COUNCIL ASSESSMENT REPORT

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Panel Reference	**2017STH003**
DA Number	**366/17**
LGA	**Eurobodalla Shire Council**
Proposed Development	**Quarry expansion and resource recovery facility**
Street Address	**Lot 1 Nerrigundah Mountain Road, Eurobodalla**
Applicant/Owner	Applicant: T & S Hollis, Owner: M Hollis
Date of DA lodgement	10 January 2017
Number of Submissions	**Zero (0)**
Recommendation	**Approval subject to conditions**
Regional Development Criteria (Schedule 4A of the EP&A Act)	**8. Particular Designated Development** **(a) extractive industries, which meet the requirements for designated development under clause 19 of Schedule 3 to the EP&A Regulation 2000.**
List of all relevant s79C(1)(a) matters	• State Environmental Planning Policy 33 – Hazardous and Offensive Development • State Environmental Planning Policy 44 – Koala Habitat Protection • State Environmental Planning Policy 55 – Remediation of Land • State Environmental Planning Policy (Infrastructure) 2007 • State Environmental Planning Policy (Rural Lands) 2008 • State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 • Eurobodalla Local Environmental Plan 2012 (ELEP 2012) • Draft planning agreement that a developer has offered to enter into under section 93F
List all documents submitted with this report for the Panel's consideration	• Environmental Impact Statement – Eurobodalla Quarry Expansion and Resource Recovery Activities, dated December 2016 • Response letter dated 11 May 2017 to matters raised in Council's letter dated 22 February 2017 and Appendices: A - Biodiversity Addendum dated May 2017 B - Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations; C - Revised mitigation measures. • Response letter dated 28 July 2017 to matters raised by OEH with updated biodiversity measures. • Replacement quarry plan (Appendix C) to reduce the extent of the proposed excavation proposed within the existing quarry basin. • Existing Deed of Agreement (Road Maintenance) • Water Quality Management Strategy (Revision C) for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations
Report prepared by	**David Sheehan**
Report date	**17 November 2017**

Summary of s79C matters Have all recommendations in relation to relevant s79C matters been summarised in the Executive Summary of the assessment report?	**Yes**
Legislative clauses requiring consent authority satisfaction Have relevant clauses in all applicable environmental planning instruments where the consent authority must be satisfied about a particular matter been listed, and relevant recommendations summarized, in the Executive Summary of the assessment report? *e.g. Clause 7 of SEPP 55 - Remediation of Land, Clause 4.6(4) of the relevant LEP*	**Yes**
Clause 4.6 Exceptions to development standards If a written request for a contravention to a development standard (clause 4.6 of the LEP) has been received, has it been attached to the assessment report?	**Not Applicable**
Special Infrastructure Contributions Does the DA require Special Infrastructure Contributions conditions (S94EF)? *Note: Certain DAs in the Western Sydney Growth Areas Special Contributions Area may require specific Special Infrastructure Contributions (SIC) conditions*	**No**
Conditions Have draft conditions been provided to the applicant for comment? *Note: in order to reduce delays in determinations, the Panel prefer that draft conditions, notwithstanding Council's recommendation, be provided to the applicant to enable any comments to be considered as part of the assessment report*	**No**

EXECUTIVE SUMMARY

The application seeks approval for the expansion of an existing quarry and to carry out resource recovery activities as a secondary operation on the same land.

The development is defined as an 'extractive industry' and 'resource recovery facility' both of which are permissible uses of the land. The use of the land for the continued extractive activity is considered an essential form of primary industry and is considered an appropriate use of the land given the resources it contains and its isolation from urban areas.

The application has been submitted as 'designated development' by virtue of the proposed works meeting the respective thresholds for 'crushing, grinding or separating works', 'extractive industry' and 'waste management facilities or works' specified by clauses 16, 19 and 32 of Schedule 3 of the Regulations and Sections 29 and 77A of the EP&A Act. Pursuant to clause 8, Schedule 4A of the EP&A Act the development also meets regional development criteria and therefore requires determination by the Planning Panel.

