management Plan to be prepared, if the proposal is
Other	Trust	The community do not trust the operatior will manage the operations appropriately	001, 004	The operator will be required to implement the conc EPA and Council will be able to take action.
Other	Existing operation	The existing operation are non-compliant	001, 002	Council have investigated the current operations ar use rights. During the preparation of the EIS it was due to the boundary fence not being on the propert remediation plan developed and a development app by Council.
Support	General	Supportive of the proposal	071. 072. 075. 118. 121. 130	

eir objection to the proposal with no specific reason. It is considered the ould address any specific concern associated with these objections.

osal was submitted by the Beyond Bentley group. It is considered the ould address any specific concern associated with these objections.

in Section 7.4.2 of the EIS. This shows the GHG from the proposal are nsport of material and a third due to operations. Assuming all quarry ation, the main variable per tonne of quarry material will be GHG during uppling materials from a quarry is haulage. By default, this often means the supply the material, thereby ensuring the minimal amount of GHG GHG emissions per tonne from Bentley Quarry, will have lower GHG tion.

undertaken as part of development in accordance with accepted scientific equirements. This has provided an acceptable level of certainty about the ation, so a lack of scientify certaintity has not been claimed as a reason for edation.

sessments have been undertaken as part of development in accordance t statutory and agency requirements. This has shown the proposal has cts should be minimal. Ultimately, extractive industries are not sustainable ey are necessary to the development and maintanence of important

ation measures are recommendations, to ensure the proposal does not ed these mitigation measures and any others required by Council and other ditions and then the associated environmental management plans. The tly how the mitigation measures will be implemented.

sible for ensuring compliance, because the proposal is a scheduled activity ency responsible for ensuring compliance with all environmental

d this can be managed on site, however, as a contingency, it has been ails about blasting and managing flyrock will be developed in the Blast s approved. ditions of consent and controls in the approved management plans. If not,

nd have found them to be compliant with the requirements of the continuing noted that extraction had occured outside the property boundary. This was y boundary. As soon as this was discovered Council were notified, a plication lodged. The development application is currently being assessed

# Appendix B Community support

We are aware the Richmond Valley Council has received a lot of submissions objecting to the Development Application at Bentley Quarry. We would like the Council to know that not all the local community objects to this proposal. We didn't lodge a submission because we didn't realise it would matter. We believe the quarry is good for the community because it provides a local source of good quality material with minimal impact. It's in a good location and will benefit our area in many ways, including providing jobs and positively impacting our local economy. Rob and Sarah have lived in the Bentley for six years now, with children at the local schools and have always helped out with loads of gravel, rock and machinery when required. We support the Bentley Quarry and think it will be good for the valley.

Name	Address	Phone	Signature
		Number	
Todd Haling	1795 Bentley Road, Bentley	0402136595	1X
Allan Trustur	4 835 ManifolilRd Bert	96663528	3 plasmestur
Helen trustur	1835 Manifold Rd Bent	66635283	NM. Junt-
Jun Henre	the Holmond Be	alle, (2633)	& 47 Hewett
BMHarett	6 Holmes Rd Bently	66635251	13m Hewelt
Am Henett	2025 Bentley Ad Berth	16630A2	103732 Jan 12 wett
Joy Hathaway	925 Naughton's Liap Rd Benthe	66635058	Hatteray
Frank Hathaway	925 Naughtous hap Rd Beutley	66635058	Althrace
MARK OMGART	1840 BENTCLY KDBEN	1240360613	MOMEARE
Jael Havitly	1820 Bentley Rabona	4,0435805	III AFte
gley Johne	1355 Bently Me Bently 1	246564	
Nadia Bulmer	1365 Bentley Ka Dentey	0419246360	april .
Harian Bulmer	1365 Bentley Rol Bentleys	0438903806	Eller
Kobbie Graham	1480 Bentley Kel Bentle	0 04002311	58 POR 1 1 - 1 -
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0	NAUGHTONS -GAP 247	0	Charles V
Jim Dwyer.	2 BACK CRI RD BOOR	ABEE PARIT.	for Duga
MARY PWYCK	91 (1 (1 (1 "	66635257	one winger
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#### BRETT HARLEY BUILDER

11<sup>th</sup> April 2022

RE: DA for Bentley Quarry 1465 Bentley Road Bentley NSW 2480

To whom it may concern

I am writing this letter to show my support for the extension of Bentley Quarry. As a local builder in the area, I regularly source gravel for new builds & driveways as well as many other developments.

I believe while we do have a magnificent area here in the Northern Rivers we do still require resources to sustain our future. We require quarries like this to allow for future development and to be able to maintain existing infrastructure.

I did not write a submission of support as I did not think I needed to however I am in full support of Bentley Quarry and their DA application.

I do hope that it will be approved.

Kind regards Brett Harley

ABN 16 839 331 763 22 Marigold Drive, Fairy Hill 2470 Ph. (02) 666 333 62 brettharley@bigpond.com Licence Number: 101778C

#### **Northern Rivers Property Services Pty Ltd**

ABN 28 125 790 472

85 Powells Road, Naughtons Gap N.S.W. 24705 Rambaldinis Road, Naughtons Gap N.S.W 2470

To Whom it May Concern

I am writing this on the 10th February 2022 in support of Bentley Quarry.

My name is Chris Brooker and I am the Director of Northern Rivers Property Services Pty Ltd which is located at Naughtons Gap and is approximately 3.5 kms from Bentley Quarry.

I have lived in the area for 48 years and to my knowledge there has always been a quarry in that vicinity. I have never been impacted in any way by any environmental problems eg. dust or noise from the quarry. Also when driving past the quarry there is no visual sign of a quarry being there other than the sign on the front gate.

I have for a number of years used the Bentley Quarry materials to service my customers in farm road repairs and construction site fill. It would be a significant loss to my company if the quarry was too close and a greater loss to the Richmond Valley, Lismore and Kyogle Councils as the material is excellent for rural road repairs and could also be used for the proposed Casino to Bentley rail trail construction.

Yours truly,

Chris Brooker Dated 10<sup>th</sup> February, 2022 Witnessed by: April 2, 2022

Dear Richmond Valley Council,

I have seen on Facebook that you've received a lot of submissions against the Bentley Quarry Development Proposal.

This letter is to show my support for the Application.

I recently sold my rental property in Goonellabah. I wanted to fix the driveway up a bit before the sale advertisement went out.

Rob, at Bentley Quarry, delivered some gravel to me and he was professional and easy to deal with. Good product too.

I think we need businesses in the Northern Rivers more than ever right now and especially a business such as this that can provide a good product that will help with the clean up after the flooding.

Kerry Edwards

800 Cluny Road, Armidale

0412817291

Richmond Valley Council – Bentley Quarry

To whom it may concern,

I want to voice my support for the Bentley Quarry. My partner was born and raised in Casino and has recently been voicing her concerns over some of the uncivilized actions of locals opposed to the proposed quarry. This has prompted me to reach out in hopes of being a voice for the Quarry.

Whilst in part I agree with some concerns of locals regarding the impact on the environment, road use, and noise impacts, the concerns at this stage are unwarranted because they are based on accusations or assumptions that have not yet occurred. We cannot rely on unfounded biases to steer us away from an excellent opportunity.

I am confident that the company and people involved take compliance and the environment seriously and they should be afforded an opportunity. This is a local family-owned company and who better to be custodians of the quarry than those who live here.

• The quarry will create jobs and opportunities for locals where

employment opportunities are limited. Money will be spent locally and be put back into our community.

• After the most recent floods, the demand for gravel and materials

such as road base is extreme, not to mention the speed at which it can be accessed locally.

Don't forget the quarry provides income to the local council through taxation!

Michael Simpson 25 Roseapple Cct Oxenford, Qld <u>mikeedwardsimpson@gmail.com</u> 0431017618

# Appendix C

#### C-1 Introduction

This Land Use Conflict Risk Assessment (LUCRA) has been prepared for the proposed Bentley Quarry at Lot 2 DP 1196757, 1465 Bentley Road, Bentley. The proposed quarry is located in a rural area with an abandoned dwelling 650 m north and a proposed subdivision with a dwelling located 600 m to the southwest. An approved but not constructed dwelling is located approximately 450 m east. The nearest occupied dwelling is located 1.25 km to the east.

The purpose of the assessment is to address the Richmond Valley DCP 2021 which requires that a LUCRA be prepared for development applications that are within a certain buffer distance to a conflicting land use. The buffer distance for quarries that include blasting is 1000 m from rural dwellings and site specific determination for roads, property boundaries and bores (as well as other land uses).

Land use conflicts occur when one land use is perceived to infringe upon a neighbouring land use. In rural areas land use conflicts commonly occur between agricultural and residential uses. A LUCRA has been prepared to assess the potential of any negative impacts on surrounding land use and provide options for mitigation of potential impacts. This LUCRA has been developed based on the *Land Use Conflict Risk Assessment Guide* (DPI, 2011) and the *Living and Working in Rural Areas – A handbook for managing land use conflicts on the NSW North Coast* (DPI, 2007).

There are four key steps in undertaking a LUCRA, which are:

- Describe the site and surround characteristics
- Evaluate the risk level of each activity associated with the proposal
- Identify risk reduction management strategies
- Record the LUCRA results

#### C-2 Background information (Step 1)

#### C-2-1 Site overview

The property is approximately 212 hectares in area and sits on undulating pastureland 14km to the west of Lismore.

The northern portion of the property has been cleared due to historical agricultural land uses, with scattered paddock trees remaining. Native vegetation exists on the higher slopes in the southern portion of the site, which rise to a ridgeline.

The project site is zoned RU1 Primary Production under *Richmond Valley Local Environmental Plan* (LEP) 2012, as is the surrounding area.



Figure C.1 Existing quarry looking north-west

#### C-2-2 Site history

The property predominantly consists of cleared land that is currently being used for cattle grazing. The southern section of the site is covered in native vegetation.

The property includes a house and agricultural shed and is occupied by the owners of the site.

The site has been used for rock extraction for many years, with obvious signs of benching from past operations. A small quarry has been operating at the project site intermittently since the 1970's and more frequently of late. The recent operations have been limited to an extraction rate of 3,000 m<sup>3</sup> (estimated to be 6,000 tonnes based on a conversion of 2 tonnes per m<sup>3</sup>) and a disturbance footprint of approximately 1 hectare.

#### C-2-3 Topography and catchments

The northern edge of the site, where the existing quarry is located, has an elevation of 63 m Australian Height Datum (AHD). The site slopes up towards the south to a ridge with an elevation of 256 m AHD. The ridge is the highest point in the area, with the surrounding plains having an elevation between 60 and 200 m AHD.

The existing quarry is approximately 5 m below the natural ground surface.

No watercourses are located on the site, however there is an ephemeral drainage line to the west where a dam has been constructed. This flows north into Back Creek. Back Creek is located approximately 883 m to the north of the existing quarry, travelling in an east-west direction. Another watercourse is located approximately 872 m to the west of the quarry, travelling in a north-south direction and connecting to Back Creek.

#### C-2-4 Geology and soils

Reference to eSpade indicates the quarry site is located within the McKee (9450mc) soil landscape which comprises low undulating hills and rises with relief of 30 m to 50 m and slopes of up to 10% (~5°) related to tertiary basalts. The landscape is typically extensively cleared and comprises grassland with sporadic stands of mature trees. Soils are generally shallow, high plasticity and highly reactive.

#### C-2-5 Groundwater

Groundwater at the site occurs within an unconfined weathered and fresh basalt aquifer which is part of the North Coast Volcanics groundwater source. According to the background document for the Water Sharing Plan (DPI-Water, 2016), the North Coast Volcanics is a fractured rock groundwater source with moderate bore yields in the order of 5-10 L/s where fractures occur and excellent water quality.

A search of Australian Groundwater Explorer (BOM 2019a) database identified 56 registered bores within an approximate five kilometre radius of the site. Of the registered bores, 21 were registered as stock watering and domestic supply bores, 31 were registered for water supply, while the remainder have an unknown purpose and for monitoring.

The majority of bores are shallow, having been installed to a depth of less than 25 m. There are no bores within 1 km from the site. The closest bores, GW037176 and GW038734, are registered as stock and domestic and water supply bores respectively and are located approximately 1.5 km from the site.

#### C-2-6 Surrounding land uses

Land uses surrounding the project site are predominantly associated with agricultural activity, predominately grazing but some cropping reportedly occurs on the lower river flats to the north-east.

A sensitive receptor is defined as a location where people are likely to work or reside. This may include dwellings, schools, hospitals, offices or public recreational areas. Nearby sensitive receptors in the vicinity of the project site include:

- A dwelling is located approximately 360 m south of the proposed quarry, which is owned and occupied by the applicant (R1).
- The closest dwelling that is not associated with the project is located 650 m north of the proposed quarry. Disputed Plains Homestead has been vacant since the 1990s (NSW State Heritage Inventory, N.D.) (R2).
- An occupied dwelling that is not associated with the project is located 1.27 km south-west of the proposed quarry (R3).
- The closest occupied dwelling to the east of the quarry is located 1.2 km to the east (R6).
- The closest commercial receptor is the Bentley Community Market shed approximately 800 m to the east of the quarry (R7).
- An approved residence (not yet built) and proposed farm stay approximately 450 m and 550 m east of the quarry, respectively (R9 and R10).
- R8 is a B&B and has been included as a receptor due to the proximity of the building to Bentley Road.
- There is also a proposed subdivision to the west of the quarry with two proposed house locations which have also been included as receptors (R4 and R5).
- The proposed Bentley Rail Tourist Hub is receptor (R11) and is located approximately 1.48 km west of the site.

The locations of the above and other relevant features are shown on Figure C.2.

#### C-2-7 Planning controls

According to Richmond Valley LEP 2012 the site and surrounding area are zoned RU1 Primary Production. The objectives of zone RU1 Primary Production 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 ensure that development does not unreasonably increase the demand for public services or public facilities.

The minimum lot size for the area is 40 hectares.

The Lismore LGA boundary is 1.7km to the east but the zoning and minimum lot size are the same.

#### C-2-8 Community consultation

Consultation with the community has been undertaken to understand any concerns with the proposal. In summary the relevant concerns raised, included:

- The proposal is not consistent with the holistic agricultural approach being adopted by neighbouring farms
- The proposal will limit the subdivision potential and value of neighbouring properties
- Noise impacts
- Traffic impacts
- Dust impacts
- Water impacts
- Undermine the stability of Bentley Road

#### C-2-9 Proposal

The project involves a hard rock quarry with an annual extraction rate of 300,000 tpa and a maximum daily extraction rate of 2,000 tpd. The total disturbance area is approximately 6.5 hectares which includes an extraction area of approximately 3.65 hectares. The primary purpose of the project is to supply materials for use as fill and for road construction and maintenance. Plans of the project are provided in the EIS.

Project activities would generally include:

- Initial and progressive installation of environmental controls including erosion and sediment control measures.
- Delineation of the site and stockpiling areas.
- Construction of fencing.
- Crush and screen material at the site to use to construct the access road and intersection.
- Construction of an access road and intersection with Bentley Road, including installation of signage.
- Construction of a site office, weighbridge and car parking area.
- Importation of clean soil for landscape mounds to the east and west of the quarry.
- Vegetation clearance, soil stripping and stockpiling.
- Expanded quarry operations.
- Close and rehabilitate the quarry.

More details regarding the proposal are provided in the EIS.



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Data source: LPI: DTDB, 2017. World Imagery: Maxar. Created by: Imoriton

#### C-3 Risk evaluation (Step 2)

To assess potential land use conflict risks from the proposal a risk assessment matrix, consistent with DPI (2011), has been adopted. It has been used to identify the effects of the proposed land use on neighbouring land uses and identifies a risk rating for each impact based on the probability (P) of occurrence and the consequence (C) of the impact, as outlined in Table C.1.

			Probability			
		Α	В	С	D	E
		Almost Certain	Likely	Possible	Unlikely	Rare
	1. Severe	25	24	22	19	15
nce	2. Major	23	21	18	14	10
duei	3. Moderate	20	17	13	9	6
nse	4. Minor	16	12	8	5	3
ပိ	5. Negligible	11	7	4	2	1

#### Table C.1 Land use conflict risk ranking matrix

The site is predominately surrounded by agricultural land uses and rural dwellings but rural tourism has also been considered given the existing B&B (R8), proposed tourist accommodation on Bungabbee Road and the planned rail trail. Bentley Road is also considered, while bores are considered with agriculture.

Table C.2	Initial risk evaluation

Land use	Details	Probability	Consequence	Risk Ranking
Rural dwelling	The nearest occupied dwelling is 1.25 km to the east but there is the potential for the abandoned dwelling 650 m to the north and the proposed dwelling site 600 m to the west to be occupied in the future. The approved dwelling 450 m to the east may also be built. Unmitigated impacts may include: - Noise - Dust - Traffic - Vibration - Visual - Property value	В	2	21
Agriculture	Agriculture in the area is primarily grazing but some cropping reportedly occurs on the lower river flats to the north-east. The agricultural land uses are not considered as sensitive as rural dwellings but potential impacts include: – Noise – Dust – Vibration – Water – Development potential and value	В	3	17
Tourism	The proposed rail trail is over 1 km from the proposed quarry but there is a proposal to establish tourism accommodation 550 m to the east. While the rail trail would be a sensitive land use, the separation distance is considered to be a mitigating factor.	В	2	21*
Land use	Details	Probability	Consequence	Risk Ranking
--------------	--	-------------	-------------	--------------
	Regardless, potential impacts on it and the accommodation include:			
	– Noise			
	– Dust			
	– Traffic			
	- Vibration			
	– Visual			
Bentley Road	Bentley Road is relatively close to the proposed quarry, so there are potential issues with:	В	3	17
	– Dust			
	– Traffic			
	- Vibration			
	– Visual			

\* This ranking is based on the proposed tourist accommodation which has not been approved or built, without this the risk ranking would be 8

Based on the LUCRA Guide (DPI 2011) a ranking of 25 is the highest magnitude of risk, considered to be a highly likely, very serious event. A rank of 10 or below is considered to be low risk. Based on this, rural dwellings, tourism, agriculture and Bentley Road require management strategies. If the proposed tourist accommodation is not considered, the risk of a conflict with tourism land uses is considered low.

# C-4 Management strategies (Step 3)

To reduce the potential risk of land use conflict identified in Step 2, a range of management strategies are outlined in Table C.3. The risk is then ranked again with consideration of the management strategies. As shown, the mitigated risk rankings are all below 10 and therefore considered acceptable and low risk of conflict.

Land use	Details	Probability	Consequence	Risk Ranking
Rural dwelling	Management strategies/mitigation for the potential impacts are outlined in the relevant sections of the EIS and illustrated on Figure B2. While there are no mitigation measures specifically for property value, it is believed the other management strategies will mitigate this impact. It is also considered that given the long history of extraction at the site, the chances of a quarry being established would be reflected in the current property prices. As shown by the relative section of the EIS and Figure B2, the mitigation measures proposed mean the proposal clearly achieves the relevant criteria at most sensitive receivers, indicating the conflict should be minimal. However the noise levels at the approved dwelling at R9 will be equal to the criteria. Although within the criteria, there is potential for conflict with this receiver, however it is noted that the modelling is based on a worst case scenario, which is expected to rarely occur. Most of the time the noise would be below the criteria and consistent with the background noise, suggesting the	C	4	8
	conflict should be rare.			

Table C.3Management strategies

Land use	Details	Probability	Consequence	Risk Ranking
	A further factor considered to reduce the potential for conflict with R9 is that it is located relatively close to Bentley Road and Bungabbee Road. Bentley Road is a relatively busy regional road and so the traffic noise R9 would be exposed to is likely to desensitise the residents to noise.			
Agriculture	Management strategies/mitigation for the potential impacts are outlined in the relevant sections of the EIS.	D	4	5
	As shown by the relative section of the EIS, the mitigation measures proposed mean the proposal achieves the relevant criteria, indicating the conflict would be minimal.			
	While there is no mitigation measures specifically for property value, it is believed the other management strategies will mitigate this impact.			
	In regard to development potential, due to the zoning and minimum lot size restrictions, all properties within 1 km of the site are not able to be subdivided further (except the property to the west which already has lodged a subdivision and the applicants property). Regardless, if the quarry is approved and in the future, there is a proposal for a development within the vicinity or 1km, based on the DCP and SEPP (Resources and Energy), Council will need to consider the impact the quarry has on that development and the compatibility of the uses. As demonstrated by the relative sections of the EIS and Figure B2 most of the impacts, above the relevant criteria, are contained within the property where the quarry is located or Bentley Road. This indicates that the quarry should not impact on any development in the vicinity or, if approved, prevent any form of development occurring. The exception is Lot 2 DP 122850 to the north, which is impacted by noise. However, the impact is predicted during Stage 1 and reduces during subsequent stages, so unless there is a proposal in the short-term, it is considered the impacts would not influence any future development.			
	Likewise, if in future another land use is proposed on a neighbouring property e.g. eco- tourist facility, it is considered the quarry will not prevent this from occurring. As shown in the relevant section of the EIS and Figure B2, the impacts are largely contained on the same property as the quarry. Where impacts in excess of the relevant criteria extend onto adjacent properties, the properties still have ample room to establish a development outside the extent of the impact. It should also be noted, the impacts have been predicted based on worst case scenarios, which are unlikely to occur and if they do it would only be for short durations.			

Land use	Details	Probability	Consequence	Risk Ranking
Tourism	As shown by Figure B2, the proposal is unlikely to have any noticeable impact on the rail trail or the proposed camping area. Likewise with the glamping facility proposed to the east, the results indicate the impacts will be within the relevant criteria.	D	4	5
	It should also be noted, the impacts have been predicted based on worst case scenarios, which are unlikely to occur and if they do it would only be for short durations.			
Bentley Road	Management strategies/mitigation for the potential impacts are outlined in the relevant sections of the EIS.	D	4	5
	As shown by the relative section, the mitigation measures proposed mean the proposal achieves the relevant criteria, indicating the conflict would be minimal.			

# C-5 LUCRA results (Step 4)

The LUCRA assessed potential land use conflicts of the proposed quarry with rural dwellings, agriculture, tourism and roads. The assessment identified all land uses to be at risk of conflict if not mitigated.

Following further evaluation when mitigation measures are considered, the risk of land use conflict were reduced to below 10 and therefore considered acceptable and a low risk of conflict.

While some conflict is expected due to the objections some of the neighbours have expressed to the proposal, it should be noted, the impacts have been predicted based on worst case scenarios, which are unlikely to occur and if they do it would only be for short durations. Provided the mitigation measures recommended are implemented it is anticipated the quarry will assimilate into the area with impacts consistent with the surrounding rural land use. It is therefore considered the risk of land use conflict to be limited and acceptable.

# Appendix D Noise Impact Assessment



# **Bentley Quarry** Noise and Vibration Impact Assessment

R & S Contracting Pty Ltd

19 April 2022

The Power of Commitment



#### GHD Pty Ltd | ABN 39 008 488 373

GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300, Australia
T +61 2 4979 9999 | F +61 2 9475 0725 | E ntlmail@ghd.com | ghd.com

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# Glossary

Term	Description
AHD	Australian Height Datum
ANFO	Ammonium Nitrate Fuel Oil
AS	Australian Standard
Ambient Noise Level	The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. Usually assessed as an energy average over a set time period 'T' ( $L_{Aeq}$ , T).
AWS	Automated weather station
Background Noise Level	The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. It is quantified by the noise level that is exceeded for 90 percent of the measurement period 'T' ( $L_{A90}$ ,T). Background Noise Levels are often determined for the day, evening and night-time periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often 7 days).
ВоМ	Bureau of Meteorology
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
DECC	Department of Environment and Climate Change (NSW Government), later known as the Department of Environment Climate Change and Water, and now known as the Office of Environment and Heritage (OEH).
EPA	Environment Protection Authority
GHD	GHD Pty Ltd
ha	hectare
LAeq(period)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
LA1(period)	The sound pressure level that is exceeded for one percent of the measurement period.
L <sub>A10(period)</sub>	The sound pressure level that is exceeded for 10 percent of the measurement period.
LA90(period)	The sound pressure level that is exceeded for 90 percent of the measurement period.
L <sub>Amax</sub>	The maximum sound level recorded during the measurement period.
Mitigation	Reduction in severity.
R & S	R & S Contracting Pty Ltd
NIA	Noise Impact Assessment
Noise Sensitive Receptor	Noise sensitive land use that may be impacts by noise from the development.
NPI	Noise Policy for Industry
PPV	Peak particle velocity
PSNG	Project Specific Noise Goals
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.

Term	Description
Sound Pressure Level (SPL or Lp)	The level of sound measured on a sound level meter and expressed in decibels (dB). Where LP = 10 log10 (Pa/Po)2 dB (or 20 log10 (Pa/ Po) dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 $\mu$ Pa (20 x 10-6 Pa) for airborne sound. SPL varies with distance from a noise source.
Sound Power Level, LW	The sound power level of a noise source is the inherent noise of the device. Therefore, sound power level does not vary with distance from the noise source or with a different acoustic environment.
Sound transmission Loss	The amount in decibels by which a random sound is reduced as it passes through a sound barrier.
Tonality	Noise containing a prominent frequency or frequencies characterised by definite pitch.
tpa	Tonnes per annum
tpd	Tonnes per day
vtpd	vehicle trips per day

# 1. Introduction

# 1.1 Purpose of this report

GHD Pty Ltd (GHD) was engaged by R & S Contracting Pty Ltd (R & S Contracting) to prepare a Noise and Vibration Impact Assessment (NVIA) to address the potential noise and vibration impacts from the proposed quarry expansion at Bentley Quarry located at Lot 2 DP 1196757, Bentley Road, Bentley.

R & S Contracting proposes to construct and operate a hard rock quarry (Bentley Quarry) to extract up to 300,000 tonnes per annum (tpa) (2000 tonnes per day (tpd)) over 30 years, with a total disturbance area of approximately 6.5 hectares (ha) (the project). Bentley Quarry will predominantly supply materials for use as fill and for road construction and maintenance.

# 1.2 Scope of work

The scope of work to conduct the Noise Impact Assessment involved:

- Review of existing information including equipment lists, quarrying methodology and site layout.
- Undertake background noise monitoring at three sensitive receptor locations surrounding the quarry.
- Establish project specific noise goals (PSNG) and vibration limits for the proposed quarry expansion with consideration to the NSW *Noise Policy for Industry* (NPI) (EPA, 2017) and Australian and New Zealand Environment Council (ANZEC 1990) *Technical Basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.*
- Identify likely principal noise sources during operation and their sound power levels.
- Undertake one noise modelling scenario for the proposed operations using computer noise modelling software to predict sound pressure levels emanating from the site based on operations at the proposed production rate.
- Undertake a blasting impact assessment.
- Comment on predicted noise levels and provide recommendations for in-principal noise mitigation measures where exceedances are predicted. Possible noise mitigation measures will be discussed with R & S Contracting where required.
- Prepare a Noise Impact Assessment detailing the above.

# 1.3 Limitations

This report has been prepared by GHD for R & S Contracting Pty Ltd and may only be used and relied on by R & S Contracting Pty Ltd for the purpose agreed between GHD and R & S Contracting Pty Ltd as set out in Sections 1.1 and 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than R & S Contracting Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

Specifically, this report does not take into account the effects, implications and consequences of or responses to COVID-19, which is a highly dynamic situation and rapidly changing. These effects, implications, consequences of and responses to COVID-19 may have a material effect on the opinions, conclusions, recommendations, assumptions, qualifications and limitations in this report, and the entire report must be re-examined and revisited in light of COVID-19. Where this report is relied on or used without obtaining this further advice from GHD, to the maximum extent permitted by law, GHD disclaims all liability and responsibility to any person in connection with, arising from or in respect of this report whether such liability arises in contract, tort (including negligence) or under statute.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

# 2. Project description

# 2.1 Site description

The proposed quarry would be located at the existing quarry on Bentley Road, Bentley formally described as Lot 2 DP 1196757 as shown in Figure 2.1.

Main site access is via Bentley Road.





Data source: LPI: DTDB, 2017. World Imagery: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: tmorton

### 2.1.1 Project overview

The project involves a hard rock quarry, with an annual maximum extraction rate of 300,000 tpa and a maximum daily extraction rate of 2000 tpd. The total area of disturbance would be 6.5 ha with a pit of 3.65 ha. A maximum of 50,000 tpa of soil, topsoil and waste concrete would be imported to the site to be used for constructing landscape mounds, rehabilitation and blending with aggregate material.

The primary purpose of the project is to supply suitable aggregate resources for use as general fill and for the construction and maintenance of roads in the region.

The site has been used for extraction for many years, with obvious signs of benching from past operations. A small quarry operation continues at the site which operates under existing use rights. This limits the operation to 3000 m<sup>3</sup> (estimated to be 6000 tonnes based on a conversion of 2 tonnes per m<sup>3</sup>) and a disturbance footprint of approximately 1 ha. No blasting or crushing occurs on-site. Due to increasing demand, it is proposed to increase the extraction rate and include blasting and crushing.

# 2.2 Site establishment

The site establishment phase of the quarry would be relatively short (i.e. about 2 months) period. The main activity would be the construction of the access road and the intersection of the access and Bentley Road. Other activities would include:

- Initial and progressive installation of environmental controls including erosion and sediment control measures.
- Vegetation clearance, soil stripping and stockpiling.
- Construction of temporary drainage controls.
- Importation of clean soil for landscape mounds to the east and west of the quarry.
- Construction of a site office and car parking area.

It is proposed to crush and screen material at the site following approval so it is suitable to use during the construction of the access road and intersection.

### 2.3 Operation

The quarry operations would be carried out in four stages and in response to demand. To minimise the initial impact of the proposed quarry, Stage 1 would encompass the existing footprint of the quarry and expand it at a depth of RL 63 m until the northern half of the proposed quarry is exhausted. Stage 2 continues at RL 63 m to the southern extent of the proposed quarry. Stage 3 will involve lowering the northern half of the proposed quarry to its final depth of RL 49 m. This will involve constructing a sediment basin and drainage pipe through the western wall of the quarry to the discharge location. Stage 4 would be the final stage which would continue at RL 49 m to the southern extent of the proposed quarry. A summary of the stages is outlined in Table 2.1 and the general layout is provided further in the report in Figure 7.1.

Stages	Volume (m³)	Volume (tonnes <sup>1</sup> )
1	107,000	214,000
2	148,000	296,000
3	188,000	376,000
4	190,000	380,000
Total	633,000	1,266,000

	Table	2.1	Quarry	stages
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Note 1 – Based on a density of 2 tonnes per m<sup>3</sup>

### 2.3.1 Stripping and stockpiling

Topsoil stripping would occur in stages prior to excavation. Generally, areas would be stripped immediately prior to quarrying. Overburden would be used to construct the perimeter bunds and landscaped to provide a visual screen.

### 2.3.2 Extraction and blasting

Overlying weathered material would be removed using dozers and excavators to a depth of about 5 m. Underlying fresh rock would require blasting.

Blasting would be strictly controlled and conducted by a suitably qualified blasting contractor who would bring explosives onto site as required and fill a series of holes that would be pre-drilled by a separate drilling contractor.

Bulk emulsion explosives such as Ammonium Nitrate Fuel Oil (ANFO) would be used. Following blasting, all blasting equipment and any unused explosives would be removed from site. No explosives would be stored on site. Blasting would be undertaken in 20,000-30,000 tonne shots. It is anticipated that up to one blast per month would be undertaken during peak periods of demand but on average 3-4 blasts would be required per year.

### 2.3.3 Crushing and screening

Contractors would crush and screen the extracted material using mobile plant positioned close to the extraction area. An excavator would feed the excavated rock into a mobile primary crusher. The primary crusher would then pass the crushed material to a secondary mobile crusher for further crushing, at which point the material would be passed through a screening plant to sort the crushed aggregate into different grades depending on market demand. The screening plant would discharge the crushed and screened aggregate into a stockpile area using a radial stacking conveyor.

### 2.3.4 Blending

Some of the extracted material would be blended with imported waste concrete and possibly clay and sand, depending on the specifications the ultimate client requires.

### 2.3.5 Stockpiling

Material would be stockpiled in designated areas within the pit. Material would be stored in various grades for sale or distribution.

Some imported materials may be stockpiled to the east of the pit.

### 2.3.6 Pre-coat operation

At times, pre-coated materials may be required to be provided. To satisfy this demand, a mobile pre-coat plant would periodically be used. This is a fully self-contained plant that would precoat the aggregates, which would be stockpiled within the quarry until sold.

### 2.3.7 Hours of operation

The hours of operation would generally be limited to the following times.

Period	Start time	Finish time
Monday to Friday	7:00 am	6:00 pm
Saturday	7:00 am	2:00 pm
Sunday & Public Holidays	No operations	

Staff may arrive and leave site before and after these times to 'start-up' and 'shut-down' the quarry but excavation, crushing or loading would not occur outside the times specified above. Blasting would only occur on weekdays between the hours of 10:00 am and 3:00 pm.

# 2.4 Quarry equipment

Table 2.3 lists the plant and equipment proposed to be operating on site and will be split up between the construction and operational phases of the project.

Туре	Typical make/model	Approximate number	Typical frequency of use	Description
Dozer	Caterpillar D6/D8	1	20%	Clearing and grubbing of vegetation and stripping of topsoil
				Construction of bunding
				Rehabilitation
				construction
Excavator	Kobelco 350	2	100%	Excavating material and stockpiling
				Clearing and grubbing of vegetation and stripping of topsoil
Jaw, cone, and impact crusher	McClosky J50	1	80%	Crushing rock and waste concrete
Front end loader	Komatsu WA480 FE	1	100%	Loading material into the haul trucks and stockpiling material within the pit floor
Screen	Fast Trax FT6203	1	70%	Aggregate/gravel production and overburden screening
				Mixing imported waste concrete with aggregate
Grader	Komatsu	1	25%	Road and bund construction and maintenance
				To be used mainly during construction
Haul trucks	Truck and dog contractors	Up to 70 per day	100%	Delivery of materials to customers and carting, unsuitable material to rehabilitation areas, importing soil and importing waste concrete
Pre-coat plant	Various – similar to screen plant	1	20%	Used to produce pre-coated aggregate as required
Water cart	Komatsu	1	40%	To water pit floor and stockpiles
Water pump	Honda	2	40%	To dewater excavation / basin and to fill water cart from standpipe
				To water stockpiles and put moisture in products

#### Table 2.3Quarry equipment

Туре	Typical make/model	Approximate number	Typical frequency of use	Description
Hand tools	Various	5	5%	General activities maintaining plant
Light vehicles	4x4 Vehicles	Up to 5	20%	Transporting staff to, from, and around site

It is anticipated that not all of the equipment listed above would be operational on-site at any one time.

# 2.5 Traffic generation

### 2.5.1 Workforce traffic

During operation it is likely that there would be a maximum of five workers or plant operators on the site at any one time. This would yield a daily workforce traffic generation in the order of 10 vehicle trips per day (vtpd). It is assumed the majority of the workforce would arrive between 6:30 am and 7:30 am and depart generally between 3:00 pm and 6:30 pm.

### 2.5.2 Heavy vehicle traffic

Truck and dog trailer combinations have a capacity of about 32 tonnes. At maximum daily production (i.e. 2000 tonnes), the quarry is expected to generate about 70 truck and dog loads or 140 truck movements per day. The truck movements would start at 7:00 am and continue evenly throughout the day, until 6:00 pm, making about 7 truckloads or 14 movements per hour.

This rate of maximum truck movement is expected to be infrequent and for short durations. The average number of truck movements is expected to be a lot less and there would be times when no trucks would access the site.

The total truck movements would also include movements associated with importing materials or trucks using the weighbridge but not hauling materials to or from the quarry.

# 3. Sensitive receptors

Noise sensitive receptors are defined in the *Noise Policy for Industry* (NPI) based on the type of occupancy and the activities performed in the surrounding land uses. Sensitive noise and vibration receptors could include:

- Residences
- Educational facilities
- Hospitals and medical facilities
- Places of worship
- Passive and active recreational areas such as parks, sporting fields, golf courses (note that these recreational areas are only considered sensitive when they are in use or occupied)
- Commercial or industrial premises

Nearby sensitive receptors in the vicinity of the site are the following dwellings:

- A dwelling is located approximately 360 m south of the proposed quarry, which is owned and occupied by the applicant (R1).
- The closest dwelling that is not associated with the project is located 650 m north of the proposed quarry.
   Disputed Plains Homestead has been vacant since the 1990s (NSW State Heritage Inventory, N.D.) (R2).
- An occupied dwelling that is not associated with the project is located 1.27 km south-west of the proposed quarry (R3).
- The closest occupied dwelling to the east of the quarry is located 1.2 km to the east (R6).
- The closest commercial receptor is the Bentley Community Market shed approximately 800 m to the east of the quarry (R7).
- An approved residence (not yet built) and proposed farm stay (not yet operational) approximately 450 m and 550 m east of the quarry, respectively (R9 and R10).
- Although not included as a receptor in the operational noise assessment, R8 has been included as a receptor for the road traffic noise assessment in section 7.3. This receptor has been included due to the proximity of the building to Bentley Road ('Disputed Plains').
- There is also a proposed subdivision to the west of the quarry with two proposed house locations which have also been included as receptors (R4 and R5).
- The proposed Bentley Rail Tourist Hub has been added as a holiday accommodation receptor (R11).

Table 3.1 below outlines locations of all receptors identified.

Receptor name	Receptor type	Easting (m)	Northing (m)
R1	Residential	512811	6815075
R2	Residential	513197	6815939
R3	Residential	511696	6814861
R4	Residential	512381	6815074
R5	Residential	511381	6814766
R6	Residential	514140	6814834
R7	Commercial	513852	6815332
R8	Residential	514654	6815032
R9	Residential	513520	6815418
R10	Holiday accommodation	513621	6815514
R11	Holiday accommodation	511643	6816318

#### Table 3.1 Sensitive receptors

Sensitive receptor locations are displayed in Figure 3.1.





# 4. Existing environment

GHD has undertaken long term unattended monitoring to determine the Rating Background Levels (RBLs) in accordance with the *Noise Policy for Industry*.

Noise logging was undertaken using three SVAN 977 noise loggers, which were all within current NATA accredited calibration. These instruments conform to the requirements of Type 1 as set out in AS 1259.2 (1990) *Acoustics – Sound Level Meters – Integrating – Averaging* or AS IEC 61672.1 (2013) *Electro Acoustics - Sound Level Meters Specifications*. Quarry activities ceased during the logging period in order to obtain a true background noise level without quarry activity.

The noise loggers were deployed on 3 August 2021 and were retrieved on 18 August 2021. This provided sufficient time to enable a full seven days of data to be captured, allowing for any periods of adverse weather during the survey to be excluded. The loggers were programmed to accumulate A-weighted, fast time response environmental noise data continuously over sampling periods of 15 minutes for the entire logging duration.

Pre-measurement calibration checks were performed on the noise monitoring equipment using a sound level calibrator with a sound pressure level of 94 dBA at 1 kHz. At completion of the measurements, the calibration was re-checked to ensure that the sensitivity of the noise monitoring equipment had not varied. The noise loggers were found to be within the acceptable tolerance of  $\pm$  0.5 dBA.

Logged data was reviewed to exclude any anomalous data and data potentially affected by adverse weather conditions. Meteorological data for the monitoring period in 30-minute intervals was sourced from the Lismore Airport AWS.

Table 4.1 outlines the unattended noise monitoring locations and Table 4.2 outlines the Rating Background Level (RBL) results for each noise logger.

Logger ID	Representative Receptor ID	Equipment type and serial number	Date deployed and retrieved	Picture
L1	R1	SVAN 977 SN 45748	03/08/2021 – 18/08/2021	
L2	R2	SVAN 977 SN 36820	03/08/2021 – 18/08/2021	
L3	R3	SVAN 977 SN 45746	03/08/2021 – 18/08/2021	

#### Table 4.1 Unattended noise monitoring locations

#### Table 4.2 Summary of rating background noise levels, dBA

Logger ID	Rating background level 90 <sup>th</sup> percentile L <sub>A90(15min)</sub>				
	Day <sup>1,2</sup>	Evening <sup>1,2</sup>	Night <sup>1,2</sup>		
L1	31 (35)	19 (30)	18 (30)		
L2	30 (35)	23 (30)	20 (30)		
L3	28 (35)	19 (30)	12 (30)		

Note:

 Daytime 7:00 am to 6:00 pm; Evening 6:00 pm to 10:00 pm; Night-time 10:00 pm to 7:00 am. Sundays and Public Holidays, Daytime 8:00 am to 6:00 pm; Evening 6:00 pm to 10:00 pm; Night-time 10:00 pm to 8:00 am.

2. In accordance with the NPI, minimum RBLs apply. The daytime RBLs will increase to 35 dBA and evening and night-time RBLs will increase to 30 dBA.

# 5. Effects of meteorology on noise levels

### 5.1 Overview

Meteorological conditions may increase noise levels by focusing soundwave propagation paths at a single point. Such refraction of sound waves will occur during temperature inversions (atmospheric conditions where temperatures increase with height above ground level), and where there is a wind gradient (that is, wind velocities increasing with height) with wind direction from the source to the receptor.

The NPI provides two options for a proponent to consider meteorological effects on noise levels:

- Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receptor wind vectors for all receptors and F class temperature inversions with wind speeds up to 2 m/s at night.
- 2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30 percent determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30 percent of the time, standard meteorological conditions may be adopted for the assessment.

This assessment has used the option 1 approach and assumed a source to receptor wind and temperature inversion conditions to represent a conservative assessment of noise impacts.

# 5.2 Wind

Wind has the potential to increase noise at a receptor when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases, the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration. Where wind blows from the source to the receptor at speeds up to 3 m/s for more than 30 percent of the time in any season (NPI, 2017), then wind is considered to be a feature of the area.

Wind speed and direction data, among other parameters, have been measured at the Bureau of Meteorology (BoM) automated weather station (AWS) at Lismore (Station Number 94572) for many years. Thus, a detailed approach has been utilised for the purpose of this assessment.

In order to determine the prevailing conditions, weather data from the full calendar year of 2020 was obtained from the BoM AWS at Lismore (approximately 13 km south east of the project site).

In accordance with the NPI, this data was analysed to determine the frequency of occurrence of winds of speeds up to 3 m/s in each season during the day, evening and night-time period. The results of the wind analysis are provided in Table 5.1 presented graphically in Figure 5.1 to Figure 5.4. In each figure, the wind directions and percentage occurrence are those dominant during each season.

Seasonal wind records indicate that winds up to 3 m/s do not exceed the 30 percent threshold during the day periods. Prevailing winds are therefore not considered a feature of the area during the day and evening period and have not been considered as part of this assessment.

Wind direction	Percentage occurrence of winds between 0.5 m/s to 3 m/s (%)			
	Spring	Summer	Autumn	Winter
	Day	Day	Day	Day
N	10	7	9	10
NNE	2	2	1	1
NE	1	2	1	1
ENE	0	0	0	0
E	1	1	1	0
ESE	1	1	1	1
SE	1	1	1	1
SSE	1	2	2	2
S	2	4	3	2
SSW	1	1	2	3
SW	1	1	1	2
WSW	0	0	1	1
W	1	1	1	2
WNW	1	1	0	0
NW	2	2	1	1
NNW	2	4	3	3
Calm	13	16	20	18

#### Table 5.1 Percentage occurrence of winds 0.5 m/s to 3 m/s

Note:

1. 16-direction wind compass rose the percentage occurrence of light winds for each of the 16 directions is the arithmetic sum of the direction being reported and the four closest directions (that is, two on either side).

















# 6. Project specific noise and vibration goals

# 6.1 Noise Policy for Industry

The NSW EPA *Noise Policy for Industry* (NPI) provides guidance on the assessment of operational noise impacts. The guideline includes both intrusive and amenity goals that are designed to protect receptors from noise significantly louder than background level, and to limit the total noise level from all sources near a receptor.

The NPI noise goals are planning levels and are not mandatory limits required by legislation; however, the noise goals assist regulatory authorities establish licensing conditions. Where noise goals are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise goals cannot be achieved, negotiation is required between the regulatory authority to evaluate the economic, social and environmental costs and benefits of the development against the noise impacts. The regulatory authority then sets statutory compliance levels that reflect the achievable and agreed noise limits from the development.

### 6.1.1 Intrusive noise goals

Intrusive noise goals control the relative audibility of operational noise compared to the background level at residential receptors. The intrusive noise goals are determined by a 5 dB addition to the measured (or adopted) background level. The NPI recommends that the intrusive noise goals for the evening period should not exceed the daytime period and the night-time period should not exceed the evening period. The intrusive noise goals are only applicable to residential receptors.

### 6.1.2 Amenity noise goals

The amenity noise goals limit the total level of extraneous noise for all receptor types and is based on the overall acoustic characteristics of the receptor area and the existing level of noise, excluding other sources that are uncharacteristic of the usual noise environment. Residential receptors are characterised into 'urban', 'suburban', 'rural' or other categories based on noise criteria specific to land use and associated activities.