The application is also Integrated Development. A license is required to operate the premises from the Environment Protection Authority (EPA) under Chapter 3 of the Protection of the Environment Operations Act. The EPA has provided its general terms of approval and these are required to be adopted in any consent.

The application, EIS and supplementary documents have been prepared in accordance with the Environmental Planning and Assessment Act 1979 and Regulations 2000 and are considered satisfactory.

The proposal was publicly exhibited and notified in accordance with Section 79(1) of the Act. No submissions were received from the public during that period.

In respect of matters of which Council must be satisfied prior to determination, Council is satisfied that the matters for consideration at Part 3 of SEPP (Mining, Petroleum Production and Extractive Industries) 2007 have been adequately addressed by the proposal and potential impacts can be managed through adoption of the suggested mitigation measures and will be monitored through an environmental licence issued by the EPA. Council is satisfied that the likelihood of contamination is low, and the proposed land use does not require remediation prior to commencement pursuant to the matters for consideration at clause 7 of SEPP 55 – Remediation of Land. The proposed biodiversity management measures and offsetting area will achieve satisfactory mitigation of potential impacts associated with the development. Council is therefore satisfied pursuant to the requirements at cl. 6.6(4) of Eurobodalla Local Environmental Plan 2012 that, subject to adoption of those measures, the development will have acceptable and manageable biodiversity impact. In relation to bushfire matters, Council is satisfied that the proposal will meet the aims and objectives specified within Planning for Bushfire Protection as required and specified at 79BA of the EPA&A Act.

Council has identified that the proposed development will generate additional load on the local traffic network which has not been designed for heavy vehicles. A deed of agreement is currently in place between Council and the applicant to manage the maintenance impact associated with the existing quarry. To manage the additional impacts on the road pavement from the different operations as a result of the proposed development the existing deed of agreement would require amendment. The applicant has agreed to enter into a Voluntary Planning Agreement to extend the existing deed of agreement to work on the same terms (based on per tonne). This is acceptable to Council and a condition is recommended.

The EIS and supplementary statements provide a detailed analysis of the likely impacts of the proposal. These impacts include noise, vibration, dust, traffic, heritage, remediation, surface hydrology, water quality, groundwater, biodiversity, soil and land forms, air quality, cumulative impacts, land use, hazard and risks, and principles of ESD. The appraisal of these matters is considered satisfactory and it is agreed that many of these likely impacts can be carefully managed by the suggested mitigation measures or additional conditions of approval as recommended by referral agencies.

The quarrying of this material is likely to bring social and economic benefits to the area and potentially reduce the costs of transporting the material from locations outside the shire. The location of a resource recovery activity on the property is considered an efficient use of the land and will have a measurable reduction in the waste stream to authorized landfill locations.

The application is recommended for approval.

REPORT

1.0 DESCRIPTION OF THE LOCALITY AND THE SITE

The property is situated approximately 7.5km to the south-west of Bodalla and contains an existing approved hard rock quarry and concrete batching plant. The existing quarry operation is known as Eurobodalla Quarry. The property is irregular in shape and has an area of 57.11 hectares. The western portion of the property is heavily forested while land to north of the existing quarry is cleared and utilised for livestock grazing. The northern boundary of the site is defined by Swamp Creek which is tributary of the Tuross River situated approximately 2.5km to the east.

Dampier State Forest adjoins the subject property to the north and west. Land to the south of the subject property is partially cleared for grazing activity and is known as 'Tyrone Farm'. Land to the east of the subject property is currently utilised for livestock grazing and contains a siltstone extractive industry that is also owned and operated by the applicant. Access to that extractive industry is obtained via an access track situated to the north and east of the hard rock quarry on the subject land.

The existing Eurobodalla quarry is operated by the applicant. Approved quarry activities include extraction of basalt material, crushing and screening of extracted materials, transport of materials from the site and concrete batching. The existing quarry is limited to a maximum extraction of 100,000 tonnes/ year with a maximum of 1,400 tonnes leaving the property per day.

Access to the property, and the location of the existing haul route, is obtained via an unnamed road from the southern boundary which connects with Nerrigundah Mountain Road. Nerrigundah Mountain Road joins Eurobodalla Road to the east which connects to the Princes Highway approximately 9km to the north-east.

2.0 BACKGROUND

On 2 October 1998 Council issued consent to DA 166/99 for selective timber harvesting upon multiple parcels of land known as 'Elizabeth Farm'. This type of development required separate approval under the Native Vegetation Act and was followed by separate deferred commencement

approval by the Department of Land and Water Conservation dated 19 April 1999. That consent permitted clearing on some but not all of the areas sought.

On 17 September 2002 Council issued deferred commencement approval to a designated development application (DA 848/02) for a Hard Rock Quarry on the subject land. Deferred commencement matters to be satisfied prior to the operation of the consent relate to road and access upgrade requirements. The approved site covered an area of approximately 5.57 hectares. An appeal was lodged with the Land and Environment Court on 17 October 2002 (10775 of 2002) pursuant to s.98 of the EP&A Act with key issues relating to access upgrades, land to which the development relates and whether the consent of other authorities were required prior to the grant of consent. A judgment by the Court was made on 28 February 2003 which answered the questions of law by stating that the haul route did not constitute land to which the development application relates and that integrated approvals were not required. Court issued orders were given on 10 April 2003 allowing the appeal and issuing development consent subject to revised conditions, including a revised list of required road works at Conditions 1 and 2 and a more specific condition in relation to the schedule of approved plans at Condition 4.

On 8 February 2005 Council approved DA 572/05 for 2 dams on the subject and adjoining land to the east. Both dams have been installed.

On 11 April 2007 Council issued development approval (451/07) for concrete works and batching plant within the existing quarry site. The proposed batching plant area was proposed within an area which was being utilised as a stockpile site and was to produce a maximum of 150 tonnes per day or 30,000 tonnes per year of concrete which was the maximum quantity that could be produced without becoming a designated development. This is reflected in Condition 5 of the consent, which also stipulates that the total quantity of material (concrete and quarry material) exported from the site is not to exceed 1400 tonnes per day or 100,000 tonnes per year in accordance with the existing quarry consent. This application was modified on 31 October 2011, where Council approved modification application M451/07 to allow a single cement silo to have a maximum height of 18m. An Occupation Certificate was issued on 7 April 2014 by an accredited certifier.

On 6 March 2008 Council issued development approval (259/08) for an extension to the existing Eurobodalla Quarry site. The DA proposed a 2 hectare extension to the north-west of the existing quarry. Resource extraction rates were to remain within the existing approved limits.

On 21 August 2013 Council approved DA 468/13 for an extractive industry on land approximately 1km to the west of the existing quarry for the purpose of extracting siltstone material. The resource is being extracted for the purpose of blending it with the course-grade durable basalt from the main quarry to provide a suitable road base material.

Development observed on site appears to conform to approved plans on file. There is no further background which is considered relevant to the assessment of the current application.

3.0 DESCRIPTION OF THE PROPOSAL

Section 3.1 of the EIS provides a description and overview of the proposed works as follows:

a) An expansion of the quarry extraction area, including:

   i) A 13.1 hectare enlargement of the quarry extraction footprint to the north and west of the approved extraction areas, bringing the total quarry area to approximately 20.8 hectares.

   ii) Excavation to a greater depth within the approved quarry footprint. Section 3.2.3 of the EIS seeks a final depth of between RL 10 (at the northernmost section of the proposed new extraction area) and RL 15 (at the southernmost section of the approved extraction area).

   iii) An increase in the annual limit of extraction and removal of resources from the currently approved 100,000 tonnes/year to 175,000 tonnes/year.

   iv) An extension of the life of the quarry operations to 30 years from the date of approval of the current development application.

b) Construction of a hardstand area for the storage and processing of extracted materials and recovered wastes. Section 3.1.2 of the EIS provides that the hardstand stockpile area would occupy an area approximately 4.55 hectares in size.

c) Resource recovery and processing activities, including:

   i) Recovery and processing of a range of 'clean' (uncontaminated) non-putrescible wastes including selective inert building and construction wastes (concrete, asphalt, sand, VENM, bricks etc).

   ii) Composting of a limited quantity of Category 1 organics, including general garden waste, untreated timber and wood. Construction of a leachate pond to capture leachate runoff from the composting pad.