With consideration to the NPI 'Noise Amenity Area' Classification, the residential receptors identified in this assessment have been classified as 'rural'.

The PSNG are outlined in Table 6.1 and reflect the most stringent noise level requirements derived from the intrusive and amenity noise goals.

The operational PSNG for all residential receptors (see Section 3) are based on measured background noise levels (see Table 4.2).

Sensitive receptors	Period <sup>1</sup>	Rating background noise level (RBL)	Intrusiveness noise level (INL) <sup>2</sup> L <sub>Aeq(15minute)</sub>	Amenity noise level (ANL) <sup>3</sup> L <sub>Aeq(15minute)</sub>	Project specific noise goals L <sub>Aeq(15minute)</sub>
All residential	Day	35	40	48	40
	Evening	30	35	43	35
	Night	30	35	43	35
Commercial	When in use	-	-	65	65
Holiday accommodation <sup>4</sup>	Day	-	-	53	53
	Evening	-	-	48	48
	Night	-	-	43	43

 Table 6.1
 Operational noise goals, dBA – Sensitive receptors

Notes:

- 1. Day is defined as 7:00 am to 6:00 pm, Evening is defined as 6:00 pm to 10:00 pm and Night is defined as 10:00 pm to 7:00 am.
- 2. Intrusiveness noise level is L<sub>Aeq,(15minute)</sub> = RBL + 5.
- 3. Amenity noise level (ANL) is rural ANL (Table 2.2 NPI) minus 5 dBA plus 3 dBA to convert from a period level to a 15minute level.
- 4. Holiday accommodation ANL is recommended ANL for a residence for the relevant noise amenity area and time of day.

# 6.2 Traffic on public roads

GHD understand that rock material would be hauled from the site along Bentley Road. Therefore, the quarry has the potential to create additional traffic noise on Bentley Road.

The NSW *Road Noise Policy* (OEH, 2011) (RNP) provides non-mandatory road traffic noise target levels for land use developments with potential to create additional traffic on public roads.

Bentley Road has been considered a local road in accordance with the RNP. The road traffic noise target levels are presented in Table 6.2.

Table 6.2 RNP traffic noise target levels at residential receptors – dBA

Type of development	Day (7:00 am – 10:00 pm)	Night (10:00 pm – 7:00 am)
Existing residences affected by additional traffic on existing local roads generated by land use developments.	L <sub>Aeq(1 hour)</sub> 55 (external)	L <sub>Aeq(1 hour)</sub> 50 (external)

# 6.3 Corrections for annoying noise characteristics

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant lowfrequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. The *NSW Noise Policy for Industry* (2017) outlines correction factors that are to be applied to the source noise level at the receptor before comparison with the project specific noise levels, to account for the additional annoyance caused by these modifying factors. Table 6.3 sets out the corrections to be applied.

#### Table 6.3 Modifying factors corrections

Factor	Assessment/ measurement	When to apply	Correction <sup>[1]</sup>	Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2- 2007 – Annex D).	<ul> <li>Level of one-third octave band exceeds the level of the adjacent bands on both sides by:</li> <li>5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz</li> <li>8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz</li> <li>15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz</li> </ul>	5 dB <sup>[2,3]</sup>	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. Note: Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low- frequency noise	Measurement of source contribution C-weighted and A- weighted level and one-third octave measurements in the range 10–160 Hz	<ul> <li>Measure/assess source contribution C- and A-weighted L<sub>eq,T</sub> levels over same time period.</li> <li>Correction to be applied where the C minus A level is 15 dB or more and: <ul> <li>Where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.</li> <li>Where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dBA positive adjustment to measured/predicted A-weighted levels applies for the adjustment to measured/predicted A-weighted levels applies for the adjustment to measured/predicted A-weighted levels applies for the adjustment applies for the adjustment applies for the daytime period.</li> </ul> </li> </ul>	2 or 5 dB <sup>[2]</sup>	A difference of 15 dB or more between C- and A- weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receptor varies by more than 5 dBA and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for night-time only.

Factor	Assessment/ measurement	When to apply	Correction <sup>[1]</sup>	Comments
Duration	Single-event noise duration may range from 1.5 min to 2.5 h.	One event in any assessment period.	0 to 20 dBA	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum adjustment	Refer to individual modifying factors.	Where two or more modifying factors are indicated.	Maximum correction of 10 dBA <sup>[2]</sup> (excluding duration correction).	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.

2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

#### Table 6.4 One-third octave low-frequency noise threshold

Hz/dBZ	One-third octave Lzeq,15-min threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dBZ	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dBZ = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to five metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.
- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receptor location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a
  planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development
  consent or licence.

Intermittent noise: noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dBA; for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.

Correction for duration: this is applied where a single-event noise is continuous for a period of less than two and a half hours in any assessment period. The allowable exceedance of the LAeq,15min equivalent noise criterion is shown in Table C3 for the duration of the event. This adjustment is designed to account for unusual and one-off events, and does not apply to regular and/or routine high-noise level events.

Allowable duration of noise (one event in any 24-hour period)	Allowable exceedance of L <sub>Aeq,15-min</sub> equivalent project noise trigger level at receptor for the period of the noise event, dBA					
	Daytime and evening (7:00 am – 10:00 pm)	Night-time (10:00 pm – 7:00 am)				
1 to 2.5 hours	2	Nil				
15 minutes to 1 hour	5	Nil				
6 minutes to 15 minutes	7	2				
1.5 minutes to 6 minutes	15	5				
less than 1.5 minutes	20	10				

#### Table 6.5 Adjustment for duration

**Note:** Where the duration of the noise event is smaller than the duration of the project noise trigger level (that is, less than 15 minutes) the allowable adjusted project noise trigger level becomes:

 $10Log_{10}\left(\left(10^{\frac{PNTL}{10}}x\left(\frac{900-duration}{900}\right)\right)+\left(10^{\frac{PNTL+allowable exceedance (Table C3)}{10}}x duration\right)\right)$ 

Maximum correction: the maximum correction to be applied to the predicted or the measured level where two or more modifying factors are present. The maximum adjustment is 10 dBA where the noise contains two or more modifying factors (excluding the duration correction).

# 6.4 Vibration targets

The following documents were used to establish the criteria to be used in this assessment:

- Australian and New Zealand Environment Council (ANZEC 1990) Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration
- Australian Standard AS2187.2 (2006) Explosives Storage and use Part 2: Use of explosives
- British Standards Institution 1993, BS7385.2 Guide to damage levels from groundborne vibration

### 6.4.1 Airblast overpressure

#### 6.4.1.1 Human comfort criteria

Airblast overpressure impacts for human comfort criteria has been assessed in accordance with *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC 1990) which specifies recommended human comfort criteria for blasting activities.

The recommended maximum level for airblast overpressure is 115 dB(L) peak. This level may be exceeded on up to 5 per cent of the total number of blasts over a period of 12 months. However, the airblast overpressure must not exceed 120 dB(L) peak for any blast.

#### 6.4.1.2 Structure damage

AS2187.2 (2006) recommends a limit of 133 dB(L) airblast overpressure on structures as research showed no damage (even cosmetic) occurs at airblast levels below this level. This assessment uses the aforementioned limit as the assessment criteria for structures.

### 6.4.2 Ground vibration

#### 6.4.2.1 Human comfort criteria

Ground vibration impacts for human comfort criteria has been assessed in accordance with *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC 1990) which specifies recommended human comfort criteria for blasting activities.

Ground-borne vibration levels should not exceed a peak particle velocity of 5 mm/s. The recommended peak particle velocity of level may be exceeded on up to 5 per cent of the total number of blasts over a period of 12 months. However, the level should not exceed 10 mm/s.

#### 6.4.2.2 Structure damage

AS2187.2 (2006) recommends adopting BS7385.2 values for the prevention of minor or cosmetic damage occurring in structures from ground vibration. It lists the vibration limit for residential type buildings as 15 mm/s at 4 Hz (ppv). This assessment uses the aforementioned limit as the assessment criteria for structures.

### 6.4.3 Criteria summary

#### Table 6.6 Blasting criteria

Criteria description	Criteria values
Airblast overpressure – Human comfort criteria	115 dB(L) <sub>peak</sub>
Airblast overpressure – Structure damage (residential)	133 dB(L) <sub>peak</sub>
Ground vibration – Human comfort criteria	5 mm/s
Ground vibration – Structure damage (residential)	15 mm/s

# 7. Operational noise impact assessment

### 7.1 Operational noise modelling

### 7.1.1 Modelling methodology

The Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology was utilised within Datakustik's CadnaA modelling software (Version 2021), to predict noise emissions from the operation of the project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. With respect to topography of the quarry site, 3D quarry designs for both Stage 1 and Stage 2 were used in separate models to reflect the changing landscape as the quarry progresses through the stages.

The model used this map, together with noise source data (refer to Table 7.1), ground cover (a combination of soft and hard 0.5) and atmospheric information (refer to Section 7.1.5) to predict noise levels at the nearest sensitive receptors (assumed 1.5 m above ground level). With respect to ground cover, based on site visits during the background noise monitoring phase, it was observed that a vast majority of the ground cover in the study area was of a soft, grassy, absorptive type which is to be expected in a rural, farmland type area. This could be justification to use a higher ground absorption component, such as 0.7 or 0.75, however a 0.5 ground absorption component was used to ensure a more conservative assessment with higher ground reflection overall.

### 7.1.2 Acoustically significant sources

Sound power levels for acoustically significant items of plant and equipment operating during site operations have been obtained from manufacture data where possible. Where this was not possible data was obtained from a GHD noise source database of similar equipment. The  $L_{Aeq}$  sound power levels of relevant plant and equipment utilised for the purpose of predicting noise emission levels are provided in Table 7.1.

Noise source	Octave centre frequency (Hz) dBA								Source of	
	63	125	250	500	1k	2k	4k	8k	LW GBA	data
Caterpillar D8 dozer	91	102	100	98	102	99	97	91	108	А
35 t excavator	75	93	94	101	101	99	94	87	106	A
Komatsu WA480 FE loader	76	90	101	101	104	99	93	85	108	В
McClosky Jaw J50	89	100	101	104	108	105	101	94	112	В
Secondary/tertiary cone/impact crushers	84	95	103	113	115	113	106	97	119	В
Screen FT6203 / pre-coat plant	79	91	105	106	105	102	98	91	111	В
Grader	108	107	103	99	104	98	94	85	112	А
Water cart	84	91	90	92	94	93	88	83	100	В
Haul trucks	92	99	96	104	103	102	96	90	109	А
Truck and dog	94	94	95	103	105	105	103	95	111	A
Light vehicles	69	74	75	78	80	80	73	70	86	В

 Table 7.1
 Equipment sound power levels

Notes:

A. BS 5228.1-2009.

B. GHD database of similar plant.

#### 7.1.2.1 Modifying factor corrections

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency or dominant low-frequency content, it can cause greater levels of annoyance than other noise sources at the same noise level. The NPI provides correction factors which are to be applied to the predicted noise levels for when such sources exist.

A review of site noise sources has been undertaken. No on-site noise sources were found to contain low frequency or tonal characteristics. Intermittency characteristics need only be assessed where the noise source occurs during the night period. Since the project does not operate during the night-time period, intermittency was not assessed.

Since noise sources have been selected from either BS 5228 or the GHD database, it is recommended to review the noise spectrum of the actual equipment to be operating on site to ensure they contain no tonal or low frequency characteristics, and are in good working condition prior to commencement of Stage 1.

### 7.1.3 Traffic generation

The traffic generation associated with the project is summarised in Table 7.2.

Vehicle type	Vehicles per day (vehicle trips)	Daytime peak hour movements
Light vehicles	5 (10)	5 (5 in, 5 out)
Heavy vehicles	70 (140)	7 (7 in, 7 out)
Total	75 (150)	12 (12 in, 12 out)

Table 7.2 Traffic generation per day and in each peak hour for the project

### 7.1.4 Operational noise modelling scenarios

As the quarry progresses throughout its lifetime, the shape of the working area would change. For example, the pit walls would become larger, the equipment would eventually be situated well below ground level, and the location of the working area would move throughout various stages. The quarry is expected to operate over four stages, depicted in Figure 7.1.



Figure 7.1 Proposed quarry stages section

Stages 1 and 2 have been modelled as it is anticipated these stages would produce the highest noise impact due to the landform being more elevated. The proposed working areas of Stages 1 and 2 are depicted in Figure 7.2.



Figure 7.2 Proposed Stages 1 and 2 working areas

An operational scenario (Scenario A) has been modelled and assessed for each stage for proposed operations at initial face of stage.

For this scenario, the noise impact of the quarry on surrounding receptors has been assessed at Maximum daily production, which is expected to generate about 70 truck and dog loads (140 movements) per day (worst case seven loads per hour).

The operational scenario modelled is summarised in Table 7.3. A tick ( $\checkmark$ ) indicates that the equipment is in operation during the scenario. A cross (×) indicates that the equipment is not in operation during the relevant scenario. It should be noted that the operational scenario modelled is likely to represent an acoustically worst case scenario as it is assumed all equipment is operational at once.

Plant and equipment	Scenario A			
Stage 1 and Stage 2				
Caterpillar D8 dozer	x			
35T excavator x2	$\checkmark$			
Grader	x			
Komatsu WA480 FE loader	<ul> <li>✓</li> </ul>			
McClosky Jaw J50	$\checkmark$			
Secondary/tertiary cone/impact crushers	$\checkmark$			
Screen FT6203	$\checkmark$			
Pre-coat plant	$\checkmark$			
Haul trucks x7	$\checkmark$			
Light vehicles x5	$\checkmark$			
Plant and equipment	Scenario A			
------------------------------------	--------------			
Stage 1 and Stage 2				
Truck and dog (on quarry property)	$\checkmark$			
Truck and dog (on local roads)	$\checkmark$			

The following assumptions were made regarding the model configuration:

- All acoustically significant plant and equipment operates simultaneously. This is considered a conservative worst case as this is unlikely to occur.
- Mobile noise sources, such delivery vehicles, were modelled at typical locations and assumed to operate in repetitive cycles.
- The scenarios were modelled for daytime only, as the quarry hours of operation are anticipated to be between 7:00 am and 6:00 pm only (during weekdays).

#### 7.1.5 Atmospheric conditions

Prediction of noise emission levels was carried out under worst case prevailing atmospheric conditions, as per review of meteorological data presented in Section 5. Atmospheric parameters under which noise predictions were made are given in Table 7.4.

Table 7.4 Weather parameters used for noise modelling

Atmospheric condition	Air temperature	Relative humidity	Wind velocity and direction	Atmospheric stability class
Day – prevailing winds	20°C	75%	3 m/s direct source to receptor	D

#### 7.2 Operational noise model results

Noise levels were predicted for future operation based on the operating conditions outlined throughout section 7. The predicted noise levels for daytime site operations are shown in Table 7.5.

Model results indicate that noise levels generated from worst case quarry operations for Stage 1 are predicted to exceed criteria at R1 and R2 by 2 and 3 dB respectively. These exceedances are considered low risk as R1 is the quarry owner and R2 is the abandoned homestead which is uninhabited. Additionally, the NPI considers an exceedance of 2 dB to be negligible and does not warrant receptor-based treatments or controls. Nevertheless, mitigation measures to alleviate noise impacts during Stage 1 at R2 are detailed in Section 8.3.

Model results indicate that noise levels generated from worst case quarry operations for Stage 2 are predicted to exceed criteria at R1 by 1 dB. This exceedance is considered marginal and also low risk based on the ownership as discussed above.

Contact has been made with the owners at R2 to explain the predicted exceedance. Correspondence relating to this can be found in Appendix A.

Model results also indicate a 4 dB exceedance at approved residence at R9 during all stages. The noise impact at this receiver is dominated by truck movements entering and exiting the quarry via the access road, and is not impacted by major changes to operations within the pit. Mitigation measures to alleviate noise impacts at R9 are detailed in Section 8.4.

Noise levels are predicted to comply with the NPI daytime noise criteria at all other residential and non-residential receptors.

It should be noted that this assessment is considered conservative as it is based on all quarry equipment operating simultaneously, as well as all three crushing plants operating simultaneously, which is unlikely (typically only two are operational at any one time) and if it does occur, it would be infrequent. This conservative approach is likely to result in predicted operational noise levels being higher than actual noise levels. For example, if only two crushers are used the predicted noise levels would decrease by up to 2 dB at the closest receptors.

An assessment of noise mitigation measures has been provided in Section 8. It should be noted that the noise modelling is based on worst case operating conditions with conservative assumptions regarding site operations and equipment sound power levels.

Figure 7.3 and Figure 7.4 shows the predicted operational noise contour plots for Stages 1 and 2.

#### Table 7.5 Predicted operational noise levels

Sensitive receptor	Noise criterion LAeq dBA	Predicted noise level LAeq dBA		
	Daytime	Stage 1	Stage 2	
		Scenario A	Scenario A	
R1	40	42	41	
R2	40	43	40	
R3	40	30	27	
R4	40	37	34	
R5	40	23	21	
R6	40	27	27	
R7	65	34	34	
R9	40	44	44	
R10	53	39	40	
R11	53	30	28	









#### 7.3 Road traffic noise

Continuous traffic flow related noise is typically calculated using the United Kingdom Calculation of Road Traffic Noise (CoRTN) algorithm, however due to the non-continuous nature of the heavy vehicle movements to and from the site, the United States EPA's Intermittent Traffic Noise guidelines has been utilised to determine potential impacts. The following equation outlines the mathematical formula used in calculating the  $L_{eq,T}$  noise level for intermittent traffic noise.

$$L_{eq}, T = L_b + 10\log\left[1 + \frac{ND}{T} \left(\frac{10^{(L \max - Lb)/10} - 1}{2.3} - \frac{(L_{\max} - L_b)}{10}\right)\right]$$

Where:

L<sub>b</sub> is background noise level, dBA

Lmax is vehicle maximum noise level, dBA

T is the time for each group of vehicles (min)

N is number of vehicle trips

D is duration of noise of each vehicle (min)

The parameters above were determined as follows:

- Background noise levels are based on the RBLs shown in Table 4.2
- The heavy vehicle maximum noise level of 109 dBA
- The duration of each vehicle passby was 30 seconds
- The time for each group of vehicles was 60 minutes
- Although it is anticipated that:
  - 60 percent of heavy vehicles would be arriving or departing the quarry from the east along Bentley Road
  - 10 percent would be arriving or departing the quarry from the west along Bentley Road
  - 30 percent would be arriving or departing the quarry from the west along Bentley Road then Naughtons Gap Road

the calculations assume all vehicles would pass by each receptor as a worst case scenario.

Table 7.6 summarises the predicted road traffic noise levels at residential receptors from haul trucks travelling along the local roads when the quarry is operating at peak daily production and compares this against the RNP criteria.

Sensitive receptor	Generated heavy vehicle movements per hour (peak daily production)	RNP criteria, day	Distance from road (m)	Predicted road noise level L <sub>Aeq(1 hour)</sub> dBA <sup>1</sup>
R1			450	35
R2			480	34
R3			480	34
R4			570	32
R5	7	L <sub>Aeq(1 hour)</sub> 55 (external)	360	36
R6			310	38
R8 <sup>2</sup>			80	50
R9			50	54
R10			160	44

 Table 7.6
 Predicted road traffic noise level during peak daily production at residential receptors

Notes:

- 1. Predicted results include a 2.5 dBA façade correction.
- Although not included in the operational noise assessment as a receptor due to distance, an additional receptor (R8) has been included in the traffic noise assessment due to the close proximity to Bentley Road. Location of R8 is approximately 1.6 km east of the Quarry and 80 m from Bentley Road.

Table 7.6 shows that using this algorithm, road traffic noise from haul trucks travelling along local roads is expected to comply with the RNP criteria.

#### 7.4 Vibration from blasting

Overlying weathered material would be removed using dozers and excavators to a depth of about 5 m, however underlying fresh rock would require blasting. It is anticipated that up to one blast per month would be undertaken during peak periods of demand but on average 3-4 blasts would be required per year.

Blasting would be strictly controlled and conducted by a suitably qualified blasting contractor who would bring explosives onto site as required and fill a series of holes that would be pre-drilled by a separate drilling contractor.

A general assessment of blasting has been undertaken to determine the maximum instantaneous charge (MIC) allowed to ensure compliance with the blasting criteria at the closest receptor. Estimations for typical ground vibration and air blast overpressure during blasting have been made with consideration to Australian Standard AS2187.2 (2006) *Explosives – Storage and use – Use of explosives.* 

Blasting is non-linear in nature and variability in ground type and meteorological conditions makes it difficult to accurately predict ground vibration and airblast overpressure without site specific measurement data therefore these blasting predictions should only be used as a guide. The values calculated in the assessment are based on no adverse meteorological conditions (i.e. calm wind conditions and no temperature inversions).

#### 7.4.1 Estimation of air blast overpressure during blasting

Air blast overpressure can be estimated using the following equation:

$$P = K_a \left(\frac{R}{Q^{1/3}}\right)^a$$

Where:

P is the pressure (kPa)

R is the distance from charge (m)

Q is the maximum instantaneous charge (kg)

Ka is the site constant

a is the site exponent

For confined blast hole charges, AS2187-2 (2006) states that the site constant value is commonly in the range of 10 to 100. Due to the absence of data and blast design, a value of 50 has been adopted for this assessment.

For confined blast hole charges, AS2187-2 (2006) uses a good estimate of the site exponent value of -1.45. Due to the absence of data and blast design, this value has been used for the assessment.

Air blast overpressure propagation can be increased with unfavourable meteorological conditions and decreased with topographic shielding. Unconfined surface charges would considerably increase the air blast overpressure propagation.

#### 7.4.2 Estimation of ground vibration during blasting

Ground vibration has been estimated using the following equation:

$$V = K_g \left(\frac{R}{Q^{1/2}}\right)^{-B}$$

Where:

V is the peak vector sum ground vibration peak particle velocity (mm/s)

R is the distance from charge (m)

Q is the maximum instantaneous charge (kg)

Kg is the site constant

B is the site exponent

For blasting carried out to a free face in average field conditions, AS2187-2 (2006) uses a site constant of 1140 and site exponent of 1.6. Due to the absence of data and blast design, these values have been used for the assessment. This resultant value can vary from 0.4 - 4 times depending on ground conditions and other factors.

#### 7.4.3 Predicted blasting impact zones

Airblast overpressure and ground vibration has been predicted for a range of maximum instantaneous charge masses and are shown in Figure 7.5 and Figure 7.6 for varying distances and assumed site parameters. The distance to comply with the *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990) and AS2187.2 building damage criteria are also shown.



Figure 7.5 Airblast overpressure impact zone based on charge mass



Figure 7.6 Ground vibration impact zone based on charge mass

#### 7.4.4 Assessment of blasting

It is noted that the current proposed blasting location is in a rural environment, with the nearest sensitive receptor approximately 360 m away (R1).

The predicted results shown in Figure 7.5 and Figure 7.6 indicate that blasting would be restricted by the air blast overpressure rather than the ground vibration levels.

#### 7.4.4.1 Human comfort

Based on the calculated results, a MIC of no more than 1.5 kg can be used in order to remain within the recommended 115 dB(L) criteria at the nearest identified sensitive receptor (R1).

If the closest occupied dwelling not associated with the quarry were used (although not currently built, but assumed to be occupied in the near future; R9 approximately 450 m away), a MIC of no more than 2.5 kg can be used in order to remain with the recommended 115 dB(L) criteria.

Based on the calculated results, a MIC of no more than 145 kg can be used in order to remain within the recommended 5 mm/s PPV human comfort criteria at all sensitive receptors.

In this case, the human comfort criteria for air blast overpressure is the limiting criteria.

#### 7.4.4.2 Structural damage

Since the human comfort criteria is the limiting criteria in terms of ground vibration, a residential building damage assessment will not be done as it is highly unlikely residential structural damage would result from small MIC quantities (i.e. estimated MIC would need to exceed 145 kg to exceed 5 mm/s human comfort vibration criteria and exceed 550 kg to exceed the 15 mm/s structural damage criteria at the closest dwelling).

Bentley Road is approximately 60 m from the current stage 1 starting point. If blasting is required during stage 1, although damage is not likely, it is recommended not to exceed the 15 mm/s maximum PPV building damage criteria at the road, which equates to approximately 16 kg MIC. When blasting in close proximity to the road (within 500 m) it is recommended to temporarily close Bentley Road to traffic while blasting is occurring. This is common practice for mines and quarries located close to any road.

This recommended MIC quantity exceeds the recommended 2.5 kgs in order to comply with air blast overpressure criteria at the closest residential receivers. As such, using this quantity (2.5 kg) would result in an approximate PPV value of 3.4 mm/s at Bentley Road, which is unlikely to cause structural damage.

#### 7.4.4.3 Assessment limitations

Information regarding the site specific variables were not available for the blast overpressure and vibration calculations. Values used in calculations were assumed based on AS2187.2 (2006) recommendations. The calculations do not take into consideration meteorological conditions and assumes calm wind conditions.

It is recognised that the design of the blasting would be up to the blast contractor. The above results are based on assumed values in the absence of specific information regarding blasting at the proposed site.

# 8. Noise mitigation and management recommendations

Noise predictions have been based on several conservative assumptions and model configurations, such as peak production rate and haul truck movements, worst case source to receptor winds, and equipment operating simultaneously. For these reasons, it is likely that actual site noise on a day-to-day basis would be lower than the predicted values.

The following discussion around potential noise mitigation measures is provided to assist in achieving the adopted noise goals.

#### 8.1 Work ethics

All site workers would be sensitised to the potential for noise impacts on local residents and encouraged to take practical and reasonable measures to minimise the impact during the course of their activities. This would include:

- Where practical, machines would be operated at low speed or power and switched off when not being used rather than left idling for prolonged periods.
- Keep truck drivers informed of designated vehicle routes, parking locations and delivery hours.
- Avoid dropping materials from height and avoid metal to metal contact on material.
- All engine covers would be kept closed while equipment is operating.

#### 8.2 Community relations

Consultation and cooperation with the neighbours to the site would assist in minimising uncertainty, misconceptions, and adverse reactions to noise. It is recommended that the quarry manager erects signage at the entrance of the quarry with a phone number and permanent site contact so that noise complaints can be received and addressed in a timely manner.

#### 8.3 Northern boundary noise bund

To alleviate noise impacts from Stage 1 at noise sensitive receiver R2, it is recommended to construct an earth bund on the northern boundary of the quarry, situated between the quarry pit and Bentley Road. However, as it is currently uninhabited, this should only be done if a resident moves into the property during Stage 1 operations as there is little benefit otherwise. The proposed earth bund should be at least 2 m tall (above ground level (AGL) and approximately 80 m in length. This will reduce the estimated noise impact at R2 to 39 dB(A), which is within the 40 dB(A) LAeq(15minute) daytime criteria. The proposed noise bund can be found in Figure 8.1.

#### 8.4 Noise bund to east of access road

To alleviate noise impacts from truck movements during all Stages (including Stages 3 and 4) at noise sensitive receiver R9, it is recommended to construct an earth bund to the east of the access road entrance along the entire north/south leg of the road. However, as this dwelling is not yet built, the noise bund should only be considered if the dwelling at R9 is built. The proposed earth bund should be at least 3 m tall (AGL) and approximately 60 m in length, and should be setback from Bentley Road at least 5 m to comply with sight distance requirements for truck drivers. This will reduce the noise impact at R9 to 40 dB(A), which is compliant with the 40 dB(A) LAeq(15minute) daytime criteria. This also in turn reduces estimated noise impacts at R7 to 30 dB(A) and at R10 to 37 dB(A). The proposed noise bund can be found in Figure 8.1.





# 8.5 General noise mitigation options for industrial sources

Additional mitigation options that should be considered if required for noise control are:

- Siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noisesensitive area; or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise. Bentley Quarry has already incorporated a screening bund around the west, southern and eastern sides of the proposed quarry pit to improve visual amenity and reduce noise impacts.
- Ensuring all equipment is not operating simultaneously, i.e. using only two pieces of crushing plant simultaneously instead of three would lower the predicted noise impacts at the closest receptors by up to 2 dB.
- Keeping equipment well maintained.
- Restricting truck speed on the site to reduce noise from the transport operation.
- Employing "quiet" practices when operating equipment (e.g. positioning and unloading of trucks in appropriate areas).
- Running staff-education programmes on the effects of noise and the use of quiet work practices.
- Using a non-acoustic warning method to warn if a vehicle is reversing or if this method does not prove satisfactory for safety reasons, adjusting the reversing alarm volume on heavy equipment to make them "smarter", by limiting acoustic range to immediate danger area.
- Using pieces of equipment with efficient muffler design.
- Using vehicles with quieter engines.
- Active noise control.

#### 8.6 Compliance noise monitoring program

To validate the predicted noise levels in this report, noise monitoring should be undertaken within three months of commencement of Stage 1 operation at a minimum of three representative locations during the day period. Truck passby monitoring should also be undertaken to ensure road traffic noise levels associated with Bentley Quarry are within the identified RNP road noise criteria.

Should the results of monitoring identify exceedances of the predicted noise levels, additional reasonable and feasible mitigation measures would be implemented in consultation with the client and affected property owners.

All acoustic instrumentation shall meet the requirements of AS IEC 61672 2004 *Electroacoustics - Sound level meters* (Parts 1, 2 & 3) and carry current National Association of Testing Authorities (NATA) and manufacturer calibration certificates. Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding  $\pm 0.5$  dB(A).

#### 8.6.1 Reporting

A noise compliance assessment report shall be prepared, including all details of the noise monitoring. As a minimum, the compliance noise report should include the following items:

- Scope of work.
- Details of instrumentation and methodology.
- Noise criteria.
- Details of monitoring locations.
- Time, date, duration of measurements.
- Meteorological conditions during monitoring.
- A description of the quarry operations during monitoring.

- L<sub>Amax</sub>, L<sub>A1</sub>, L<sub>A10</sub>, L<sub>A90</sub>, L<sub>Aeq</sub> levels over the measurement period, including noise levels (SPL) of events attributed to Interchange operations as well as other noise sources.
- High level assessment of noise environment including dominant noise sources. Noise contribution from quarry
  operations should be estimated.
- Statement of compliance/non-compliance.
- Recommendations for additional mitigation measures if required.

#### 8.7 General blast mitigation options

- All residential receptors or landholders with land within 1 km of Bentley Quarry will be notified two days prior to any blasting being undertaken at the site.
- A website or telephone hotline should be set up to provide information for anyone who wishes to be informed of the upcoming blasting schedules.
- A maximum instantaneous charge of no more than 1.5 kg can be used in order to remain within the recommended 115 dB(L) human comfort overpressure criteria at the nearest identified sensitive receptor (R1).
- A maximum instantaneous charge of no more than 2.5 kg can be used in order to remain within the recommended 115 dB(L) human comfort overpressure criteria at the nearest identified sensitive receptor not associated with the Quarry (R9).
- Based on the calculated results, a maximum charge mass of no more than 145 kg can be used in order to remain within the recommended 5 mm/s PPV human comfort ground vibration criteria at all sensitive receptors, however it should be noted that the human comfort overpressure criteria is the limiting criteria.
- If blasting during stage 1 operations, it is recommended not to exceed the 15 mm/s maximum PPV structural damage criteria at Bentley Road, which equates to approximately 16 kg MIC. Again it should be noted that the human comfort overpressure criteria is the limiting criteria. When blasting in close proximity to the road (within 500 m), Bentley Road should be closed to traffic while blasting is occurring.

#### 8.8 Blast monitoring

Initial blast monitoring should be conducted where one or more sensitive sites may be exposed to airblast and or ground vibration (i.e. R1 and R9, however if R9 is not yet constructed, use R6) to ensure that the blasting program is able to comply with the prescribed criteria. This will enable changes to be made to the blasting methods if it is found that the levels do not comply with the criteria. This monitoring should be done over enough blasts to show consistent results, usually a minimum of five. These tests should be done at the most affected sensitive sites in two or more directions. The closest residential sensitive receptors to Bentley Quarry are R1 and R9, or R6 if R9 is not yet constructed.

Regular ongoing monitoring should be continued at the closest sensitive receptors to confirm overpressure and ground vibration targets are met. This should be outlined in an appropriate Blast Management Plan. Where the initial monitoring shows that vibration targets are easily met at the closest receptors, ongoing monitoring may not be required, however any changes to blasting methods or MIC amounts would warrant a restart of the monitoring program.

# 9. Conclusion

An assessment of the potential noise impacts from future operations at Bentley Quarry has been undertaken. This assessment has led to the following conclusions, which are subject to the limitations outlined in Section 1:

- The proposed quarry is in a rural environment. Measured RBL levels at all locations were all minimum assessable background levels as per the NPI.
- An operational daytime noise criterion of 40 dBA L<sub>eq(15 min)</sub> was adopted for residential receptors, 65 dBA for commercial receptors, and 53 dBA for holiday accommodation.
- The noise assessment indicates that the noise levels due to operation of the quarry are expected to exceed criteria at R1 and R2 by up to 3 dB during stage 1 worst case operating conditions, and marginally exceed criteria by up to 1 dB during stage 2 worst case operating conditions. R1 and R2 can be considered low risk receptors as R1 is the quarry owner and R2 is an abandoned uninhabited homestead.
- The noise assessment also indicates an estimated 4 dB exceedance at approved residence at R9 during all stages. The noise impact at this receiver is dominated by truck movements entering and exiting the quarry via the access road, and is not impacted by major changes to operations within the pit. Mitigation measures to alleviate noise impacts at R9 are detailed in Section 8.4.
- The noise impacts are predicted to comply at all other sensitive receptors in the area when operating under worst case conditions.
- The operational noise assessment has been undertaken based on a worst case operating scenario, with all
  equipment operating at maximum sound power levels and simultaneously. For these reasons, it is likely that
  actual site noise on a day-to-day basis would be lower than the predicted values.
- Further recommendations have been provided in Section 8 to assist in minimising potential noise impacts.
- The predicted growth in quarry traffic along local roads due to peak production operations was investigated using the United States EPA's Intermittent Traffic Noise guidelines. This model indicated road noise along the local roads would comply with the RNP criteria at all assessed sensitive receptors.
- A blasting assessment has been undertaken and shows that:
  - A maximum instantaneous charge of no more than 1.5 kg can be used in order to remain within the recommended 115 dB(L) overpressure criteria at the nearest identified sensitive receptor (R1).
  - A maximum instantaneous charge of no more than 2.5 kg can be used in order to remain within the recommended 115 dB(L) criteria at the nearest identified sensitive receptor not associated with the quarry (R9).
  - Based on the calculated results, a maximum charge mass of no more than 145 kg can be used in order to remain within the recommended 5 mm/s PPV human comfort criteria at all sensitive receptors.
  - If blasting close to Bentley Road, it is recommended not to exceed the 15 mm/s maximum PPV building damage criteria at Bentley Road, which equates to approximately 16 kg MIC, however if using the limiting MIC quantity of 2.5 kg, it is estimated this would result in an approximate PPV value of 3.4 mm/s at Bentley Road which is unlikely to cause structural damage. When blasting in close proximity to the road (within 500 m) it is recommended to temporarily close Bentley Road to traffic while blasting is occurring.

# 10. References

Australian and New Zealand Environment Council (ANZEC 1990) *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.* 

Australian Standard AS2187.2 (2006) Explosives - Storage and use Part 2: Use of explosives.

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# Appendices

# Appendix A Correspondence relating to R2 exceedances

#### **Ben Luffman**

From:	Robbie Graham <robbieggraham@activ8.net.au></robbieggraham@activ8.net.au>
Sent:	Wednesday, 27 October 2021 11:50 AM
То:	Ben Luffman
Cc:	rob@bentleyquarry.com.au
Subject:	noise modelling at Bentley

You don't often get email from robbieggraham@activ8.net.au. Learn why this is important

#### Ben Luffman

Dear Ben

Thank you for your report on the noise modelling at our house Lot 1 DP122850 Bentley Road, Bentley. We understand that the noise modelling for the proposed Bentley Quarry at Lot 2 DP1196757 indicates a 2.6dB exceedance at our house when 3 crushers are operating during Stage 1. While this is based on a worst case senario it is understood it would not occur on a frequent bases and the noise levels would reduce as the quarry progresses to Stage 2 3 and 4. While the house is currently unoccupied, this may not always be the case and with in house living this 2.6 exceedance would be cancelled out, and there for we do not object to the exceedance.

**Robert Graham** 

For Robert Shirley & Peter Graham. 1480 Bentley Road



ghd.com



# Appendix E



# **Bentley Quarry** Air Quality Impact Assessment

R & S Contracting Pty Ltd 29 April 2022

The Power of Commitment



#### GHD Pty Ltd | ABN 39 008 488 373

230 Harbour Drive, Coffs Harbour, New South Wales 2450, Australia **T** +61 2 6650 5600 | **F** +61 2 9472 0725 | **E** cfsmail@ghd.com | **ghd.com** 

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# 1. Introduction

#### 1.1 Purpose of this report

GHD was engaged by R & S Contracting Pty Ltd (R & S Contracting) to prepare an Air Quality Impact Assessment (AQIA) to address the potential air quality impacts from the proposed quarry expansion at Bentley Quarry, located at Lot 2 DP 1196757.

Bentley Quarry proposes to construct and operate a hard rock quarry to extract up to 300,000 tonnes per annum (tpa) over 30 years, with a total disturbance area of approximately 6.5 hectares (the Project). The project will predominantly supply materials for use as fill and for road construction and maintenance.

This report provides an updated assessment of air quality impacts previously presented in GHD's Bentley Quarry Air Quality Impact Assessment (Rev 0) (29/10/2021) to include a new receptor. The assessment methodology for this report was updated to a level 2 assessment in accordance with the NSW Approved Methods for the Modelling and Assessment of Air Pollutants (EPA, 2016) (Approved Methods). Importantly a contemporaneous assessment of background particulate matter concentrations was included as per the Approved Methods. Other changes included changes to source characterisation and use of the LOWWIND model setting.

## 1.2 Scope of work

The following scope of work was undertaken as part of the AQIA:

- A review was undertaken of background information, in particular, sensitive receivers, site location, access roads, prevailing meteorology and available background air quality, using DPIE monitoring network
- A dust emission inventory for the proposed quarry expansion has been developed based on key quarry operations and equipment. This was based on a maximum quarry throughput. Emission rates for TSP, PM10 and PM2.5 were characterised using emission factors published in the National Pollutant Inventory (NPI) Emission Estimation Technique Manual (EETM) for Mining V 3.1.
- A dust modelling scenario using site specific meteorology and the atmospheric dispersion model AERMOD was undertaken.
- Maximum cumulative dust impacts were predicted from quarry operations on the surrounding environment and at nearby sensitive receptors
- Recommended in-principle mitigation and management measures to reduce dust impacts and, if warranted, air quality monitoring programmes.

## 1.3 Limitations

This report: has been prepared by GHD for R & S Contracting Pty Ltd and may only be used and relied on by R & S Contracting Pty Ltd for the purpose agreed between GHD and R & S Contracting Pty Ltd as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than R & S Contracting Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by R & S Contracting Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

# 2. Project description

#### 2.1 Site description

The project would be located at the existing hard rock quarry on Bentley Road, Bentley described as Lot 2 DP 1196757 and shown on Figure 2.1. The main access to the site is via Bentley Road.

The project would involve the operation of a hard rock quarry, with an annual maximum extraction rate of 300,000 tonnes per annum and a maximum daily extraction rate of 2,000 tonnes per day. The total area of disturbance would be 6.5 hectares with a pit of 3.65 hectares. A maximum of 50,000 tonnes per annum of soil, topsoil and waste concrete would be imported to the site to be used for initially constructing landscape mounds and rehabilitation as well as ongoing blending with aggregate material to meet relevant technical specifications.

The primary purpose of the project is to supply suitable aggregate resources for use as general fill and for the construction and maintenance of roads in the region.

The site has been used for rock extraction for many years, with obvious signs of benching from past operations. A small quarry operation continues at the site under existing use rights. This limits the operation to 3,000 m<sup>3</sup> per annum (estimated to be 6,000 tonnes based on a conversion of 2 tonnes per m<sup>3</sup>) and a disturbance footprint of approximately 1 hectare. No blasting and crushing occurs on-site at present. Due to increasing demand, it is proposed to increase the extraction rate and include blasting and crushing as part of the project.

## 2.2 Site establishment

The site establishment phase of the quarry would be relatively short (i.e. about 2 months) period. The main activity would be the construction of the access road and the intersection of the access and Bentley Road. Other activities would include:

- Initial and progressive installation of environmental controls including erosion and sediment control measures.
- Vegetation clearance, soil stripping and stockpiling.
- Construction of temporary drainage controls.
- Importation of clean soil for landscape mounds to the east and west of the quarry.
- Construction of a site office and car parking area.

It is proposed to crush and screen material at the site following approval so it is suitable to use during the construction of the access road and intersection.





## 2.3 Operation

The quarry operations would be carried out in four stages and in response to demand. To minimise the initial impact of the proposed quarry, Stage 1 would encompass the existing footprint of the quarry and expand it at a depth of RL63 m until the northern half of the proposed quarry is exhausted. Stage 2 continues at RL63 m to the southern extent of the proposed quarry. Stage 3 will involve lowering the northern half of the proposed quarry to its final depth of RL49 m. Stage 4 would be the final stage which would continue at RL49 m to the southern extent of the proposed quarry. A summary of the stages is outlined in Table 2.1.

#### Table 2.1Quarrying stages

Stages	Total extracted volume (m <sup>3</sup> )	Throughput (tonnes <sup>1</sup> )
1	107,000	214,000
2	148,000	296,000
3	188,000	376,000
4	190,000	380,000
Total	633,000	1,266,000

Note 1 – Based on a density of 2 tonnes per m<sup>3</sup>

#### 2.3.1 Stripping and stockpiling

Topsoil stripping would occur in stages prior to excavation. Generally, areas would be stripped immediately prior to quarrying. Overburden would be used to construct the perimeter bunds and landscaped to provide a visual screen.

#### 2.3.2 Extraction

Overlying weathered material would be removed using bulldozers and excavators to a depth of about 5 m. Underlying fresh rock would require blasting.

Blasting would be strictly controlled and conducted by a suitably qualified blasting contractor who would bring explosives onto site as required and fill a series of holes that would be pre-drilled by a separate drilling contractor.

Bulk emulsion explosives such as Ammonium Nitrate Fuel Oil (ANFO) would be used. Following blasting, all blasting equipment and any unused explosives would be removed from site. No explosives would be stored on site. Blasting would be undertaken in 20,000-30,000 tonne shots. It is anticipated that up to one blast per month would be undertaken during peak periods of demand but on average 3-4 blasts would be required per year.

#### 2.3.3 Crushing and screening

Contractors would crush and screen the extracted material using mobile plant positioned close to the extraction area. An excavator would feed the excavated rock into a mobile primary crusher. The primary crusher would then pass the crushed material to a secondary mobile crusher for further crushing, at which point the material would be passed through a screening plant to sort the crushed aggregate into different grades depending on market demand. The screening plant would discharge the crushed and screened aggregate into a stockpile area using a radial stacking conveyor.

#### 2.3.4 Blending

Some of the extracted material would be blended with imported waste concrete and possibly clay and sand, depending on the specifications the client requires.

#### 2.3.5 Stockpiling

Material would be stockpiled in designated areas within the pit. Material would be stored in various grades for sale or distribution. Some imported materials may be stockpiled to the east of the pit.

#### 2.3.6 Pre-coat operation

At times, pre-coated materials may be required to be provided. To satisfy this demand, a mobile pre-coat plant would periodically be used. This is a fully self-contained plant that would precoat the aggregates, which would be stockpiled within the quarry until sold.

#### 2.3.7 Hours of operation

The hours of operation would generally be limited to the following times.

Table 2.2	Hours of operation
	nouro or operation

Period	Start time	Finish time
Monday to Friday	7:00 AM	6:00 PM
Saturday	7:00 AM	2:00 PM
Sunday & Public Holidays	No operations	

Staff may arrive and leave site before and after these times to 'start-up' and 'shut-down' the quarry but excavation, crushing or loading would not occur outside the times specified above. Blasting would only occur on weekdays between the hours of 10 am and 3 pm.

#### 2.4 Quarry equipment

Table 2.3 lists the plant and equipment proposed to be operating on site and will be split up between the construction and operational phases of the project.

Туре	Typical make/model	Approximate number	Typical frequency of use	Description
Dozer	Caterpillar D6/D8	1	20%	Clearing and grubbing of vegetation and stripping of topsoil. Construction of bunding. Rehabilitation. To be used mainly during construction.
Excavator	Kobelco 350	2	100%	Excavating material and stockpiling. Clearing and grubbing of vegetation and stripping of topsoil.
Jaw, cone, and impact crusher	McClosky J50	1	80%	Crushing rock and waste concrete.
Front End Loader	Komatsu WA480 FE	1	100%	Loading material into the haul trucks and stockpiling material within the pit floor.
Screen	Fast Trax FT6203	1	70%	Aggregate/gravel production and overburden screening. Mixing imported waste concrete with aggregate.
Grader		1	25%	Road and bund construction and maintenance. To be used mainly during construction.
Haul trucks	Truck and dog contractors	Up to 70 per day	100%	Delivery of materials to customers and carting, unsuitable material to rehabilitation areas, importing soil and importing waste concrete.
Pre-coat plant	Various – similar to screen plant	1	20%	Used to produce pre-coated aggregate as required.
Water cart	Komatsu	1	40%	To water pit floor and stockpiles.

Table 2.3Quarry equipment

Туре	Typical make/model	Approximate number	Typical frequency of use	Description
Water pump	Honda	2	40%	To dewater excavation / basin and to fill water cart from standpipe.
				To water stockpiles and put moisture in products.
Hand tools	Various	5	5%	General activities maintaining plant.
Light vehicles	4x4 Vehicles	Up to 5	20%	Transporting staff to, from, and around site.

It is anticipated that not all of the equipment listed above would be operational on-site at any one time.

## 2.5 Traffic generation

#### 2.5.1 Workforce traffic

During operation it is likely that there would be a maximum of 5 workers or plant operators on the site at any one time. This would yield a daily workforce traffic generation in the order of 10 vehicle trips per day (vtpd). It is assumed the majority of the workforce would arrive between 6:30 am and 7:30 am and depart generally between 3:00 pm and 6:30 pm.

#### 2.5.2 Heavy vehicle traffic

Truck and dog trailer combinations have a capacity of about 32 tonnes. At maximum daily production (i.e. 2,000 tonnes), the quarry is expected to generate about 70 truck and dog loads or 140 truck movements per day. The truck movements would start at 7 am and continue evenly throughout the day, until 6 pm.

This rate of maximum truck movement is expected to be infrequent and for short durations. The average number of truck movements is expected to be a lot less and there would be times when no trucks would access the site.

The total truck movements, includes any movements associated with importing materials or trucks using the weighbridge but not hauling materials to or from the quarry.

# 3. Existing environment

#### 3.1 Sensitive receptors

The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales ('the Approved Methods') (EPA, 2016) defines sensitive receptors as locations where people are likely to work or reside and may include a dwelling, school, hospital, office or recreation area.

Nearby sensitive receptors in the vicinity of the site are the following dwellings:

- A dwelling is located approximately 360 m south of the proposed quarry, which is owned and occupied by the applicant (R1).
- The Disputed Plains Homestead, a dwelling that is not associated with the proposal, is located 650 m north of the proposed quarry. Disputed Plains Homestead has been vacant since the 1990s (NSW State Heritage Inventory, N.D.) (R2).
- An occupied dwelling that is not associated with the proposal is located 1.4 km south-west of the proposed quarry (R3).
- The closest occupied dwelling to the east of the quarry is located 1.2 km to the east (R6).
- There is also a proposed subdivision to the west of the quarry with two proposed houses which have also been included as receivers (R4 and R5).
- The closest dwelling not associated with the proposal is a proposed dwelling located 470 m east of the site (R7).

The table below outlines locations of all receivers identified.

Receiver name	Receiver type	Easting (m)	Northing (m)
R1	Residential	512811	6815075
R2	Residential	513197	6815939
R3	Residential	511696	6814861
R4	Residential	512381	6815074
R5	Residential	511381	6814766
R6	Residential	514140	6814834
R7	Residential	513515	6815415

#### Table 3.1 Sensitive receptors

The sensitive receptor locations are displayed in Figure 3.1.





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Data Source:Google Earth Imagery 2021. Created By: jpotgieter2

#### 3.2 Relevant pollutants

Air quality may be impacted by a number of air pollutants, which may come from a range of different emission sources and have varying effects on human health and the environment.

Dust and particular matter were identified as the pollutants most likely to impact nearby sensitive receptors during the construction and operation of the project (further discussion is provided in Section 5). The assessment of dust and particulate matter considered the following pollutants:

- Total suspended particulates (TSP)
- Particulate matter smaller than 10 microns in diameter (PM<sub>10</sub>)
- Particulate matter smaller than 2.5 microns in diameter (PM<sub>2.5</sub>)

#### 3.3 Ambient air quality

The NSW Department of Planning and Environment (DPE) operates ambient air quality monitoring stations in selected areas around NSW.

There is no regular ambient air quality monitoring data available for the site location or its immediate surrounds. The nearest AQMS station to the site with sufficient data is the Armidale station, approximately 230 km southwest of the site. Given the NSW EPA guidance requires a cumulative assessment of dust impacts (i.e. increment from the quarry plus background), data from Armidale has conservatively been used and added to the predicted site increment in this assessment. Armidale is more built up than the project area and experiences more particulate emissions from wood heaters, local industry and transportation.

The 24-hour average air quality data recorded at the Armidale station is presented in Figure 3.2. Regular exceedances of the 24-criteria are recorded.

A summary of this data is presented in Table 3.2. TSP is not recorded at this station and therefore a TSP to PM<sub>10</sub> ratio of 2:1 was assumed (NPI, 2012).

A review of the environment and industry surrounding the project site has been undertaken to develop an understanding of the potential ambient dust levels. The area is a rural farming area with little industrial activity. It is anticipated that the ambient dust levels in the area are moderate to low.

Pollutant	Averaging period	Recorded background concentration by year (µg/m³)		
		2018	2019	2020
PM10	24 hour maximum	157	310	113
	Maximum 24 hour (below assessment criteria)	47	50	47
	24 hour 70 <sup>th</sup> percentile (below assessment criteria)	16	23	15
	Annual average	12	26	14
TSP	Annual average	24	52	28
PM <sub>2.5</sub>	24 hour maximum	38	272	54
	Maximum 24 hour (below assessment criteria)	20	20	20
	24 hour 70 <sup>th</sup> percentile (below assessment criteria)	6	10	8
	Annual average	8	17	9

 Table 3.2
 Summary of available background air quality data recorded by the Armidale DPE AQMS.



Figure 3.2 24-hour average air quality data recorded at the DPE Armidale AQMS

#### 3.4 Climate and meteorology

The Bureau of Meteorology (BoM) operates Automatic Weather Stations (AWS) at various locations around Australia. The nearest stations to the project site are Casino Airport AWS, approximately 12.5 km south, and Lismore Airport AWS, approximately 13.2 km southeast. Due to the surrounding terrain features, it has been determined that the conditions in Casino are likely to match more closely to the project site conditions. Five years (2016-2020) of meteorological data from Casino Airport AWS has been analysed for this assessment and annual and seasonal wind roses are presented below. Cloud cover data has been supplemented from Lismore Airport AWS in order to calculate the atmospheric stability.

#### 3.4.1 Annual wind patterns

Figure 3.3 shows the 5-year (2016-2020) annual average wind rose at Casino AWS, and the following features can be seen:

- Annual average wind speed of 2.8 m/s.
- Winds are most prevalent from the northwest, south and southeast sectors.
- Winds are least prevalent for the northeast sector.
- Light winds (< 3 m/s) occur predominantly from the northwest.</li>
- The observed wind speed distribution indicates that the largest proportion of high wind speeds (> 5 m/s) are from the southeast.


Figure 3.3 Annual wind rose at Casino AWS (average wind speed = 2.8 m/s)

## 3.4.2 Seasonal variation in wind patterns

The five-year seasonal wind roses are presented in Figure 3.4 and show that:

- During summer the predominant wind direction is from the southeast.
- During winter the predominant wind direction is from the northwest.
- Autumn and spring are transitional periods. During these seasons both summer and winter patterns are observed.
- The greatest proportion of light (< 3 m/s) winds occur during winter.</li>
- The greatest proportion of high (> 5 m/s) winds occur during spring and summer.





# 4. Air quality criteria

## 4.1 Legislative and policy context to the assessment

The relevant legislation and government guidance for the air quality assessment of the potential impacts of the project are:

- Protection of the Environment Operations Act 1997 (POEO Act).
- Protection of the Environment Operations (Clean Air) Regulation 2010 (Clean Air Regulation).
- National Environment Protection (Ambient Air Quality) Measure (2015) (Air NEPM).
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2016) (Approved Methods).

The POEO Act provides the statutory framework for managing pollution in NSW, including the procedures for issuing licences for environmental protection on aspects such as waste, air, water and noise pollution control. Companies and property owners are legally bound to control emissions from construction sites under the POEO Act. Activities undertaken onsite must not contribute to environmental degradation, and pollution and air emissions must not exceed the standards.

The Clean Air Regulation provides regulatory measures to control emissions from motor vehicles, fuels, and industry. The project would be operated to ensure it complies with the Clean Air Regulation.

The Air NEPM sets national standards for the six key air pollutants to which most Australians are exposed: Carbon monoxide (CO), Ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), lead and particulates. Under the Air NEPM, all Australians have the same level of air quality protection.

The Approved Methods lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in NSW. It considers the above-mentioned legislation and provides pollutant assessment criteria.

## 4.2 Assessment criteria

Assessment criteria has been taken from the Approved Methods. These criteria should be met at existing or future off-site sensitive receptors. The assessment criteria are provided as cumulative impacts, where the predicted impact of the project (incremental) is added to the existing levels (background) in order to assess the resulting pollutant impacts (cumulative). To determine the level of air quality impacts, emissions from the project must be assessed against the assessment criteria as shown in Table 4.1.

Pollutant	Averaging period	Statistic	Assessment location	Assessment criteria (µg/m³)
TSP (total suspended particulates)	Annual	Average	Sensitive receptors	90
DM	24 hour	Maximum	Sensitive receptors	50
PIVI10	Annual	Average	Sensitive receptors	25
DM	24 hour	Maximum	Sensitive receptors	25
r wi2.5	Annual	Average	Sensitive receptors	8
Deposited dust	Annual (maximum increase)	Cumulative	Sensitive receptor	2 g/m <sup>2</sup> /month
	Annual (maximum total)	Cumulative	Sensitive receptor	4 g/m <sup>2</sup> /month

 Table 4.1
 Air quality impact assessment criteria

# 5. Emission estimation

The air quality assessment of the project focused on the highest-risk potential impacts, this section details the anticipated air emissions during the operation of the quarry.

The project would extract up to 300,000 tonnes of material per annum. The actual extraction rate would be dictated by demand requirements; however, extraction would not exceed 300,000 tonnes in any twelve-month period. An average hourly extraction rate of 150 tonnes per hour has been calculated from this maximum yearly throughput.

Dust and particulate matter were identified as the primary emissions to air expected during operation of the project. The processes that may generate significant amounts of particulate matter (dust) were identified to be:

- Stripping of topsoil.
- Extraction by excavation.
- Screening and crushing of material.
- Loading of materials to trucks.
- Internal haulage routes.
- Wind erosion of topsoil and product stockpiles.

Other air emissions such as combustion products (e.g. vehicle exhaust) will also be present within the quarry, however due to the small number of vehicles, the potential for impact from these emissions is negligible. Therefore, vehicle exhaust emissions have not been considered further in this assessment.

A detailed breakdown of all activities and equipment included in this assessment for each area is provided in Table 5.1. The following additional operational assumptions and mitigation measures were included as part of the air quality assessment:

- A worst-case scenario in which all daily extracted material is crushed and screened on site. Water sprays of these activities has been included in the model.
- Haul truck travels approximately 360 m into site via the internal sealed access road at a frequency of 3 trucks (6 movements) per hour for all operating hours. Based on a truck and dog trailer combinations with a capacity of about 32 tonnes.
- Level 2 watering (> 2 litres/m<sub>2</sub>/h) present across all internal access roads.
- The use of a water truck has been assumed not to generate dust emissions, as its use will act to suppress
  emissions. Therefore, the water truck is not included in the emissions inventory.

The emission rates shown in Table 5.1 include the use of the mitigation measures discussed above.

#### Particulate emissions inventory Table 5.1

Emission source	TSP emission factor	PM <sub>10</sub> emission factor	PM <sub>2.5</sub> emission factor	Unit	Control factor - TSP	Control factor - PM10	Source activity	TSP emission rate (g/s)	PM <sub>10</sub> emission rate (g/s)	PM <sub>2.5</sub> emission rate (g/s)
Stripping	0.029	0.0073	0.0018	kg/t	0.75	0.53	Scrapers (removing topsoil) [NPI EETM for Mining <sup>1</sup> ]	0.030	0.014	0.004
Stockpiling	0.4	0.2	0.05	kg/ha	0.75	0.75	Wind erosion [NPI EETM for Mining]	0.014	0.0069	0.0017
Extraction - excavation	0.025	0.012	0.003	kg/t	0.50	0.05	Excavators/Shovels/Front- end loaders (on overburden) [NPI EETM for Mining]	0.52	0.48	0.119
Crushing	0.0054	0.0024	0.0006	kg/t	0.50	0.50	Tertiary crushing [AP-42 Section 11.19 <sup>2</sup> ]	0.23	0.10	0.025
Screening	0.013	0.0043	0.0011	kg/t	0.50	0.50	Screening [AP-42 Section 11.19 <sup>2</sup> ]	0.26	0.09	0.022
Loading trucks	0	0.0005	0.00013	kg/t	0	0	Truck loading: conveyor: crushed stone [AP-42 Section 11.19 <sup>2</sup> ]	0.000	0.021	0.0052
Haulage route	2.2	0.42	0.11	kg/VKT	0.75	0.75	Wheel generated dust from paved roads [AP-42 Section 13.2 <sup>3</sup> ]	0.35	0.067	0.017

Note 1 – National Pollutant Inventory (NPI) Emission Estimation Technique Manual (EETM) for Mining V 3.1 Note 2 – AP-42 Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing Note 3 – AP-42 Section 13.2.1 Paved Roads

# 6. Operational impact assessment

# 6.1 Modelling methodology

Air quality dispersion modelling was undertaken using AERMOD version 9.5.0. AERMOD is the approved dispersion model recommended by the US EPA and is recognised by the Victoria EPA as a suitable and advanced dispersion model that improves upon Ausplume. Ausplume is listed in the NSW EPA Approved Methods. AERMOD is not explicitly mentioned in the Approved Methods but has been approved for use by the NSW EPA in numerous air quality dispersion assessments.

AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrains.

AERMOD was configured using site-representative meteorological data as described in section 5.1 and in accordance with EPA Victoria AERMOD modelling guidance (publications 1550 and 1551):

- Meteorological data for the period January 2016 December 2020 from weather observations measured at Casino Airport AWS (BoM) and cloud cover measured at Lismore Airport AWS (BoM). The measured data was processed along with local land use characteristics using AERMET, the meteorological pre-processor for AERMOD.
- LOWWIND adjustment factors were utilised to more appropriately account of dispersion of pollutants under light wind conditions.
- The effects of terrain were included by the model which utilised terrain data at a 30 m resolution.
- Seven sensitive receptors, as identified in Section 3.1, were included in the model.
- Model results were exported as 24-hour (100th percentile) and annual (100th percentile) averaging periods.

Modelled emission sources were included in the model as volume sources for vehicles and machinery, and area sources for wind erosion.

# 6.2 Predicted impacts

The predicted particulate (TSP, PM<sub>10</sub> and PM<sub>2.5</sub>) impacts were assessed at nearby sensitive receptors during the operation of the quarry. The predicted concentrations were assessed against the assessment criteria provided in Table 4.1.

## 6.2.1 Predicted incremental concentrations

The predicted maximum incremental 24-hour impacts (impacts from quarry operations only) and incremental annual average impacts are presented in Table 6.1. There are no predicted incremental exceedances of the assessment criteria. The worst case impact is at R07, where the maximum incremental 24-hour PM<sub>10</sub> concentration is approximately 42% of the criteria. A contour plot showing incremental PM<sub>10</sub> dispersion (worst case pollutant) is provided in Figure 6.1.

Table 6.1	Predicted incremental	particulate concentrations

Receptor	A	nnual average (μg/m³)		Maximum	24 – hour (µg/m³)
	TSP	<b>PM</b> 10	PM <sub>2.5</sub>	<b>PM</b> 10	PM <sub>2.5</sub>
Assessment criteria	90	25	8	50	25
R01	0.8	0.5	0.12	19.0	4.7
R02	0.8	0.4	0.10	7.1	1.8
R03	0.2	0.1	0.03	12.4	3.1
R04	0.7	0.4	0.09	14.2	3.5
R05	0.2	0.1	0.02	5.0	1.3
R06	0.5	0.2	0.06	6.5	1.6
R07	1.4	0.6	0.14	21.3	5.3





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FIGURE 6.1 Data Source: Google Earth Imagery 2021.

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# 6.2.2 Cumulative impacts

Cumulative impacts are an assessment of the impact from the proposal in the context of the existing air quality environment.

Maximum 24-hour PM<sub>2.5</sub> concentrations and annual average concentrations are low for all pollutants and no cumulative impacts are anticipated.

The highest risk of cumulative impacts is likely associated with short term (24-hour)  $PM_{10}$  concentrations. Cumulative 24-hour  $PM_{10}$  impacts could occur in the unlikely scenario where worst case quarrying impacts occur simultaneously with elevated  $PM_{10}$  concentrations (such as during bushfires or dust storms). The ten highest predicted 24-hour incremental average for  $PM_{10}$  at each receptor are presented in Table 6.2. The figures presented show the incremental concentrations, from quarrying activities only. Where higher maximum values occur (e.g. at R01 and R07), the results show a steep degradation of impacts from rank 1 (maximum) to rank 10 (tenth highest), and therefore the potential for cumulative impacts to occur is low.

Rank	R01	R02	R03	R04	R05	R06	R07
1	19	7	12	14	5	7	21
2	18	6	8	14	5	6	21
3	17	6	8	13	4	6	19
4	11	6	6	11	2	5	13
5	11	5	5	11	2	5	9
6	11	5	4	11	2	4	8
7	10	4	4	9	2	3	8
8	9	4	3	9	2	3	6
9	9	4	2	9	2	3	6
10	8	4	2	7	1	3	6

 Table 6.2
 First 10 ranked incremental PM<sub>10</sub>
 24-hour average concentrations at sensitive receptors

## 6.2.3 Contemporaneous assessment

A contemporaneous assessment of background particulate matter concentrations was included as per EPA guidance in the Approved Methods. A contemporaneous assessment adds historical background concentrations to the predicted incremental concentrations to quantify the expected cumulative impacts. All days that contained background concentrations that already exceeded the criteria were discarded and are not considered further in this assessment.

As discussed above, the highest risk of cumulative impacts is likely associated with short term (24-hour) PM<sub>10</sub> concentrations. The highest PM<sub>10</sub> concentrations are predicted at R07 and as such a contemporaneous assessment has been completed at this receptor location.

Background values have been collected from the DPIE AQMS located in Armidale.

		•			. ,
Date	PM₁₀ background	Date	PM <sub>10</sub> increment	Date	PM₁₀ total
7/11/2019	49.9	13/7/2018	21.3	7/11/2019	50.7
17/5/2018	49.0	13/6/2018	21.0	13/6/2018	49.4
12/9/2019	48.9	16/7/2018	19.4	17/5/2018	49.3
7/12/2019	48.4	13/7/2020	12.8	12/9/2019	49.0
29/10/2019	46.6	5/8/2020	9.1	7/12/2019	48.4

 Table 6.3
 Summary of highest measured (Armidale DPIE AQMS) and predicted PM10 (µg/m³) concentrations (at R07)

Date	PM <sub>10</sub> background	Date	PM <sub>10</sub> increment	Date	PM <sub>10</sub> total
1/6/2019	46.2	31/7/2019	8.3	29/10/2019	46.7
3/10/2019	45.8	29/1/2018	7.9	1/6/2019	46.5
11/1/2020	45.6	20/5/2019	6.4	3/10/2019	45.9
21/7/2019	45.6	18/6/2018	6.3	11/1/2020	45.6
21/1/2020	45.0	21/5/2018	5.5	21/7/2019	45.6

There is one day where the predicted total  $PM_{10}$  concentration is above the criteria. This occurs on the day of the maximum background concentration which makes up 99.8% of the criteria while the incremental concentration makes up 1.6% of the criteria. As such, this exceedance is caused predominantly by the increased background concentration and not due to the impact of the project.

The assessment includes a number of conservative assumptions and provided management actions outlined in Section 7 are implemented, air quality impacts as per the EPA guidance are not anticipated. Weather conditions that cause maximum dust impact are generally consistent winds in the direction of the nearest sensitive receivers throughout the daytime period outside of rain events however dust generating activities can be managed during these conditions to prevent dust impacts.

## 6.2.4 Predicted incremental dust deposition

Dust deposition impacts are assessed against a maximum increase of 2 g/m<sup>2</sup>/month and a maximum total of 4 g/m<sup>2</sup>/month. Monthly deposition of TSP has been assessed and the average monthly deposition at the discrete receptors for 2018, 2019 and 2020 was 0.0314, 0.0327 and 0.0331 g/m<sup>2</sup> respectively. 2020 has the highest monthly deposition therefore the predicted deposition for this year has been presented in Table 6.4. No exceedances of 2 g/m<sup>2</sup>/month at sensitive receptors were predicted. Slightly increased deposition rates were predicted to occur at R01 in January and October, at R02 in March, and at R07 in July and August.

Month	Criteria	Incremental impact at receptors (g/m <sup>2</sup> /month)						
	(g/m²/month)	R01	R02	R03	R04	R05	R06	R07
Jan	2	0.21	0.03	0.01	0.04	0.01	0.00	0.04
Feb	2	0.05	0.07	0.00	0.02	0.00	0.00	0.05
Mar	2	0.04	0.11	0.00	0.01	0.00	0.00	0.05
Apr	2	0.05	0.06	0.00	0.01	0.00	0.01	0.08
May	2	0.05	0.07	0.00	0.01	0.00	0.02	0.07
Jun	2	0.02	0.09	0.00	0.01	0.00	0.03	0.08
Jul	2	0.03	0.09	0.00	0.01	0.00	0.03	0.12
Aug	2	0.03	0.03	0.00	0.01	0.00	0.03	0.14
Sep	2	0.07	0.05	0.01	0.02	0.00	0.01	0.05
Oct	2	0.11	0.03	0.01	0.04	0.01	0.00	0.04
Nov	2	0.06	0.03	0.01	0.02	0.00	0.00	0.03
Dec	2	0.06	0.04	0.01	0.03	0.00	0.01	0.06

 Table 6.4
 Predicted incremental monthly deposition impacts

# 7. Mitigation and management recommendations

The activities associated with the operation of Bentley Quarry have the potential to generate emissions to air (dust). The following management measures are recommended to minimise any potential air quality impacts during the operation of the project:

- Preparation of a dust management plan for the site which details management measures, a method for recording dust complaints and monitoring requirements.
- Monitoring should include at minimum four dust deposition gauges for the first year of operation. Monitoring
  requirements can be updated after a year of sampling based on compliance.
- Compliance monitoring (when required) is to include real-time dust sampling.
- Following control measures as outlined in Section 5 must be implemented:
  - Water sprays of crushing and screening activities.
  - Level 2 watering (> 2 litres/m<sub>2</sub>/h) present across all access roads.
- Aim to minimise the size of storage piles where possible
- Visual dust monitoring will be performed on a routine basis, and all staff will be trained to look out for visible dust leaving the worksite in the direction of sensitive receptors. If the works are creating visible dust plumes that are leaving the site boundary, the works will be modified or stopped until the dust hazard is reduced to an acceptable level.
- Ambient dust levels should be considered and care taken on days when high ambient dust levels are high, such as days when bushfires or hazard reduction burns are nearby. Production, especially high dust generating activities, should be actively minimised on these days to avoid cumulative dust impacts.
- Dust suppression will be undertaken as required, using level 2 watering (> 2 L/m<sup>2</sup>/h) via water sprays and water carts:
  - Unpaved work areas subject to traffic or wind.
  - Topsoil and aggregate stockpiles.
  - During the loading and unloading of dust generating materials.
- Maintain an orderly and clean work site.
- If complaints are received relating to dust, works will be reviewed to identify opportunities to reduce potential impacts from dust.
- Should complaints persist a dust monitoring system will be implemented to determine dust levels at receptors.

# 8. Conclusions

An assessment of the potential air quality impacts from future operations at Bentley Quarry has been undertaken. A number of residential receptors are located in the area surrounding the quarry and particulate matter was identified as the key pollutant likely to cause impacts to these receptors.

An air quality assessment was undertaken in accordance with the NSW Approved Methods. Dispersion modelling was undertaken for proposed quarrying activities including extraction, crushing and screening, stockpiling of topsoil and aggregate and trucks entering and exiting the site.

The assessment of dust impacts on surrounding residential receptors showed that no incremental impacts are predicted for TSP, PM<sub>10</sub> or PM<sub>2.5</sub>. A cumulative air quality assessment was undertaken in accordance with NSW EPA guidelines which added predicted daily dust levels to ambient air quality data. Results of the assessment demonstrate that the proposal complies with the EPA impact assessment criteria and therefore adverse impacts are not anticipated, providing relevant dust mitigation measures are implemented during operation.

Mitigation and management recommendations are provided in Section 7. These should be implemented in order to minimise dust generation and the potential for dust impacts on the surrounding environment.



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# Appendix F Visual images



Photograph 1: Image from Bentley Road looking east, showing the potenttial northern bund – Year 0

Photograph 2: Image from Bentley Road looking east, showing the potenttial northern bund – once vegetated



Photograph 3: Image from Bentley Road looking east, showing the potenttial northern bund – Year 0



Photograph 4: Image from Bentley Road looking east, showing the potenttial northern bund – once vegetated



Photograph 5: Image from Bentley Road looking west, showing the potential bund at the entrance – Year 0



Photograph 6: Image from Bentley Road looking east, showing the potential bund at the entrance – once the bund is vegetated



Photograph 7: Image from Bentley Road looking west, showing the site office – Year 0





# Appendix G Biodiversity Assessment

# Biodiversity Assessment Report Bentley Quarry Expansion



PO Box 119 Lennox Head NSW 2478 T 02 6687 7666

PO Box 1446 Coffs Harbour NSW 2450 T 02 6651 7666

> PO Box 1267 Armidale NSW 2350 T 02 6772 0454

PO Box 229 Lismore NSW 2480 T 02 6621 6677

info@geolink.net.au

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Appendix E Threatened Species Potential Occurrence Assessment

Appendix F Assessments of Significance

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# **Executive Summary**

This Biodiversity Assessment Report (BAR) has been prepared for Ben Luffman (GHD Consulting) on behalf of the client to support a development application for construction and expansion of Bentley Quarry at Lot 2 DP1196757 located at 1465 Bentley Road, Bentley, NSW ('the site'). The BAR will be included as a supporting document to an Environmental Impact Statement (EIS) submitted to Richmond Valley Council (RVC).

The site is located at 1465 Bentley Road, Bentley, NSW, a rural landholding approximately 15 km west of Lismore CBD. The site is zoned RU1 Primary Production in the Richmond Valley Local Environmental Plan 2012. The site occurs adjacent to Bentley Road and comprises predominately agricultural land which has undergone some past clearing and modification, with an existing quarry (approximately 1 ha in size).

The proposal is for the expansion of the existing hard rock quarry with an estimated total area of disturbance, proposed to be 6.5 ha with a pit approximately 3.65 ha in size. The site does not contain any areas of land mapped as being of Biodiversity Value (as per the Biodiversity Values Map and Threshold Tool). Native vegetation removal for the proposal (approximately 0.23 ha) will not exceed the clearing threshold of 1 ha, therefore the Biodiversity Offsets Scheme (BOS) is not triggered and a Biodiversity Development Assessment Report (BDAR) is not required.

#### Results of field assessment are as follows:

- Small patches of dry sclerophyll forest on the site (within the development footprint) most closely
  align with the Plant Community Type (PCT) 841: Forest Red Gum grassy open forest of the
  coastal ranges of the NSW North Coast Bioregion as described in the OEH Vegetation
  Classification system
- No threatened flora species were recorded at the site
- No threatened ecological communities (TECs) occur at the site
- Three threatened fauna were recorded utilising the site these include, Little Bent-winged Bat, Large Bent-winged Bat & Yellow-bellied Sheathtail-bat

#### Impacts of the proposal include:

- Loss of native vegetation including approximately 0.23 ha of PCT 841 Forest Red Gum grassy open forest.
- Loss of 8 hollow-bearing trees
- Potential impacts to 8 threatened fauna that have potential to occur on site or were recorded utilising the site
- Potential for injury or mortality of fauna during clearing works.
- Weed dispersal

# Review of statutory instruments relevant to the proposed subdivision was completed as follows:

- State Environmental Planning Policy (SEPP) Koala Habitat Protection 2020: potential Koala habitat does not occur, and the Policy does not apply.
- Biodiversity Conservation Act 2016 (BC Act):
  - habitat for threatened species would not be significantly affected by the proposal.



- Due to the area of vegetation requiring removal being below clearing thresholds, the Biodiversity Offsets Scheme (BOS) in the BC Act is not triggered; and a Biodiversity Development Assessment Report (BDAR) is not required.
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act):
  - no impact on any listed threatened ecological communities listed under EPBC Act
  - no impact any threatened flora species listed under the EPBC Act
  - the proposal is unlikely to lead to a significant impact on any threatened species and/or their habitat listed under the EPBC Act



# 1. Introduction and Background

### 1.1 Introduction

This Biodiversity Assessment Report (BAR) has been prepared for Ben Luffman (GHD Consulting) on behalf of the client to support a development application for construction and expansion of Bentley Quarry at Lot 2 DP1196757 located at 1465 Bentley Road, Bentley, NSW ('the site'). The BAR will be included as a supporting document to an Environmental Impact Statement (EIS) submitted to Richmond Valley Council (RVC).

This assessment has been prepared to:

- Identify the biodiversity values of the site (particularly habitat for threatened species or communities listed in the *Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection* and *Biodiversity Conservation Act 1999* (EPBC Act)
- Identify any significant habitat features of biodiversity importance
- Examine the proposal against relevant statutory requirements.

#### 1.2 The Site

The site occurs in Lot 2 DP1196757 located at 1465 Bentley Road, Bentley, NSW, a rural landholding approximately 15 km west of Lismore CBD (refer to **Illustration 1.1**). The site is zoned RU1 Primary Production in the Richmond Valley Local Environmental Plan 2012. The site occurs adjacent to Bentley Road and comprises predominately agricultural land which has undergone some past clearing and modification, with an existing quarry (approximately 1 ha in size) and driveway located within the site (refer to **Illustration 1.2**).

The site occurs within the Scenic Rim subregion of the South Eastern Queensland Bioregion as per the Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (refer (Thackway & Cresswell 1995)).

### 1.3 The proposal

The proposal is for the expansion of the existing hard rock quarry, with an annual maximum extraction rate of 300,000 tonnes per annum and a maximum daily extraction rate of 2,000 tonnes per day. The total area of disturbance is proposed to be 6.5 ha with a pit approximately 3.65 ha in size. In addition, a maximum of 50,000 tonnes per annum of soil, topsoil and waste concrete is proposed to be imported to the site to be used for constructing landscape mounds, rehabilitation and blending with aggregate material.

### 1.4 Assessment Pathway

The NSW Department of Planning, Industry and Environment (DPIE) has provided the Secretary's Environmental Assessment Requirements (SEARs) for the Environmental Impact Statement (EIS). This BAR aims to provide the supporting information and assessment for the biodiversity requirements outlined under SEARs – ID 1589.



The site does not contain any areas of land mapped as being of Biodiversity Value (as per the Biodiversity Values Map and Threshold Tool; version 11 accessed 08/09/2021 (NSW Government 2021) (**Figure 1.1**). The site is allocated a minimum lot size of 40 ha in the Richmond Valley LEP 2012, therefore up to 1 ha of native vegetation may be cleared without triggering the Biodiversity Offset Scheme (BOS) under the BC Act and the requirement for the Biodiversity Development Assessment Report (BDAR) not required.

Majority of the study area was dominated by exotic grasses and other weeds (i.e. >50% exotic cover); these areas were classed as 'Highly disturbed areas with no or limited native vegetation – exotic grasslands'. The Interim Grasslands and other Groundcover Assessment Method (IGGAM) was undertaken for grassland areas to determine the conservation value of the groundcover associated with grassland habitat. Based on the IGGAM calculator output the grassland identified within the study area was calculated to be of 'low conservation value' and be consistent with category 1-exempt land under the Section 60H (1) of the *Local Land Services Act 2013*. The BOS threshold cannot be exceeded on areas consistent with category 1 – exempt land. As such areas mapped as exotic grassland were not included in BOS clearing thresholds for the site.



Native vegetation removal for the proposal (approximately 0.23 ha) will not exceed the clearing threshold of 1 ha, therefore the BOS is not triggered and a BDAR is not required.

Figure 1.1 Biodiversity Values Map and site context – accessed 8<sup>th</sup> September 2021

#### 1.5 Definitions used in this report

The following definitions have been used throughout this BAR:

- The proposal as described in Section 1.3
- The Site the land in which the proposal occurs within (i.e. Lot 2 DP1196757)
- Study area the impact area and adjacent areas of vegetation and associated habitat surveyed as part of this investigation that may be subject to direct or indirect impacts as a result of the proposal
- Impact area this includes all areas to be directly impacted by the proposal, including the direct impact area of proposed design and construction footprint and associated ancillary infrastructure
- The locality a 10 km buffer on the study area



# 3 Km



## Locality Plan - Illustration 1.1

Information shown is for illustrative purposes only Drawn by: AB Checked by: TLJ Reviewed by: DGH Source of base data: Open Street Map Date: 22/09/2021



5815000

6814000

Geolulia Biodiversity Assessment Report - Bentley Quarry Expansion 4071-1005

The Site - Illustration 1.2

Information shown is for illustrative purposes only Drawn by: AB Checked by: TLJ Reviewed by: DGH Source of base data: ESRI World Imagery Date: 15/10/2021

# 2. Methodology

#### 2.1 Desktop assessment

The desktop assessment included analysis of the following information sources:

- Aerial photographic imagery
- NSW Mitchell Landscapes (Planning Industry and Environment 2016)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Thackway & Cresswell 1995)
- Biodiversity Values mapping (as per the Biodiversity Values Map and Threshold Tool)(NSW Government 2021)
- Directory of Important Wetlands of Australia (Department of Agriculture 2021)
- Priority weed listings for the North Coast region (Department of Primary Industries 2021a)
- Broad-scale vegetation mapping of the locality specifically the State Vegetation Type Map: CRAFTI North Coast vegetation mapping (Department of Planning Industry and Environment 2005)

#### 2.1.1 Database searches

Table 2.1 outlines the desktop database searches completed prior to field assessment.

Table 2.1	Threatened species	s database searches
-----------	--------------------	---------------------

Database	Search date	Area search	Reference
PlantNET Spatial Search	30/08/2021	Richmond Valley LGA search	(Royal Botanic Gardens 2021)
BioNet Atlas species sighting search	30/08/2021	20km x 20km centred on the study area	(Environment Energy and Science 2021a)
EPBC Protected Matters Search Tool	30/08/2021	25km buffer on the study area	(Department of Agriculture Water and the Environment 2021)
NSW Department of Primary Industries (Fishing and Aquaculture) spatial data	30/08/2021	Richmond Valley LGA	(Department of Primary Industries 2021b)



# 3. Field assessment

The study area was inspected during daylight and nocturnal hours by an ecologist on 2<sup>nd</sup> and 9<sup>th</sup> September 2021. The field assessment sought primarily to identify key biodiversity constraints by assessing the type, extent and condition of vegetation and fauna habitat, especially as it pertained to threatened species and ecological communities.

#### 3.1 Personnel

The contributors to the preparation of this report, their qualifications and roles are provided in **Table 3.1**.

#### Table 3.1 Personnel

Name	Qualifications	Position	Role
David Havilah	<ul> <li>Bachelor of Science (Major Biology)</li> <li>Accredited BAM Assessor (BAAS18129)</li> </ul>	Senior Ecologist	Technical review
Troy Jennings	<ul> <li>Bachelor of Biodiversity and Conservation</li> <li>Masters of Wildlife Management</li> <li>Cert III Conservation and Land Management</li> <li>Accredited BAM Assessor (BAAS18172)</li> </ul>	Ecologist	Reporting and field surveys
Anna Barca	<ul> <li>Associate Degree of Spatial Science</li> </ul>	GIS specialist	Spatial data management and figure preparation

#### 3.2 Weather conditions

Weather conditions during the field survey were mild and warm  $(7 - 27^{\circ}C)$ , with a moderate to strong wind. No rainfall was recorded during the field assessment (**Table 3.2**).

#### Table 3.2 Weather conditions during field assessment

Data	Temperature (°C)		Deinfell (mm)	Wind (direction/	
Date	Minimum	Maximum	Raimaii (iiiii)	speed)	
02/09/2021	15.2	24.4	0	ESE 39	
09/09/2021	7.5	27	0	NNW 39	

Source: Bureau of Meteorology (2021): Casino Airport (weather station: 058208).



### 3.3 Vegetation survey methods

The flora survey focused on mapping any native and non-native vegetation types and assessing the likelihood of threatened flora species to occur within habitats available within the study area. This was completed using a combination of the following methods:

- random meanders
- rapid point assessments
- vegetation integrity plots

A detailed overview of terrestrial flora survey methods is presented below. Vegetation surveys completed within the study area were carried out as described below and where applicable, considering the methodology detailed in the following guidelines:

- Field survey methods for environmental consultants and surveyors when assessing proposed developments or other activities on sites containing threatened species (Department of Planning Industry and Environment 2016)
- NSW Guide to Surveying Threatened Plants (Department of Planning Industry and Environment 2020)
- NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation 2004)

#### 3.3.1 Definition of native vegetation

Native vegetation is defined in Section 1.6 of the BC Act, which states that native vegetation and clearing native vegetation have the same meanings as in Part 5A of the *Local Land Services Act 2013*. Part 5A 60B of the *Local Land Services Act 2013* defines the meaning of native vegetation as any of the following types of plants native to New South Wales:

- trees (including any sapling or shrub or any scrub)
- understorey plants
- groundcover (being any type of herbaceous vegetation)
- plants occurring in a wetland.

A plant is native to New South Wales if it was established in New South Wales before European settlement. As such, all areas containing native vegetation, including previously disturbed areas, have been assessed.

#### 3.3.2 Existing vegetation mapping and verification

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. The regional vegetation mapping (Department of Planning Industry and Environment 2005) does not map any native vegetation within the study area but maps vegetation in the locality.

Analysis of aerial photographs was used to identify areas of disturbance, vegetation structure and likely native versus exotic species composition throughout the study area. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

Data on geology, dominant canopy species, native species richness, vegetation structure and condition was collected across the study area during field surveys to validate and refine this existing



vegetation classifications to determine their associated PCT in accordance with the BioNet Vegetation Classification System (Environment Energy and Science 2021b) Vegetation conditions were identified and mapped following the BAM (Department of Planning Industry & Environment 2020).

#### 3.3.3 Random meander survey

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (Cropper 1993), whereby the recorder walks in a random meander throughout the study area recording dominant and key plant species (e.g. threatened species, priority weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness.

Random meander surveys were conducted to undertake flora and fauna habitat assessments, vegetation mapping and opportunistically search for threatened species within areas of suitable habitat.

#### 3.3.4 Rapid data point assessment

Three Rapid Data Point (RDP) assessments were completed to validate and refine this existing vegetation classification to determine their associated PCT in accordance with the BioNet Vegetation Classification System(Environment Energy and Science 2021b). Data on geology, dominant canopy species, native species richness, vegetation structure and condition were collected at rapid point assessment locations. Three rapid point assessments were conducted in the study area (**Illustration 3.1**).

#### 3.3.5 Vegetation integrity survey plots

One vegetation integrity survey plot were completed within the study area in accordance with the field procedure contained in BAM 2020 (Department of Planning Industry & Environment 2020). Vegetation Integrity Plots were used primarily to quantify the native species content and cover of the grassland areas and to determine and assign Plant Community Types (PCTs).

#### 3.3.6 Condition of vegetation

Vegetation in the study area was firstly assessed to a PCT (if possible) and then aligned to a condition state, which is defined in the BAM as 'an area of native vegetation on the subject land that is the same PCT and has a similar broad condition state' (Department of Planning Industry & Environment 2020). A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition.

The broad condition states which were applied to vegetation in the study area are summarised in **Table 3.3**. These factors were defined by using factors such as levels of disturbance, weed invasion and resilience.



Table 3.3	Vegetation	broad	condition	states
	regetation			

Condition category	Description
Poor	Vegetation structurally and floristically shows some characteristic of assigned vegetation community. Vegetation is structurally modified and exhibits some regrowth as a result of historic clearing. Presence of a few canopy species and a sparse midstory present.
Miscellaneous ecosystems – disturbed areas	Highly disturbed areas with no or limited native vegetation. Canopy is either absent or sparse with a sparse midstory present, dominated by exotic species.
Miscellaneous ecosystems – grassland	Highly disturbed areas with no or limited native vegetation. No canopy species present, presence of some native groundcover but mainly dominated by exotic herbs and grasses.

#### 3.4 Fauna survey methods

This section outlines the fauna survey effort completed for species that have habitat suitable within the study area based on database searches. Fauna surveys for threatened species were undertaken during 2<sup>nd</sup> and 9<sup>th</sup> September 2021. Survey methods are described below, and the location of fauna survey effort is shown in **Illustration 3.1**.

Threatened fauna surveys completed within the study area were carried out as described below and where applicable, considering the methodology detailed in the following guidelines:

- NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)(Department of Environment and Conservation 2004)
- Survey Guidelines for Australia's Threatened Birds (Magrath et al. 2010)
- Survey Guidelines for Australia's Threatened Mammals (Department of Sustainability Environment Water Population and Communities 2004)
- Threatened Species survey and assessment guidelines: field survey and methods for fauna-Amphibians (Department of Environment and Climate Change 2009)
- 'Species credit' threatened bats and their habitats- NSW survey guide for the BAM (Office of Environment & Heritage 2018).

#### 3.4.1 Fauna habitat assessment

Fauna habitat assessments were undertaken to assess the likelihood of a threatened species of animal (those species known or predicted to occur within the locality from the literature and database review) occurring within the study area. Fauna habitat assessments were the primary assessment tool in assessing whether threatened species were likely to occur within the study area. Fauna habitat characteristics assessed included:

- structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, large forest owls, birds and reptiles
- presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians
- presence of waterways (ephemeral or permanent) and water bodies.
- presence of man-made structures (e.g. culverts) for roosting/breeding microbats.



The criteria used to evaluate the condition of habitat values is outlined in Table 3.4.

Table 3.4	Fauna habitat a	assessment	evaluation	criteria
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Habitat value	Evaluation criteria
Good	A full range of fauna habitat components are usually present (for example, old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
Moderate	Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
Poor	Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

#### 3.4.2 Diurnal bird surveys

Four formal 20-minute diurnal bird searches were completed at two locations within the study area. Bird surveys were completed by actively walking through the nominated site (transect) over a period of 20 minutes. All birds were identified to the species level, either through direct observation or identification of calls. Bird surveys were completed during different times of the day, but generally occurred during morning or late afternoon hours. Birds were also recorded opportunistically during all other surveys and site visits.

#### 3.4.3 Spotlighting

Spotlighting was used to target arboreal, flying and ground-dwelling mammals, as well as nocturnal birds, reptiles and amphibians. Spotlighting was completed after dusk (9 September 2021) and completed on foot by an ecologist using high-powered headlamps and hand torches. Sighted animals were identified to the species level.

#### 3.4.4 Microbat surveys

Passive Ultrasonic Anabat Bat detection (Anabat Express unit -Titley Scientific, Brendale QLD) was used to record and identify the echolocation calls of microchiropteran bats foraging within the study area. Passive monitoring of survey sites was achieved by setting Anabat bat detectors to record throughout the night for five continuous nights (9 September – 14 September 2021).

Calls were analysed using Analook (Version 4.7) software with reference to 'Bat Calls of NSW: Region Based Guide to the Echolocation Calls of Microchiropteran Bats' (Pennay et al. 2004). Bat call outputs are provided in **Appendix G**.

#### 3.4.5 Exit surveys

One exit survey was undertaken at dusk in areas where roosting/ denning habitat (i.e. identified hollow-bearing trees) was identified within the study area (9 September 2021). The aim of the exit survey was to identify hollow-bearing tree dependent fauna, including microchiropteran bats, that may have been using hollow-bearing trees as habitat in the study area for roosting or breeding purposes. Following the exit survey, spotlighting was undertaken near potential roosting/ denning habitat.


#### 3.4.6 Koala spot assessment technique (SAT)

In addition to habitat assessment, targeted survey for the Koala was completed in the study area in areas of suitable habitat where Koala feed trees were identified. The study area provided one Koala Schedule 2 feed tree - *Eucalyptus tereticornis* (Forest Red Gum). At each sampling point, Spot Assessment Technique (SAT) methodology (Biolink Ecological Consultants 2009) was employed, which involved actively searching for Koala faecal pellets for approximately one metre around the trunk of 30 trees (where possible); specifically targeting feed tree species where possible.