Section 3.2 of the EIS provides a detailed account of the staging of proposed works and the intended methods of extraction. Extraction is intended to take place from the southern portion of the site (at the existing quarry pit) and progress in a northerly direction. Extraction methods will vary depending on materials being extracted comprising ripping with a bulldozer for weathered rock and blasting for hard rock which is anticipated will take place every 4 to 6 months. The existing quarry operates under a similar method of extraction.

No concurrent approvals are sought under the *Local Government Act 1993.*

During the course of assessment of the proposal the applicant has provided a number of additional documents to respond to matters raised by Council and Government Agencies. In addition to the EIS, the following documents have been considered in the understanding of the proposal:

11 May 2017 – Response letter to matters raised in Council's letter dated 22 February 2017 including the submission of:

- Biodiversity Addendum; and

- Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations; and
- Revised mitigation measures.

28 July 2017 – Response letter to matters raised by OEH with updated biodiversity measures.

14 November 2017 – Replacement quarry plan (Appendix C) to reduce the extent of the proposed excavation proposed within the existing quarry basin.

16 November 2017 – Revised Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations Appendix C (to align with EPA GTAs); and

4.0 APPLICABLE PLANNING CONTROLS

The following planning policies and control documents are of relevance to the development and were considered as part of the Section 79C assessment and form the basis of the Section 5.0 Planning Assessment**:**

- Environmental Planning and Assessment Act 1979
- Protection of the Environment Operations Act 1997 (POEO Act)
- Environmental Protection and Biodiversity Conservation Act 1999
- Water Management Act 2000
- Threatened Species Conservation Act 1995
- National Parks and Wildlife Act 1974
- Fisheries Management Act 1994
- Native Vegetation Act
- Local Land Services Act
- State Environmental Planning Policy 33 – Hazardous and Offensive Development
- State Environmental Planning Policy 44 – Koala Habitat Protection
- State Environmental Planning Policy 55 – Remediation of Land
- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy (Rural Lands) 2008
- State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
- Eurobodalla Local Environmental Plan 2012 (ELEP 2012)
- Advertisement and Notification Code
- Parking and Access Code

5.0 PLANNING ASSESSMENT

5.1 Acts and Regulations

<u>Environmental Planning and Assessment Act 1979 and Regulations</u>

The development is designated development by virtue of the proposed works meeting the respective thresholds for ‘crushing, grinding or separating works’, ‘extractive industry’ and ‘waste management facilities or works’ specified by cl. 16, 19 and 32 of Schedule 3 of the Regulations and Sections 29 and 77A of the EP&A Act.

An Environmental Impact Statement has been submitted. The application has been publicly exhibited as required by the Act and has been referred to the required integrated and consultation agencies. All departments are supportive of the proposal. The requirements and any general terms of approval from those agencies have been considered and will form conditions in the event of approval.

The Regulations stipulate that consideration must be given to the provisions of the NSW Coastal Policy where it applies, and to Australian Standard 2601 *Demolition of Buildings*. Neither apply to this site or development.

Native Vegetation Act 2003 and Local Land Services Act 2013

The Native Vegetation Act 2003 was repealed by Section 3 of the Local Land Services Amendment Act 2016 with effect from 25 August 2017. Despite the repeal of this legislation, it is noted that pursuant to Division 4 Section 25(f) of the Native Vegetation Act 2003 there was no requirement to obtain separate approval for clearing under the Act.