#### 3.4.7 Opportunistic recording of fauna species and evidence of fauna activity

Opportunistic sightings of animals were recorded during field surveys. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows was also noted. This provided indirect information on animal presence and activity. During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops.

#### 3.5 Field survey limitations

Surveys and survey effort have predominately focused within the development footprint and other areas of native vegetation which would be impacted by the proposal. No sampling technique can eliminate the possibility that a species is present within the site. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present within the site during surveys. The conclusions in this report are based upon data acquired for the proposal and the environmental field surveys, therefore, they are merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of species. It should be recognised that site conditions, including the presence of threatened species, can change with time.

Targeted surveys have been conducted to detect target sedentary animal species and threatened flora species that are considered likely to occur within the site based on habitat characteristics and previous records. As the actual distribution and the range of habitat utilised by some species is not fully understood, there is always a small possibility that other species could occur on the site despite being considered to have a low likelihood of occurrence based on their known range and known habitats.





0 100 Metres

Field Survey Effort Within Study Area - Illustration 3.1



Biodiversity Assessment Report - Bentley Quarry Expansion 4071-1012

Information shown is for illustrative purposes only Drawn by: AB Checked by: TLJ Reviewed by: DGH Source of base data: Google Earth 2021 Date: 29/04/2022 Revision: A

# 4. Existing Environment

This section provides an overview of the existing environment and potential ecological constraints of the study area based on the desktop analysis and field assessment completed.

#### 4.1 Landscape context

An overview of landscape features associated with the study area are presented in Table 4.1.

 Table 4.1
 Landscape features and planning information

Landscape feature	Occurrence in study area
IBRA bioregion	South Eastern Queensland
IBRA subregion	Scenic Rim
NSW landscape regions (Mitchell landscapes)	Lamington Volcanic Slopes
Local Government Area (LGA)	Richmond Valley Council (RVC)
Local Land Service (LLS) region	North Coast
Botanical subregion	North Coast (NNC)
Rivers, streams and estuaries	No mapped rivers, streams or estuaries occur in study area.
Important and local wetlands	No important or local wetlands occur in study area.
Connectivity features	Overall, the landscape has been cleared which has resulted in fragmentation and isolation from remnant patches of vegetation due to agricultural practices (i.e. clearing for livestock grazing). No remnant vegetation or habitat links occur with the study area.
Areas of geological significance and soil hazard features	No areas of geological significance and soil hazard features occur in the study area.
Areas of outstanding biodiversity value	No areas of outstanding biodiversity values occur in the study area.

#### 4.2 Plant community types

The study area is heavily disturbed, and the majority of original vegetation has been cleared as a result of agricultural and quarrying practices within the site and locality. One native vegetation community aligned with the plant community types (PCTs) outlined in BioNet Vegetation Classification system.

Native vegetation extent within the study area is described in **Table 4.2** and aligned with PCTs in the BioNet Vegetation Classification system where relevant.

Vegetation mapping is provided at **Illustration 4.1**. Photographs of vegetation at the site are provided in **Appendix B**; a flora inventory is provided in **Appendix C** & **Appendix D**.



Table 4.2	Plant	Community	Types

Plant Community Type	Condition	Area within study area (ha)
Native vegetation		
PCT 841: Forest Red Gum grassy open forest of the coastal ranges of the NSW North Coast Bioregion	Poor	0.25
Miscellaneous ecosystems		
Highly disturbed areas with no or limited native vegetation – Exotic do vegetation	ominated	0.28
Highly disturbed areas with no or limited native vegetation – Exotic do grassland	ominated	8.59
Total	vegetation	9.13

## 4.2.1 PCT 841 Forest Red Gum grassy open forest of the coastal ranges of the NSW North Coast Bioregion

The study area contains several small patches of *PCT 841: Forest Red Gum grassy open forest of the coastal ranges of the NSW North Coast Bioregion*. Based on landscape position and woodland being present in similar situations in the locality, it is likely that the study area would have once contained a woodland dominated by *Eucalyptus tereticornis* with this previously existing woody canopy vegetation (shrubs and trees) having been largely removed. Presence of *Corymbia intermedia* (Pink Bloodwood) still persist, with *Eucalyptus tereticornis* (Forest Red Gum) and *Angophora subvelutina* (Broad-leaved Apple) also occurring scattered in the study area.

A summary of the characteristics of PCT 841 within the study area is in provided in **Table 4.3** and depicted in **Plate 4.1** and **Plate 4.2**. The extent of PCT 841 within the study area is shown in **Illustration 4.1**.

PCT 841 does not correspond to any listed TEC as stated in BioNet Vegetation Classification (Environment Energy and Science 2021b). However, some floristics are similar to the TEC Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion, as a precaution, an assessment of this community against the TEC criteria of Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion has been undertaken in Section 5.1.

### Table 4.3Summary of PCT 841: Forest Red Gum grassy open forest of the coastal ranges ofthe NSW North Coast Bioregion

Description	
РСТ	Upper stratum consists of <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Angophora subvelutina</i> (Broad-leaved Apple), <i>Eucalyptus</i> <i>siderophloia</i> (Grey Ironbark) and <i>Corymbia intermedia</i> (Pink Bloodwood).
	Middle stratum consists of <i>Breynia oblongifolia</i> (Coffee Bush). Ground stratum consists of <i>Dianella caerulea</i> (Blue Flax-lily), <i>Dichondra repens</i> (Kidney Weed), <i>Lomandra longifolia</i> (Spiny- headed Mat-rush), <i>Themeda australis</i> (Kangaroo Grass) & <i>Imperata cylindrica</i> var. <i>major</i> (Blady Grass).
% cleared	50



Description	
Extent in study area	0.25 ha
Condition in study area	Poor condition within the study area, heavily disturbed understorey with exotic grasses dominating.
Canopy species in plot	Corymbia intermedia (Pink Bloodwood)
Midstory/shrub species in plot	<i>Notelaea longifolia</i> (Large Mock-olive), <i>Streblus brunonianus</i> (Whalebone Tree) & <i>Alphitonia excelsa</i> (Red Ash)
Ground layer species in plot	Groundcover generally includes <i>Lomandra multiflora</i> (Many- flowered Mat-rush), <i>Cenchrus caliculatus</i> (Hillside Burrgrass), <i>Paspalum dilatatum</i> * (Paspalum*), <i>Melinis repens</i> * (Red Natal Grass*), <i>Cenchrus clandestinus</i> * (Kikuyu Grass*), <i>Chloris</i> <i>ventricose</i> (Tall Chloris), <i>Imperata cyclindrica</i> (Blady Grass) and <i>Themeda triandra</i> (Kangaroo Grass).
Exotic species in plot	Paspalum dilatatum <sup>*</sup> (Paspalum <sup>*</sup> ), <i>Melinis repens</i> <sup>*</sup> (Red Natal Grass <sup>*</sup> ), <i>Bidens pilosa</i> <sup>*</sup> (Cobblers Pegs), <i>Phytolacca octandra</i> <sup>*</sup> (Inkweed <sup>*</sup> ), <i>Asclepias curassavica</i> <sup>*</sup> (Blood Flower <sup>*</sup> ), <i>Tecoma</i> <i>stans</i> <sup>*</sup> (Yellow Bells <sup>*</sup> ), <i>Verbena bonariensis</i> <sup>*</sup> (Purpletop <sup>*</sup> ) & <i>Cenchrus clandestinus</i> <sup>*</sup> (Kikuyu Grass <sup>*</sup> ).
Notes	Based on landscape position and presence of <i>Eucalyptus</i> <i>tereticornis</i> & <i>Eucalyptus siderophloia</i> dominated forest being present in similar situations in the locality and in other patches in the study area, it is likely that the study area would have once contained larger patches of forest dominated by <i>Eucalyptus</i> <i>tereticornis</i> and other associated canopy species (mentioned above) this previously existing woody canopy vegetation (shrubs and trees) has been removed. Community present within the study area is likely to be disturbed representation of PCT 841. Floristic composition present in plot is provided below.



Plate 4.1 Small patch of regrowth Pink Bloodwoods with disturbed understorey within RDP 2.



Plate 4.2 Vegetation occurring within RDP 2 and occurrence of Pink Bloodwoods with disturbed understorey.

## 4.2.2 Miscellaneous ecosystem - Highly disturbed areas with no or limited native vegetation – exotic vegetation

Areas within the study area that were dominated with exotic herbs, groundcover and midstorey were classed as 'highly disturbed areas with no or limited native vegetation – exotic vegetation'. These areas were identified within patches surrounding the existing quarry pit and also along the roadside boundary associated with Bentley Road reserve. Presence of some native ground cover and canopy species were present however overall these areas were dominated with exotic species. Rapid data points undertaken in these areas identified a canopy which included *Ligustrum sinense*\* (Small-leaved Privet\*), *Mallotus philippensis* (Red Kamala), *Jagera pseudorhus* (Foam Bark Tree), *Solanum mauritianum*\* (Wild Tobacco Bush\*) and *Solanum chrysotrichum*\* (Devil's Fig\*). The midstorey and ground vegetation consists of *Lantana camara*\* (Lantana\*), *Ageratina adenophora*\* (Crofton Weed\*), *Ageratina riparia*\* (Mistflower\*), *Imperata cylindrica* (Blady Grass), *Paspalum dilatatum*\* (Blady Grass), *Cenchrus caliculatus*\* (Kikuyu Grass\*) and *Themeda triandra* (Kangaroo Grass).

These areas are shown in **Plate 4.3** and **Plate 4.4**. The extent and occurrence within the study area is shown in **Illustration 4.1**.





Plate 4.3 Miscellaneous ecosystems - Highly disturbed areas with no or limited native vegetation

Plate 4.4 Miscellaneous ecosystems -Highly disturbed areas with no or limited native vegetation (presence of native trees along boundary of road reserve)

## 4.2.3 Miscellaneous ecosystem - Highly disturbed areas with no or limited native vegetation – exotic grasslands

The majority of the study area was dominated by exotic grasses and other weeds; these areas were classed as 'Highly disturbed areas with no or limited native vegetation – exotic grasslands'.

A vegetation integrity plot was undertaken to quantify native species richness and percentage cover to identify if these areas were a 'derived native grassland' of any associated PCTs identified in the area. The vegetation was dominated by exotic species, particularly *Cenchrus clandestinus*\* (Kikuyu Grass\*), *Paspalum dilatatum*\* (Paspalum\*), *Melinis repens*\* (Red Natal Grass\*) and *Sporobolus africanus*\* (Parramatta Grass\*). These areas are shown in **Plate 4.5** and **Plate 4.6**.

The Interim Grasslands and other Groundcover Assessment Method (IGGAM) was undertaken for grassland areas to determine the conservation value of the groundcover associated with grassland habitat. Based on the IGGAM calculator output the grassland identified within the study area was calculated to be of 'low conservation value' and be consistent with category 1-exempt land under the Section 60H (1) of the *Local Land Services Act 2013*.





Plate 4.5 Miscellaneous ecosystems - Highly disturbed areas with no or limited native vegetation (exotic grasslands)



Plate 4.6 Miscellaneous ecosystems -Highly disturbed areas with no or limited native vegetation (exotic grasslands)





100 Metres

#### Vegetation and Habitat Features Within Study Area - Illustration 4.1



Information shown is for illustrative purposes only Drawn by: AB Checked by: TLJ Reviewed by: DGH Source of base data: Google Earth 2021 Date: 15/10/2021

#### 4.3 Priority and high threat weeds

The study area is considerably disturbed due to previous agricultural practices and consequently weed species are common. A total of 25 exotic species were recorded throughout the study area (refer to **Appendix C**).

Exotic grasses included *Paspalum dilatatum*\*, *Cenchrus clandestinus*\*, *Melinis repens*\* and *Sporobolus africanus*\*. Other weeds common to disturbed areas are prevalent, including *Senecio madagascarensis*\*, *Bidens pilosa*\*, *Ageratum houstonianum*\*, *Lantana camara*\*, *Salvia verbenaca*\*, *Bidens subalternans*\*, *Ageratina adenophora*\*, *Cirsium vulgare*\*, *Ageratina adenophora*\*, *Ageratina riparia*\*, *Phytolacca octandra*\*, and *Gomphocarpus physocarpus*\*. Identified exotic trees included *Solanum chrysotrichum*\*, *Solanum mauritianum*\*, *Tecoma stans*\*, *Ligustrum sinense*\* and *Ligustrum lucidum*\*.

The following species were identified as 'High Threat' weeds:

- Tecoma stans\* (Yellow Bells)
- Senecio madagascariensis\* (Fireweed)
- Paspalum dilatatum\* (Paspalum)
- Ligustrum sinense\* (Small-leaved Privet)
- Ligustrum lucidum\* (Large-leaved Privet)
- Lantana camara\* (Lantana)
- Ageratina riparia\* (Mistflower)
- Ageratina adenophora\* (Crofton Weed)

Four weed species identified in the study area during the field assessment are listed as priority weeds listed under the *Biosecurity Act 2015* for the North Coast region:

- Lantana camara\* (Lantana)
- Solanum chrysotrichum\* (Devil's Fig)
- Senecio madagascariensis\* (Fireweed)
- Tecoma stans\* (Yellow Bells)

Two weed species identified in the study area are listed as Weeds of National Significance (WoNS) under the National Weeds Strategy, these include *Senecio madagascariensis*\* (Fireweed\*) and *Lantana camara*\* (Lantana\*).

#### 4.4 Fauna species recorded

A total of 41 fauna species were recorded during field surveys, including two amphibians, 28 birds, 5 mammals and one reptile. Three threatened fauna species listed under the BC Act and/or the EPBC Act were recorded during field surveys (**Table 4.4**). A comprehensive list of fauna species recorded within the study area is provided in **Appendix C**. In addition, microbat call sequences recorded via Anabat detectors are provided in **Appendix G**.

Scientific name	Common Name	BC Act	EPBC Act	Notes
Miniopterus australis	Little Bent-winged Bat	V	-	
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Recorded by Anabat
Saccolaimus flaviventris	Yellow-bellied Sheathtail- bat	V	-	detectors

#### Table 4.4 Recorded threatened fauna





#### 4.5 Fauna habitat

#### 4.5.1 Habitat Values

The site provides minimal habitat for fauna species due to the highly disturbed nature as a result of historical clearing and agricultural disturbances. Overall, fauna habitat within the study area was considered to be of poor condition based on the criteria outlined in **Table 3.4**. Habitat values of the site are summarised as follows:

- Majority of the study area is highly disturbed and dominated with exotic vegetation. Small patches where trees and shrubs occur do provide potential shelter and foraging (fruit, nectar, pollen, insect) opportunities for birds, reptiles and terrestrial mammals, however, due to the sites limited connectivity these patches are likely only utilised by highly mobile species (i.e. birds or large macropods) or species which are well adapted to disturbed environments.
- Exotic pastureland dominated by the presence of exotic grasses and herbaceous weeds, surrounding the majority of the existing quarry. Exotic pasture habitat is predominately utilised by open country bird and mammal species for foraging purposes. These patches were heavily dominated with exotic species and as a result were in a low condition states as they lacked the important microhabitat features such as native tussocks, open rocky patches, fallen timber and old growth trees with large hollows.
- Presence of a small patches of Pink Bloodwood (*Corymbia intermedia*), Forest Red Gum (*Eucalyptus tereticornis*), and Grey Ironbark (*Eucalyptus siderophloia*) trees, which occur in the impact area, provide potential foraging (fruit, nectar, pollen, insect) resources for locally occurring birds, microbats and flying-foxes. These trees were identified to contain small hollows (5-10cm) which may be utilised by hollow dependant fauna species (i.e. microbats). Due to the site's isolation and lack of connectivity from remnant native vegetation, it is likely that utilisation of these hollows would be limited to fauna species which are highly mobile and well adapted to disturbed and open country environments (i.e. birds and bats).
- Despite exit surveys and spotlight surveys being undertaken at the identified hollow-bearing trees, no microbats or other hollow-dependant fauna species were observed emerging or utilising hollows at the time of survey. Despite this, hollows may still be utilised by hollow-dependant fauna species on an intermittent basis.

#### 4.5.2 Connectivity

The study area is not within any mapped wildlife corridors as per Fauna Corridors for North East NSW (Department of Planning Industry and Environment 2010). Due to the lack of remnant vegetation and isolation from larger intact vegetation patches the site does not provide any significant connectivity value to the surrounding landscape. Additionally, the proposal would not result in severing or fragmenting any local corridors or large habitat patches. The proposal predominately occurs within existing cleared areas with the removal of some mature paddock trees. As such the proposal is not considered likely to adversely impact wildlife connectivity or movement in the locality.



# 5. Threatened Biodiversity

This section provides an overview of the threatened species, populations and communities recorded or considered likely to use habitat in the study area. Threatened biodiversity is listed as Vulnerable, Endangered or Critically Endangered under the NSW BC Act and FM Act. Threatened biodiversity listed under the Commonwealth EPBC Act is detailed in **Section 6**.

#### 5.1 Threatened ecological communities

BioNet search results identified habitat for twelve threatened ecological communities listed under the BC Act within the search area (refer to **Appendix A**).

PCT 841 does not correspond to any listed TEC as stated in BioNet Vegetation Classification (Environment Energy and Science 2021b). However, some floristics are similar to the TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*, as a precaution, an assessment of this community against the TEC criteria of *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion* has been undertaken in **Table 5.1**. Based off field assessments and TEC criteria, no Threatened Ecological Communities (TECs) listed under the BC Act occur within the study area.

Determination criteria	Site assessment
Does the site occur in Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes or Port Stephens?	<b>Yes</b> – site occurs within Richmond Valley LGA
Does the site occur below 50m elevation, or occur on a localised river flat up to 250m elevation?	<b>No</b> – site occurs >50m elevation and does not occur on a localised river flat.
Does the site occur on clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains?	<b>No</b> – site is associated with McKee soils, which are shallow and well drained soils. The Landscape is characterised by low undulating hills and rises on Lismore Basalts geology. The site does not occur along any drainage line or river terrace associated with coastal floodplains.
Does the tree layer contain any of the following: <i>Eucalyptus tereticornis, E.</i> <i>siderophloia, Corymbia intermedia</i> or, (north of the Macleay floodplain), <i>Lophostemon</i> <i>suaveolens</i> ?	<b>Yes</b> – the dominant tree layer consists of <i>Eucalyptus tereticornis</i> , <i>E. siderophloia</i> and <i>Corymbia intermedia.</i>
Are rainforest trees or shrubs scattered throughout?	<b>No</b> – very few rainforest trees or shrubs occurred within the study area. Some juvenile <i>Alphitonia excelsa</i> (Red Ash) were identified under <i>Corymbia intermedia</i> . However, the site was predominately clear of understorey species.
Are there relatively low numbers of <i>Casuarina</i> species, <i>Melaleuca</i> species and <i>Eucalyptus robusta</i> ?	<b>No</b> – no <i>Casuarina</i> spp., Melaleuca spp. or <i>Eucalyptus robusta</i> occur in the site.

#### Table 5.1 Subtropical Coastal Floodplain Forest TEC determination criteria



Determination	<b>Does not meet criteria</b> - Whilst some floristics of Subtropical Coastal Floodplain Forest TEC occur within the site, the overall position and landscape occurrence of PCT841 within the site does not correspond to the determination criteria of Subtropical Coastal Floodplain Forest TEC.
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#### 5.2 Threatened flora species

BioNet search results identified records of 5 threatened flora species listed under the BC Act within the search area. Supplementary database searches including PlantNet identified 32 threatened flora species listed under the BC Act that have the potential to occur within the study area (refer to **Appendix A**).

Based on field assessments, no threatened flora species were detected within the study area.

#### 5.3 Threatened fauna species

BioNet search results identified records of 11 threatened fauna species listed under the BC Act within the search area (refer to **Appendix A**).

Three threatened fauna species were confirmed at the site during the field assessments (**Table 4.4**). Based on the desktop analysis and habitat present, species assessed as having a moderate or higher likelihood of occurrence within the study area were further considered (refer to **Table 5.1** and potential occurrence assessment in **Appendix D**).

Tests of significance have been completed for the species recorded or assessed has having a moderate or higher likelihood of occurrence within the study area (refer to **Table 5.1** and **Appendix E**).

Table 5.2Threatened fauna listed under BC Act recorded or with moderate - higher likelihoodof occurrence in study area

Scientific Name	Common Name	BC Act <sup>1</sup>	Likelihood of occurrence
Blossom nomads			
Glossopsitta pusilla	Little Lorikeet	V	<b>Moderate -</b> potential foraging habitat in the form of blossom eucalypts.
Pteropus poliocephalus	Grey-headed Flying-fox	V	<b>Moderate</b> - potential foraging habitat in the form of blossom eucalypts.
Arboreal mammals			
Phascolarctos cinereus	Koala	V	<b>Moderate –</b> habitat present in form of small stands of native <i>Corymbia</i> and Forest Red Gum species in study area. BioNet records within close proximity to study area.
Microbats			
Micronomus norfolkensis	Eastern Coastal Free- tailed Bat	V	



Scientific Name	Common Name	BC Act <sup>1</sup>	Likelihood of occurrence
Scoteanax rueppellii	Greater Broad-nosed Bat	v	<b>Moderate -</b> Potential habitat present in patches of native vegetation stands with canopy cover
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	
Miniopterus australis	Little Bent-winged Bat	V	Recorded – Anabat detector
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	

(1) V = Vulnerable under the BC Act



# 6. Matters of National Environmental Significance

Matters of National Environmental Significance (MNES), listed under the EPBC Act, are addressed in this section. The following biodiversity MNES protected under the EPBC Act were considered for their relevance to the proposal:

- wetlands of international importance (Ramsar) (EPBC Act sections 16 and 17B)(Department of Agriculture 2021)
- listed threatened species and communities (EPBC Act sections 18 and 18A)
- listed migratory species (EPBC Act sections 20 and 20A).

#### 6.1 Wetlands of International importance

No wetlands of international importance occur within the study area or broader locality. As such, the proposal will not impact any wetlands of international importance.

#### 6.2 Listed EPBC Act threatened ecological communities

Results of the Protected Matters Database Search Tool (PMST) identified habitat for two threatened ecological communities within the search area.

Field assessments did not record any threatened ecological communities listed under the EPBC Act to occur within the study area.

#### 6.3 Listed EPBC Act threatened flora species

The database searches identified 29 threatened flora species listed under the EPBC Act that have the potential to occur in the locality of the study area (refer to potential occurrence assessment at **Appendix D**).

Field assessments did not record any threatened flora species listed under the EPBC Act to occur within the study area.

#### 6.4 Listed EPBC Act threatened fauna species

The database searches identified 38 threatened fauna species listed under the EPBC Act that have the potential to occur in the locality of the study area. Of these, two threatened fauna species were assessed as having a moderate likelihood of occurring in the study area based on available habitat, mobility and known occurrences in the wider locality (**Table 6.1**).



# Table 6.1Threatened fauna listed under the EPBC Act with a moderate or higher likelihood ofoccurrence in study area

Scientific Name	Common Name	EPBC Act <sup>1</sup>	Likelihood of occurrence
Pteropus poliocephalus	Grey-headed Flying-fox	V	<b>Moderate</b> - potential foraging habitat in the form of blossom eucalypts.
Phascolarctos cinereus	Koala	E	<b>Moderate –</b> habitat present in form small stands of native <i>Corymbia</i> and Forest Red Gum species in study area. BioNet records within close proximity to study area.

(1) V = Vulnerable under the EPBC Act

#### 6.4.1 EPBC Koala Habitat Assessment

The distribution of Koalas in New South Wales mainly occurs on the central and north coasts, with populations on the western side of the Great Dividing Range.

Habitat consists of eucalypt woodlands and forests, in which the Koala feeds on more than 70 eucalypt species and 30 non-eucalypt species across its range. Preferred browse species are different across regions. Koalas are inactive for most of the day and do most of their feeding and moving during the night. Although predominantly arboreal, Koalas would descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size. During breeding periods (spring - summer), Koala bellowing predominantly occurs in the first half of the night during, the timing of which can vary slightly between locations (Law et al. 2020).

The Koala was not recorded in the study area during the field assessment informing this report, however recent (<5yrs) records for this species were returned from the Atlas of NSW Wildlife database(Environment Energy and Science 2021a). In addition, whilst the study area is predominately disturbed, presence of *Eucalyptus tereticornis* occurred within the study area. *Eucalyptus tereticornis* is listed as a Schedule 2 Koala food tree (Koala SEPP 2020) species. Despite not recording any individuals within the study area, due to records of the species within the locality and as a precautionary measure an EPBC Koala Habitat Assessment was undertaken.

#### Koala Habitat Assessment Tool

The Koala Habitat Assessment Tool within the '*EPBC Act referral guidelines for the vulnerable Koala*' (Department of the Environment 2014) was used to determine whether Koala habitat in the study area classifies as '*habitat critical to the survival of the Koala*' (**Figure 6.1**). It should be noted that whilst the listing of Koala has been updated (12/02/2022) to '*Endangered*' under the EPBC Act, the Koala Habitat Assessment Tool was deemed still useful in order to determine habitat quality for the species within the site. To be classified as habitat critical to the survival of the Koala vegetation must score 5 or above using the habitat assessment tool. A summary of the key assessment criteria (coastal population criteria) and scoring for the study area against the referral guidelines is provided in **Table 6.2** and illustrated in **Figure 6.1**.

Koala habitat in the study area scored 3 out of 10 (**Table 6.2**) using the Koala Habitat Assessment Tool. Therefore, habitat in the study area is not likely to constitute habitat critical to the survival of the species.



Table 6.2	EPBC Koala habitat assessment tool

Attribute	Score	Habitat ap	opraisal	
	1	Desktop	Recent records (<5 yrs) exist within the locality (10km) of the site (BioNet 2021)	
Koala occurrence		On-site	No Koala individuals or traces of Koalas (scats, scratching etc.) were recorded in the study area during field surveys	
Vocatation		Desktop	Not applicable	
structure and composition	1	On-site	Field assessment identified one Koala SEPP 2020 food tree species; <i>Eucalyptus tereticornis</i> (Forest Red Gum) which occurred within study area.	
Habitat connectivity	0	The study area is not part of contiguous landscape ≥500 ha		
	1	Desktop	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack in locality (10km)	
Key existing threats		On-site	The status of wild dog populations and level of predation is not known. No evidence of Koala activity or mortality from vehicle strike was observed in the study area during field surveys.	
Recovery value	0	The study area consists of a highly disturbed agricultural / pastureland, which contained isolated <i>Corymbia intermedia</i> , Eucalyptus <i>siderophloia</i> and <i>Eucalyptus tereticornis</i> trees. The study area is subject to existing edge effects and fragmentation, with large expanses of habitat cleared in the proposal locality for agricultural land use, effectively isolating the study area from large habitat remnants.		
Total score	3	Decision: a score of 3 obtained, therefore study area is not likely to contain critical habitat for Koala.		

A comparison of the proposal's potential impacts was assessed against Figure 2 of the '*EPBC Act referral guidelines for the vulnerable Koala*' (Department of the Environment 2014) to determine where impacts were likely to be adverse. As illustrated in **Figure 6.1**, it was concluded that the proposal is unlikely to have an adverse impact on the habitat critical for the species due to the following:

- Study area does not occur in an 'Area of Regional Koala Significance' (Department of Environment and Energy, 2021)
- The study area is disturbed and does not occur within an area of continuous remnant native vegetation or wildlife corridor (with large expanses of habitat cleared in the proposal locality for agricultural land use)
- The proposal will not fragment or impact habitat that is important to the recovery objectives for the species within the locality.

The EPBC Act significant impact assessment concluded that the proposal is unlikely to have a significant impact on the Koala (**Appendix E**).



Attribute	Score	Inland	Coastal		
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	Evidence of one or more koalas within the last 2 years.		
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.		
	0 (low)	None of the above,	None of the above.		
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, <b>OR</b> 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	Has forest or woodland with 2 or more known koala food tree species, <b>OR</b> 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.		
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	Has forest or woodland with only 1 species of known koala food tree present.		
	0 (low)	None of the above.	None of the above.		
Habitat connectivity	#2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.Area is part of a contiguous land ≥ 500 ha.			
	+1 (medium)	Area is part of a contiguous landscape < 1000 ha, but ≥ 500 ha.Area is part of a contiguous lands < 500 ha, but ≥ 300 ha.			
	0 (low)	None of the above. None of the above.			
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present			
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, <b>OR</b> Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.			
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, <b>OR</b> Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.			
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.			
	+1 (medium)	Uncertain whether the habitat is important objectives for the relevant context, as outli	nt for achieving the interim recovery ined in Table 1.		
	0 (low)	Habitat is unlikely to be important for ach the relevant context, as outlined in Table 1	nieving the interim recovery objectives for I.		

Figure 6.1 Assessment of habitat critical to the survival of the Koala



#### 6.5 Listed migratory species

Migratory species are protected under international agreements to which Australia are a signatory, including JAMBA, CAMBA, RoKAMBA and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

Based on EPBC protected matters area search and other desk-top database searches, 16 migratory species have been recorded or have suitable habitat within the wider locality of the study area.

The PMST retrieved a number bird species that are estuarine or freshwater wetland frequenting species and for which there is no suitable habitat within the study area. Two species of swift were also retrieved from database searches, and although these species are considered likely to occur intermittently above the study area during seasonal movements in the locality, they are unlikely to use terrestrial habitats within the study area.

If any migratory species were to occur within the study area, the site would not be classed as 'important habitat' as defined by the '*Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*' (Department of the Environment 2013) as the site did not contain:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an
  ecological significant proportion of the population of the species
- habitat utilised by a migratory species which is at the limit of the species range
- habitat within an area where the species is declining.

Due to the highly disturbed vegetation and the lack of important habitat features (i.e. wetlands) that are often utilised by most migratory species, no listed migratory species were identified to have a moderate or higher likelihood of occurrence within the study area.

As such, it is unlikely that the proposal would significantly affect any migratory species and therefore migratory species have not been considered further.



# 7. Impacts and Mitigation

This section contains a description of the impacts of the proposal on biodiversity and the required mitigation measures for the proposal.

#### 7.1 Impacts of the proposal

Based on the results of the field assessment, biodiversity impacts of the proposal are relatively low, particularly with the low impacts on native vegetation. The proposed development may result in potential biodiversity impacts as follows:

- Removal of native vegetation
- Loss of hollow-bearing trees
- Potential for injury or mortality of fauna during clearing works.
- Weed dispersal
- Noise, dust and vibration
- Vehicle strike

#### 7.1.1 Removal of vegetation

The construction of the proposal will require the removal of approximately 0.23 ha of native vegetation in the form of PCT 841. Approximately 5.72 ha of highly disturbed areas with no or limited native vegetation would also be impacted (**Table 7.1**).

#### Table 7.1 Vegetation communities to be impacted

Plant Community type	Condition	Area in impact area (ha)
Native vegetation		
PCT 841: Forest Red Gum grassy open forest of the coastal ranges of the NSW North Coast Bioregion	Poor	0.23
Non-native vegetation		
Miscellaneous ecosystem – Highly disturbed areas with no or limited native vegetation – exotic vegetation		
Miscellaneous ecosystem – Highly disturbed areas with no or limited native vegetation – exotic grasslands		5.74
Total vegetation (native & non-native) impacted		

#### 7.1.2 Removal of hollow-bearing trees

The proposal is likely to include the loss of 8 hollow-bearing trees and has the potential to affect native animals such as:

- hollow-nesting and canopy-nesting birds
- hollow-dependent bats
- arboreal mammals and reptiles.



#### 7.1.3 Injury and mortality

Fauna injury or death has the greatest potential to occur during construction when vegetation clearing would occur. The extent of this impact would be proportionate to the extent of vegetation that is cleared. Less mobile species (e.g. ground dwelling reptiles and frogs), or those that are nocturnal and nest or roost in trees during the day (e.g. arboreal mammals and microchiropteran bat species), may find it difficult to rapidly move away from the clearing when disturbed.

Owing to the proposed vegetation to be removed being predominately disturbed habitat and a small number of paddock trees, the utilisation by fauna species is considered to be low. Management measures, including pre-clearance surveys and presence of qualified ecologist / wildlife carer would be incorporated during clearing procedures.

#### 7.1.4 Weed dispersal

The proposal has the potential to further disperse weeds into nearby areas of native vegetation and adjacent properties. The greatest potential for weed dispersal and establishment associated with the proposal would include earthworks, movement of soil and attachment of seed (and other propagules) to vehicles and machinery where these are utilised within or adjacent to retained vegetation. The clearing of native vegetation for the proposal, including earthworks would increase the potential for weed invasion into adjacent patches of native vegetation. Management measures would be required to minimise the risk of introduction and spread of weeds. With appropriate weed management, the overall impact of weed invasion within surrounding areas is likely to decrease in the medium to long term.

#### 7.1.5 Noise, vibration and dust

During all stages of the proposal, an increased noise and vibration level in the site and immediate surrounds are likely due to vegetation clearing, ground disturbance, machinery / vehicle movements, and general human presence. The noise and vibration from activities associated with the proposal have the potential to disturb fauna and may disrupt foraging. Noise can affect animal behaviour by causing animals to retreat from favourable habitat near noise sources, reducing time spent feeding and resulting in energy depletion and lower likelihood of survival and reproduction (Newport et al. 2014, Larkin et al. 1996).

Noise assessment modelling for both construction and operational phases are expected to marginally increase (1-3 dB under worse case scenarios) above the National Policy for Industry (NPI) criteria at two sensitive receivers (residential houses) approximately 300-500m from the proposal site (R & S Contracting & GHD 2022a). Noise impacts are predicted to comply to NPI criteria at all other sensitive receptors located further away from the proposal area (R & S Contracting & GHD 2022a). The marginal increases in noise levels are expected to be negligible and low risk (R & S Contracting & GHD 2022a). Mitigation measures to alleviate noise impacts, including bunding, are outlined in Noise and Vibration Impact Assessment (R & S Contracting & GHD 2022a).

Overall noise and vibration impacts aren't anticipated to significantly increase above ambient noise levels beyond the immediate proposal area, marginal increases in noise levels will be mitigated against (R & S Contracting & GHD 2022a). The wildlife within the study area is likely to be habituated to frequent noise exposure from the surrounding residential properties, existing roadways, agricultural practices (i.e. tractors) and existing quarry activities. The impacts from noise and vibrations are predominately localised to the proposal area and surrounding 300-500m radius. Within these impacted areas, little remnant vegetation persists, larger and more continuous and sensitive areas of remnant



vegetation patches (to the south and north of the site) aren't expected to be significantly impacted from noise or vibration. The proposal is unlikely to have a significant or long-term impact on native wildlife populations.

Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the proposal site. This has the potential to reduce photosynthesis and transpiration and cause abrasion and heating of leaves resulting in reduced growth rates and decreases in overall health of the vegetation. Dust pollution is likely to be greatest during periods of substantial earthworks, vegetation clearing, vehicle movements for construction and decommissioning activities and during adverse weather conditions. However, deposition of dust on foliage is likely to be highly localised (100m) and intermittent with majority of the immediate area surrounding the proposal area historically cleared of remnant native vegetation and the occurrence of agricultural pastureland. It is unlikely that dust impacts would impact any significant patches or areas of native vegetation outside the proposal area and is therefore not considered likely to be a major impact of the proposal. Air Quality Assessment of the proposal concluded that the proposal would comply with EPA impact assessment criteria and no adverse impacts due to dust are anticipated by the proposal (R & S Contracting & GHD 2022b).

#### 7.1.6 Vehicle strike

The proposal will generate additional vehicular movements, particularly during construction but also during operation. The increase in traffic on local road networks during the operation phase is approximately 3%, with approximately 140 truck movements a day (R & S Contracting & GHD 2021). Vehicle movements as a result of the proposal will be limited during daylight hours (7am-6pm). Road speed limits along Bentley Road would be maintained at current limits, and within the proposal area low speed limits will be maintained (≤50km/hr). Based on the marginal increase in vehicle movements and the daytime traffic timeframes, it is unlikely that the proposal would result in significant increases in the levels of roadkill mortality than what already exists in the area.





# Information shown is for illustrative purposes only Drawn by: AB Checked by: TLJ Reviewed by: DGH Source of base data: Google Earth 2021

Date: 29/04/2022 Revision: A

### 7.2 Mitigation

In order to address the impacts of the proposal on biodiversity, the mitigation measures outlined in **Table 7.2** are prescribed.

Impact / issue	Mitigation
Vegetation and habitat loss	<ul> <li>Mark the limits of clearing and install temporary fencing around the construction footprint area prior to construction activities commencing to avoid unnecessary vegetation and habitat removal/disturbance</li> <li>Prior to clearing commencing a suitably qualified ecologist is to undertake a pre-clearing survey to ensure no fauna are present within clearing area</li> <li>Implement clearing protocols, including:         <ul> <li>Marking trees to be removed and preparing an inventory of trees and hollows to be removed</li> <li>Checking hollow-bearing trees for the presence of bird nests and arboreal mammals, such as possum and bats, prior to felling</li> <li>Animals found to be occupying trees should be safely removed before the clearing of trees if possible and relocated into nearby woodlands.</li> </ul> </li> </ul>
	<ul> <li>A Vegetation Management Plan (VMP) will be prepared and will incorporate (but not limited to) the following:</li> </ul>
	<ul> <li>Protocols and implementation schedule of weed control and management in accordance with the <i>Biosecurity Act 2015</i> surrounding the proposal area</li> <li>Compensatory / offset planting of native trees species which will include:</li> </ul>
	<ul> <li>A ratio of 5:1 native tree planted (a total of 50) for the removal of 10 mature <i>Eucalyptus spp</i> and <i>Corymbia</i> spp trees impacted</li> <li>Compensatory/offset trees will be planted within a designated area within the Site (refer to <b>Illustration 7.1</b>) and be a combination of <i>Eucalyptus tereticornis, Eucalyptus siderophloia</i> and <i>Corymbia intermedia</i></li> </ul>
	<ul> <li>Replacement of hollow-bearing trees with nest boxes, with a removal ratio 2 (nest boxes):1 (hollow-bearing tree removed). Nest boxes are to be replaced with similar sized hollows entries that are being removed, with a combination of microbat and arboreal mammal designed boxes (bird nest boxes should be avoided due to the presence of Common Mynas and the likely utilisation of boxes by the pest species). Nest boxes will be positioned in mature trees within a designated offset area within the Site (refer to Illustration 7.1).</li> <li>Maintenance and monitoring schedule outlining timing, frequency and corrective actions associated with management of weeds, offset plantings and nest box replacement</li> </ul>
Erosion and sedimentation	<ul> <li>Best practice erosion and sediment controls should be implemented in accordance with Volume 2D of Managing Urban Stormwater: soils and construction (Landcom 2004, Department of Environment and Climate Change 2008). Design temporary scour protection and energy dissipation measures to protect receiving environments from erosion.</li> </ul>
Weeds	<ul> <li>A VMP will provide measures to be implemented during construction to ensure the potential for the introduction of weed propagules to the site is minimised</li> </ul>



	<ul> <li>Priority weeds within the study area would be managed in accordance with the <i>Biosecurity Act 2015</i> and/or Council management measures and incorporated into the VMP.</li> </ul>
Rehabilitation and Landscaping	<ul> <li>Landscaping and screen bunding will utilise endemic native species.</li> </ul>
Vehicle strike	Low speed limits (≤50km/hr) would be implemented in the proposal footprint to reduce the potential of vehicle strike to fauna.



# 8. Statutory Requirements

The following sections examine the findings of the site assessment with regard to relevant statutory requirements which require consideration for the development application.

# 8.1 State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2020 & 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP) commenced 17 March 2021. This Policy aims to encourage the conservation and management of areas of natural vegetation that provides habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW. At this stage:

- In nine of these LGAs Metropolitan Sydney (Blue Mountains, Campbell Town, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA – Koala SEPP 2021 applies to all zones.
- In all other identified LGAs, Koala SEPP 2021 does not apply to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3.

The site resides in Richmond Valley LGA and the land zoning is RU1 – Primary Production Land, as a result Koala SEPP 2020 applies to the site. This is an interim measure while new land management and private native forestry codes are developed. Based on the above, the following assessment has been completed.

Circular B35 (Department of Urban Affairs and Planning, 1995) underpins SEPP 44 and sets out the framework for Koala SEPP assessments over several steps as indicated in **Figure 8.1** (see below).

#### Is the Land 'potential Koala habitat'?

The Koala SEPP 2020 defines potential Koala habitat as "areas of native vegetation where Schedule 2 trees constitute at least 15% of the total number of trees in the upper or lower strata of the tree component". With regard to potential and core Koala habitat assessment, Section 1.5 of Circular B35 states that:

"In relation to affected DAs it is the intention of the policy that investigations for 'potential' and 'core' koala habitats be limited to those areas which it is proposed to disturb habitat."

On this basis, this Koala SEPP 2020 assessment pertains to the impact area on site and associated adjacent vegetation within the study area, hence allowing for disturbance during construction and operation of the proposal. Within the study area, one Schedule 2 tree species occurs – *Eucalyptus tereticornis* (Forest Red Gum). These trees occur in the study area in isolation and constitute at least 15% of the total number of trees in the upper or lower strata of the tree component across the study area. On this basis, potential Koala habitat does occur within the impact area.



#### Is the Land 'core Koala habitat'?

In regard to the definition of 'core Koala habitat', SEPP 2020 defines potential Koala habitat as "*an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population*".

Despite targeted surveys, including SAT surveys, nocturnal surveys and lack of direct observations, no Koalas were identified within the impact area. Although Koala's may occur within the locality and there is possibility that individuals may intermittently occur within the impact area in order to move and access greater quality habitat in the locality, it is unlikely that the impact area is 'core habitat' for Koalas. Due to the impact area highly disturbed nature, lack of high-density Koala feed trees and its isolated and fragmented position in the landscape from higher quality habitats, makes it unlikely to provide habitat that is reliant on a local residential Koala population with breeding females. Furthermore, as addressed under the Koala EPBC Habitat Assessment (**Section 6.4.1**), it is unlikely that the impact area contains 'critical Koala habitat' which would be important to the recovery objectives for the species within the locality. Under this basis, the proposal does not contain 'core Koala habitat' and in accordance with Circular B35, the Policy requires no further consideration.







#### 8.2 Biodiversity Conservation Act 2016 (BC Act)

The BC Act requires a test of significance (five-part test) when assessing whether an action, development or activity is likely to significantly affect threatened species, ecological communities or their habitats. As there is potential for a number of threatened fauna species to occur at the site, tests of significance have been completed (refer to **Appendix E**).

The tests of significance concluded that habitat for threatened species and communities would be unlikely to be significantly affected by the proposal. Native vegetation loss does not exceed clearing



thresholds in the BOS in the BC Act. On this basis, development of the site (as proposed) does not require a BDAR.

#### 8.3 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The objective of the EPBC Act is to ensure that actions likely to cause a significant impact on MNES undergo an assessment and approval process. Under the EPBC Act, a person must not take an action that has, will have or is likely to have a significant impact on any of the MNES without approval from the Australian Government Minister for the Environment (the Minister). Proposed 'actions' that have the potential to significantly impact on matters of MNES must be referred to the Australian Minister for the Environment for assessment. The purpose of the referral process is to determine whether or not a proposed action will need formal assessment and approval under the EPBC Act, and what assessment method will apply. If the Minister determines that a referred project is a 'controlled action' under the EPBC Act, the approval of the Minister would be required. MNES relevant to this report include threatened species, ecological communities and migratory species.

The EPBC Act has been considered in this assessment through:

- desktop review to determine the listed biodiversity matters that are predicted to occur within the locality of the project and hence could occur, subject to the habitats present
- field surveys for listed threatened entities including migratory species
- assessment of potential impacts on threatened and migratory species, including assessments of significance in accordance with the EPBC Act significant impact guidelines (Department of the Environment 2013) where relevant
- identification of suitable impact mitigation and environmental management measures for threatened and migratory species, where required.

This biodiversity assessment identified that the proposal's impacts are not likely to have a significant impact on any threatened biodiversity listed under the EPBC Act. Accordingly, an EPBC Act Referral is not considered a requirement for the proposal.