As of 25 August 2017 vegetation clearing on rural land is regulated by the Local Land Services Act 2013. The clearing required to carry out the activity will have planning approval under Part 4 of the EPA&A Act 1979 and therefore requires no further consideration under the Local Land Services Act 2013 pursuant to cl. 60O of that Act.

Protection of the Environment Operations Act 1997 (POEO Act)

Pursuant to the provisions and Schedule 1 of the POEO Act the proposal requires an amendment of the existing Environment Protection Licence to accommodate the change to extraction limits, extraction area and the additional resource recovery and composting operations. The EPA have issued General Terms of Approval in relation to these matters and will form conditions in the event of Development Approval. By issuing these conditions, Council is of the understanding that the EPA are satisfied that the proposed development will incorporate appropriate safeguards to avoid potential offences under the Act. The EPA have specified monitoring procedures within their terms of approval and are the appropriate regulatory authority to remedy any such offence.

Environmental Protection and Biodiversity Conservation Act 1999

The EIS and biodiversity addendum and letter dated 11 May 2017 have completed a thorough survey of the proposal area and conclude that, subject to the adoption of mitigation measures, the development will not have a significant impact on any matters of national environmental significance. This view is considered a reasonable conclusion and referral to the Commonwealth Environment Minister is not necessary.

Water Management Act 2000

The Water Management Act provides a framework to regulate activities within proximity of water resources and the use and storage of water. The Department of Primary Industries – Water have confirmed that the proposal does not trigger a Controlled Activity Approval requirement or will exceed the Harvestable Rights threshold.

The EIS provides that the existing Eurobodalla Quarry holds a Water Supply Works and Water Use Approval which permits diversion of up to 260ML of water from Swamp Creek for industrial and irrigation purposes. The EIS further notes that it is unlikely that any water required for the operation

will be extracted from Swamp Creek and will likely be sourced from on-site sediment detention ponds. DPI Water has reviewed the proposal and confirmed this view.

The proposal is assessed to meet requirements and provisions of the Water Management Act which are relevant to the development.

5.2 Environmental Planning Instruments

The following Environmental Planning Instruments are relevant to the assessment of this application:

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP)

Pursuant to the provisions at cl. 7(3) an extractive industry is permitted on land on which development for the purposes of agriculture or industry may be carried out (with or without development consent). Clause 7(4) also relevantly provides that on land on which an extractive industry is being carried out the processing of extractive material and processing of construction and demolition waste or of other material that is to be used as a substitute for extractive material can also be carried out with development consent.

Clause 8 of the Mining SEPP provides that where an extractive industry is permissible with development consent under a Local Environmental Plan (LEP), development may be carried out with consent without the provisions of the LEP having to be satisfied and they have no effect in determining whether or not development for that purpose may be carried out on that land.

Part 3 of the Mining SEPP lists matters of consideration which Council must be satisfied prior to determination. These matters have been considered and are discussed below.

Adjoining land is primarily utilised for the purpose of forest and agriculture with the closest residential dwelling situated 1.4km to the south. The adjoining land is considered best suited to the purpose as grazing and forestry due to the steep terrain, prior and existing uses, clearing and location relative to existing services. It is noted that the resource located on the subject land runs in a seam that continues in a southerly fashion over the adjacent land to the south and, given the scarcity of the natural resource, it is considered reasonable to suggest that the highest and best utilisation of land immediately to the south of the subject property may extend to a similar extractive industry.

Impacts to adjoining uses associated with the extraction can mainly be attributed to noise, dust, vibration and traffic. All these impacts are currently occurring on site in association with the existing quarry. It is noted that the existing quarry has operated for a period in excess of 10 years with a sound performance record. Safeguards and mitigation measures proposed within the EIS and addendums have been reviewed by Council and relevant stakeholders and are considered both reasonable and satisfactory to ensure the operation takes place with limited impacts to adjoining land uses, transport related impacts and best practice measures to mitigate impact to water resources, threatened species and biodiversity. The proposed indicative staging of the development provided within the EIS is considered sufficient to ensure that the resource is extracted in an efficient manner.