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# Appendix A

**Database Search Results** 



Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) ,Commonwealth listed ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -28.74 West: 153.08 East: 153.18 South: -28.84] returned a total of 112 records of 16 species. Report generated on 30/08/2021 1:56 PM

Kingdom	Class	Family	Spacios Coda	Sciontific Namo	Exotic	Common Namo	NSW	Comm.	Record	Infe
Kinguoin	Class	T armiy	Species Code	Scientific Name	LAULIC	Common Name	status	status	S	
						Emu population in the New South Wales North				•
Animalia	Aves	Casuariidae	0001	Dromaius novaehollandiae		Coast Bioregion and Port Stephens local	E2,P		1	-
						government area				
Animalia	Aves	Ciconiidae	0183	Ephippiorhynchus asiaticus		Black-necked Stork	E1,P		5	•
Animalia	Aves	Jacanidae	0171	Irediparra gallinacea		Comb-crested Jacana	V,P		1	
Animalia	Aves	Cacatuidae	0265	^Calyptorhynchus lathami		Glossy Black-Cockatoo	V,P,2		12	•
Animalia	Aves	Strigidae	0248	Ninox strenua		Powerful Owl	V,P,3		2	•
Animalia	Aves	Neosittidae	0549	Daphoenositta chrysoptera		Varied Sittella	V,P		3	
Animalia	Mammalia	Phascolarctidae	1162	Phascolarctos cinereus		Koala	V,P	V	37	•
Animalia	Mammalia	Pseudocheiridae	1133	Petauroides volans		Greater Glider	Р	V	6	•
Animalia	Mammalia	Pteropodidae	1280	Pteropus poliocephalus		Grey-headed Flying-fox	V,P	V	11	•
Animalia	Mammalia	Miniopteridae	1346	Miniopterus australis		Little Bent-winged Bat	V,P		1	•
Animalia	Mammalia	Miniopteridae	3330	Miniopterus orianae oceanensis		Large Bent-winged Bat	V,P		1	•
Plantae	Flora	Fabaceae (Caesalpinioideae)	8772	Senna acclinis		Rainforest Cassia	E1		1	2
Plantae	Flora	Fabaceae (Faboideae)	2833	Desmodium acanthocladum		Thorny Pea	V	V	17	-
Plantae	Flora	Myrtaceae	4283	Rhodamnia rubescens		Scrub Turpentine	E4A		11	•
Plantae	Flora	Poaceae	4776	Arthraxon hispidus		Hairy Jointgrass	V	V	1	•
Plantae	Flora	Ranunculaceae	5494	Clematis fawcettii		Northern Clematis	V	V	2	•

	100 C					
-FloraGnline						New South Wales
Introduction	NEW SOUTH WAL	ES FLORA	ONLINE		Printable Page	Flora Online
Index Search						1 m 3
Spatial Search Identification Keys				Search Result		
Classification Glossary		he page for th	at favon			
- WeedAlert	" denotes an introduced	species				
+ Telopea Journal	<ul> <li>denotes a threatened</li> <li>denotes a gazetted w</li> </ul>	species eed				
+ Other Data Sources			NOND BRIEFIL			
	Asteraceae	Rutidosis	HMUNU RIVER Local Government Area (LGA) * heterogama			
	Brassicaceae	Lepidium	+ peregrinum			
	Cyperaceae	Cyperus	+ aquatilis			
	Ericareae - Enacridoidea	Hibbertia e Melichrus	marginata     sn_Gibberacee (Renwell 97239)			
	Fabaceae - Faboideae	Indigotera	+ baileyr			
		Pultenaea	+ mantima			
	( and a second	Rhynchosia	<ul> <li>acumualissima</li> </ul>			
	Lamaceae	Prostantnera	<ul> <li>cneoinera</li> <li>calustris</li> </ul>			
	Lythraceae	Rotala	+ tripartita			
	Myrtaceae	Eucalyptus	• glaucina			
		Gossia	fragrantissima     irbicana			
		Rhodamnia	* rubescens			
		Rhodomyrtus	+ psidioides			
	2 Auguste	Syzygium	<ul> <li>hodgkinsoniae</li> </ul>			
	Urchidaceae	Oberonia	+ complanata + trania			
		Peristeranthu	s+hilli			
		Phaius	<ul> <li>australis</li> </ul>			
	Orehandharaaa	Pterostylis	+ nigncans			
and the second second	Poaceae	Paspalidium	+ grandispiculatum			
	Polygalaceae	Polygala	+ linanifolia			
	Polygonaceae	Persicana	* elabor			
and the second s	Polypodiaceae	Belvisia	+ mucronata var. mucronata			
and a second	Proteaceae	Grevillea	+ guadricauda			
	and the second se	Macadamia	+ integritolia			
	Designation	Chamber	+ tetraphylla			
	Ranunculaceae	Gemaus	* /awcetar			
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Australian Government

Department of Agriculture, Water and the Environment

# **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 <u>Environment Assessments</u> and the EPBC Act including significance guidelines, forms and application process details.

Report created: 30/08/21 14:34:03

Summary Details Matters of NES Other Matters Protected by the EPBC Act Extra Information Caveat Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates Buffer: 10.0Km



# 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 <u>Administrative Guidelines on Significance</u>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	60
Listed Migratory Species:	16

### 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 <u>permit</u> 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:	21
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

### **Extra Information**

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

State and Territory Reserves:	3
Regional Forest Agreements:	1
Invasive Species:	34
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	Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Atrichornis rufescens		
Rufous Scrub-bird [655]	Endangered	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Cvclopsitta diophthalma coxeni		
Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Dasyornis brachypterus		
Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area

<u>Erythrotriorchis radiatus</u> Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
<u>Falco hypoleucos</u> Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Name	Status	Type of Presence
---	-----------------------	--
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Turnix melanogaster		
Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Maccullochella ikei		
Clarence River Cod, Eastern Freshwater Cod [26170]	Endangered	Species or species habitat may occur within area
Frogs		
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
Mixophyes fleavi		
Fleay's Frog [25960]	Endangered	Species or species habitat may occur within area
Mixophyes iteratus		
Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
Insects		
Argynnis hyperbius inconstans		
Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi		
Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		

Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area		
Dasyurus maculatus maculatus (SE mainland population	<u>on)</u>			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area		
Petauroides volans				
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area		
Petrogale penicillata				
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to 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		
Pseudomys novaehollandiae				
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area		

Name	Status	Type of Presence
Pseudomys oralis Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	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
<u>Clematis fawcettii</u> Stream Clematis [4311]	Vulnerable	Species or species habitat likely to occur within area
<u>Corchorus cunninghamii</u> Native Jute [14659]	Endangered	Species or species habitat known to occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat likely to occur within area
<u>Cynanchum elegans</u> White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area
Desmodium acanthocladum Thorny Pea [17972]	Vulnerable	Species or species habitat known to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat may occur within area
<u>Endiandra floydii</u> Floyd's Walnut [52955]	Endangered	Species or species habitat may occur within area
<u>Eucalyptus glaucina</u> Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area
<u>Floydia praealta</u> Ball Nut, Possum Nut, Big Nut, Beefwood [15762]	Vulnerable	Species or species habitat may occur within area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat known to occur within area
Lepidium peregrinum Wandering Pepper-cress [14035]	Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth- shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough- shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Marsdenia longiloba		
Clear Milkvine [2794]	Vulnerable	Species or species habitat may occur within area
Myrsine richmondensis		
Purple-leaf Muttonwood, Lismore Muttonwood [83888]	Endangered	Species or species habitat may occur within area
Owenia cepiodora		
Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat likely to occur within area
Persicaria elatior		
Knotweed, Tall Knotweed [5831]	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
Plectranthus nitidus		
Nightcap Plectranthus, Silver Plectranthus [55742]	Endangered	Species or species habitat likely to occur within area
Rhodamnia rubescens		
Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area
Rhodomyrtus psidioides		
Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area
Sarcochilus fitzgeraldii		
Ravine Orchid [19131]	Vulnerable	Species or species habitat may occur within area
Sophora fraseri		
[8836]	Vulnerable	Species or species habitat known to occur within area
Syzygium hodgkinsoniae		
Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Tylophora woollsii		
[20503]	Endangered	Species or species habitat may occur within area
Reptiles		
Coeranoscincus reticulatus		
Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area
Delma torquata		
Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information ]
* Species is listed under a different scientific name on th	ne EPBC Act - Threatened	Species list.
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Migratory Terrestrial Species

Name	Threatened	Type of Presence
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus		
Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Mviagra cvanoleuca		
Satin Flycatcher [612]		Species or species habitat likely 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 may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known 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 may occur within area

Gallinago hardwickii

Latham's Snipe, Japanese Snipe [863]

Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]

Pandion haliaetus Osprey [952]

Tringa nebularia Common Greenshank, Greenshank [832] Species or species habitat known to occur within area

Critically Endangered S

Species or species habitat may occur within area

Species or species habitat known to occur within area

Species or species habitat may 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 may occur within area Anseranas semipalmata Magpie Goose [978] Species or species habitat may occur within area Apus pacificus Fork-tailed Swift [678] Species or species habitat likely to occur within area Ardea ibis Cattle Egret [59542] Species or species habitat may occur within area Calidris acuminata Sharp-tailed Sandpiper [874] Species or species habitat known to occur within area Calidris ferruginea Curlew Sandpiper [856] Species or species habitat Critically Endangered known to occur within area Calidris melanotos Pectoral Sandpiper [858] Species or species habitat may occur within area Gallinago hardwickii

Latham's Snipe, Japanese Snipe [863]

Species or species habitat

<u>Haliaeetus leucogaster</u> White-bellied Sea-Eagle [943]

Hirundapus caudacutus White-throated Needletail [682]

Lathamus discolor Swift Parrot [744]

Merops ornatus Rainbow Bee-eater [670]

Monarcha melanopsis Black-faced Monarch [609]

Monarcha trivirgatus Spectacled Monarch [610] Species or species habitat known to occur within area

Vulnerable

Species or species habitat known to occur within area

Critically Endangered

Species or species habitat likely to occur within area

Species or species habitat may occur within area

Species or species habitat known to occur within area

Species or species habitat known to occur within area

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

### **Extra Information**

State and Territory Reserves	[Resource Information]
Name	State
Bungabbee	NSW
Muckleewee Mountain	NSW
UNE Special Management Zone No1	NSW

## **Regional Forest Agreements**

[Resource Information]

[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

### **Invasive Species**

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

Name	Status	Type of Presence
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
Passar domostique		
Hauga Sparrow [405]		Spanias or spanias habitat
House Sparrow [405]		likely to occur within area
		intery to occur within area
Pvcnonotus iocosus		
Red-whiskered Bulbul [631]		Species or species habitat
		likely to occur within area
		, ,
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat
		likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat
		likely to occur within area
Frogs		
Rhinella marina		
Cane Toad [83218]		Species or species habitat
		known to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat
		likely to occur within area
Canis lupus familiaris		
Domestic Dog [82654]		Species or species habitat
		likely to occur within area
Folis catus		
Cat House Cat Domestic Cat [10]		Spacing or appairs habitat
Gai, House Gai, Domestic Gai [19]		likely to occur within area
		intery 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]

Mus musculus House Mouse [120]

Oryctolagus cuniculus Rabbit, European Rabbit [128]

Rattus norvegicus Brown Rat, Norway Rat [83]

Rattus rattus Black Rat, Ship Rat [84]

Vulpes vulpes Red Fox, Fox [18]

### Plants

Alternanthera philoxeroides Alligator Weed [11620] Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species

Name	Status	Type of Presence
Oshawaha asarti i		habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera		Species or species habitat likely to occur within area
Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
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
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to 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] Pinus radiata		Species or species habitat likely to occur within area
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to 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]

Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]

Species or species habitat likely to occur within area

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

-28.78871 153.13329

# Acknowledgements

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-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 Government National Environmental Scien

-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 B Photographs





Plate B.1 Western edge of existing quarry – facing south-east



Plate B.2 Western edge of existing quarry – facing south



Plate B.3 Western edge of existing quarry – facing west



Plate B.4 Access road into existing quarry – facing east





Plate B.5 Southern edge of existing quarry – facing west

Plate B.6 Exotic dominated grassland on southern side of existing quarry



## Appendix C

Flora and Fauna Inventory



### Table C.1 Flora inventory

Family	Scientific Name	Common Name	Native / Exotic	BC Act	EPB C Act
Apiaceae	Centella asiatica	Indian Pennywort	N		
Apiaceae	Cyclospermum leptophyllum	Slender Celery	E		
Apocynaceae	Asclepias curassavica	Blood Flower	E		
Araliaceae	Hydrocotyle digitata	-	N		
Asparagaceae	Lomandra multiflora	Many-flowered Mat- rush	N		
Asteraceae	Ageratina adenophora	Crofton Weed	E		
Asteraceae	Ageratina riparia	Mistflower	E		
Asteraceae	Ageratum houstonianum	-	E		
Asteraceae	Bidens pilosa	Cobblers Pegs	E		
Asteraceae	Cirsium vulgare	Spear Thistle	E		
Asteraceae	Geitonoplesium cymosum	Scrambling Lily	N		
Asteraceae	Senecio madagascariensis	Fireweed	E		
Bignoniaceae	Tecoma stans	Yellow Bells	E		
Convolvulaceae	Dichondra repens	Kidney Weed	N		
Euphorbiaceae	Mallotus philippensis	Red Kamala	N		
Fabaceae	Acacia spp.	-	N		
Fabaceae	Trifolium repens	White Clover	E		
Moraceae	Maclura cochinchinensis	Cockspur Thorn	N		
Moraceae	Streblus brunonianus	Whalebone Tree	N		
Myrtaceae	Acmena smithii	Lilly Pilly	N		
Myrtaceae	Angophora subvelutina	Broad-leaved Apple	N		
Myrtaceae	Corymbia intermedia	Pink Bloodwood	N		
Myrtaceae	Eucalyptus tereticornis	Forest Red Gum	N		
Myrtaceae	Eucalyptus siderophloia	Grey Ironbark	N		
Oleaceae	Ligustrum lucidum	Large-leaved Privet	E		
Oleaceae	Ligustrum sinense	Small-leaved Privet	E		
Oleaceae	Notelaea longifolia	Large Mock-olive	N		
Passifloraceae	Passiflora edulis	Common Passionfruit	E		
Passifloraceae	Passiflora suberosa	Cork Passionflower	E		
Passifloraceae	Passiflora subpeltata	White Passionflower	E		



Family	Scientific Name	Native / Exotic	BC Act	EPB C Act	
Phytolaccaceae	Phytolacca octandra	Inkweed	E		
Poaceae	Bothriochloa spp.	-	N		
Poaceae	Cenchrus clandestinus	Kikuyu	E		
Poaceae	Chloris spp.	-	N		
Poaceae	Chloris ventricosa	Plump Windmill Grass	N		
Poaceae	Dichanthium tenue	Small Bluegrass	N		
Poaceae	Echinopogon spp.	-	N		
Poaceae	Imperata cylindrica	Blady Grass	N		
Poaceae	Melinis repens	Red Natal Grass	E		
Poaceae	Paspalum dilatatum	Paspalum	E		
Poaceae	Setaria spp.	-	N		
Poaceae	Sporobolus africanus	Parramatta Grass	E		
Poaceae	Themeda triandra	Kangaroo Grass	N		
Rhamnaceae	Alphitonia excelsa	Red Ash	N		
Rosaceae	Rubus rosifolius	Native Rasberry	N		
Sapindaceae	Jagera pseudorhus	Foambark	N		
Solanaceae	Solanum chrysotrichum	Devil's Fig	E		
Solanaceae	Solanum mauritianum	Wild Tobacco Bush	E		
Verbenaceae	Lantana camara	Lantana	E		
Verbenaceae	Verbena bonariensis	Purpletop	E		
Verbenaceae	Verbena rigida	Veined Verbena	E		



### Table C.2Fauna inventory

Scientific Name	Common Name	Native / Introduced	BC Act	EPBC Act
Amphibians (2)				
Litoria nasuta	Rocket Frog	N		
Litoria caerulea	Green Tree Frog	N		
Birds (28)	1	1	1	
Acridotheres tristis	Common Myna	I		
Anthus novaeseelandiae	Australasian Pitpit	N		
Cacatua galerita	Sulphur-crested Cockatoo	N		
Cacatua sanguinea	Little Corella	N		
Cincloramphus cruralis	Brown Songlark	N		
Cisticola exilis	Golden-headed Cisticola	N		
Coracina novaehollandiae	Black-faced Cuckoo-shrike	N		
Corvus coronoides	Australian Raven	N		
Corvus orru	Torresian Crow	N		
Cracticus nigrogularis	Pied Butcherbird	N		
Dacelo novaeguineae	Laughing Kookaburra	N		
Elanus axillaris	Black-shouldered Kite	N		
Eolophus roseicapilla	Galah	N		
Falco cenchroides	Nankeen Kestrel	N		
Glossopsitta concinna	Musk Lorikeet	N		
Grallina cyanoleuca	Magpie-lark	N		
Gymnorhina tibicen	Australian Magpie	N		
Hirundo neoxena	Welcome Swallow	N		
Malurus cyaneus	Superb Fairy-wren	N		
Malurus melanocephalus	Red-backed Fairy-wren	N		
Neochmia temporalis	Red-browed Finch	N		
Ocyphaps lophotes	Crested Pigeon	N		
Pardalotus striatus	Striated Pardalote	N		
Petrochelidon nigricans	Tree Martin	N		
Rhipidura leucophrys	Willie Wagtail	N		
Sphecotheres vieilloti	Australasian Figbird	N		
Threskiornis spinicollis	Straw-necked Ibis	N		
Vanellus miles	Masked Lapwing	N		
Mammals (10)		•	•	
Austronomus australis	White-striped Mastiff Bat	N		
Bos taurus	Cow	I		
Felis catus	Cat	I		
Macropus giganteus	Eastern Grey Kangaroo	N		
Miniopterus australis	Little Bent-winged Bat	N	V	
Miniopterus orianae oceanensis	Large Bent-winged Bat	N	V	



Scientific Name	Common Name	Native / Introduced	BC Act	EPBC Act
Rhinolophus megaphyllus	Eastern Horseshoe Bat	N		
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	N	V	
Vespadelus pumilus	Eastern Forest Bat	N		
Vulpes vulpes	Fox	I		
Reptiles (1)				
Cryptoblepharus virgatus	Wall Skink	N		



# Appendix D Flora Plot data



Date	2/09/2021		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Name of Plot	RDP - 1		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			23	9	3	1	3	1	0	1	14	7
Species	Cover	Abundanco	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	cover	Abundance	129.1	43.5	13	0.3	30	0.1	0	0.1	85.6	78.2
Lantana camara	25	20	HT									25
Senecio madagascarensis	0.2	100	HT									0.2
Ligustrum lucidum	3	1	HT									3
Ligustrum sinense	10	3	HT									10
Ageratina adenophora	10	50	HT									10
Ageratina riparia	10	50	HT									10
Maclura cochinchinensis	0.1	2	OG							0.1		
Imperata cylindrica	15	30	GG				15					
Mallotus philippensis	5	2	TG		5							
Jagera pseudorhus	5	1	TG		5							
Cirsium vulgare	0.1	30	EX								0.1	
Passiflora subpeltata	0.1	2	EX								0.1	
Passiflora suberosa	0.1	1	EX								0.1	
Solanum mauritianum	3	15	EX								3	
Rubus rosifolius	0.3	20	SG			0.3						
Solanum chrysotrichum	2	15	EX								2	
Melinis repens	2	100	EX								2	
Paspalum dilatatum	20	1000	HT									20
Themeda triandra	5	100	GG				5					
Cenchrus caliculatus	10	500	GG				10					
Acmena smithii	3	1	TG		3							
Verbena rigida	0.1	100	EX								0.1	
Hydrocotyle digitata	0.1	50	FG					0.1				

Fasting.	152 122501
Easting	153.132501
Northing	-28.788056
Orientation	270
Plot size	20x50m
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	0
20-29	0
10-19	Present
5-9	Present
<5	Present
Hollows	0
Length logs (m)	0

BAM Attributes 1x1 plot (%)	Average of 5 subplots (%)
Litter (%)	25

Date	2/09/2021		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Name of Plot	RDP - 2		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			26	12	4	0	5	1	0	2	14	4
Species	Cover	Abundanco	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abunuance	124.4	56.3	22	0	34	0.1	0	0.2	68.1	30.1
Corymbia intermedia	10	3	TG		10							
Alphitonia excelsa	5	1	TG		5							
Lantana camara	10	20	HT									10
Ageratum houstonianum	0.1	1	EX								0.1	
Maclura cochinchinensis	0.1	1	OG							0.1		
Imperata cylindrica	3	100	GG				3					
Senecio madagascarensis	5	100	HT									5
Verbena rigida	0.1	13	EX								0.1	
Themeda triandra	5	100	GG				5					
Paspalum dilatatum	15	500	HT									15
Cenchrus caliculatus	10	500	GG				10					
Chloris ventricosa	15	100	GG				15					
Geitonoplesium cymosum	0.1	4	OG							0.1		
Centella asiatica	0.1	2	FG					0.1				
Notelaea longifolia	4	3	TG		4							
Streblus brunonianus	3	1	TG		3							
Cirsium vulgare	2	20	EX								2	
Bidens pilosa	0.2	200	EX								0.2	
Phytolacca octandra	0.1	1	EX								0.1	
Melinis repens	10	200	EX								10	
Asclepias curassavica	0.2	20	EX								0.2	
Tecoma stans	0.1	2	HT									0.1
Lomandra multiflora	1	15	GG				1					
Verbena bonariensis	0.2	50	EX								0.2	
Passiflora edulis	0.1	1	EX								0.1	
Cenchrus clandestinus	25	2000	EX								25	

Easting	153.13204
Northing	-28.78874
Orientation	239
Plot size	20x50m
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	1
20-29	2
10-19	Present
5-9	Present
<5	Present
Hollows	3
Length logs (m)	5

BAM Attributes 1x1 plot (%)	Average of 5 subplots (%)
Litter (%)	1

Date	2/09/2021		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Name of Plot	RDP - 3 (outside s	study area)	# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	8	2	1	4	0	0	1	2	2
Species	Cover	Abundance	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	cover	Abunuance	73.1	66.1	18	3	45	0	0	0.1	7	7
Angophora subvelutina	15	2	TG		15							
Alphitonia excelsa	3	2	TG		3							
Lantana camara	5	4	HT									5
Imperata cylindrica	15	300	GG				15					
Senecio madagascarensis	2	100	HT									2
Themeda triandra	5	200	GG				5					
Chloris spp.	15	100	GG				15					
Cenchrus caliculatus	10	100	GG				10					
Acacia spp.	3	2	SG			3						
Geitonoplesium cymosum	0.1	1	OG							0.1		

Easting	153.130932
Northing	-28.788752
Orientation	190
Plot size	20x50m
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	0
20-29	0
10-19	Present
5-9	0
<5	0
Hollows	0
Length logs (m)	0

BAM Attributes 1x1 plot (%)	Average of 5 subplots (%)
Litter (%)	0

Date	2/09/2021		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Name of Plot	RDP - 4 (exotic g	rassland)	# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	5	0	0	4	1	0	0	12	2
Species	Cover	Abundanco	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abunuance	98.1	12.1	0	0	12	0.1	0	0	86	23
Phytolacca octandra	0.1	1	EX								0.1	
Senecio madagascarensis	3	100	HT									3
Bidens pilosa	1	100	EX								1	
Cenchrus clandestinus	50	3000	EX								50	
Trifolium repens	0.5	50	EX								0.5	
Melinis repens	6	100	EX								6	
Sporobolus africanus	5	100	EX								5	
Foeniculum vulgare	0.1	10	EX								0.1	
Setaria spp.	5	100	GG				5					
Bothriochloa spp.	5	150	GG				5					
Verbena bonariensis	0.1	20	EX								0.1	
Dichondra repens	0.1	510	FG					0.1				
Cirsium vulgare	0.1	15	EX								0.1	
Paspalum dilatatum	20	1000	HT									20
Echinopogon spp.	1	50	GG				1					
Dichanthium tenue	1	30	GG				1					
Gomphocarpus physocarpus	0.1	2	EX								0.1	

Easting	153.13328
Northing	-28.78953
Orientation	238
Plot size	20x50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	0
20-29	0
10-19	0
5-9	0
<5	0
Hollows	0
Length logs (m)	0

BAM Attributes 1x1 plot (%)	Average of 5 subplots (%)
Litter (%)	0

## Appendix E

# Threatened Species Potential Occurrence Assessment



### **Potential of Occurrence Assessment**

A potential of occurrence assessment was completed to assess the likelihood of occurrence of each threatened species or population identified with the in the study area. All threatened biodiversity identified in background research were considered. The assessment is based on the habitat profile for the species and other habitat information in the Threatened Species Profile Database (Environment Energy and Science Group). The assessment also takes into consideration the dates and locations of nearby records and information about species populations in the locality.

#### **Threatened Flora Potential Occurrence Assessment**

For this proposed activity, the likelihood of occurrence of threatened and migratory species and populations was determined based on the criteria shown in Table D.1.

Table D.1	Potential of occurrence criteria for	r threatened flora species	and populations
-----------	--------------------------------------	----------------------------	-----------------

Potential of occurrence	Criteria
Known	The species was observed in the study area either during the current survey or during another survey less than one year prior.
High	<ul> <li>A species has a high likelihood of occurrence if:</li> <li>the study area contains or forms part of a large area of high-quality suitable habitat that has not been subject to recent disturbance (e.g. fire), the species is known to form a persistent soil seedbank and the species has been recorded recently (within 10 years) in the locality</li> <li>the species is a cryptic flowering species that has been recorded recently (within 10 years) in the locality and has a large area of high-quality potential habitat within the construction footprint that was not seasonally targeted by surveys.</li> </ul>
Moderate	A species has a moderate likelihood of occurrence if:      the species:         has a large area of high-quality suitable habitat in the study area that has not been subject to recent disturbance (e.g. fire)         the species is known to form a persistent soil seedbank, but         the species has not been recorded recently (within 10 years) in the locality         the species:             has a small area of high-quality suitable habitat or a large area of marginal habitat in the study area That has not been subject to recent disturbance (e.g. fire)             the species is known to form a persistent soil seedbank             the species:                  has a small area of high-quality suitable habitat or a large area of marginal habitat in the study area That has not been subject to recent disturbance (e.g. fire)                  the species is known to form a persistent soil seedbank                  the species is known to form a persistent soil seedbank                  the species is known to form a persistent soil seedbank                  the species is known to form a persistent soil seedbank                  the species is known to form a persistent soil seedbank                  the species is a cryptic flowering species, with a small area of high-quality potential habitat or a large area of marginal habitat within the proposal footprint, that was not seasonally targeted by surveys.
Low	<ul> <li>A species has a low likelihood of occurrence if:</li> <li>it is not a cryptic species, nor a species known to have a persistent soil seedbank species and was not detected despite targeted searches</li> <li>the species is a cryptic flowering species, with a small area of high-quality potential habitat or a large area of marginal habitat within the proposal footprint, that was not seasonally targeted by surveys as the species has not been recorded within 50 years in the locality.</li> </ul>



#### Table D.2 Threatened flora potential occurrence assessment

	Common	Sta	tus	Habitat Requirement	Suitability	Potential Occurrence	
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	Assessment of Significance	
Arthraxon hispidus	Hairy-joint Grass	V	V	Moist shady places in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps.	Low	No suitable habitat occurs. Not considered further.	
Belvisia mucronata	Narrow-Leaf Fern	E	-	Forms small clumps on trees or rocks in dry rainforest or along creeks in moist open forest.	Low	No suitable habitat occurs. Not considered further.	
Bosistoa transversa	Yellow Satinheart	V	V	Lowland subtropical rainforest up to 300 m in altitude, from Maryborough in Queensland to Nightcap Range (north of Lismore) in NSW.	Low	No suitable habitat occurs. Not considered further.	
Bulbophyllum globuliforme	Hoop Pine Orchid	V	V	Found almost exclusively in the McPherson Range between NSW and Queensland, at altitudes between 300 and 600 m. It also occurs at Maleny and Noosa in south-east Queensland. Grows on Hoop Pines ( <i>Araucaria cunninghamii</i> ) in upland subtropical rainforest.	Low	No suitable habitat occurs. Not considered further.	
Centranthera cochinchinensis	Swamp Foxglove	Е	-	Occurs in northern Australia and south-east Asia and known from NSW north from Wooli. Uncommon in swampy areas and other moist sites.	Low	No suitable habitat occurs. Not considered further.	
Clematis fawcettii	Northern Clematis	V	V	Found in widely dispersed areas in southern Queensland and in north-east NSW north from Lismore. Found in drier rainforest, usually near streams.	Low	No suitable habitat occurs. Not considered further.	
Corchorus cunninghamii	Native Jute	E	E	Occurs from the Richmond River in north-east NSW to the Brisbane River in Queensland. In NSW populations occur at Bungabbee and Toonumbar. Occurs in ecotones between wet eucalypt forest and dry to dry- subtropical rainforest on sheltered slopes and gullies, and grassy, open forest on exposed slopes and ridges.	Low	No suitable habitat occurs. Not considered further.	
Cryptocarya foetida	Stinking Cryptocarya	V	V	Coastal south-east Queensland and north-east NSW south to Iluka. Found in littoral, warm temporate and subtropical rainforest, wet sclerophyll forest and <i>Camphor laurel</i> forest usually on sandy soils, but mature trees are also known on basalt soils.	Low	No suitable habitat occurs. Not considered further.	



	Common	Status		Habitat Requirement	Suitability	Potential Occurrence	
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	Assessment of Significance	
Cynanchum elegans	White-flowered Wax Plant	E	E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal Banksia <i>Banksia</i> <i>integrifolia subsp. integrifolia</i> coastal scrub; Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honeymyrtle <i>Melaleuca armillaris</i> scrub to open scrub.	Low	No suitable habitat occurs. Not considered further.	
Cyperus aquatilis	Water Nutgrass	E	-	In NSW, known only from a few sites north from Grafton. Grows in ephemerally wet sites, such as roadside ditches and seepage areas from small cliffs, in sandstone areas.	Low	No suitable habitat occurs. Not considered further.	
Desmodium acanthocladum	Thorny Pea	V	V	Occurs only in north-east NSW. It is found in the Lismore area, and there are also records from near Grafton, Coraki, Casino and the Mount Warning area. Found in dry rainforest and fringes of riverine subtropical rainforest.	Low	Records within locality, however, habitat highly disturbed and no suitable habitat occurs. Not considered further.	
Dichanthium setosum	Bluegrass	-	V	In NSW, occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Low	Not identified during field assessment. More commonly known on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW. Not considered further.	
Endiandra floydii	Crystal Creek Walnut	E	E	Confined to the Tweed and Brunswick Valleys and Byron Bay area of north-east NSW, and to one or two locations in south-east Queensland. Warm temperate, subtropical rainforest or wet sclerophyll forest with Brush Box overstorey, and in and Camphor Laurel forest. The species can occur in disturbed and regrowth sites.	Low	No suitable habitat occurs. Not considered further.	



	Common	Status		Habitat Requirement	Suitability	Potential Occurrence
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	Assessment of Significance
Eucalyptus glaucina	Slaty Red Gum	V	V	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well- watered soils.	Low	Not identified during field assessment. Not considered further.
Floydia praealta	Ball Nut	V	V	Small, scattered populations distributed from Gympie in Queensland to the Clarence River in north-east NSW. Riverine and subtropical rainforest, usually on soils derived from basalt.	Low	No suitable habitat occurs. Not considered further.
Gossia fragrantissima	Sweet Myrtle	E	E	Occurs in south-east Queensland and in north-east NSW south to the Richmond River. Mostly found on basalt-derived soils. Dry subtropical and riverine rainforest.	Low	No suitable habitat occurs. Not considered further.
Grevillea quadricauda	Four-tailed Grevillea	V	V	Gravelly loam in understorey of dry eucalypt forest near creeks.	Low	Not identified during field assessment. Not considered further.
Hibbertia marginata	Bordered Guinea Flower	V	V	Occurs only in north-east NSW, where it is restricted to the southern Richmond Range between Casino and Grafton. Grassy or shrubby dry open eucalypt forest at low altitudes on sandstone.	Low	Not identified during field assessment. Not considered further.
Indigofera baileyi	Bailey's Indigo	E	-	Open woodlands on loam and clay loam soils, typically from granite or basalt, but also from sediments in the Clarence lowlands.	Low	Not identified during field assessment. Not considered further.
Lepidium peregrinum	Wandering Pepper Cress	E	E	Occurs in scattered refugia in north-eastern NSW (near Tenterfield) and south-eastern Queensland. The largest site containing most of the known <i>Lepidium peregrinum</i> population is in a designated Travelling Stock Reserve. Occurs in an open riparian forest on the banks of the Tenterfield creek at Clifton.	Low	No suitable habitat occurs. Not considered further.
Macadamia integrifolia	Macadamia Nut	-	V	While specimens have been collected from the North Coast of NSW (e.g. Lismore, Gross 1995), this species is not known to occur naturally in NSW. Grows in remnant rainforest, preferring partially open areas such as rainforest edges	Low	No suitable habitat occurs. Not considered further.
Macadamia tetraphylla	Rough-shelled Bush Nut	V	V	Subtropical rainforest usually near the coast.	Low	No suitable habitat occurs. Not considered further.



	Common	Status		Habitat Requirement	Suitability	Potential Occurrence
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	Assessment of Significance
Marsdenia longiloba	Clear Milkvine	E	V	Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	Low	No suitable habitat occurs. Not considered further.
Melaleuca irbyana	Weeping Paperbark	E	-	Found in only a few places in north-east NSW, including near Coraki, Casino and Coutts Crossing south of Grafton. Also occurs in near Ipswich in south- east Queensland. Only two populations are recorded in conservation reserves in NSW, these are Warragai Creek Nature Reserve and Bungawalbin National Park. Open eucalypt forest in poorly drained, usually clay, sandstone or alluvial soils.	Low	No suitable habitat occurs. Not considered further.
Melichrus sp. Newfoundland State Forest	Hairy Melichrus	E	E	Dry sclerophyll and eucalypt forest on sandstone where there is a well-developed shrub layer of many species.	Low	No suitable habitat occurs. Not considered further.
Myrsine richmondensis	Ripple-leaf Muttonwood	E	Е	Subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil.	Low	No suitable habitat occurs. Not considered further.
Oberonia complanata	Yellow-flowered King of the Fairies	V	-	Grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves.	Low	No suitable habitat occurs. Not considered further.
Oberonia titania	Red-flowered King of the Fairies	V	-	Occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves.	Low	No suitable habitat occurs. Not considered further.
Owenia cepiodora	Onion Cedar	V	V	North from the Richmond River in north-east NSW extending just across the border into Queensland. Subtropical and dry rainforest on or near soils derived from basalt.	Low	No suitable habitat occurs. Not considered further.
Paspalidium grandispiculatum	-	V	V	Restricted to poor sandy soils on sandstone. It has been found in open forest of Turpentine ( <i>Syncarpia</i> <i>glomulifera</i> ) on undulating topography as well as in drier forest types on ridges.	Low	No suitable habitat occurs. Not considered further.
Peristeranthus hillii	Brown Fairy-chain Orchid	V	_	Restricted to coastal and near-coastal environments, particularly Littoral Rainforest and Lowland Rainforest on Floodplain. The species is an epiphyte, growing in clumps on tree trunks and thick vines. Flowers appear during September and October.	Low	No suitable habitat occurs. Not considered further.



	Common	Status		Habitat Requirement	Suitability	Potential Occurrence
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	Assessment of Significance
Persicaria elatior	Tall Knotweed	V	V	Damp or swampy situations and sometimes with Melaleuca linariifolia.	Low	No suitable habitat occurs. Not considered further.
Phaius australis	Southern Swamp Orchid	Е	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest mostly in coastal areas.	Low	No suitable habitat occurs. Not considered further.
Plectranthus nitidus	Nightcap Plectranthus	E	E	Grows on rocky cliff-faces and boulders, in the shelter and shade provided by the adjacent rainforest and dry rainforest.	Low	No suitable habitat occurs. Not considered further.
Polygala linariifolia	Native Milkwort	E	-	Sandy soils in dry eucalypt forest or woodland with sparse understorey.	Low	No suitable habitat occurs. Not considered further.
Prostanthera palustris	Swamp Mint-bush	V	V	Only known from the Jerusalem Creek area in the north of Bundjalung National Park, near Evans Head. Grows in in wet shrubland to heathland subject to extended waterlogging in poorly drained white siliceous sandy soil with a high organic content.	Low	No suitable habitat occurs. Not considered further.
Pterostylis nigricans	Dark Greenhood	V	-	Coastal heathland with Heath Banksia (Banksia ericifolia) and lower growing heath with lichen encrusted soil surfaces, sandy soils.	Low	No suitable habitat occurs. Not considered further.
Pultenaea maritima	Coast Headland Pea	V	-	Grasslands on exposed coastal headlands.	Low	No suitable habitat occurs. Not considered further.
Rhodamnia rubescens	Scrub Turpentine	CE	CE	Subtropical rainforests, warm temperate rainforests, littoral rainforests, and wet sclerophyll forests. It may also occur as a pioneer in adjacent areas of dry sclerophyll and grassy woodland associations.	Low	No suitable habitat occurs. Not considered further.
Rhodomyrtus psidioides	Native Guava	CE	CE	Rainforest and its margins with sclerophyll vegetation, often near creeks and drainage lines. Pioneer species in disturbed environments such as regrowth and rainforest margins.	Low	No suitable habitat occurs. Not considered further.
Rhynchosia acuminatissima	Pointed Trefoil	V	-	In or near dry rainforest dominated by Hoop Pine ( <i>Araucaria cunninghamii</i> ). Other associated species include Brush Box ( <i>Lophostemon confertus</i> ), Grey Ironbark ( <i>Eucalyptus siderophloia</i> ), Rough-leaved Elm ( <i>Aphananthe philippinensis</i> ) and Native Holly ( <i>Alchornea ilicifolia</i> ).	Low	No suitable habitat occurs. Not considered further.



Scientific Name	Common Name	Sta BC Act	atus EPBC Act	Habitat Requirement (EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Assessment of Significance
Rotala tripartita	-	Е	-	Rotala tripartita is a riparian species that often grows in free-standing water with sedges. There appear to be extreme fluctuations in abundance of the species, with plants observed to germinate prolifically and establish in large numbers after substantial rainfall. Individuals disappear above-ground during dry periods and may only persist during these times in the soil seed-bank.	Low	No suitable habitat occurs. Not considered further.
Rutidosis heterogama	Heath Wrinklewort	V	V	North coast populations between Wooli and Evans Head in Yuraygir and Bundjalung National Parks. It also occurs on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes. Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Low	No suitable habitat occurs. Not considered further.
Sarcochilus fitzgeraldii	Ravine Orchid	V	v	North-east NSW, north of the Macleay River, to Maleny in south-east Queensland. Grows mainly on rocks, amongst organic matter, in cool, moist, shady ravines, gorges and on cliff faces in dense subtropical rainforest at altitudes between 500 and 700 m. Occasional clumps are found on the bases of fibrous-barked trees.	Low	No suitable habitat occurs. Not considered further.
Senna acclinis	Rainforest Cassia	E	-	Occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. Grows on the margins of subtropical, littoral and dry rainforests.	Low	No suitable habitat occurs. Not considered further.
Sophora fraseri	Brush Sophora	V	v	Occurs north from the Casino district in north-east NSW, where it is very rare. Also in south-east Queensland where it is widespread but not common. Usually found in wet situations in wet sclerophyll forest or vine forest, often near rainforest.	Low	No suitable habitat occurs. Not considered further.
Syzygium hodgkinsoniae	Red Lilly Pilly	V	v	A restricted range from the Richmond River in north- east NSW to Gympie in Queensland. Locally common in some parts of its range, but otherwise sparsely distributed. Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils.	Low	No suitable habitat occurs. Not considered further.
Thesium australe	Austral Toadflax	V	V	Grassland or grassy eucalypt woodland where <i>Themeda australis</i> is predominant, on grassy headlands.	Low	No suitable habitat occurs. Not considered further.



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Scientific Name	Common Name	Sta BC Act	tus EPBC Act	Habitat Requirement (EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Assessment of Significance
Tylophora woollsii	Cryptic Forest Twiner	E	E	Moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	Low	No suitable habitat occurs. Not considered further.
V = Vulnerable; E = En	dangered; CE = Critica	lly Endanger	ed	1	1	<u>.</u>



#### **Threatened Fauna Potential Occurrence Assessment**

For this proposed activity, the likelihood of occurrence of threatened and migratory species and populations was determined based on the criteria shown in Table D.3.

Table D.3 Potential of occurrence criteria for threatened fauna species and populatio	ential of occurrence criteria for threatened fauna species and p	opulations
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Potential of occurrence	Criteria									
Known	The species was observed in the study area either during the current survey or during another survey less than one year prior.									
High	<ul> <li>A species has a high likelihood of occurrence if:</li> <li>the study area contains or forms part of a large area of high-quality suitable habitat</li> <li>important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the study area</li> <li>the species has been recorded recently in similar habitat in the locality</li> <li>the study area is likely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.</li> </ul>									
Moderate	<ul> <li>A species has a moderate likelihood of occurrence if:</li> <li>the study area contains or forms part of a small area of high-quality suitable habitat</li> <li>the study area contains or forms part of a large area of marginal habitat</li> <li>important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the study area</li> <li>the study area is unlikely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.</li> </ul>									
Low	<ul> <li>A species has a low likelihood of occurrence if:         <ul> <li>potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct)</li> <li>the species is considered to be a rare vagrant, likely only to visit the study area very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).</li> </ul> </li> </ul>									
None	Suitable habitat is absent from the study area.									



#### Table D.4 Threatened fauna potential occurrence assessment\*

\*Pelagic marine species identified in the search results are not assessed as no habitat occurs at the site

	Common	Status		Habitat Requirement	Suitability	Potential Occurrence
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	and need for Test of Significance
Amphibians						
Mixophyes balbus	Stuttering Frog	E	V	Cool rainforest, moist eucalypt forest and occasionally along creeks in dry eucalypt forest. Typically, at elevations between 200 and 1420m above sea level in their northern range.	None	No suitable habitat occurs. Not considered further.
Mixophyes fleayi	Fleay's Barred Frog	E	E	Rainforest and wet eucalypt forest of the escarpment and foothills, close to gravely streams.	None	No suitable habitat occurs. Not considered further.
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	None	No suitable habitat occurs. Not considered further.
Fish						
Maccullochella ikei	Eastern Freshwater Cod	E (FM Act)	E	Permanent clear rocky streams with instream cover and deep pools. Native to only the Clarence and Richmond Rivers in northern New South Wales.	None	No suitable habitat occurs. Not considered further.
Avifauna						
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Atrichornis rufescens	Rufous Scrub- bird	V	E	Subtropical, warm temperate, cool temperate rainforest and moist eucalypt forest with rainforest mid-storey. Moist, densely vegetated lower levels with deep leaf litter.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	None	No suitable habitat occurs. Not considered further. Not considered further.
Calidris ferruginea	Curlew Sandpiper	E	CE	Tidal mudflats, sandy ocean shores and occasionally inland freshwater or salt-lakes.	None	No suitable habitat occurs. Not considered further. Not considered further.



	Common Name	Status		Habitat Requirement	Suitability	Potential Occurrence
Scientific Name		BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	and need for Test of Significance
Calyptorhynchus Iathami	Glossy Black- Cockatoo	V	-	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1000 m.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Cyclopsitta diophthalma coxeni	Coxen's Fig-parrot	CE	E	Drier rainforests and adjacent wet eucalypt forest, wetter lowland also wetter lowland rainforests.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Dromaius novaehollandiae	Emu population in the NSW North Coast Bioregion and Port Stephens LGA	Е	-	Open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Ephippiorhynchus asiaticus	Black-necked Stork	Е	-	Swamps, mangroves, mudflats, dry floodplains.	None	No suitable habitat occurs. Not considered further. Not considered further.
Erythrotriorchis radiatus	Red Goshawk	CE	V	Open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water. Typically found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Population in NSW is naturally small (probably only one pair) and lies at extreme of the natural range of the species in Australia.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.



		Status		Habitat Requirement	Suitability	Potential Occurrence
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	and need for Test of Significance
Falco hypoleucos	Grey Falcon	E	v	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Low	No suitable habitat occurs. No BioNet records within locality. Not considered further.
Glossopsitta pusilla	Little Lorikeet	V	-	Forages primarily in the canopy of open <i>Eucalyptus</i> forest and woodland, yet also sources food in <i>Angophora, Melaleuca</i> and other tree species.	Moderate	Potential foraging habitat in the form of blossom eucalypts. Considered further in report.
Grantiella picta	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box- Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	Low	Lack of preferred habitat occurs i.e. large presence of mistletoes. Not considered further. Not considered further.
Hirundapus caudacutus	White-throated Needletail	-	V	Almost exclusively aerial, occurring most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. Breeding does not occur in Australia.	Low	May irregularly occur flying over the study area during seasonal movements. Unlikely to rely on habitat in study area. Not considered further.
Irediparra gallinacea	Comb-crested Jacana	V	-	Among vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	None	No suitable habitat occurs. Not considered further. Not considered further.
Lathamus discolor	Swift Parrot	E	E	On mainland Australia foraging occurs where eucalypts are flowering profusely or where abundant lerp infestations occur. Favoured feed trees include winter flowering species such as Swamp Mahogany ( <i>Eucalyptus robusta</i> ), Spotted Gum ( <i>Corymbia maculata</i> ), Red Bloodwood ( <i>C.gummifera</i> ), Forest Red Gum ( <i>E.tereticornis</i> ), Mugga Ironbark ( <i>E.sideroxylon</i> ), and White Box ( <i>E.albens</i> ). Commonly used lerp infested trees include Inland Grey Box ( <i>E.macrocarpa</i> ), Grey Box ( <i>E.moluccana</i> ), Blackbutt ( <i>E.pilularis</i> ) and Yellow Box ( <i>E.melliodora</i> ).	Low	Lack of preferred habitat and lack of substantial blossom/lerp eucalypt woodlands within study area. May occur in locality in higher quality habitat areas. Not considered further.


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Scientific Name	Common Name	Sta BC Act	atus EPBC Act	Habitat Requirement (EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Test of Significance
Ninox strenua	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest. Requires large tracts of forest or woodland habitat but may also occur in fragmented landscapes.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Numenius madagascariensis	Eastern Curlew	-	CE	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats and sometimes saltmarsh of sheltered coasts.	None	No suitable habitat occurs. Not considered further. Not considered further.
Rostratula australis	Australian Painted Snipe	Е	E	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	None	No suitable habitat occurs. Not considered further. Not considered further.
Turnix melanogaster	Black-breasted Button-quail	V	V	Drier rainforests and vine scrubs, often in association with Hoop Pine and a deep moist leaf litter layer.	None	No suitable habitat occurs. Not considered further. Not considered further.
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forest and woodlands.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitat areas. Not considered further.
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Sandstone cliffs and fertile woodland valley habitat within close proximity of each other.	Low	No suitable habitat occurs. Not considered further.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	None	No suitable habitat occurs. Not considered further.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts in tree hollows.	Moderate	Potential foraging habitat present in patches of native vegetation stands with canopy cover. Considered further in report.
Miniopterus australis	Little Bent-winged Bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	Recorded	Recorded by Anabat detector.
Miniopterus orianae oceanensis	Large Bent- winged Bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	Recorded	Recorded by Anabat detector.



Scientific Name	Common Name	Sta BC Act	atus EPBC Act	Habitat Requirement (EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Test of Significance
Myotis macropus	Southern Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	Low	No suitable habitat occurs. Not considered further.
Petauroides volans	Greater Glider	-	V	Wide range of habitats including tall open woodland, eucalypt forests and low woodlands.	Low	No suitable habitat occurs. Not considered further.
Petrogale penicillata	Brush-tailed Rock Wallaby	E	v	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves, overhangs during the day, and foraging in grassy areas nearby at night.	Low	No suitable habitat occurs. Not considered further.
Phascolarctos cinereus	Koala	V	v	Appropriate food trees in forests and woodlands, and treed urban areas.	Moderate	Marginal habitat present in form small stands of native <i>Corymbia</i> and Forest Red Gum species in study area. BioNet records within close proximity to study area. Considered further in report.
Potorous tridactylus	Long-nosed Potoroo	V	V	Cool temperate rainforest, moist and dry forests, and wet heathland, inhabiting dense layers of grass, ferns, vines and shrubs.	Low	No suitable habitat occurs. Not considered further.
Pseudomys novaehollandiae	New Holland Mouse	V	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	No suitable habitat occurs. Not considered further.
Pseudomys oralis	Hastings River Mouse	E	E	Dry open forests with dense, low groundcover with diverse mix of ferns, grass, sedges and herbs.	Low	No suitable habitat occurs. Not considered further.
Pteropus poliocephalus	Grey-headed Flying-fox	V	v	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Moderate	Potential foraging habitat in the form of blossom eucalypts. Considered further in report.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Forages in a variety of habitats, roosts in tree hollows and buildings.	Recorded	Recorded by Anabat detector.
Scoteanax rueppellii	Greater Broad- nosed Bat	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Moderate	Potential foraging habitat present in patches of native vegetation stands with canopy cover. Considered further in report.



	Common	Sta	ntus	Habitat Requirement	Suitability	Potential Occurrence
Scientific Name	Name	BC Act	EPBC Act	(EPBC Act SPRAT and/ or DPIE/EES Threatened Species Profiles websites)	of Site Habitat	and need for Test of Significance
Argynnis hyperbius	Australian Fritillary	E	CE	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet ( <i>Viola betonicifolia</i> ) occurs.	Low	No suitable habitat occurs. Not considered further.
Phyllodes imperialis southern subspecies	Pink Underwing Moth	E	E	Undisturbed subtropical rainforest below 600 m. Breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, <i>Carronia</i> <i>multisepalea</i> , grows in a collapsed shrub-like form.	Low	Lack of preferred habitat within study area. May occur in locality in larger higher quality habitats. Not considered further.
Reptiles						
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	E	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. The Three-toed Snake-tooth Skink lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs.	Low	No suitable habitat occurs. Not considered further.
Delma torquata	Collared Delma	-	V	Usually inhabits eucalypt dominated woodland and open forest where it is associated with suitable micro- habitats i.e. exposed rocky outcrops.	Low	Lack of preferred habitat within study area. May occur in locality in higher quality habitats. Not considered further.



# Appendix F

**Assessments of Significance** 



# **BC Act Assessments of Significance**

The proposed works would be assessed under Section 5.5 of the EP&A Act. As such, Section 7.3 of the BC Act outlines the 'test of significance' that is to be undertaken to assess the likelihood of significant impact upon threatened species or ecological communities listed under the BC Act.

Assessments of significance have been completed for the following threatened species listed under the BC Act:

- Blossom Nomads (Little Lorikeet and Grey-headed Flying-fox)
- Koala
- Microbats (Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Yellow-bellied Sheathtail-bat & Greater Broad-nosed Bat)

# **Blossom Nomads**

The Grey-headed Flying-fox (*Pteropus poliocephalus*), and Little Lorikeet (*Glossopsitta pusilla*) have been grouped for assessment owing to similarities in ecology and habitat preference. These threatened opportunistic blossom nomads loosely share similar habitat requirements; threats that affect their recovery; and potential impacts as a result of the proposed action (refer Table E 1). Under the BC Act, The Grey-headed Flying-fox and Little Lorikeet are listed as Vulnerable. Under the EPBC Act the Grey-headed Flying-fox is listed as Vulnerable.

Common Name	BC Act	EPBC Act	Habitat & distribution	Threatening processes
Grey-headed Flying-fox	V	V	A distribution that typically extends approximately 200 km from the coast of Eastern Australia, from Rockhampton in Queensland to Adelaide in South Australia. Foraging areas include subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Feed on the nectar and pollen of native trees, in particular <i>Eucalyptus, Melaleuca</i> and <i>Banksia</i> , and fruits of rainforest trees and vines, as well as from cultivated gardens and orchards. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	<ul> <li>Clearing of woodlands for agriculture</li> <li>Loss of roosting and foraging sites</li> <li>Electrocution on powerlines, entanglement in netting and on barbedwire</li> <li>Heat stress</li> <li>Conflict with humans</li> <li>Incomplete knowledge of abundance and distribution across the species' range.</li> <li>Climate change and reduction in resources due to drought.</li> </ul>
Little Lorikeet	V	-	Forages in the canopy of open eucalypt forest and woodland, utilising <i>Eucalyptus, Angophora, Melaleuca</i> and other tree species. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year. Riparian habitats are particularly used, due to higher	<ul> <li>Clearing of woodlands for agriculture</li> <li>Loss of old hollow-bearing trees</li> <li>Competition with the introduced Honeybee</li> <li>Infestation of habitat by invasive weeds</li> </ul>

#### Table E 1 Ecology of threatened blossom nomads



soil fertility and hence greater productivity. The species feeds mostly on nectar and pollen, but occasionally also on native fruits such as mistletoe. Nests are generally located (within hollows) in proximity to feeding areas if possible and entrances are small (three centimetres) and usually high above the ground (two to 15 metres). Nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including species like <i>Allocasuarina</i> .	<ul> <li>Inappropriate fire regimes</li> <li>Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners</li> <li>Climate change impacts including reduction in resources due to drought</li> <li>Degradation of woodland habitat and vegetation structure due to overgrazing.</li> </ul>

#### **Specific Impacts**

The proposal would result in the removal of 0.23 ha of PCT 841 Forest Redgum - Pink Bloodwood open forest. The impacted vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for both species in the context of the site and adjacent areas of suitable habitat. A small number of hollow bearing trees which may be utilised by the Little Lorikeet in a local context will be impacted as a result of the proposal. No roosting habitat for Grey-headed Flying-fox would be affected.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

(a) in the case of a threatened species, 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

The Grey-headed Flying-fox was not recorded utilising habitat within the study area, however, recent records (BioNet) are known in the locality. This species is known to travel long distances to forage and utilise fruit and blossom resources. For this reason, the Grey-headed Flying-fox is likely to intermittently occur within the study area utilising blossoming eucalypts and fruiting trees. During field investigations no roosting camps were identified and none are known to occur in the locality. On this basis the proposal is unlikely to have an adverse effect on the life cycle of Grey-headed Flying-fox.

The Little Lorikeet was not recorded during field assessments. However, the study area does provide potential foraging resources in the form of blossom resources. It is likely that the study area would have potential for the species to occur on a seasonal basis or intermittent basis during the occurrence of food availability. A small number (3) hollow-bearing trees, which provide small hollows (5-10cm diameter) will be impacted as a result of the proposal. Despite some potential breeding habitat being impacted for Little Lorikeet, due to the small number of trees; the undesirable location of hollows within open paddock and the availability of higher quality habitat within the greater locality (i.e Bungabbee State Forest and Nature Reserve) it is unlikely that the impact of these trees would have adverse effect on the life cycle of for the species.

Approximately 0.23 ha of potential habitat is likely to be affected by the proposed action. Although the proposed action will represent the loss of potential foraging and breeding (hollows for Little Lorikeet) habitat, the proposed action area would only be a small component of locally occurring resources that would be accessible to these species within the greater locality. On this basis it would be highly unlikely that an adverse effect on the life cycle of the of either species would occur such that a viable local population of the species is likely to be placed at risk of extinction.



(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

Not applicable.

(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

Approximately 0.23 ha of suitable habitat would be affected by the proposal.

#### (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

Habitat connectivity is not likely to be affected by the proposal. The majority of the proposal area occurs in a previously disturbed and highly modified landscape (agricultural land). Approximately 0.23 ha of habitat is likely to be affected by the proposal with vegetation removal limited to removal of a small isolated disturbed patch of PCT 841. The proposal would not significantly exacerbate fragmentation than what already exists due to historic clearing for primary production. Furthermore, given that blossom nomad species are highly mobile, the proposal would not present a significant barrier to these species. It is considered unlikely that habitat would become further isolated or fragmented significantly beyond that currently existing in the study area.

#### (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 habitat to be removed (0.23 ha of PCT 841) is minor in a local context where grassy woodlands occur extensively. No barriers to dispersal for any of the subject species would be created due to the proposal. The habitat to be removed is unlikely to be of any significant importance to the subject species. In addition, these species would not only be limited to this area but to a much greater region. Owing to the small extent of potential habitat likely to be affected, the proposal is unlikely to affect the long-term survival of these species.

#### (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 proposal will not impact on any declared area of outstanding biodiversity value.

(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.

With respect to threatened blossom nomads, the proposed action is consistent with three key threatening processes under the BC Act:

- Clearing of Native Vegetation
- Loss of hollow-bearing trees (in case of Little Lorikeet only)
- Removal of dead wood and dead trees

As native vegetation clearing is required the proposal would incrementally contribute to clearing of native vegetation. This also applies to loss of hollow-bearing trees and removal of dead wood and



dead trees (three hollow-bearing trees). Given the proposed extent of clearing and the large extent of native vegetation in the greater locality, impacts are unlikely to be significant. The degree that the proposal would contribute to any threatening process is not considered likely to place the local population of any of the mentioned species at significant risk of extinction.

#### Conclusion

The extent of native vegetation clearing and habitat removal associated with the proposed action is small (0.23 ha) in terms of the available habitat for these species within the surrounding landscape. Although the loss of foraging habitat for blossom nomads is considered to be an incremental loss of potential habitat locally, the proposed action is not likely to have a significant impact upon these species that might lead to their extinction locally.

# Koala

The Koala is listed as Vulnerable under the BC Act and Endangered under the EPBC Act. The Koala was not recorded in the study area during the field assessment informing this report, however, recent (<5yrs) records for this species were returned from the BioNet (Department of Planning Industry and Environment, 2021). In addition, whilst the study area is predominately disturbed, presence of isolated *Eucalyptus tereticornis* trees occurred within the study area. *Eucalyptus tereticornis* is listed as a Schedule 2 Koala food tree species for the species. Due recent records of the species within the locality and as a precautionary measure an Assessment of Significance was undertaken.

#### Habitat and Ecology

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales it mainly occurs on the central and north coasts, with populations on the western side of the Great Dividing Range.

Habitat consists of eucalypt woodlands and forests, in which the Koala feeds on more than 70 eucalypt species and 30 non-eucalypt species. Preferred browse species are different across regions. Koalas are inactive for most of the day and do most of their feeding and moving during the night. Although predominantly arboreal, Koalas would descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size.

Threatening processes for this species include:

- Loss, modification and fragmentation of habitat
- Predation by feral and domestic dogs
- Intense fires that scorch or kill the tree canopy
- Road-kills
- Climate change and reduction in resources due to drought.

#### **Specific Impacts**

The proposal would result in the removal of 0.23 ha of PCT 841 Forest Redgum - Pink Bloodwood open forest. Whilst the study area is predominately disturbed, presence of *Eucalyptus tereticornis* occurred within the study area. *Eucalyptus tereticornis* is listed as a Schedule 2 Koala food tree species for the species. *Eucalyptus tereticornis* occur as isolated paddock trees within the study area, the removal of these trees represents a minor reduction of potential foraging and temporary refuge habitat which may be utilised by Koalas in the locality on an opportunistic basis. The proposal would not result in barriers to Koala movement nor significantly increase the likelihood of vehicle strike to Koalas in the locality.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.



(a) in the case of a threatened species, 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

The Koala was not recorded in the study area during the field assessment informing this report, however, records for this species occur within the locality of the study area. Whilst the study area is predominately disturbed, small patches of PCT 841 Forest Redgum - Pink Bloodwood open forest with presence of Eucalyptus tereticornis occurred. Eucalyptus tereticornis is listed as a Schedule 2 Koala food tree species. The proposal would impact on approximately 0.23 ha of habitat in the form of PCT 841 (poor and isolated trees condition). Any population of Koala potentially using the study area are likely to be part of a viable population extending throughout the locality and are likely to be present in other parts of the locality. The proportional impact to this potential habitat is very small and would constitute <1% of available habitat for the species. Due to the proposal occurring within disturbed agricultural pastureland, it is considered unlikely that local population of Koala would be restricted to the study area and the proposal is not likely to have an adverse effect on the life cycle of the species such that a viable local population is likely to be placed at risk of extinction.

(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

Not applicable.

(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

It is estimated that proposal would impact on approximately 0.23 ha of potential habitat for the Koala in the form of PCT 841 Forest Redgum - Pink Bloodwood open forest (poor condition and isolated trees).

#### (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

Habitat within the study area is already fragmented at a local scale by the agricultural and primary production. Landscape scale fragmentation is unlikely to occur from the proposal as the work would involve removing vegetation from small, isolated patches rather than breaking apart of large blocks of vegetation into many smaller patches. Importantly, the proposal would not result in the breaking apart of large blocks of high-quality habitats. No further habitat fragmentation on a landscape scale would occur because of the proposal. Loss of small amount of potential habitat is likely to increase by a small extent.

#### (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 habitat in the study area is not likely to be important to the long-term survival of the Koala. The study area does not occur in a mapped 'Area of Regional Koala Significance'. Potential habitat recorded in the study area is not considered important to the long-term survival of the species, with the proposal likely to impact approximately 0.23 ha of poor condition habitat in an existing highly disturbed agricultural landscape. Although the loss of native vegetation would be an incremental loss of local



habitat, the quality and importance are not considered to be significant to the long-term survival of any local population of Koala.

(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 proposal will not impact on any declared area of outstanding biodiversity value.

(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.

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 38 listed KTPs. With respect to the Koala, the proposal is consistent with one KTP; being clearing of native vegetation. The extent of native vegetation clearing and habitat removal associated with the proposal is relatively small in terms of the available habitat for these species within the proposal locality.

#### Conclusion

In summary, the proposal is considered unlikely to result in a significant effect on the Koala. Whilst approximately 0.23 ha of potential habitat will be impact, Koalas using the study area are likely to use habitat that extends through the locality and due to the small extent of impact expected within an existing disturbed area, it is considered unlikely that local population of Koala would be restricted to the study area. Given the extent of potentially suitable habitat that exists in the locality and the very small proportional impact likely to occur from the proposal, any impacts to the Koala are unlikely to be significant.

## **Threatened Microbats**

Threatened microchiropteran bat species have been assessed together as they generally share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the proposed action. Threatened microchiropteran bats considered for this impact assessment are:

- Eastern Freetail-bat (Mormopterus norfolkensis)
- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Greater Broad-nosed Bat (Scoteanax rueppellii)
- Yellow-bellied Shealthtail-bat (Saccolaimus flaviventris)

These species have been assessed as a guild because of their similarity in habitat usage and habits, which are described in **Table E 2**.

Common Name	BC Act	EPBC Act	Habitat & distribution	Threats
Eastern Freetail-bat	V	-	Thought to live in Sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge	<ul> <li>Loss of hollow-bearing trees</li> <li>Loss of foraging habitat</li> <li>Application of pesticides in or adjacent to foraging areas</li> <li>Artificial light sources spilling onto foraging and/or roosting habitat</li> <li>Large scale wildfire or hazard reduction burns on foraging and/or roosting habitat.</li> </ul>

#### Table E 2 Ecology of threatened microbats



Common Name	BC Act	EPBC Act	Habitat & distribution	Threats
				<ul> <li>Climate change and reduction in resources due to drought.</li> </ul>
Little Bent- winged Bat	V		Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	<ul> <li>Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic.</li> <li>Destruction of caves that provide seasonal or potential roosting sites.</li> <li>Changes to habitat, especially surrounding maternity/nursery caves and winter roosts.</li> <li>Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals.</li> <li>Predation from foxes, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.</li> <li>Predation from feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.</li> <li>Introduction of exotic pathogens such as the White-nosed fungus.</li> <li>Hazard reduction and wildfire fires during the breeding season.</li> <li>Large scale wildfire or hazard reduction can impact on foraging resources.</li> <li>Poor knowledge of reproductive success and population dynamics.</li> </ul>
Large Bent- winged Bat	V	-	Hunt in forested areas, catching moths and other flying insects above the tree tops. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man- made structures.	<ul> <li>Disturbance by recreational cavers and general public accessing caves and adjacent areas particularly during winter or breeding.</li> <li>Loss of high productivity foraging habitat.</li> <li>Introduction of exotic pathogens, particularly white-nose fungus.</li> <li>Cave entrances being blocked for human health and safety reasons, or vegetation (particularly blackberries) encroaching on and blocking cave entrances.</li> <li>Hazard reduction and wildfire fires during the breeding season.</li> <li>Predation by feral cats.</li> </ul>
Greater Broad-nosed Bat		-	The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically, it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow- flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings	<ul> <li>Disturbance to roosting and summer breeding sites</li> <li>Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions</li> <li>Loss of hollow-bearing trees</li> <li>Pesticides and herbicides may reduce the availability of insects or result in the accumulation of toxic residues in individuals' fat stores</li> <li>Changes to water regimes are likely to impact food resources, as is the use of pesticides and herbicides near waterways.</li> </ul>



Common Name	BC Act	EPBC Act	Habitat & distribution	Threats
				<ul> <li>Climate change and reduction in resources due to drought.</li> </ul>
Yellow-bellied Shealthtail Bat	V	-	Yellow-bellied Sheathtail Bats are wide ranging in distribution and habitat type preferences. They forage high and fast through the canopy in taller forest types, flying lower through the strata in shorter forest types. They feed on insects and are nocturnally active. Typically, they roost in groups of 1 – 6 individuals in tree hollows and buildings. In treeless areas they have been recorded roosting in mammal burrows.	<ul> <li>Disturbance to roosting and summer breeding sites.</li> <li>Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.</li> <li>Loss of hollow-bearing trees; clearing and fragmentation of forest and woodland habitat.</li> <li>Pesticides and herbicides may reduce the availability of insects or result in the accumulation of toxic residues in individuals' fat stores.</li> <li>Climate change and reduction in resources due to drought.</li> </ul>

#### **Specific Impacts**

The proposal would result in the removal of 0.23 ha of PCT 841 - Forest Redgum - Pink Bloodwood open forest. The impacted vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for threatened microbats in the context of the site and adjacent areas of suitable habitat. In addition to vegetation to be cleared, approximately 8 hollow-bearing trees are expected to be impacted by the proposal. In regard to Bent-wing bats, no maternity caves or significant roosting habitat will be impact. Habitat to be impacted provides foraging, potential roosting and breeding resources for these species.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

(a) in the case of a threatened species, 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

The study area contains native vegetation communities that occur as a small patches or isolated trees within open agricultural pastureland. Approximately 0.23 ha of vegetation to be impacted provides foraging and roosting for microchiropteran bats, 8 hollow-bearing trees will be removed as part of the proposal and avoidance has been made where possible.

Whilst 0.23 ha of foraging and potential roosting habitat may be removed as part of the proposal, an abundance of similar or high-quality roosting opportunities occur in the wider locality. The removal of 0.23 ha would represent <1% of available habitat for these species. In addition, the removal of 8 hollow-bearing trees is likely to constitute only a small amount of breeding habitat for these species.

While vegetation to be removed represents foraging opportunities for microchiropteran bats, it is considered unlikely that the removal of this vegetation will significantly affect locally occurring microchiropteran bat populations, due to the small scale of the study area and the availability of similar and higher quality habitat adjacent to the study area and in the wider locality.

The action proposed is unlikely to have an adverse effect on the life cycle of hollow-dwelling microchiropteran bats to the point that these species are likely to be placed at risk of extinction.



(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

Not applicable.

(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

Approximately 8 hollow-bearing trees and 0.23 ha of native vegetation representing potential habitat for these species is likely to be affected by the proposed action.

#### (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

Habitat connectivity is not likely to be affected by the proposal. The majority of the study area occurs on previously disturbed land associated with agricultural pastureland. Approximately 0.23 ha of native vegetation is likely to be affected in the study area and vegetation removal will be largely limited to previously disturbed areas. Consequently, it is considered unlikely that the proposed action would significantly isolate or fragment potential habitat beyond which currently exists within the study area. As the proposal will result in disturbance to disturbed agricultural pastureland, and given the species high mobility, the proposed action is unlikely to represent significant increases to habitat isolation and or fragmentation.

#### (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,

A relatively small area of potential foraging and roosting habitat (0.23 ha & 8 hollow-bearing trees) will be affected by the proposed action. The proposal would not impact habitat considered critical (i.e. large maternity roosting areas) to the long-term survival of populations in the locality and is unlikely to further create a barrier to movement for these species.

#### (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 proposal will not impact on any declared area of outstanding biodiversity value.

(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.

With respect to microchiropteran bats, the proposal is consistent with three key threatening processes under the BC Act:

- clearing of native vegetation
- loss of hollow-bearing trees (hollow-dependant microbats0
- removal of dead wood and trees.

The extent of native vegetation clearing and habitat removal associated with the proposal is considered relatively small, 0.23 ha of marginal and fragmented habitat. Although the proposal will represent the loss of potential foraging and roosting habitat (approximately 8 hollow-bearing trees),



such habitat would only be a small component of locally occurring resources accessible to these species (<1% of available in 10 kms of the study area).

#### Conclusion

Approximately 0.23 ha potential habitat in the form of PCT 841 containing hollow-bearing trees (8), which may be used by these species for foraging and roosting purposes. Habitat to be impacted occurs as disturbed land associated with agricultural pastureland. The proposal will not increase fragmentation, and given the high mobility of assessed species, the proposal is unlikely to represent significant increases to habitat isolation and or fragmentation to these species. The habitat is not considered critical habitat to long term survival of these species within the locality. Given this, the proposal is considered unlikely to lead to a significant impact on these species their habitat.



# **EPBC Significance Assessments**

For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment, 2013). These significance assessments have been prepared for the following community and threatened species:

- Grey-headed Flying-fox (Pteropus poliocephalus)
- Koala (Phascolarctos cinereus)

# **Grey-headed Flying-fox**

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1. Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

#### Is this part of an important population:

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water. Grey-headed Flying-foxes can migrate up to 75 km north during the winter and during this time young flying-foxes establish camps.

With reference to DoEE's National Flying-fox monitoring viewer, there are no recorded Flying-fox camps within the study area (DoEE 2021). The closest significant recorded camps in relation to the study area include:

- Lismore (Rotary Park camp #255) about 15km to the east of the study area, according to the National Flying Fox monitoring viewer this camp includes 2500+ individuals in 2020
- Casino (camp #26) about 12km to the south-west of the study area, according to the National Flying Fox monitoring viewer this camp includes between 10,000+ individuals from surveys in 2019

Occurrences of this species within the study area are not at the limits of the species' distribution, nor are any maternity camps present in the study area, and as such the habitat within the study area can only be considered to represent a part of the foraging range of widely occurring individuals. However, the Grey-headed Flying-fox has no separate or distinct populations (DoE 2014a). The species constantly exchanges genetic information between camps throughout its geographic range. Therefore, the species occurs as one population and therefore any individuals that occur in the study area would be considered to form part of 'an important population'.

# An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

#### Lead to a long-term decrease in the size of an important population of a species

The proposal would impact about 0.23 ha of potential foraging habitat in the form of PCT 841 poor condition classes. Due to the nomadic nature of Grey-headed Flying-fox and their ability to forage up to 50 km from roost sites, the Grey-headed Flying-fox would not be restricted to habitat in the study area. Grey-headed Flying-fox are likely to be present in other parts of the locality as there is a large amount of potentially suitable habitat in the form of PCT841 mapped as occurring in the locality.



Although the proposal will add incrementally to the loss of a small amount (0.23 ha) of potential foraging habitat in the locality, the proportional impact is very small. Therefore, the proposal is not likely to lead to a long-term decrease in the size of the Grey-headed Flying-fox population.

#### Reduce the area of occupancy of an important population

The project would result in the removal of up to 0.23 ha of potential foraging habitat in the form of PCT 841 poor condition classes. The removal of 0.23 ha of vegetation, that contains varying sources of blossom and fruit trees that form part of the Grey-headed flying fox diet, does not comprises a significant proportion of foraging habitat available to the species in the surrounding locality. The removal of this 0.23 ha of potential foraging habitat would have a minimal impact on the area of occupancy of the species.



#### Figure E.1 Distribution map for Grey-headed Flying-fox (Department of the Environment, 2021)

#### Fragment an existing important population into two or more populations

Habitat connectivity is not likely to be affected by the proposal. The majority of the study area occurs within disturbed land (agriculture / pastureland). About 0.23 ha of potential foraging habitat is likely to be affected by the proposal with vegetation removal largely limited removal of isolated paddock trees. As the study area is disturbed in nature and doesn't disturb significant vegetation, the proposal would not further fragment or isolate any previously undisturbed patches of habitat than what already exists in the study area and locality. Furthermore, given that the Grey-headed Flying-fox is highly mobile and nomadic, the proposal would not present a significant barrier. It is not considered likely that habitat



would become further isolated or fragmented significantly beyond that currently existing in the study area.

#### Adversely affect habitat critical to the survival of a species

The foraging habitat within the study area meets the DECCW (2009) criteria for habitat critical for the survival of Grev-headed Flying-fox due to its proximity to existing camps (within 50km) but removal of 0.23 ha of isolated paddock trees of poor condition PCT 841 foraging habitat is unlikely to significantly impact on this species, given the abundance of higher quality myrtaceous foraging habitat within the greater locality.

#### Disrupt the breeding cycle of an important population

No roost sites/camps occur within the study area nor would the proposed action affect any roosts/camps in the locality. Therefore, it is unlikely that the proposed action would disrupt the breeding cycle of the population of Grey-headed Flying-fox.

#### Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

No. The action proposed would only affect about 0.23 ha of potential foraging habitat for this species. As this species is known to forage up to 50 km from roost sites, the action proposed is unlikely to significantly affect the availability of quality habitat for this species.

#### Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

It is not likely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become further established as a result of the proposed action.

#### Introduce disease that may cause the species to decline

No. There are no known diseases that are likely to increase in the area as a result of the proposed action.

Australian flying-foxes, including the Grey-headed Flying-fox, are natural reservoirs for at least three diseases- Australian Bat Lyssavirus (ABL), Hendra virus and Menangle virus. While injured and orphaned Grey-headed Flying-foxes have a higher chance of testing positive for ABL, it is unlikely the proposed action will introduce this disease.

White-nosed syndrome, a fungal disease causing widespread concern due to its impact upon bat populations in North America, has only been identified in microbats. The disease has not been identified in Australia.

#### Interfere substantially with the recovery of the species

Due to the relatively small foraging habitat likely to be affect by the proposed action (about 0.23 ha) and as no roost camps are located in the study area, the proposed action is not likely to interfere with the recovery of this species.

#### Conclusion

The Grey-headed Flying-fox frequents habitats that contain eucalypt blossom and native fruits such as figs, which are their favoured foods. The study area contains eucalypt species, these include those that are utilised by this species for blossom resources. A relatively small amount of foraging habitat 0.23 ha will be affected by the proposed action, although this is unlikely to be significant to local



populations, due to the abundance of similar and greater guality foraging habitat elsewhere within the study area and in the wider locality. There are no Grey-headed Flying-fox camps within the study area.

The proposed action is not considered to fragment any locally occurring populations, disrupt their breeding cycles, introduce disease that may cause the species to decline or interfere with the recovery of the species. The proposed action therefore considered unlikely to have a significant impact on the Grey-headed Flying-Fox.

# Koala

The Koala (Phascolarctos cinereus) is listed as Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013).

#### An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will result in one or more of the following:

#### Lead to a long-term decrease in the size of a population

The Koala was not recorded in the study area during the field assessment informing this report, however, records for this species occur within the locality of the study area. Whilst the study area is predominately disturbed, small patches of PCT 841 Forest Redgum - Pink Bloodwood open forest with presence of Eucalyptus tereticornis occurred. Eucalyptus tereticornis is listed as a Koala SEPP 2020 Schedule 2 Koala food tree species. The proposal would impact on approximately 0.23 ha of habitat in the form of PCT 841 (poor condition and isolated trees). Any population of Koala potentially using the study area are likely to be part of a viable population extending throughout the locality and are likely to be present in other parts of the locality. The proportional impact to this potential habitat is very small and would constitute <1% of available habitat for the species. Due to the proposal occurring within disturbed agricultural pastureland, it is considered unlikely that local population of Koala would be restricted to the study area. It is unlikely that the impact of 0.23 ha would lead to a long-term decrease in the size of the population for Koala.

#### Reduce the area of occupancy of the species

The proposal would impact on approximately 0.23 ha of habitat in the form of PCT 841 (poor condition and isolated trees). The proportional impact to this potential habitat is very small and would constitute <1% of available habitat for the species. Due to the proposal occurring within disturbed agricultural pastureland, it is considered unlikely that local population of Koala would be restricted to the study area. It is unlikely that the impact of 0.23 ha of habitat would result in significant reduction in area of occupancy for the population.

#### Fragment an existing population into two or more populations

Habitat within the study area is already fragmented at a local scale by the agricultural and primary production. Landscape scale fragmentation is unlikely to occur from the proposal as the work would involve removing vegetation from small, isolated patches rather than breaking apart of large blocks of vegetation into many smaller patches. Importantly, the proposal would not result in the breaking apart of large blocks of high-quality habitats. No further habitat fragmentation on a landscape scale would occur because of the proposal. Loss of small amount of potential habitat is likely to increase by a small extent. It is unlikely that the proposal would fragment the existing population into two or more populations.

#### Adversely affect habitat critical to the survival of a species



No critical habitat is listed for the Koala under the EPBC Act. However, the Koala Habitat Assessment Tool within the 'EPBC Act referral guidelines for the vulnerable Koala' was used to determine whether Koala habitat in the study area classifies as 'habitat critical to the survival of the Koala' (Figure 6.1). To be classified as habitat critical to the survival of the Koala vegetation must score 5 or above using the habitat assessment tool. A summary of the key assessment criteria and scoring for the study area against the referral guidelines is provided in Table 6.2 and illustrated in Figure 6.1 of the main report body.

Koala habitat in the study area scored 3 out of 10 (Table 6.2) using the Koala Habitat Assessment Tool. Therefore, habitat in the study area is not likely to constitute habitat critical to the survival of the species. A comparison of the proposal's potential impacts was assessed against Figure 2 of the 'EPBC Act referral guidelines for the vulnerable Koala' (Department of the Environment, 2014) to determine where impacts were likely to be adverse. As illustrated in Figure 6.1, it was concluded that the proposal is unlikely to have an adverse impact on the habitat critical for the species due to the following:

- Study area does not occur in an 'Area of Regional Koala Significance' (Department of Environment and Energy, 2021)
- The study area is disturbed and does not occur within an area of continuous remnant native vegetation or wildlife corridor (with large expanses of habitat cleared in the proposal locality for agricultural land use)
- The proposal will not fragment or impact habitat that is important to the recovery objectives for the species within the locality.
- the proposal is likely to impact relatively small area (0.23 ha) of potential Koala habitat.

It is unlikely that the impact of 0.23 ha of potential habitat for Koala in the study area will adversely affect the survival of the local Koala population.

#### Disrupt the breeding cycle of a population

Due to the proposal occurring within disturbed agricultural pastureland, it is considered unlikely that local population of Koala would be restricted to the study area. Habitat within the study area is already fragmented at a local scale by the agricultural and primary production. The impact of 0.23 ha of potential Koala habitat is unlikely to exacerbate movement or significantly reduce area of occupancy of breeding individuals for the population. It is unlikely the proposal would significantly disrupt the breeding cycle of the population of Koalas.

#### Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The habitat in the study area is not likely to be important to the long-term survival of the Koala. The study area does not occur in a mapped 'Area of Regional Koala Significance'. Potential habitat recorded in the study area is not considered important to the long-term survival of the species, with the proposal likely to impact approximately 0.23 ha of poor condition habitat in an existing highly disturbed agricultural landscape. Although the loss of native vegetation would be an incremental loss of local habitat, the guality and importance are not considered to be significant to the long-term survival of the population of Koala. While a small amount potential marginal foraging habitat would be impacted, it is unlikely to be of an extent that would cause this species to decline.

#### Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

It is unlikely that invasive species (such as introduced predators) that are harmful to the Koala would become further established as a result of the proposal.



#### Introduce disease that may cause the species to decline

It is unlikely that the proposal would significantly fragment a koala population to the point where dispersal is limited and therefore disease transmission between individuals is increased. As *Chlamydia* bacteria in Koalas and Koala Retrovirus is primarily transmitted between Koala individuals (DECC, 2008), it is unlikely that the proposal would introduce disease that may cause the species to decline.

#### Interfere substantially with the recovery of the species

A national recovery plan for the Koala has been prepared under the EPBC Act (March 2022). The goal of this plan is to 'stop the trend of decline in population size of the listed Koala, by having resilient, connected, and genetically healthy metapopulations across its range, and to increase the extent, quality and connectivity of habitat occupied.'(Department of Agriculture Water and the Environment 2022).

Potential habitat recorded in the study area is not considered important to the long-term survival of the species, with the proposal likely to impact approximately 0.23 ha of poor condition habitat in an existing highly disturbed agricultural landscape. Although the loss of native vegetation would be an incremental loss of local habitat, the quality and importance are not considered to be significant to the long-term survival of the population of Koala and would therefore not substantially interfere with the recovery of the species across its range.

At a state level, the proposal would not significantly interfere with the Saving Our Species recovery strategies or Approved NSW Recovery Plan (DECC, 2008). The study area does not occur within any priority management or koala management areas for the species (OEH, 2021). As a result the proposed action is unlikely to adversely interfere with the recovery of this species.

#### Conclusion

The proposal is considered unlikely to result in a significant effect on the Koala. Whilst approximately 0.23 ha of potential habitat will be impact, Koalas using the study area are likely to use habitat that extends through the locality and due to the small extent of impact expected within an existing disturbed area, it is considered unlikely that local population of Koala would be restricted to the study area. Given the extent of potentially suitable habitat that exists in the locality and the very small proportional impact likely to occur from the proposal, any impacts to the Koala are unlikely to be significant.



# Appendix G

Anabat call analysis





# Appendix 1Representative sonograms from the Bentley data set.<br/>X-axis (time)=10 msec per tick; time between pulses removed



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Miniopterus orianae





Miniopterus australis

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Rhinolophus megaphyllus



7/10/2021



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# H-1 Bentley Quarry Bushfire Assessment

RVC has mapped part of Lot 2 DP 1196757 as 'Vegetation Category 1', 'Vegetation Category 2' and 'Vegetation Buffer' bushfire prone land, as shown on Figure H.1. The location where the proposed quarry is located is not mapped as bushfire prone.

The proposal consists of an extractive industry which includes a site office. According to *Planning for Bush Fire Protection* (NSW RFS, 2019) this is considered 'Other Development'.

To demonstrate compliance with *Planning for Bush Fire Protection* (NSW RFS, 2019), as required by Section 4.14 of the EP&A Act 1979, a Bushfire Hazard Assessment has been presented in Table H.1. This indicates the proposal can comply with the requirements.



Figure H.1 Bushfire prone land mapping

#### Table H.1 Bush Fire Risk Assessment

Performance Criteria	Response
Asset Protection Zones (APZ)	<ul> <li>Based on the vegetation and slope of the area, the asset protection zone (APZ) required for the site office to achieve a Bushfire Attack Level (BAL) 29 is:</li> <li>North – 10 m (Grassland and upslope)</li> <li>East – 11 m (Grassland and &gt;0-5<sup>0</sup> slope)</li> <li>South – 10 m (Grassland and upslope)</li> <li>West – 10 m (Grassland and upslope)</li> <li>The required APZ is achievable within the constraints of the site.</li> </ul>
Construction standards	AS3959-2009 construction standards are not applicable to the site office, however, as it is a metal shed, it is considered to comply with BAL 29.
Access	The access is within 200 m of Bentley Road, is sealed and suitable for fire trucks.
Services	Electricity is not required initially and when it is it will be extended underground. Water is available on site from dams and rainwater tanks but due to the nature of the building and site, a dedicated water supply is not proposed.
Landscaping	The landscaping would be maintained, in accordance with Appendix 4 of NSW RFS (2019).



230 Harbour Drive, Coffs Harbour, New South Wales 2450 Australia www.ghd.com



Your ref: DA2022/0107 Our ref: 12547851

24 May 2022

Rachel Heath Planit Consulting PO Box 1623 Kingscliff NSW 2487

DA2022/0107 Bentley Quarry, Lot 2 DP1196757, 1465 Bentley Road Bentley – Detailed site investigation

Dear Rachel

# 1. Introduction

GHD Pty Ltd (GHD) was engaged by R&S Contracting Pty Ltd (R&S Contracting) to undertake a detailed site investigation (DSI) for contamination at the location of the proposed Bentley Quarry. Bentley Quarry is located at Lot 2 DP 1196757, 1465 Bentley Road, Bentley (the site).

### 1.1 Background

A development application for the proposed Bentley Quarry is currently with Richmond Valley Council (Council) for assessment. During the assessment process, some public submissions indicated part of the proposed quarry site was historically used as a crop dusting airstrip. Planes were reportedly refuelled and loaded with chemicals on the site.

To assist in the assessment of the development application, Council has requested the risk of contamination be investigated.

The proposed quarry area/site is 6.5 hectares, with a proposed extraction area of about 3.65 hectares. The existing quarry pit is about 1 hectare in area.

### 1.2 Objectives

The objective of this investigation was to determine if the site is suitable from a contamination perspective, for its intended use (as a quarry).

### 1.3 Scope of work

The scope of works for this investigation included:

- A preliminary site investigation (PSI) including:
  - A review of historical aerial photographs and records.
  - Site inspection.
- Collecting soil samples from 30 locations (SS01 to SS30) using a shovel.
- Laboratory analysis for contaminants of potential concern (COPC).
- Implementing a quality control and quality assurance (QA/QC) program.
- Preparation of this DSI letter report.

The Power of Commitment

# 2. Preliminary site investigation

A PSI was completed to identify potential sources of contamination. The outcomes of this investigation are presented below.

### 2.1 Review of historical aerials

A selection of historical aerial photographs was examined in order to assess past activities and land uses at the site. Photographs were examined from the years 1958, 1971, 1979, 1987, 1991, 1997, 2009, 2016 and 2021 with a 150 m buffer around the site. Copies of the aerial photographs are provided in the Lotsearch report in Attachment 1.

In summary, this showed the site was cleared prior to 1958 and primarily appears to have been used for grazing since this time. A quarry was established along the northern boundary and on the northern side of Bentley Road prior to 1971. The quarry appeared to still be actively used in 1979 but appeared to be covered in grass by 1987. The concrete pad, reportedly used for the airstrip was evident in the 1987 photograph. It appears some minor extraction had occurred within the quarry area prior to 1991 and was continuing in the 1997, 2009 and 2016 photographs. There appeared to be some minor disturbance adjacent to the concrete pad in 2009. By 2021 the whole former quarry area appears active again and an access road established. A house and shed have been built to the south of the site.

The airstrip is not clearly evident in any of the historical aerial photographs but based on anecdotal evidence and a slightly different colour in the grass, it is assumed the airstrip ran in an easterly direction from the concrete pad, as indicated on Figure 3.1.

### 2.2 Site inspection

A site inspection was undertaken on 12 April 2022 by an experienced Environmental Scientist. The purpose of the inspection was to identify and observe any areas of potential contamination, discuss historical use and current activities with site personnel and confirm proposed sampling locations.

Selected photographs taken during the inspection are provided in Table 4.2, and key features of the investigation area are shown on Figure 3.1. In summary, the site inspection and anecdotal evidence revealed:

- A portion of the site is currently used as a quarry.
- The remainder of the site is covered in thick grass, with the occasional tree.
- Two concrete pads with a stormwater pit in the centre are located in the south-east corner of the site.
   They are reported to be associated with the former airfield.
- A stockpile of material consisting of topsoil from the quarry footprint is located on the eastern side of the quarry pit.
- No obvious signs of contamination i.e., staining or odours were noted.

### 2.3 Potential sources of contamination

Potential sources of contamination associated with historical activities at the site include:

- Historical fuel and chemical storage and dispensing, associated with the former airfield.
- Pesticide and/or herbicides use from agricultural activities.
- Hydrocarbon impacts from spills and leaks associated with quarry and farm machinery.

Potential sources of off-site contamination are considered to be limited due to the agricultural nature of surrounding properties.

# 3. Methodology

### 3.1 Data Quality Objectives

The Data Quality Objective (DQO) process was applied to the DSI as described below, to ensure that data collection activities were appropriate and the stated objectives achieved.

A process for establishing data quality objectives for an investigation site has been defined by *Australian Standard AS4482.1* (2005) and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM), as amended by the *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)* (NEPC 2013)).

The DQO process involves seven steps as described and addressed in Table 3.1.

#### Table 3.1 Data quality objectives

#### Data Quality Objectives

#### Step 1: State the problem

It has been reported that a portion of the proposed quarry was used as an airstrip for crop dusting planes. Previous agricultural and quarrying activities may also have been a source of contamination. Investigations are required to assess potential contamination within the site and assess whether it is suitable for its intended use.

#### Step 2: Identify the decision

The identified decisions were:

- Do COPC concentrations within the site exceed the relevant assessment criteria?
- Is the data quantity and quality sufficient to assess the risk to humans and the environment?

Is the site suitable for its intended use?

#### Step 3: Identify inputs to the decision

Data input to the decision making process included:

Review of historical aerials and site inspection

Quantitative data gained via sampling and analysis gained during this investigation.

Adopted assessment criteria discussed in Section 3.4.

#### Step 4: Define the study boundaries

The spatial boundaries of the study were considered to be the proposed quarry area, as shown in Figure 2. Vertical boundaries of the study area were surface soils to a maximum depth of 0.1 m. Temporal boundaries include historical aerial imagery as discussed in Section 2.1 and data collected during this investigation.

#### Step 5: Develop an analytical approach

The analytical approach was to collect soil samples from 30 locations (as described in Section 3.2.1) within the site and assess whether the soil contaminant concentrations exceed the adopted assessment criteria presented in Section 3.4. The data quality was to meet the QA/QC criteria discussed in Section 3.5.

#### Step 6: Specify limits on decision errors

Two types of decision errors were considered possible:

The site is considered 'uncontaminated' when in fact it is contaminated.

The site is considered 'contaminated' when in fact it is not contaminated.

The implications of the first decision error were considered less acceptable than the second, as the first error could involve unacceptable risk to health and/or the environment. The risks associated with the second error are primarily limited to unwarranted remediation. The limits on the first decision error were therefore addressed by use of conservative investigation criteria (which incorporate a factor of safety).

The risk of the second decision error occurring was minimised by reducing the potential for unrepresentative data which could arise from the following causes:

Sampling errors which occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the site, (i.e. the samples collected are not representative of the site conditions).

Measurement errors which occur during sample collection, handling preparation, analysis and data reduction.

To minimise the potential for unrepresentative data, Data Quality Indicators (DQIs) outlined in Section 3.5 were evaluated including completeness, comparability, representativeness, precision and accuracy.

#### Data Quality Objectives

#### Step 7: Optimise the design for obtaining data

The sampling program (Section 3.2) was designed to provide sufficient information to allow a sound scientific and statistical evaluation of the questions set out in Step 2. Works were completed in accordance with NSW Environment Protection Authority (EPA) guidelines and accepted industry standards. To optimise the design of the investigations, a sampling and analytical program was prepared to specifically target information required to meet the project objectives.

### 3.2 Sampling

### 3.2.1 Sampling locations

Nineteen sampling locations targeted the area historically used as the crop-dusting airstrip. This was based on the area being approximately 0.8 hectares and the sampling rate recommended in the *Sampling Design Guidelines* (NSW EPA 1995).

Due to the recent extraction within the existing quarry area which exposed fresh, natural material, that was unlikely to be contaminated, the area was inspected for signs of contamination. In the absence of any signs of contamination, a representative sample of the quarry floor and two samples from the stockpile were collected.

Due to the low risk of contamination across the remainder of the site, the collection of 8 representative samples from random locations was considered adequate.

The sampling locations are shown on Figure 3.1.

### 3.2.2 Soil sampling methodology

All samples were collected in general accordance with GHD's Standard Field Operating Procedures (SFOP) by a GHD Environmental Scientist on 12 April 2022. The SFOP aims to ensure that all environmental samples were collected by a set of uniform and systematic methods as required by the QA system. The SFOP describes decontamination procedures, sample identification procedures, chain of custody information, sample duplicate frequency and field equipment calibration requirements.

The following procedures were followed for all sampling work:

- Surface samples were collected using a shovel.
- Soil samples were recovered directly from the shovel using a clean pair of gloves for each sample to avoid cross contamination.
- Soils were described in general accordance with Unified Soil Classification System (USCS).
- Samples were placed in laboratory-supplied jars/bags appropriate for the analysis required and placed on ice.
- Samples were stored in a dedicated container for transport to the project analytical laboratory with chain of custody documentation.
- Samples were submitted to a National Association of Testing Authority (NATA) accredited laboratory to enable sufficient time for extraction and analysis within holding times specified.
- Soil samples were submitted for analysis from each sample location.
- Field equipment was cleaned between sampling locations with decontamination protocols consistent with the methods recommended by AS4482.1: 2005. Equipment was cleaned using a phosphate free detergent (e.g. 'Decon Neutracon') and final rinse with deionised water.
- QA/QC sampling was undertaken through collection of intra-laboratory duplicates as discussed in Section 3.5.

## 3.3 Laboratory Analysis

The samples were submitted to a NATA accredited laboratory Eurofins Pty Ltd (Eurofins) for analysis, as indicated in Table 3.2. The analysis was based on the COPC associated with the potential sources of contamination identified in the PSI (refer to Section 2).

Table 3.2	Laboratory analysis

Area	No. samples	Analysis
Former air strip	19	Organochloride pesticides (OCP)
		Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
		Total Recoverable Hydrocarbons (TRH).
		Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN)
Quarry	3	TRH/BTEXN
		Heavy metals
Remaining area	8	OCP
		Heavy metals



Figure 3.1 Sample locations

6

### 3.4 Assessment criteria

Concentrations of COPC were compared to assessment criteria provided in the NEPM (NEPC, 2013) and in CRC CARE (2011) *Health Screening Levels for petroleum hydrocarbons in soil and groundwater*.

As the site is proposed to be used for an extractive industry, the results were compared against NEPM investigation levels appropriate for a commercial/industrial land use setting and are summarised in Table 3.3.

Ecological investigation levels (EILs) for nickel were based on the added contaminant limit that was calculated from an average cation exchange capacity (CEC) of 35 meq/100g and an average ambient background concentration of 64 mg/kg. The added contaminant limit for the zinc EIL was also based on the average CEC of 35 meg/100g, an average ambient background concentration of 86 mg/kg and a conservative pH of 4.5.

Title	Level	Abbr.	Reference
Soil HSLs (Health screening levels for vapour intrusion)	Commercial/ Industrial	HSL D	Schedule B1 Table 1A(3) Conservative sand criteria applied.
Soil HILs (Health investigation levels)	Commercial/ Industrial	HIL D	Schedule B1 Table 1A(1)
Soil ESLs (Ecological screening levels)	Commercial/ Industrial	ESLs for Commercial/ Industrial	Schedule B1 Table 1B(6) Conservative course soil criteria applied.
Soil EILs (Ecological investigation levels)	Commercial/ Industrial	EILs for Commercial/ Industrial	Schedule B1 Tables 1B(1) to 1B(5) Except nickel and zinc, as explained above, the lowest added contaminant limits were applied as conservative criteria.
Management limits	Commercial/ Industrial	Commercial/ Industrial management limit	Schedule B1 Table 1B(7) Conservative course soil criteria applied.
Soil Direct Contact HSLs	Commercial/ Industrial	HSL D	CRCCare Appendix B Table B4
Soil Direct Contact Intrusive Maintenance Worker	Direct Contact Intrusive Works	Direct Contact Intrusive Works	CRCCare Appendix B Table B4
Soil HSL for Vapour Intrusion for Intrusive Maintenance Workers	Intrusive Works Sand 0 m to <2 m	Intrusive Works Sand 0 m to <2 m	CRCCare Appendix B Table B3

Table 3.3 Soil assessment criteria

### 3.5 Data quality indicators

QA/QC practices were applied to all stages of data gathering and subsequent sample handling procedures and were designed to provide control over both field and laboratory operations. Additionally, the analytical laboratory completed their own internal QA procedures, as required by NATA registration, during the analysis of samples. The laboratory quality control procedures included analysis of method blanks, laboratory duplicate samples, laboratory control samples, matrix spike samples and surrogates.

Results of the QA/QC program were used to determine if the data met the objectives of the study and are acceptable for the intended use.

# 4. Results

### 4.1 Observations

The material encountered during the investigation is summarised in Table 4.1. Photos of the material are provided in Table 4.2. No staining or odours were detected nor was any asbestos observed.

Table 4.1	Soil description
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Area	Soil Description	
Former air strip	Clay with trace sand, low plasticity, dark brown, moist with rootlets and grass	
Quarry	Clayey gravel, brown, moist	
Remaining area	Clay with trace sand, low plasticity, dark brown, moist with rootlets and grass	

Table 4.2 Priolographis	Table 4.2	Photographs
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## 4.2 Laboratory Results

Laboratory documents and a summary table of results are attached to this letter.

In summary, there were no exceedances of the adopted assessment criteria.

## 4.3 Quality assurance/quality control

### 4.3.1 Field duplicates

Three duplicate samples were analysed which meets the duplicate sampling rate of 10% defined in the NEPM.

Soil duplicate relative percent difference (RPD) results were compared with the acceptable RPDs for each laboratory limit of reporting (LOR) multiplier range which was considered to be 200 (1-10 x LOR); 50 (10-30 x LOR); 50 (>30 x LOR). All RPD results were within the acceptance criteria.

Inter-laboratory duplicates were not collected and analysed as part of this investigation. The lack of interlaboratory duplicate samples means that verification of the primary laboratory analysis could not be carried out; however, given the relatively small number of samples used in this assessment, analysis of three intralaboratory duplicate sample and using a NATA accredited laboratory is considered sufficient for the purposes of this assessment.

Rinsate blanks were not collected and therefore a quantitative assessment of the potential for cross contamination in the field wasn't undertaken. Given the generally low concentrations of COPC and the use of GHD's SFOP and decontamination protocols, it is considered unlikely that cross contamination may have occurred to materially affect the overall results.
Trip blanks and trip spikes were not collected during the investigation and therefore an assessment of volatile loss or introduction of volatiles during transport could not be conducted. Given that the main COPC are non to semi-volatile only and that samples were analysed within the recommended holding times it is considered unlikely that significant volatile loss from samples would have occurred.

Overall, the soil sampling program and analytical data was considered to meet the appropriate QA/QC standards, taking into consideration the lack of inter-laboratory duplicates, rinsates, trip blanks and trip spikes.

#### 4.3.2 Laboratory program

The NATA certified laboratories utilised for this project (Eurofins MGT) undertook their own QA and QC procedures. GHD has reviewed the internal laboratory control data provided within the laboratory reports, which are attached to this letter. All laboratory QA and QC data was within acceptable limits.

#### 4.3.3 QA/QC Summary

Based on the results and discussion above, the soil sampling program and analytical data was considered to meet the appropriate QA/QC standards for the investigation.

## 5. Conclusion

Based on this assessment and taking into account the limitations in Section 6, the site is considered suitable from a contamination perspective for its intended use as a quarry.

## 6. Limitations

This report has been prepared by GHD Pty Ltd for R&S Contracting and may only be used and relied on by R&S Contracting for the purpose as set out in Section 1 of this report.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect except where GHD has been negligent in the adoption of those Assumptions. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by R&S Contracting and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Inspections undertaken in respect of this Report are limited to visual inspections and limited soil investigations only. The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Except as otherwise expressly stated in this Report GHD makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials ("ACM") on the site. If fill material has been imported on to the site at any time, or if any buildings constructed prior to the prohibition date of asbestos in Australia, 31 December 2003, have been demolished on the site or material from such buildings disposed of on the site, the site may contain asbestos or ACM.

Except as otherwise expressly stated in this Report, GHD makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.

## 7. References

AS4482.1:2005 - Guide to the investigation and sampling of sites with potentially contaminated soil.

CRC CARE 2011. Health Screening Levels for petroleum hydrocarbons in soil and groundwater. Technical report series No. 10. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE). Friebel, E. and Nadebaum, P.

NEPC 2013. National Environment Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater.

NSW EPA 1995. Sampling Design Guidelines. NSW Environmental Protection Authority.

Regards

Ren

Ben Luffman Senior Environmental Consultant

+61 2 66505613 ben.luffman@ghd.com

Attachments:

Historical aerial photographs Summary results tables Laboratory results

# Attachments

# Attachment 1

## **Historical aerial photographs**



Date: 06 Apr 2022 Reference: LS030896 EA Address: 1465 Bentley Road, Bentley, NSW 2480

### Aerial Imagery 2021

1465 Bentley Road, Bentley, NSW 2480





Aerial Imagery 2016 1465 Bentley Road, Bentley, NSW 2480





Aerial Imagery 2009 1465 Bentley Road, Bentley, NSW 2480





### Aerial Imagery 1997

1465 Bentley Road, Bentley, NSW 2480





### Aerial Imagery 1991

1465 Bentley Road, Bentley, NSW 2480





Aerial Imagery 1987 1465 Bentley Road, Bentley, NSW 2480





Aerial Imagery 1979 1465 Bentley Road, Bentley, NSW 2480





Aerial Imagery 1971 1465 Bentley Road, Bentley, NSW 2480





Aerial Imagery 1958 1465 Bentley Road, Bentley, NSW 2480





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# Attachment 2

## **Summary results tables**



#### Attachment 2 Table 1 Summary results

					T				4-1-							DTEV								040		
			Inor	ganics		-		Me	lais	1	1	1				BIEXN			1		1	IRF	1 - NEPM 2	013	<del></del>	
			Moisture Content (%)	Cation exchange sapacity	Arsenic	Cadmium	Chromium (III+VI)	Copper	-ead	Mercury	Vickel	Zinc	3enzene	Toluene	Ethylbenzene	(o) Xylene (o)	Kylene (m & p)	Kylene Total	Vaphthalene	<sup>-</sup> 1 (C6-C10 minus 3TEX)	26-C10 Fraction	=2 (>C10-C16 minus Vaphthalene)	>C10-C16 Fraction	=3 (>C16-C34 ⁻raction)	=4 (>C34-C40 -raction)	-C10-C40 (Sum of Fotal)
			%	meg/100g	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	i ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka	ma/ka
EQL			1	0.05	2	0.4	5	5	5	0.1	5	5	0.1	0.1	0.1	0.1	0.2	0.3	0.5	20	20	50	50	100	100	100
NEPM 2013 EIL-Commercial/Industrial																										
>=0m, <2m					160		310 <sup>#1</sup>	85 <sup>#2</sup>	1,800		664 <sup>#3</sup>	276#4							370							
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coa	rse Soil																									
>=0m. <2m								1					75	135	165			180		215#5			170 <sup>#6</sup>	1.700	3.300	
NEPM 2013 Table 1A(1) HIL D Comm/Ind					3.000#7	900	3,600#8	240,000	1.500#9	730#10	6.000	400.000												.,		
NEPM 2013 Table 1B(7) Management Limits Co	mm / Ind. Coarse Soil				0,000		0,000	,	.,		-,	,									700#11		1 000#11	3 500	10 000	
CRC CARE 2011 Soil Direct Contact HSL-D Com	nercial / Industrial												430	99 000	27 000			81 000	11 000	26 000	700	20,000	1,000	27 000	38,000	
CRC CARE 2011 Soil HSL Van Int Intrusive Works	0 to <2m Sand												77	NI #12	NII #12			NII #12	NII #12	NII #12		NI #12		21,000	00,000	
NEPM 2013 Table 1A(3) HSL D Comm/Ind Soil for	Vanour Intrusion Sand												11	INL	INL			INL	INL	INL		INL				
	vapour mitusion, Sand												2	NII #12	NII #12			220	NII #12	260 <sup>#5</sup>		NII #12				
>=011, < 111													5		INL			230	INL	200		INL				
Data Eiold ID	Donth	Lab Banart																								
			15	24	0.1	<0.4	00	26	<e.< td=""><td>&lt;0.1</td><td>70</td><td>80</td><td>&lt;0.1</td><td>&lt;0.1</td><td>-0.1</td><td>&lt;0.1</td><td>&lt;0.0</td><td>&lt;0.2</td><td>&lt;0 E</td><td>&lt;20</td><td>&lt;20</td><td>&lt;50</td><td><e0< td=""><td>&lt;100</td><td>&lt;100</td><td>&lt;100</td></e0<></td></e.<>	<0.1	70	80	<0.1	<0.1	-0.1	<0.1	<0.0	<0.2	<0 E	<20	<20	<50	<e0< td=""><td>&lt;100</td><td>&lt;100</td><td>&lt;100</td></e0<>	<100	<100	<100
12/04/2022 3301_0.0-0.1	0-0.1	000070/004757	10	- 34	Z.1	<0.4	00	20	<0 <5	<0.1	13	09	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 5502_0.0-0.1	0-0.1	000070	22	-	<2	< 0.4	120	21	<5	<0.1	0/	100	<0.1	<0.1	<0.1	<0.1	<0.2	< 0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 \$505_0.0-0.1	0 - 0.1	880878	32	-	<2	<0.4	71	14	56	<0.1	110	93 54	<u.1< td=""><td><u. i<="" td=""><td>&lt;0. I</td><td>&lt;0. I</td><td>&lt;0.Z</td><td>&lt;0.5</td><td>&lt;0.5</td><td>~20</td><td>~20</td><td>&lt;50</td><td>&lt;00</td><td>&lt;100</td><td>&lt;100</td><td>&lt;100</td></u.></td></u.1<>	<u. i<="" td=""><td>&lt;0. I</td><td>&lt;0. I</td><td>&lt;0.Z</td><td>&lt;0.5</td><td>&lt;0.5</td><td>~20</td><td>~20</td><td>&lt;50</td><td>&lt;00</td><td>&lt;100</td><td>&lt;100</td><td>&lt;100</td></u.>	<0. I	<0. I	<0.Z	<0.5	<0.5	~20	~20	<50	<00	<100	<100	<100
12/04/2022 S304_0.0-0.1	0 - 0.1	880878	31	-	29	<0.4	71	14	8.0	<0.1	34	59	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	
12/04/2022 1 001	0 - 0 1	880878	31	-	<2.9	<0.4	100	20	8.0	<0.1	67	81	-	-		-	-	-	-	-	-	-	-		<u> </u>	+ -
12/04/2022 SS06_0.0-0.1	0 - 0 1	880878	33	-	<2	<0.4	95	20	6.4	<0.1	48	70	-	-		_	_	_	_	_	_	-	_		<u> </u>	-
12/04/2022 SS07_0.0-0.1	0 - 0 1	880878	30	-	<2	<0.4	84	15	<5	<0.1	53	69	-	-	-	-	-	-	_	-	-	-	-	-	<u> </u>	
12/04/2022 SS08_0.0-0.1	0 - 0 1	880878	38	-	<2	<0.4	89	18	<5	<0.1	58	87	-	-	-	-	-	-	_	-	-	-	-	-	<u> </u>	
12/04/2022 SS09 0.0-0.1	0 - 0.1	880878	48	-	<2	<0.4	98	23	<5	<0.1	52	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12/04/2022 SS10 0.0-0.1	0 - 0.1	880878	41	-	<2	< 0.4	54	14	<5	< 0.1	53	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12/04/2022 SS11 0.0-0.1	0 - 0.1	880878	26	-	<2	< 0.4	58	14	5.5	< 0.1	39	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12/04/2022 SS12 0.0-0.1	0 - 0.1	880878	35	-	<2	< 0.4	93	19	<5	< 0.1	74	92	< 0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 FD02	0 - 0.1	880878	32	-	<2	< 0.4	94	22	<5	<0.1	79	110	< 0.1	<0.1	<0.1	< 0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	140	<100	140
12/04/2022 SS13_0.0-0.1	0 - 0.1	880878	40	-	<2	<0.4	78	21	<5	<0.1	66	91	<0.1	<0.1	<0.1	<0.1	<0.2	< 0.3	< 0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS14_0.0-0.1	0 - 0.1	880878	35	-	<2	<0.4	86	21	<5	<0.1	74	100	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS15_0.0-0.1	0 - 0.1	880878/884757	43	36	<2	<0.4	92	21	7.0	<0.1	63	110	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	<0.5	<20	<20	<50	<50	140	<100	140
12/04/2022 SS16_0.0-0.1	0 - 0.1	880878	44	-	<2	<0.4	81	28	<5	<0.1	58	150	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS17_0.0-0.1	0 - 0.1	880878	55	-	<2	<0.4	68	18	<5	<0.1	48	92	<0.1	<0.1	<0.1	<0.1	<0.2	< 0.3	< 0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS18_0.0-0.1	0 - 0.1	880878	44	-	<2	<0.4	96	22	<5	<0.1	66	110	<0.1	<0.1	<0.1	<0.1	<0.2	< 0.3	< 0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS19_0.0-0.1	0 - 0.1	880878	36	-	<2	<0.4	100	18	<5	<0.1	71	74	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS20_0.0-0.1	0 - 0.1	880878	32	-	<2	<0.4	110	21	<5	<0.1	75	77	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS21_0.0-0.1	0 - 0.1	880878	33	-	<2	<0.4	100	19	<5	<0.1	73	78	<0.1	<0.1	<0.1	<0.1	< 0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS22_0.0-0.1	0 - 0.1	880878	34	-	<2	<0.4	57	22	<5	<0.1	49	100	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	120	<100	120
12/04/2022 FD03	0 - 0.1	880878	39	-	<2	<0.4	64	22	<5	<0.1	48	120	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	190	<100	190
12/04/2022 SS23_0.0-0.1	0 - 0.1	880878	34	-	<2	<0.4	110	21	<5	<0.1	75	92	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	110	<100	110
12/04/2022 SS24_0.0-0.1	0 - 0.1	880878	35	-	<2	<0.4	110	22	<5	<0.1	78	99	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	100	<100	100
12/04/2022 SS25_0.0-0.1	0 - 0.1	880878/884757	29	35	<2	<0.4	130	21	<5	<0.1	87	92	<0.1	<0.1	<0.1	<0.1	<0.2	< 0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
12/04/2022 SS26_0.0-0.1	0 - 0.1	880878	40	-	<2	<0.4	100	17	<5	<0.1	62	75	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	180	<100	180
12/04/2022 SS27_0.0-0.1	0 - 0.1	880878	40	-	<2	<0.4	110	18	5.0	< 0.1	65	80	< 0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	160	<100	160
12/04/2022 SS28_0.0-0.1	0 - 0.1	880878	35	-	<2	<0.4	96	16	<5	<0.1	61	/4	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	120	<100	120
12/04/2022 SS29_0.0-0.1	0 - 0.1	880878	35	-	<2	<0.4	99	16	<5	<0.1	61	80	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	150	<100	150
12/04/202215530 0.0-0.1	10 - 0.1	1880878	32		<2	< 0.4	90	16	<5	<().1	63	1 /9	<0.1	<().1	< 0.1	<().1	< 0.2	< 0.3	< 0.5	<20	<20	<50	<50	130	<100	130

Comments

#1 Generic - based on 1% clay content

#2 Generic - based on pH 4.5

#3 Based on CEC = 35 cmol/kg and average background concentration of 64 mg/kg #4 Generic - based on CEC = 35 cmol/kg, pH 4.5 and average background concentration of 86 mg/kg

#5 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#6 Errata 30 April 2014 - Naphthalene should not be subtracted from >C10-C16 (as there is no separate ESL for naphthalene)

#7 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (refer Schedule B7).

#8 In the absence of a guideline value for total chromium, chromium VI value adopted

#9 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific bioavailability should be considered where appropriate.

#10 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is present, or suspected to be present.

#11 Separate management limits for BTEX & naphthalene are not available hence should not be subtracted from the relevant fractions to obtain F1 & F2

#12 Not limiting: Derived soil HSL exceeds soil saturation concentration

#### **Bentley Quarry DSI**



#### Attachment 2 Table 1 Summary results

					TR	I - NEPN	1 1999													C	C Pestici	ides											·,
					tion	tion	tion	n of	le AVic	chlorine AVic				in						DD - Lab		alpha)	(beta)	ulfate		de		ne)		oxide	nzene		
				6-C9 Fractio	:10-C14 Frac	15-C28 Frac	29-C36 Frac	:10-C36 (Sun otal)	)rganochlorin esticides EP,	)ther organoc esticides EP/	,4'-DDE	-BHC	Jdrin	ldrin + Dieldr	-BHC	chlordane	-BHC	,4 DDD	,4 DDT	DT+DDE+DI alc	ieldrin	indosulfan I (	indosulfan II	indosulfan Su	indrin	indrin aldehy	indrin ketone	-BHC (Lindaı	leptachlor	leptachlor ep	lexachlorobe	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	oxaphene
				O ma/ka			O ma/ka				4 ma/ka	a ma/ka				O ma/ka	D ma/ka	4 ma/ka	4 ma/ka			Ш ma/ka	Ш ma/ka	Ш ma/ka	Ш ma/ka	Ш ma/ka	Ш ma/ka	ס ma/ka				≥ ma/ka	
FOI				20	20	50 F	111g/Kg 50	50	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	μ <u>γ</u> /κ <u>γ</u>	0.05	0.5
NEPM 2013	-II -Commercial/Industrial			20	20		50		0.1	0.1	0.00	0.00	0.00	0.00	0.00	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.5
>=0m <2m																			640	640													
NEPM 2013	Table 1B(6) ESLs for Comm/Ind_Coa	arse Soil																	010	010													
>=0m <2n																																	
NEPM 2013	Table 14(1) HIL D Comm/Ind													45		530				3 600					100				50		80.000	2 500	160
NEDM 2012	Table 1R(7) Management Limite C	amm / Ind. Coorce Soil														000				0,000					100						00,000	2,000	100
CRC CARE	2011 Soil Direct Contact HSL-D Com	mercial / Industrial																															
	2011 Soil HSL Van Int Intrusive Work	n 0 to <2m Sand																															
NEDM 2013	Table 1A(3) HSL D Comm/Ind Soil fo	s,0 to <211,3dilu																															
		i vapour mirusion, Sanu																															
2-011, S 11																																	
Data	Field ID	Donth	Lab Bonort																														
Date				<20	<20	<50	<50	<50	1	1	1	1 1																		<del></del>			T
	12/04/2022 \$501_0.0-0.1	0-0.1	000070/004737	<20	<20	<50	<50	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<u>⊢-</u> /	<u> </u>	<u> </u>	
	12/04/2022 8502_0.0-0.1	0 - 0.1	880878	<20	<20	<50	<50	<50					-		-	-	-	-	-	-		-	-	-		-	-	-	-	+	<u> </u>	<u> </u>	
	12/04/2022 SS04 0 0-0 1	0 = 0.1	880878	-20	-20	-00	-00	-00	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<50	<0.05	<0.5
	12/04/2022 ED01	0 - 0 1	880878	-	-	-	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<50	<0.05	<0.5
	12/04/2022 SS05 0.0-0.1	0 - 0.1	880878	-	-	-	-	-	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS06 0.0-0.1	0 - 0.1	880878	-	-	-	-	-	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS07 0.0-0.1	0 - 0.1	880878	-	-	-	-	-	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS08 0.0-0.1	0 - 0.1	880878	-	-	-	-	-	<0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS09_0.0-0.1	0 - 0.1	880878	-	-	-	-	-	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<50	<0.05	< 0.5
	12/04/2022 SS10_0.0-0.1	0 - 0.1	880878	-	-	-	-	-	< 0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS11_0.0-0.1	0 - 0.1	880878	-	-	-	-	-	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<50	<0.05	< 0.5
	12/04/2022 SS12_0.0-0.1	0 - 0.1	880878	<20	<20	<50	<50	<50	<0.1	<0.1	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	<0.1	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	<50	<0.05	<0.5
	12/04/2022 FD02	0 - 0.1	880878	<20	<20	53	110	163	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	<0.5
	12/04/2022 SS13_0.0-0.1	0 - 0.1	880878	<20	<20	<50	<50	<50	< 0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS14_0.0-0.1	0 - 0.1	880878	<20	<20	<50	<50	<50	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	<50	< 0.05	<0.5
	12/04/2022 \$\$15_0.0-0.1	0-0.1	880878/884757	<20	<20	<b>88</b>	93	181	< 0.8	< 0.8	<0.2	<0.2	<0.2	<0.Z	<0.2	< 0.4	<0.2	<0.2	<0.2	<0.Z	<0.2	<0.2	<0.2	<0.2	<0.Z	<0.2	<0.2	<0.2	<0.2	<0.2	<200	<0.05	< 0.5
	12/04/2022 5516_0.0-0.1	0 - 0.1	000070	<20	<20	<50	<50	<50	<0.1	<0.1	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	<50	< 0.05	<0.5
	12/04/2022 SS17_0.0-0.1	0 - 0.1	880878	<20	<20	<50	55	55	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<50	<0.05	<0.5
	12/04/2022 SS19_0.0-0.1	0 = 0.1	880878	<20	<20	<50	50	50	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<50	<0.05	<0.5
	12/04/2022 SS20_0.0-0.1	0 - 0 1	880878	<20	<20	<50	<50	<50	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<50	<0.05	< 0.5
	12/04/2022 SS21 0.0-0.1	0 - 0.1	880878	<20	<20	<50	69	69	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS22 0.0-0.1	0 - 0.1	880878	<20	24	<50	100	124	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 FD03	0 - 0.1	880878	<20	<20	67	150	217	<0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS23_0.0-0.1	0 - 0.1	880878	<20	<20	<50	95	95	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS24_0.0-0.1	0 - 0.1	880878	<20	<20	<50	78	78	<0.1	<0.1	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	<50	<0.05	<0.5
	12/04/2022 SS25_0.0-0.1	0 - 0.1	880878/884757	<20	<20	<50	54	54	<0.1	<0.1	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	<0.05	< 0.5
	12/04/2022 SS26_0.0-0.1	0 - 0.1	880878	<20	<20	76	120	196	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	12/04/2022 SS27_0.0-0.1	0 - 0.1	880878	<20	<20	58	120	178	<0.1	<0.1	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	<50	<0.05	<0.5
	12/04/2022 SS28_0.0-0.1	0 - 0.1	880878	<20	<20	<50	93	93	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	<0.5
	12/04/2022 SS29_0.0-0.1	0 - 0.1	880878	<20	<20	55	120	175	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
1	12/04/2022ISS30_0 0-0 1	0 - 0 1	880878	<20	<20	<50	100	100	<() 1	<() 1	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<50	<0.05	<() 5

Comments

#1 Generic - based on 1% clay content

#2 Generic - based on pH 4.5

#3 Based on CEC = 35 cmol/kg and average background concentration of 64 mg/kg #4 Generic - based on CEC = 35 cmol/kg, pH 4.5 and average background concentration of 86 mg/kg

#5 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#6 Errata 30 April 2014 - Naphthalene should not be subtracted from >C10-C16 (as there is no separate ESL for naphthalene)

#7 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (refer Schedule B7).

#8 In the absence of a guideline value for total chromium, chromium VI value adopted

#9 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific bioavailability should be considered where appropriate.

#10 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is present, or suspected to be present.

#11 Separate management limits for BTEX & naphthalene are not available hence should not be subtracted from the relevant fractions to obtain F1 & F2

#12 Not limiting: Derived soil HSL exceeds soil saturation concentration



#### Attachment 2 Table 2 RPD Table

	Inorganics				Me	tals							BTEXN			
-	Moisture Content (%)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Naphthalene
	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	1	2	0.4	5	5	5	0.1	5	5	0.1	0.1	0.1	0.1	0.2	0.3	0.5

LOR

Date	Field ID	Lab Report Number	Matrix Type																
12/04/2022	SS04_0.0-0.1	880878	Soil	32	<2	<0.4	71	14	5.6	<0.1	47	54	-	-	-	-	-	-	-
	FD01	880878	Soil	31	2.9	<0.4	71	12	8.0	<0.1	34	59	-	-	-	-	-	-	-
RPD (%)				3	37	0	0	15	35	0	32	9	-	-	-	-	-	-	-
12/04/2022	SS12_0.0-0.1	880878	Soil	35	<2	<0.4	93	19	<5	<0.1	74	92	<0.1	<0.1	<0.1	<0.1	< 0.2	<0.3	<0.5
	FD02	880878	Soil	32	<2	<0.4	94	22	<5	<0.1	79	110	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	< 0.5
RPD (%)	·		•	9	0	0	1	15	0	0	7	18	0	0	0	0	0	0	0
12/04/2022	SS22_0.0-0.1	880878	Soil	34	<2	<0.4	57	22	<5	<0.1	49	100	<0.1	<0.1	<0.1	<0.1	< 0.2	< 0.3	<0.5
	FD03	880878	Soil	39	<2	<0.4	64	22	<5	<0.1	48	120	<0.1	<0.1	<0.1	<0.1	< 0.2	<0.3	<0.5
RPD (%)	*		•	14	0	0	12	0	0	0	2	18	0	0	0	0	0	0	0

\*RPDs have only been considered where a concentration is greater than 1 times the LOR.

\*\*Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: 200 (1 - 10 x LOR); 50 (10 - 30 x LOR); 50 ( > 30 x LOR) ) \*\*\*Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

#### 12547851 Bentley Quarry



#### Attachment 2 Table 2 RPD Table

		TRH	- NEPM	2013				TRH	- NEPM	1999	
F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
20	20	50	50	100	100	100	20	20	50	50	50

LOR

Date	Field ID	Lab Report Number	Matrix Type												
12/04/2022	SS04_0.0-0.1	880878	Soil	-	-	-	-	-	-	-	-	-	-	-	-
	FD01	880878	Soil	-	-	-	-	-	-	-	-	-	-	-	-
RPD (%)				-	-	-	-	-	-	-	-	-	-	-	-
12/04/2022	SS12_0.0-0.1	880878	Soil	<20	<20	<50	<50	<100	<100	<100	<20	<20	<50	<50	<50
	FD02	880878	Soil	<20	<20	<50	<50	140	<100	140	<20	<20	53	110	163
RPD (%)				0	0	0	0	33	0	33	0	0	6	75	106
12/04/2022	SS22_0.0-0.1	880878	Soil	<20	<20	<50	<50	120	<100	120	<20	24	<50	100	124
	FD03	880878	Soil	<20	<20	<50	<50	190	<100	190	<20	<20	67	150	217
RPD (%)				0	0	0	0	45	0	45	0	18	29	40	55

\*RPDs have only been considered where a concentration is greater than 1 times the LOR.

\*\*Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: 200 (1 - 10 x LOR); 50 (10 - 30 x LOR); 50 ( > 30 x LOR) ) \*\*\*Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

#### 12547851 Bentley Quarry



#### Attachment 2 Table 2 RPD Table

												OC	Pesticio	les											
	Organochlorine pesticides EPAVic	Other organochlorine pesticides EPAVic	,4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	. Methoxychlor	, Toxaphene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg
_	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	50	0.05	0.5

LOR

Date	Field ID	Lab Report Number	Matrix Type																									
12/04/2022	SS04_0.0-0.1	880878	Soil	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	FD01	880878	Soil	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
RPD (%)		<u>.</u>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/04/2022	SS12_0.0-0.1	880878	Soil	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	FD02	880878	Soil	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
RPD (%)		<u>.</u>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/04/2022	SS22_0.0-0.1	880878	Soil	<0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	< 0.5
	FD03	880878	Soil	<0.1	<0.1	<0.05	< 0.05	<0.05	< 0.05	<0.05	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	<0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<50	< 0.05	<0.5
RPD (%)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

\*RPDs have only been considered where a concentration is greater than 1 times the LOR.

\*\*Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: 200 (1 - 10 x LOR); 50 (10 - 30 x LOR); 50 ( > 30 x LOR) )

\*\*\*Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

#### 12547851 Bentley Quarry

# **Attachment 3**

Laboratory results



GHD Pty Ltd NSW Level 15, 133 Castlereagh Street Sydney NSW 2000

Attention:

Ben Luffman

Report Project name Project ID Received Date 880878-S BENTLEY QUARRY 12547851 Apr 14, 2022

Client Sample ID			SS01_0.0-0.1	SS02_0.0-0.1	SS03_0.0-0.1	SS04_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036738	S22- Ap0036739	S22- Ap0036740	S22- Ap0036741
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	-
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	-
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	-
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	-
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	< 50	-
Naphthalene <sup>N02</sup>	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	-
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	< 20	< 20	< 20	-
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	-
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	< 50	< 50	< 50	-
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	-
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	-
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	-
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	91	79	97	-
Heavy Metals						
Arsenic	2	mg/kg	2.1	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	83	86	120	71
Copper	5	mg/kg	26	21	21	14
Lead	5	mg/kg	< 5	< 5	< 5	5.6
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	73	87	110	47
Zinc	5	mg/kg	89	100	93	54
% Moisture	1	%	15	22	27	32



NATA Accredited Accreditation Number 1261 Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.



Client Sample ID			SS01_0.0-0.1	SS02_0.0-0.1	SS03_0.0-0.1	SS04_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofine Sample No			S22-	S22-	S22-	S22-
Euronnis Sample No.			Ap0030738	Ap0030739	Ap0030740	Ap0036741
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	-	-	< 0.1
4.4'-DDD	0.05	mg/kg	-	-	-	< 0.05
4.4'-DDE	0.05	mg/kg	-	-	-	< 0.05
4.4'-DDT	0.05	mg/kg	-	-	-	< 0.05
a-HCH	0.05	mg/kg	-	-	-	< 0.05
Aldrin	0.05	mg/kg	-	-	-	< 0.05
b-HCH	0.05	mg/kg	-	-	-	< 0.05
d-HCH	0.05	mg/kg	-	-	-	< 0.05
Dieldrin	0.05	mg/kg	-	-	-	< 0.05
Endosulfan I	0.05	mg/kg	-	-	-	< 0.05
Endosulfan II	0.05	mg/kg	-	-	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	-	-	< 0.05
Endrin	0.05	mg/kg	-	-	-	< 0.05
Endrin aldehyde	0.05	mg/kg	-	-	-	< 0.05
Endrin ketone	0.05	mg/kg	-	-	-	< 0.05
g-HCH (Lindane)	0.05	mg/kg	-	-	-	< 0.05
Heptachlor	0.05	mg/kg	-	-	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	-	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	-	-	< 0.05
Methoxychlor	0.05	mg/kg	-	-	-	< 0.05
Toxaphene	0.5	mg/kg	-	-	-	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	-	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	-	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	-	-	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	-	-	< 0.1
Dibutylchlorendate (surr.)	1	%	-	-	-	89
Tetrachloro-m-xylene (surr.)	1	%	-	-	-	89

Client Sample ID			SS05_0.0-0.1	SS06_0.0-0.1	SS07_0.0-0.1	SS08_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036742	S22- Ap0036743	S22- Ap0036744	S22- Ap0036745
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	100	95	84	89
Copper	5	mg/kg	20	20	15	18
Lead	5	mg/kg	8.0	6.4	< 5	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	67	48	53	58
Zinc	5	mg/kg	81	70	69	87
% Moisture	1	%	31	33	30	38



Client Sample ID			SS05_0.0-0.1	SS06_0.0-0.1	SS07_0.0-0.1	SS08_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofine Sample No			S22-	S22-	S22-	S22-
Date Sempled			Apr 12 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Organochlorine Pesticides	1	r				
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	100	107	95	104
Tetrachloro-m-xylene (surr.)	1	%	116	109	99	108

Client Sample ID			SS09_0.0-0.1	SS10_0.0-0.1	SS11_0.0-0.1	SS12_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036746	S22- Ap0036747	S22- Ap0036748	S22- Ap0036749
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	-	-	-	< 20
TRH C10-C14	20	mg/kg	-	-	-	< 20
TRH C15-C28	50	mg/kg	-	-	-	< 50
TRH C29-C36	50	mg/kg	-	-	-	< 50
TRH C10-C36 (Total)	50	mg/kg	-	-	-	< 50
Naphthalene <sup>N02</sup>	0.5	mg/kg	-	-	-	< 0.5
TRH C6-C10	20	mg/kg	-	-	-	< 20
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	-	-	-	< 20
TRH >C10-C16	50	mg/kg	-	-	-	< 50
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	-	-	-	< 50
TRH >C16-C34	100	mg/kg	-	-	-	< 100
TRH >C34-C40	100	mg/kg	-	-	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	-	-	-	< 100



Client Sample ID			SS09_0.0-0.1	SS10_0.0-0.1	SS11_0.0-0.1	SS12_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
			S22-	S22-	S22-	S22-
Eurofins Sample No.			Ap0036746	Ap0036747	Ap0036748	Ap0036749
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
втех						
Benzene	0.1	mg/kg	-	-	-	< 0.1
Toluene	0.1	mg/kg	-	-	-	< 0.1
Ethylbenzene	0.1	mg/kg	-	-	-	< 0.1
m&p-Xylenes	0.2	mg/kg	-	-	-	< 0.2
o-Xylene	0.1	mg/kg	-	-	-	< 0.1
Xylenes - Total*	0.3	mg/kg	-	-	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	-	-	78
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	98	54	58	93
Copper	5	mg/kg	23	14	14	19
Lead	5	mg/kg	< 5	< 5	5.5	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	52	53	39	74
Zinc	5	mg/kg	88	45	51	92
% Moisture	1	%	48	41	26	35
Organochlorine Pesticides	-	-				
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
VIC EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutyicniorendate (surr.)	1	<u>%</u>	/3	98	90	62
I etrachioro-m-xylene (surr.)	1	%	86	113	112	/5



Client Sample ID			SS13 0.0-0.1	SS14 0.0-0.1	SS15 0.0-0.1	SS16 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
			S22-	S22-	S22-	S22-
Eurofins Sample No.			Ap0036750	Ap0036751	Ap0036752	Ap0036753
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	88	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	93	69
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	181	69
Naphthalene <sup>N02</sup>	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	140	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	140	< 100
втех						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	131	78	132	88
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	78	86	92	81
Copper	5	mg/kg	21	21	21	28
Lead	5	mg/kg	< 5	< 5	7.0	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	66	74	63	58
Zinc	5	mg/kg	91	100	110	150
% Moisture	1	%	40	35	43	44
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.4	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
a-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05



Client Sample ID Sample Matrix Eurofins Sample No. Date Sampled			SS13_0.0-0.1 Soil S22- Ap0036750 Apr 12, 2022	SS14_0.0-0.1 Soil S22- Ap0036751 Apr 12, 2022	SS15_0.0-0.1 Soil S22- Ap0036752 Apr 12, 2022	SS16_0.0-0.1 Soil S22- Ap0036753 Apr 12, 2022
Test/Reference	LOR	Unit			, , , , , , , , , , , , , , , , , , , ,	
Organochlorine Pesticides						
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.8	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.2	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.8	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.8	< 0.1
Dibutylchlorendate (surr.)	1	%	51	88	INT	102
Tetrachloro-m-xylene (surr.)	1	%	62	97	82	96

Client Sample ID			SS17_0.0-0.1	SS18_0.0-0.1	SS19_0.0-0.1	SS20_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036754	S22- Ap0036755	S22- Ap0036756	S22- Ap0036757
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	55	50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	55	50	< 50
Naphthalene <sup>N02</sup>	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	66	69	50	102
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	68	96	100	110
Copper	5	mg/kg	18	22	18	21
Lead	5	mg/kg	< 5	< 5	< 5	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1



Client Sample ID			SS17_0.0-0.1	SS18_0.0-0.1	SS19_0.0-0.1	SS20_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
			S22-	S22-	S22-	S22-
Eurofins Sample No.			Ap0036754	Ap0036755	Ap0036756	Ap0036757
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Heavy Metals	1					
Nickel	5	mg/kg	48	66	71	75
Zinc	5	mg/kg	92	110	74	77
% Moisture	1	%	55	44	36	32
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
а-НСН	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	95	97	86	64
Tetrachloro-m-xylene (surr.)	1	%	104	110	103	84

Client Sample ID			SS21_0.0-0.1	SS22_0.0-0.1	SS23_0.0-0.1	SS24_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036758	S22- Ap0036759	S22- Ap0036760	S22- Ap0036761
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	24	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	69	100	95	78
TRH C10-C36 (Total)	50	mg/kg	69	124	95	78
Naphthalene <sup>N02</sup>	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	< 20	< 20	< 20	< 20



Client Sample ID			SS21 0.0-0.1	SS22 0.0-0.1	SS23 0.0-0.1	SS24 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
			S22-	S22-	S22-	S22-
Eurofins Sample No.			Ap0036758	Ap0036759	Ap0036760	Ap0036761
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	120	110	100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	120	110	100
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	55	66	74	74
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	100	57	110	110
Copper	5	mg/kg	19	22	21	22
Lead	5	mg/kg	< 5	< 5	< 5	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	73	49	75	78
Zinc	5	mg/kg	78	100	92	99
% Moisture	1	%	33	34	34	35
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dialdrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldebyde	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	ma/ka	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/ka	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05



Client Sample ID Sample Matrix Eurofins Sample No.			SS21_0.0-0.1 Soil S22- Ap0036758	SS22_0.0-0.1 Soil S22- Ap0036759	SS23_0.0-0.1 Soil S22- Ap0036760	SS24_0.0-0.1 Soil S22- Ap0036761
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	95	73	92	87
Tetrachloro-m-xylene (surr.)	1	%	108	118	99	95

Client Sample ID			SS25_0.0-0.1	SS26_0.0-0.1	SS27_0.0-0.1	SS28_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036762	S22- Ap0036763	S22- Ap0036764	S22- Ap0036765
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	76	58	< 50
TRH C29-C36	50	mg/kg	54	120	120	93
TRH C10-C36 (Total)	50	mg/kg	54	196	178	93
Naphthalene <sup>N02</sup>	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	180	160	120
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	180	160	120
втех						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	71	66	67	82
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	130	100	110	96
Copper	5	mg/kg	21	17	18	16
Lead	5	mg/kg	< 5	< 5	5.0	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	87	62	65	61
Zinc	5	mg/kg	92	75	80	74
% Moisture	1	%	29	40	40	35



Client Sample ID			SS25_0.0-0.1	SS26_0.0-0.1	SS27_0.0-0.1	SS28_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
			S22-	S22-	S22-	S22-
Eurofins Sample No.			Ap0036762	Ap0036763	Ap0036764	Ap0036765
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Organochlorine Pesticides	1					
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	63	83	88	83
Tetrachloro-m-xylene (surr.)	1	%	68	81	84	82

Client Sample ID			SS29_0.0-0.1	SS30_0.0-0.1	FD01	FD02
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22- Ap0036766	S22- Ap0036767	S22- Ap0036768	S22- Ap0036769
Date Sampled			Apr 12, 2022	Apr 12, 2022	Apr 12, 2022	Apr 12, 2022
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	-	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	-	< 20
TRH C15-C28	50	mg/kg	55	< 50	-	53
TRH C29-C36	50	mg/kg	120	100	-	110
TRH C10-C36 (Total)	50	mg/kg	175	100	-	163
Naphthalene <sup>N02</sup>	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	-	< 20
TRH C6-C10 less BTEX (F1) <sup>N04</sup>	20	mg/kg	< 20	< 20	-	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	-	< 50
TRH >C10-C16 less Naphthalene (F2) <sup>N01</sup>	50	mg/kg	< 50	< 50	-	< 50
TRH >C16-C34	100	mg/kg	150	130	-	140
TRH >C34-C40	100	mg/kg	< 100	< 100	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	150	130	-	140



Cheft Sample D SS29_0.0-0.1 SS30_0.0-0.1 FD01 FD0	2
Sample Matrix Soil Soil Soil	
S22- S22- S22- S22-	-
Eurofins Sample No.     Ap0036766     Ap0036767     Ap0036768     Ap0	036769
Date Sampled         Apr 12, 2022         Apr 12, 2022         Apr 12, 2022         Apr	12, 2022
Test/Reference LOR Unit	
BTEX	
Benzene 0.1 mg/kg < 0.1 < 0.1 -	< 0.1
Toluene 0.1 mg/kg < 0.1 < 0.1 -	< 0.1
Ethylbenzene 0.1 mg/kg < 0.1 < 0.1 -	< 0.1
m&p-Xylenes 0.2 mg/kg < 0.2 < 0.2 -	< 0.2
0-Xylene 0.1 mg/kg < 0.1 < 0.1 -	< 0.1
Xylenes - Total*         0.3         mg/kg         < 0.3         < 0.3         -	< 0.3
4-Bromofluorobenzene (surr.) 1 % 78 69 -	78
Heavy Metals	
Arsenic         2         mg/kg         < 2         < 2         2.9	< 2
Cadmium         0.4         mg/kg         < 0.4         < 0.4         < 0.4	< 0.4
Chromium         5         mg/kg         99         90         71	94
Copper         5         mg/kg         16         12	22
Lead 5 mg/kg < 5 < 5 8.0	< 5
Mercury         0.1         mg/kg         < 0.1         < 0.1         < 0.1	< 0.1
Nickel 5 mg/kg 61 63 34	79
Zinc 5 mg/kg 80 79 59	110
% Moisture         1         %         35         32         31	32
Organochlorine Pesticides	
Chlordanes - Total         0.1         mg/kg         < 0.1         < 0.1         < 0.1	< 0.1
4.4'-DDD 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
4.4'-DDE 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
4.4'-DDT 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
a-HCH 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
Aldrin         0.05         mg/kg         < 0.05         < 0.05         < 0.05	< 0.05
b-HCH 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
d-HCH 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
Dieldrin 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
Endosulfan I 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
Endosulfan II 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
Endosultan sulphate         0.05         mg/kg         < 0.05         < 0.05	< 0.05
Endrin 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
Endrin aldenyde         0.05         mg/kg         < 0.05         < 0.05           Exclusion         0.05         mg/kg         < 0.05	< 0.05
Endrin Ketone 0.05 mg/kg < 0.05 < 0.05 < 0.05	< 0.05
g-HCH (Lindane)         0.05         mg/kg         < 0.05         < 0.05           Uestashlar         0.05         mg/kg         < 0.05	< 0.05
Heptachion         0.05         mg/kg         < 0.05         < 0.05         < 0.05           Heptachion         0.05         mg/kg         < 0.05	< 0.05
Heptachior epoxide         0.05         mg/kg         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05         < 0.05 <t< td=""><td>&lt; 0.05</td></t<>	< 0.05
Instaction         U.U0         Intg/kg         < U.U0         < U.	< 0.05
Tovanhana 0.5 mg/kg < 0.03 < 0.05 < 0.05	< 0.05
Use         Use <thuse< th=""> <thuse< th=""> <thuse< th=""></thuse<></thuse<></thuse<>	< 0.0
DDT + DDE + DDD (Total)* 0.05 ma/ka < 0.05 < 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*         0.1         mg/kg         < 0.1         < 0.1         < 0.1	< 0.03
Vio EPA IWRG 621 Other OCP (Total)*         0.1         mg/kg         < 0.1         < 0.1         < 0.1	< 0.1
Dibuty/chlorendate (surr.)         1         %         85         70         84	77
Tetrachloro-m-xylene (surr.)         1         %         78         68         81	85



Client Sample ID			FD03
Sample Matrix			Soil
			S22-
Eurofins Sample No.			Ap0036770
Date Sampled			Apr 12, 2022
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons		0	
	20	ma/ka	< 20
TRH C10-C14	20	ma/ka	< 20
TRH C15-C28	50	ma/ka	67
TRH C29-C36	50	ma/ka	150
TRH C10-C36 (Total)	50	ma/ka	217
Nanhthalene <sup>N02</sup>	0.5	ma/ka	< 0.5
	20	ma/ka	< 20
TRH C6 C10 locc BTEX (E1) <sup>N04</sup>	20	mg/kg	< 20
	50	mg/kg	< 20
TRH > C10 C16 loss Norbtholons (E2) <sup>N01</sup>	50	mg/kg	< 50
	100	mg/kg	< 50
TRH >C10-C34	100	mg/kg	190
	100	mg/kg	< 100
	100	тід/кд	190
			0.4
Benzene	0.1	mg/kg	< 0.1
	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	72
Heavy Metals	1		
Arsenic	2	mg/kg	< 2
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	64
Copper	5	mg/kg	22
Lead	5	mg/kg	< 5
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	48
Zinc	5	mg/kg	120
% Moisture	1	%	39
Organochlorine Pesticides			
Chlordanes - Total	0.1	mg/kg	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05
а-НСН	0.05	mg/kg	< 0.05
Aldrin	0.05	mg/kg	< 0.05
b-HCH	0.05	mg/kg	< 0.05
d-HCH	0.05	mg/kg	< 0.05
Dieldrin	0.05	mg/kg	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05
Endrin	0.05	mg/kg	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05



Client Sample ID Sample Matrix Eurofins Sample No.			FD03 Soil S22- Ap0036770
Test/Reference	LOR	Unit	Api 12, 2022
Organochlorine Pesticides			
g-HCH (Lindane)	0.05	mg/kg	< 0.05
Heptachlor	0.05	mg/kg	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05
Toxaphene	0.5	mg/kg	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1
Dibutylchlorendate (surr.)	1	%	83
Tetrachloro-m-xylene (surr.)	1	%	90


### Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Teeting Cite	Evite at a d	Listelin or Times
Description	Testing Site	Extracted	Holding Time
Eurofins Suite B6			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Apr 20, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Apr 20, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Apr 20, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Apr 20, 2022	14 Days
- Method: LTM-ORG-2010 BTEX and Volatile TRH			
Metals M8	Sydney	Apr 20, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Apr 19, 2022	14 Days
- Method: LTM-GEN-7080 Moisture			
Organochlorine Pesticides	Sydney	Apr 20, 2022	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			

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web: w email:	ww.eurofins.com.au EnviroSales@eurofins	Env	ironment	Testing	Melbourne 6 Monterey Road Dandenong South VIC 3 Phone : +61 3 8564 5000 NATA # 1261 Site # 1254	1 175 G ) P 4 N	ydney 79 Mag Girrawee Phone : - IATA #	owar R n NSW +61 2 9 1261 Si	oad 2066 900 8400 te # 1821	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 7 NATA # 1261 Site # 20794	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 6253 4444 NATA # 2377 Site # 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
Co Ad	mpany Name: dress:	GHD Pty Ltc Level 15, 13 Sydney NSW 2000	I NSW 3 Castlereagh	n Street			O R P Fa	rder l eport hone: ax:	No.: #:	880878 02 9239 7100 02 9239 7199		Received: Due: Priority: Contact Name:	Apr 14, 2022 10:17 Apr 26, 2022 5 Day Ben Luffman	7 AM
Pro Pro	oject Name: oject ID:	BENTLEY C 12547851	UARRY								E	Eurofins Analytical Se	ervices Manager : En	ıma Beesley
		Sa	Imple Detail			Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins Suite B6					
Melk	ourne Laborate	ory - NATA # 12	261 Site # 125	4										
Sydi	ney Laboratory	- NATA # 1261	Site # 18217			Х	X	Х	X					
Bris	bane Laborator	y - NATA # 126	1 Site # 2079	4										
Nay	field Laboratory	/ - NATA # 1261	Site # 25075	)										
Exte	rnal Laboratory	<u>ATA # 2377 51</u>	10 # 25/0											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID									
1	SS01_0.0-0.1	Apr 12, 2022		Soil	S22- Ap0036738			x	х					
2	SS02_0.0-0.1	Apr 12, 2022		Soil	S22- Ap0036739			x	x					
3	SS03_0.0-0.1	Apr 12, 2022		Soil	S22- Ap0036740			x	x					
4	SS04_0.0-0.1	Apr 12, 2022		Soil	S22- Ap0036741	х	x	x						
5	SS05_0.0-0.1	Apr 12, 2022		Soil	S22- Ap0036742	х	x	x						
6	SS06_0.0-0.1	Apr 12, 2022		Soil	S22-	Х	Х	Х						

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web: w email:	ww.eurofins.com.au EnviroSales@eurofins	Env	ironment Tes	Melbo 6 Mon Dande Phone NATA	urne terey Road enong South VIC 31 9 : +61 3 8564 5000 # 1261 Site # 1254	5 75 G P N	ydney 79 Mago Firrawee hone : 4 ATA # 2	owar Ro n NSW 61 2 99 1261 Sit	oad 2066 900 8400 te # 1821	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 7 NATA # 1261 Site # 20794	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 6253 4444 NATA # 2377 Site # 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
Co Ad	ompany Name: Idress:	GHD Pty Ltd Level 15, 13 Sydney NSW 2000	I NSW 3 Castlereagh Stree	ət			O Re Pl Fa	rder I eport hone: ax:	No.: #:	880878 02 9239 7100 02 9239 7199		Received: Due: Priority: Contact Name:	Apr 14, 2022 10:17 Apr 26, 2022 5 Day Ben Luffman	7 AM
Pro Pro	oject Name: oject ID:	BENTLEY Q 12547851	UARRY								E	Eurofins Analytical Se	rvices Manager : Em	ıma Beesley
		Sa	Imple Detail			Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins Suite B6					
Mell	oourne Laborate	ory - NATA # 12	e1 Site # 1254											
Syd	ney Laboratory	- NATA # 1261	Site # 18217			Х	X	X	X					
Bris	bane Laborator	<u>y - NATA # 126</u>	1 Site # 20794											
May	tield Laboratory	/ - NATA # 1261	Site # 25079						$\left  \right $					
Fyte	n Laboratory - I	NATA # 23// Si /	te # 2370						$\left  \right $					
				Ar	0036743									
7	SS07_0.0-0.1	Apr 12, 2022	Soil	S2	22- 00036744	х	x	x						
8	SS08_0.0-0.1	Apr 12, 2022	Soil	S2 Ap	22- 00036745	х	х	х						
9	SS09_0.0-0.1	Apr 12, 2022	Soil	S2 Ap	22- 00036746	х	x	х						
10	SS10_0.0-0.1	Apr 12, 2022	Soil	S2 Ap	22- 00036747	х	x	х						
11	SS11_0.0-0.1	Apr 12, 2022	Soil	S2 Ap	22- 00036748	х	x	х						
12	SS12_0.0-0.1	Apr 12, 2022	Soil	S2 Ap	22- 00036749	Х		Х	Х					

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web: web: web: web: web: web: web: web:	www.eurofins.com.au	Env	ironment Testi	Melbourne 6 Monterey Road Dandenong South V Phone : +61 3 8564 NATA # 1261 Site #	IC 3175 5000 1254	Sydney 179 Mag Girrawee Phone : - NATA #	owar Ro n NSW +61 2 99 1261 Si	oad 2066 900 8400 te # 1821	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 7 NATA # 1261 Site # 20794	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 6253 4444 NATA # 2377 Site # 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
Cc Ac	ompany Name: Idress:	GHD Pty Ltd Level 15, 13 Sydney NSW 2000	l NSW 3 Castlereagh Street			O R Pi Fi	rder I eport hone: ax:	No.: : #: :	880878 02 9239 7100 02 9239 7199		Received: Due: Priority: Contact Name:	Apr 14, 2022 10:17 Apr 26, 2022 5 Day Ben Luffman	7 AM
Pr Pr	oject Name: oject ID:	BENTLEY Q 12547851	UARRY							E	Eurofins Analytical Se	ervices Manager : Em	ima Beesley
		Sa	Imple Detail		Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins Suite B6					
Mell	bourne Laborate	ory - NATA # 12	e1 Site # 1254										
Syd	ney Laboratory	- NATA # 1261	Site # 18217		Х	X	Х	х					
Bris	bane Laborator	y - NATA # 126	1 Site # 20794										
May	field Laboratory	/ - NATA # 1261	Site # 25079										
Pert	th Laboratory - N	NATA # 2377 Si	te # 2370										
Exte	ernal Laboratory	A		000				+					
13	SS13_0.0-0.1	Apr 12, 2022	Soil	S22- Ap0036750	x		X	X					
14	3314_0.0-0.1	Api 12, 2022	301	Ap0036751	X		Х	Х					
15	SS15_0.0-0.1	Apr 12, 2022	Soil	S22- Ap0036752	x		x	x					
16	SS16_0.0-0.1	Apr 12, 2022	Soil	S22- Ap0036753	x		x	x					
17	SS17_0.0-0.1	Apr 12, 2022	Soil	S22- Ap0036754	x		x	x					
18	SS18_0.0-0.1	Apr 12, 2022	Soil	S22- Ap0036755	x		x	x					
19	SS19_0.0-0.1	Apr 12, 2022	Soil	S22-	Х		Х	Х					

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web: w email:	ww.eurofins.com.au EnviroSales@eurofins	Env	ironment Tes	Melbo 6 Mont Dande Phone NATA	urne terey Road enong South VIC 31 : : +61 3 8564 5000 # 1261 Site # 1254	1 75 G P N	ydney 79 Mago iirrawee hone : + IATA # 1	owar Ro n NSW 61 2 99 261 Sit	oad 2066 900 8400 se # 18217	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 6253 4444 NATA # 2377 Site # 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
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		Sa	Imple Detail			Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins Suite B6					
Mell	oourne Laborate	ory - NATA # 12	261 Site # 1254											
Syd	ney Laboratory	- NATA # 1261	Site # 18217			Х	X	Х	X					
Bris	bane Laborator	y - NATA # 126	1 Site # 20794											
May	tield Laboratory	/ - NAIA # 1261	Site # 25079											
Fyte	anal Laboratory - I	1	10 # 23/0				-							
				An	0036756		1							
20	SS20_0.0-0.1	Apr 12, 2022	Soil	I S2 Ap	22- 00036757	Х		x	x					
21	SS21_0.0-0.1	Apr 12, 2022	Soil	I S2 Ap	22- 00036758	х		х	x					
22	SS22_0.0-0.1	Apr 12, 2022	Soil	I S2 Ap	22- 00036759	х		х	x					
23	SS23_0.0-0.1	Apr 12, 2022	Soil	I S2 Ap	22- 00036760	х		х	x					
24	SS24_0.0-0.1	Apr 12, 2022	Soil	I S2 Ap	22- 00036761	х		х	x					
25	SS25_0.0-0.1	Apr 12, 2022	Soil	I S2 Ap	22- 00036762	Х		Х	x					

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web: w email:	ww.eurofins.com.au EnviroSales@eurofins	Env	ironment Test	ing Melbour 6 Monter Dandenc Phone :- NATA #	ne rey Road ong South VIC 317 +61 3 8564 5000 1261 Site # 1254	8 17 75 G Pl N	/dney 79 Mago frraweer hone : + ATA # 1	owar Ro n NSW 61 2 99 261 Sit	oad 2066 900 8400 te # 1821	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 7 NATA # 1261 Site # 20794	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 6253 4444 NATA # 2377 Site # 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
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		Sa	Imple Detail			Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins Suite B6					
Mell	ourne Laborate	ory - NATA # 12	261 Site # 1254											
Syd	ney Laboratory	- NATA # 1261	Site # 18217			Х	Х	Х	Х					
Bris	bane Laborator	y - NATA # 126	1 Site # 20794											
May	field Laboratory	/ - NATA # 1261	Site # 25079											
Pert	h Laboratory - I	NATA # 2377 Si	te # 2370											
Exte	ernal Laboratory	Apr 12, 2022	0-1	000										
20	SS27 0 0-0 1	Apr 12, 2022	Soil	S22 Ap0	- 036763	X		X	X					
	0.0-0.1	, pr 12, 2022		Ap0	036764	Х		Х	X					
28	SS28_0.0-0.1	Apr 12, 2022	Soil	S22 Ap0	- 036765	х		x	x					
29	SS29_0.0-0.1	Apr 12, 2022	Soil	S22 Ap0	- 036766	х		х	x					
30	SS30_0.0-0.1	Apr 12, 2022	Soil	S22 Ap0	- 036767	х		х	x					
31	FD01	Apr 12, 2022	Soil	S22 Ap0	- 036768	х	х	х						
32	FD02	Apr 12, 2022	Soil	S22	-	Х		Х	Х					

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web: w email:	www.eurofins.com.au EnviroSales@eurofins	.com	ironment 1	Testing	Melbourne 6 Monterey Road Dandenong South VIC Phone : +61 3 8564 500 NATA # 1261 Site # 120	1 3175 G 00 P 54 N	Sydney 79 Mago Birrawee Phone : + IATA # 1	owar Ro n NSW -61 2 99 1261 Sit	oad 2066 900 8400 e # 18217	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 7 NATA # 1261 Site # 20794	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 6253 4444 NATA # 2377 Site # 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
Co Ad	ompany Name: Idress:	GHD Pty Lto Level 15, 13 Sydney NSW 2000	d NSW 33 Castlereagh	Street			O Ri Pi Fa	rder M eport hone: ax:	No.: #:	880878 02 9239 7100 02 9239 7199		Received: Due: Priority: Contact Name:	Apr 14, 2022 10:17 Apr 26, 2022 5 Day Ben Luffman	Ϋ́ AM
Pro Pro	oject Name: oject ID:	BENTLEY C 12547851	QUARRY								E	urofins Analytical Se	rvices Manager : Em	ma Beesley
		Sa	ample Detail			Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins Suite B6					
Melk	bourne Laborato	ory - NATA # 12	261 Site # 1254			×	×	v	×					
Bris	bane Laboratory	- NATA # 1261 v - NATA # 126	Site # 18217			~		X						
May	field Laboratory	/ - NATA # 126	1 Site # 250794											
Pert	h Laboratory - N	NATA # 2377 Si	ite # 2370											
Exte	ernal Laboratory	,												
					Ap0036769									
33	FD03	Apr 12, 2022		Soil	S22- Ap0036770	x		х	x					
Test	t Counts					30	9	33	24					



#### Internal Quality Control Review and Glossary

#### General

- 1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- 2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- 3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- 4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- 5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- 6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- 7. Samples were analysed on an 'as received' basis.
- 8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
- 9. This report replaces any interim results previously issued.

#### **Holding Times**

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA. If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

#### Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	μg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres

#### Terms

APHA	American Public Health Association
coc	Chain of Custody
СР	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
ТВТО	Tributyltin oxide ( <i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

#### **QC** - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

### **QC Data General Comments**

- 1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- 2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- 3. pH and Free Chlorine analysed in the laboratory Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- 4. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
- 5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data



### **Quality Control Results**

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank		-	1	-			
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank						-	
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank			I		1		
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-HCH	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-HCH	mg/kg	< 0.05			0.05	Pass	
d-HCH	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-HCH (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	



Test			Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery				1	 1	-		
Total Recoverable Hydrocarbons								
TRH C6-C9			%	108		70-130	Pass	
TRH C10-C14			%	77		70-130	Pass	
Naphthalene			%	106		70-130	Pass	
TRH C6-C10			%	106		70-130	Pass	
TRH >C10-C16			%	76		70-130	Pass	
LCS - % Recovery						•		
BTEX								
Benzene			%	107		70-130	Pass	
Toluene			%	107		70-130	Pass	
Ethylbenzene			%	106		70-130	Pass	
m&p-Xylenes			%	109		70-130	Pass	
o-Xylene			%	111		70-130	Pass	
Xylenes - Total*			%	110		70-130	Pass	
LCS - % Recovery								
Heavy Metals								
Arsenic			%	102		80-120	Pass	
Cadmium			%	99		80-120	Pass	
Chromium			%	86		80-120	Pass	
Copper			%	87		80-120	Pass	
Lead			%	92		80-120	Pass	
Mercury			%	97		80-120	Pass	
Nickel			%	89		80-120	Pass	
Zinc			%	87		80-120	Pass	
LCS - % Recovery								
Organochlorine Pesticides								
Chlordanes - Total			%	76		70-130	Pass	
4.4'-DDD			%	100		70-130	Pass	
4.4'-DDE			%	75		70-130	Pass	
4.4'-DDT			%	93		70-130	Pass	
а-НСН			%	85		70-130	Pass	
Aldrin			%	71		70-130	Pass	
b-HCH			%	86		70-130	Pass	
d-HCH			%	89		70-130	Pass	
Dieldrin			%	77		70-130	Pass	
Endosulfan I			%	79		70-130	Pass	
Endosulfan II			%	101		70-130	Pass	
Endosulfan sulphate			%	97		70-130	Pass	
Endrin			%	73		70-130	Pass	
Endrin aldehyde			%	81		70-130	Pass	
Endrin ketone			%	94		70-130	Pass	
g-HCH (Lindane)			%	92		70-130	Pass	
Heptachlor			%	74		70-130	Pass	
Heptachlor epoxide			%	72		70-130	Pass	
Hexachlorobenzene			%	95		70-130	Pass	
Methoxychlor			%	88		70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Total Recoverable Hydrocarbons				Result 1				
TRH C6-C9	N22-Ap0031586	NCP	%	85		70-130	Pass	
TRH C10-C14	S22-Ap0041746	NCP	%	88		70-130	Pass	
Naphthalene	N22-Ap0031586	NCP	%	88		70-130	Pass	
TRH C6-C10	N22-Ap0031586	NCP	%	88		70-130	Pass	



Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH >C10-C16	S22-Ap0041746	NCP	%	86			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	N22-Ap0031586	NCP	%	77			70-130	Pass	
Toluene	N22-Ap0031586	NCP	%	81			70-130	Pass	
Ethylbenzene	N22-Ap0031586	NCP	%	79			70-130	Pass	
m&p-Xylenes	N22-Ap0031586	NCP	%	80			70-130	Pass	
o-Xylene	N22-Ap0031586	NCP	%	83			70-130	Pass	
Xylenes - Total*	N22-Ap0031586	NCP	%	81			70-130	Pass	
Spike - % Recovery							-		
Heavy Metals				Result 1					
Arsenic	S22-Ap0036571	NCP	%	100			75-125	Pass	
Spike - % Recovery				1					
Heavy Metals				Result 1					
Cadmium	S22-Ap0036756	CP	%	83			75-125	Pass	
Chromium	S22-Ap0036756	CP	%	85			75-125	Pass	
Copper	S22-Ap0036756	CP	%	84			75-125	Pass	
Lead	S22-Ap0036756	CP	%	81			75-125	Pass	
Mercury	S22-Ap0036756	CP	%	97			75-125	Pass	
Nickel	S22-Ap0036756	CP	%	87			75-125	Pass	
Zinc	S22-Ap0036756	CP	%	93			75-125	Pass	
Test	Lah Sample ID	QA	Units	Result 1			Acceptance	Pass	Qualifying
	Lub Gumple ib	Source	01113	Result 1			Limits	Limits	Code
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD		_	
TRH C10-C14	S22-Ap0041984	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S22-Ap0041984	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S22-Ap0041984	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C10-C16	S22-Ap0041984	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S22-Ap0041984	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S22-Ap0041984	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD		_	
% Moisture	S22-Ap0036738	СР	%	15	14	2.0	30%	Pass	
Duplicate				<b>D 1 1</b>					
Organochlorine Pesticides	000 1 00 11 10	NOR		Result 1	Result 2	RPD	0.001	-	
Chlordanes - Total	S22-Ap0041146	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DD1	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
ансн	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Ь-НСН	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-HCH	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosultan II	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosultan sulphate	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
	522-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-HCH (Lindane)	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	



Duplicate									
Organochlorine Pesticides	_			Result 1	Result 2	RPD			
Methoxychlor	S22-Ap0041146	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	S22-Ap0041146	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S22-Ap0036748	CP	%	26	25	2.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	S22-Ap0036752	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Naphthalene	S22-Ap0036752	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S22-Ap0036752	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate				1	1		1		
BTEX				Result 1	Result 2	RPD			
Benzene	S22-Ap0036752	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S22-Ap0036752	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S22-Ap0036752	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S22-Ap0036752	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S22-Ap0036752	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S22-Ap0036752	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate				-	-			1	
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	S22-Ap0036753	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Naphthalene	S22-Ap0036753	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S22-Ap0036753	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate				1			1	1	
BTEX			1	Result 1	Result 2	RPD			
Benzene	S22-Ap0036753	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
	S22-Ap0036753	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S22-Ap0036753	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S22-Ap0036753	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S22-Ap0036753	СР	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S22-Ap0036753	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate				Desided	Devilio	DDD	1	1	
	000 4=0000755			Result 1	Result 2	RPD	200/	Daaa	
Arsenic	S22-Ap0036755		mg/kg	< 2	< 2	<1	30%	Pass	
Cadmium	S22-Ap0036755		mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Conner	S22-Ap0036755		mg/kg	90	97	T.0	30%	Pass	
Lood	S22-Ap0030755		mg/kg	22	21	5.0	30%	Pass	
Mercury	S22-Ap0036755		mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S22-Ap0036755		mg/kg	66	66	10	30%	Pass	
Zinc	S22-Ap0036755		mg/kg	110	100	1.0	30%	Pass	
Dunlicate	022-Ap0030733	0	шу/ку	110	100	4.0	5078	1 835	
				Result 1	Result 2	RPD		1	
% Moisture	S22-Ap0036758	CP	%	33	36	9.0	30%	Pass	
Dunlicate	022 / 0000100	01	/0	00	00	0.0	0070	1 400	
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S22-Ap0036765	CP	ma/ka	< 2	< 2	<1	30%	Pass	
Cadmium	S22-Ap0036765	CP	ma/ka	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S22-Ap0036765	CP	ma/ka	96	96	<1	30%	Pass	
Copper	S22-Ap0036765	CP	ma/ka	16	16	1.0	30%	Pass	
Lead	S22-Ap0036765	CP	ma/ka	< 5	< 5	<1	30%	Pass	
Mercury	S22-Ap0036765	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S22-Ap0036765	CP	mg/ka	61	59	4.0	30%	Pass	
Zinc	S22-Ap0036765	CP	mg/kg	74	73	1.0	30%	Pass	



Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S22-Ap0036768	СР	%	31	30	4.0	30%	Pass	



### Comments

Sample Integrity	
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

### **Qualifier Codes/Comments**

Code Description

N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.

F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

### Authorised by:

Robert Biviano	Analytical Services Manager
Gabriele Cordero	Senior Analyst (NSW)
Roopesh Rangarajan	Senior Analyst (NSW)
Raymond Siu	Senior Analyst (NSW)

Glenn Jackson General Manager

Final Report - this report replaces any previously issued Report

- Indicates Not Requested

\* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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mgt

Sydney
Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
Phone: +612 9900 8400
Email: enviro.syd@mgtlabmark.com.au

# Brisbane Unit 1-21 Smallwood Place, Murrarie Phone: +617 3902 4600 Email: enviro.bris@mgtlabmark.com.au

Melbourne

2 Kingston Town Close, Oakleigh, VIC 3166 Phone: +613 8564 5000 Fax: +613 8564 5090 Email: enquiries.melb@mgtlabmark.com.au

										C	HAI	N OI	FC	JST	OD	Y RE	ECO	RD							-			-	
CLIENT DETAILS	3											_		_	5.			-			_	_			Page	1	of	2	
Company Name :	GHD			Contact	t Nam	e:		Stepha	anie Mart	tin	Purchase Order :											COC Num	ber :		1				
Company Name	Coffs Har	bour		Project	ect Manager : Ben Luffman							PROJECT Number : 12						12547851						Eurofins   mgt quote ID :					
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Special Direction	is & Comments :			-	1		11	-	TT		11	-	-	_	1		-		-			For	further inf	ormation	contact	the lab			
	1			1															1		Waters					s	oils		
															BTE	X, MAH, VO	С		14 days	BTEX	, MAH, VC	C		14 days					
																			TRH	I, PAH, Pher	ols, Pestic	ides	7 days	TRH,	PAH, Phe	nols, Pesti	cides	14 days	
				-		11													Hea	vy Metals			6 months	Heavy	/ Metals			6 months	
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				met											1.4	61			Mici	obiological te	esting		24 hours	Microl	piological	esting		72 hours	
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Brisbane

### **Eurofins Environment Testing Australia Pty Ltd**

ABN: 50 005 085 521	
Melbourne	
6 Monterey Road	
	-

Dandenong South VIC 3175 Girraween NSW 2066 Phone : +61 3 8564 5000 Phone : +61 2 9900 84 NATA # 1261 Site # 1254

Sydney 179 Magowar Road Phone: +61 2 9900 8400 NATA # 1261 Site # 18217

1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794 www.eurofins.com.au

#### Eurofins ARL Pty Ltd Eurofins Environment Testing NZ Limited ABN: 91 05 0159 898

Perth 46-48 Banksia Road Welshpool WA 6106 Phone: +61 8 6253 4444 NATA # 2377 Site # 2370 NZBN: 9429046024954 Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51

IANZ # 1327

EnviroSales@eurofins.com

Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290

### **Sample Receipt Advice**

Company name:	GHD Pty Ltd NSW
Contact name:	Ben Luffman
Project name:	BENTLEY QUARRY
Project ID:	12547851
Turnaround time:	5 Day
Date/Time received	Apr 14, 2022 10:17 AM
Eurofins reference	880878

### **Sample Information**

A detailed list of analytes logged into our LIMS, is included in the attached summary table. 1

Newcastle

4/52 Industrial Drive

Mayfield East NSW 2304

PO Box 60 Wickham 2293

NATA # 1261 Site # 25079

Phone : +61 2 4968 8448

- Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 8.4 degrees Celsius.
- All samples have been received as described on the above COC.
- COC has been completed correctly.
- Attempt to chill was evident.
- Appropriately preserved sample containers have been used.
- All samples were received in good condition.
- Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- Appropriate sample containers have been used.
- Sample containers for volatile analysis received with zero headspace. 1
- X Split sample sent to requested external lab.
- X Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

### **Notes**

### Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Emma Beesley on phone : or by email: EmmaBeesley@eurofins.com

Results will be delivered electronically via email to Ben Luffman - ben.luffman@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NSW email address.

# Global Leader - Results you can trust

Sydney         Unit F3 - 6 Building F, 16 Mars Road, Lane Cove         Phone: +612 9900 B400         Email: onviro.syd@mgtlabmark.com.au													Un Phi Em	it 1-21 S one: +6 nail: env	Brisba mallwoo 7 3902 iro.bris@	a <b>rie</b> od Place 4600 @mgtlab	, Murr mark.	arie com.au				2 Kii Pho Ema	Mell ngston Town ne: +613 85 il: enquirles	bourne n Close, O 64 5000 s.melb@mg	akleigh, VI Fax: gtlabmark.u	C 3166 +613 8564 5090 com.au	1	
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# Appendix J Wastewater Assessment

# Sewage Solutions



# **ON-SITE EFFLUENT MANAGEMENT REPORT**

# FOR A WEIGHBRIDGE OFFICE

Lot 2 in DP 1196757. 1465 Bentley Rd Bentley.

PREPARED BY: SEWAGE SOLUTIONS.

A.B.N.: 95 020 786 142

ADDRESS: PO Box 204 The Channon, NSW 2480. PHONE & FAX: 02) 66886453 MOBILE: 0419 420362 EMAIL: sewagesolutions@hotkey.net.au

TECHNICAL STAFF: JJ Bruce B.App.Sc. (Hons.)

PREPARED FOR: Robert McKenzie.

INSPECTION DATE: April 26, 2022. REPORT DATE: May 16, 2022. REPORT ID: McKenzie 220426.

> PO BOX 204 The Channon NSW 2480 m: 0419 420 362 t: 02 6688 6453 f: 02 6688 6453 e: sewagesolutions@hotkey.net.au

# SUMMARY

- A weighbridge office with worker amenities is proposed. Effluent management system design is based upon effluent loading from 3 Equivalent Persons (EP) generating 140L/d
- A septic tank with 3000L capacity is to be installed to treat office effluent to a primary quality. An outlet filter is to be fitted in this septic tank.
- A LAA consisting of one 18.2 [long] × 2m [wide] Evapotranspiration (ETA) beds is to be constructed to assimilate treated effluent into the environment.
- A document detailing required maintenance procedures, and a maintenance record table has been provided with this report.
- Constraints are addressed in Table 1 of this report.

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	2.2	Soil characteristics	1
	2.2.	1 Soil permeability	1
	2.3	Site Constraints	1
3	EFF	LUENT MANAGEMENT SYSTEM	2
	3.1	Design considerations	2
	3.2	Treatment train	2
	3.3	Septic tank	2
	3.4	Evapotranspiration bed LAA	2
4	COl	NCLUSIONS	3
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# LIST OF APPENDICES

Summary of site characteristics	Appendix 1
Summary of soil characteristics	Appendix 2
Location topographic map	Appendix 3
Site plan and system specification	Appendix 4
On-site Wastewater Model	Appendix 5

# LIST OF ACRONYMS

EPEquivalent PersonsETAEvapo-Transpiration, AbsorptionLAALand Application AreaL/dLitres / DayRVCRichmond Valley CouncilSTSeptic TankWWMWaste Water Model

### **1** INTRODUCTION

The proposal contained herein has been prepared to fulfill the requirements of Clause 26 of the Local Government (General) Regulation 2005, to support an application to council for approval of an on-site effluent management system under Section 68 of the Local Government Act 1993.

This system has been designed following a site & soil and desktop assessment and in consultation with, Robert McKenzie. Site assessment and effluent management system design have been conducted in accordance with the Australian & New Zealand Standard for on-site domestic wastewater management and the Richmond Valley Council On-Site Sewage and Wastewater Management Strategy (AS1547, 2012, RVC, 2018).

### 1.1 Proposed development

A new on-site effluent management system is required for Weighbridge Office Worker Amenities which consist of a Toilet and handwash basin and Kitchenette. The weigh bridge office is located at 1465 Bentley Rd, Bentley. System design is based upon the assumption of 3EP generating 140.4L/d.

### 2 SITE AND SOIL CHARACTERISTICS

Site and soil data was gathered during site assessment on the 26/4/22 and via desktop assessment as detailed below.

### 2.1 Site Characteristics

Site characteristics are shown in Appendix 1.

### 2.2 Soil characteristics

Soil profile characteristics are shown in Appendix 2. Soil at this site is characteristic of the McKee Soil Landscape (mc) (Morand, D.T., 1994) and has been classified as an Dark Basaltic Soil in accordance with the with the RVC WWM (RVC, 2017).

Aggregate stability was determined using the first part of Emerson's soil test (AS1289.3.8.1, 2006). This test showed that soil at the proposed LAA has the following Emerson's class:

- Horizon 1 = Class 4, 5 or 6 Slaking; No dispersion.
- Horizon 2 = Class 2 Slaking; Some dispersion (Addressed as a constraint in Table 1).
- Horizon 3 = Class 7 No slaking; No swelling.

### 2.2.1 Soil permeability

The soil at the proposed LAA is expected to be free draining. For the purpose of design calculations the long-term effluent acceptance rate of 5mm/day has been adopted, in accordance with the RVC WWM (RVC, 2017).

### 2.3 Site Constraints

Table 1 addresses constraints and ameliorations.

Site Feature	Constraint(s)	Amelioration(s)					
Vegetation	The proposed LAA is in a paddock which is grazed. Heavy stock access may shorten the effective lifespan of the ETA bed LAA.	The LAA is to be fenced to prevent heavy stock access.					
Slope type and Run-on.	<ul> <li>A) The linear convergent landform concentrates run-on which may hydraulically overload the LAA during rainfall.</li> <li>B) If the LAA extends through the centre/drainage line of the convergent landform, run-on will not be able to be diverted around the LAA without significant earthworks.</li> </ul>	<ul> <li>A) An upslope diversion drain is to be installed to divert run-on around the LAA and to the centre of the concave landform as shown in Appendix 4.</li> <li>B) The position and Relative Level (RL) of the of the office and associated amenities is to enable drainage to the proposed system without forcing the LAA into the drainage line of the convergent landform.</li> </ul>					
Buffer distance	The LAA / reserve LAA is in proximity to property boundary (road reserve boundary) and driveway.	A minimum 12m buffer is required, the LAA is to be positioned in accordance with Appendix 4 to enable the reserve LAA to achieve this buffer.					
Fill	There is fill associated with driveways.	The LAA is to be positioned downslope of fill.					
Drainage	Horizon 2 soil has dispersive characteristics, which can reduce the soil percolation rate over time.	The LAA is to be amended with Gypsum in accordance with L7.2 of AS1547.					

**Table 1.** Constraints and ameliorations

### **3** EFFLUENT MANAGEMENT SYSTEM

The effluent management system is shown in Appendix 4.

### 3.1 Design considerations

Design considerations included:

• A septic tank and ETA bed system has been designed in accordance with the owners preference.

### 3.2 Treatment train

All worker amenity effluent is to drain to a septic tank with outlet filter, where primary treatment will take place. Primary treated effluent will then drain to an ETA bed LAA.

### 3.3 Septic tank

A 3000L septic tank is to be installed to treat effluent to a primary quality, in accordance with Table J1 of AS1547 (AS1547, 2012). This septic tank is to be accredited by NSW Health (NSWHEALTH, 2021). A suitable outlet filter is to be installed at the outlet to prevent the flow on of solids to the LAA.

### 3.4 Evapotranspiration bed LAA

The Richmond Valley Council WWM (RVC, 2017) was used to calculate the size of the required LAA, which consists of one 18.2m long  $\times$  2m wide ETA bed. Design calculations are shown in Appendix 5. The LAA is to be installed in accordance with L5 – L13 of AS1547 (AS1547, 2012).

### 4 CONCLUSIONS

The proposed effluent management system can achieve Performance Objectives in Chapter 4 of Australian & New Zealand Standard for on-site domestic wastewater management (AS1547, 2012). The requirements of Richmond Valley Council On-Site Sewage and Wastewater Management Strategy (RVC, 2018) can also be met in accordance with this report.

### **5 REFERENCES**

AS1289.3.8.1. (2006) Australian Standard 1289.3.8.1. Methods for testing soils for engineering purposes. Method 3.8.1: Soil classification tests - Dispersion - Determination of Emerson class number of a soil. Standards Australia. Homebush, NSW.

AS1547. (2012) Australian Standard 1547. On-site Domestic Wastewater Management. Standards Australia and Standards New Zealand. Strathfield, NSW.

Morand, D.T. (1994) Soil Landscapes of the Lismore-Ballina 1:100 000 Sheet. Soil Conservation Service of NSW. Sydney.

NSWHEALTH. (2021) Septic tanks and collection wells - Register certificates of accreditation. NSW Governent - Health. https://www.health.nsw.gov.au/environment/domesticwastewater/Pages/stcw.aspx.

RVC. (2017) Richmond Valley Council On-Site Waste Water Model. Richmond Valley Counicl. Casino.

RVC. (2018) Richmond Valley Council On-Site Sewage and Wastewater Management Strategy. Richmond Valley Council. Casino.

SITE DETAILS				
Client Name	Rob McKenzie 0428 688 860			
<b>Details of Proposed</b>	rob@bentleyquarry.com.au			
Development	Weighbridge worker amenities, Toilet, Handwash basin &			
	Kitchenettes (3EP).			
	Treatment Train = Septic tank - Outlet filter – ETA bed LAA.			
Street Address	1465 Bentley Rd Bentley NSW 2480.			
Lot, DP Number	Lot 2 in DP 1196757.			
Local Government Area	Lismore.			
Date of assessment	26/4/22.			
Proposed Water Supply	Rain.			
Recent Weather	Showers.			
LAA DETAILS		<u>Constraint</u> (See Table 1)		
Allotment Size	214ha			
Existing Vegetation	Pasture. Stock access.	X		
Slope (%)	8%			
Slope Type	Linear convergent - Concentrates run-on	X		
Aspect	NE.			
Exposure	High.			
Boulders/Floaters/Rock Outcrops	Not evident.			
Buffer Distance	In proximity to road reserve and driveway.	X		
Run on and	Landform concentrates Run-on.	X		
Upslope seepage	No evidence of upslope seepage.			
Flooding Potential Above 1 in 20 year for LAA Above 1 in 100 year for treatment system	None.			
Drainage	Horizon 2 has dispersive characteristics.	Χ		
Vegetation indicating	Not evident.			
waterlogging				
Surface Condition Bare ground, cracking etc	Dense pasture cover, no bone patches or cracking evident.			
Fill	Associated with driveways.	Χ		
Erosion/mass movement Rills, slips etc	Not evident.			
Depth to Ground Water	>2m.			

Borehole no. 1 Located in proposed LAA.								
Soi (Mor	l Unit and, 1994)	Landscape: Mc Soil materials:	Kee (mc) = Horizon 1 mc	1. Horizon 2 = m	c2. Horizon 3	3 = ge	3.	
	SOIL DESCRIPTION							
Horizon	Depth (mm)	Texture (ribbon length)	Structure (Pedality)	Colour	Coarse Fragments (Size & %)	рН	Dispersive Class (Description)	
1	0-300	Clay loam	Strong (friable polyhedral)	Black	None	6	4, 5 or 6 (No slaking; No dispersion)	
2	300-500	Light Medium clay	Strong (Blocky)	Black grading to greyish black	Weathered basalt (6-20mm 2- 10%)	6	2 (Slaking; Some dispersion)	
3	500-1000	Light clay	Strong (polyhedral)	Light brown	Weathered basalt (2-6 mm 20- 50%)	6	7 (No slaking; No swelling)	

Borehole no. 2 Located in proximity to reserve LAA.							
Soil Unit (Morand, 1994) Landsca Soil mat		Landscape: Mc Soil materials:	Kee (mc) = Horizon 1 mc	1. Horizon 2 = m	e2. Horizon 3	3 = ge	3.
	SOIL DESCRIPTION						
Horizon	Depth (mm)	Texture (ribbon length)	Structure (Pedality)	Colour	Coarse Fragments (Size & %)	рН	Dispersive Class (Description)
1	0-300	Clay loam	Strong (friable polyhedral)	Black	None	6	4, 5 or 6 (No slaking; No dispersion)
2	300-500	Light Medium clay	Strong (Blocky)	Black grading to greyish black	Weathered basalt (6-20mm 10- 20%)	6	2 (Slaking; Some dispersion)
3	500-1000	Light clay	Strong (polyhedral)	Light brown	Weathered basalt (2-6 mm 20- 50%)	6	7 (No slaking; No swelling)

## Appendix 3 Topographic map



Map source Six Maps (2022) (http://maps.six.nsw.gov.au/). The subject development is located at Grid ref. 5131\*\*E, 68154\*\*N (GDA2020-MGA56).

Page 1 of 1





Page 1 of 3

# Appendix 4 cont. Treatment System & LAA Layout (not to scale)



### Appendix 4 cont. Insert A - Elevation View of LAA (not to scale)



## Appendix 5. RVC On-site Wastewater Model

Clear	RVC On-site Wastewater Model (Single Rural Households) OSmodel170115.xls	Default	User-
Client	Robert McKenzie	Delaun	uenneu
Address	1465 Bentley Rd. Bentley		
Site	Block size (m2)		2140000
	Buffer (m) from land applicatio stream	>100	
	Water (L/p.d) Roof water harvesting	120	
	Persons		3
	Internal wastewater sources Multiple households? How many?		
Wastewater			
components/system	Toilet 🔽		
	Bathroom		
	Laundry		
	Kitchen 🔽		
	Total wastewater flow (1/d) [needs caution if user-defined]	140.4	
	Total wastewater now (E/d) [needs caution in user-defined]	140.4	
	Accession and a second s		
Treatment system	Primary only (e.g. septic)	00/	
	Nitrogen removal %	0%	
	Maximum N allowed to go down from system (kg/yr)	15.00	_
Land application	Land application type ETA beds		
	Depth of soil above gravel layer (= root zone) (mm)	200	
	Depth of gravel layer (mm)	200	
Sector Contraction			
Soil information	Morand code (example Dark Basaltic Soils= ge, I		
	Phosphorus sorption (kg/ha.m)	12000	
	Depth to water table or bedrock (for P calcs) (m)		2
	Texture/structu	5	
	DER (IIII/d)	5	0.1
Area calculations	Hydraulic area (m2)	36.4	Calc
	Nitrogen area (m2) [allowing export of 15.00 kg/yr]	0.0	Tircu
	Phosphorus area (m2)	25.2	Print
	Required land application area (m2)	36.4	
			0.0%



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