Extracting this material is likely to bring social and economic benefits to the area and potentially reduce the costs of transporting similar material from locations outside the shire. Conditions are

considered necessary to ensure that the safeguard and mitigation measures are implemented and monitored. A rehabilitation strategy has been provided and provides a reasonable level of certainty in relation to finished landform and the content of a rehabilitation plan. Pursuant to the considerations at cl. 17 of the Mining SEPP it is considered reasonable and necessary to ensure that a detailed rehabilitation strategy is prepared and submitted to Council prior to commencement of approved work.

The activities are not considered mining or petroleum development as identified in SEPP (State and Regional Development) 2011 and as such the provisions of Part 4AA of the Mining SEPP do not require further consideration.

State Environmental Planning Policy (Rural Lands) 2008

The relevant aims of the Rural Lands SEPP aims include facilitating the orderly and economic use of development of rural lands for rural and related purposes, and implementation of measures designed to reduce land use conflicts. There are no detailed provisions within the SEPP which are relevant to the proposed development. Given the inflexibility in extractive resource locations and the existing use of the property for comparable activity, the use of this site for the extractive industry is considered appropriate. The EIS sufficiently demonstrates that the proposed development will not impact on environmentally sensitive areas. The proposed resource recovery works are considered conciliatory uses and will have limited and manageable impacts within the rural landscape. In view of the public benefits associated with the proposal and limited environmental impacts, the proposal is assessed to be satisfactory with regard for the requirements and object of the Rural Lands SEPP.

State Environmental Planning Policy 33 – Hazardous and Offensive Development

The aims and objectives of SEPP 33 are to amend the definition of hazardous and offensive industries where used in environmental planning instruments and to ensure that sufficient information is provided to consent authorities to determine whether the development is hazardous of offensive and to impose conditions to reduce of minimise any adverse impact. The EIS provides sufficient information in relation to the operation and proposed mitigation and safeguard measures are assessed as suitable to ensure that the development will avoid being categorised as either hazardous or offensive. It is noted that the EPA are the regulatory authority in this case and they have imposed conditions of consent to mitigate impacts associated with the proposal which include restrictions on noise, vibration, pollution of waters, noise, odour and dust. The provision of such conditions indicates that the EPA also consider the likely impacts of the proposal able to be appropriately managed to avoid significant impact to adjoining land uses.

State Environmental Planning Policy 44 – Koala Habitat Protection

The provisions of SEPP 44 apply to the subject development. Council must not grant consent to development unless it is satisfied that the land under application is not potential Koala Habitat. Potential koala habitat is defined in the policy as an area of native vegetation where the trees of the types listed in Schedule 2 [of SEPP 44] constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

The biodiversity assessment at section 6.5 of the EIS indicates that there are no species of trees on the property which are identified within Schedule 2. Therefore the land is not considered potential Koala habitat. Councils Environmental Planner has appropriate expertise to assess potential core koala habitat and has provided advice that concurs with the conclusions provided in the EIS in

relation to this matter. As such the proposed development is assessed as satisfactory with regard for the objectives and requirements of SEPP 44.

State Environmental Planning Policy 55 – Remediation of Land

SEPP 55 aims to promote remediation of contamination of land for the purpose of reducing the risk or harm to human health or the environment. The existing land is not known or is considered likely to be contaminated which would require remediation prior to the implementation of the proposed use and as such is considered satisfactory with regard for the provisions at cl. 7 of SEPP 55.

State Environmental Planning Policy (Infrastructure) 2007

Pursuant to the provisions at cl. 121 of SEPP Infrastructure, resource recovery facilities are permissible with consent on land zoned RU1. A resource recovery facility is defined within the cl. 120 as:

> *"a facility for the recovery of resources from waste, including such works or activities as separating and sorting, processing or treating the waste, composting, temporary storage, transfer or sale of recovered resources, energy generation from waste gases and water treatment, but not including re-manufacture of material or goods or disposal of the material by landfill or incineration"*

Clause 121 (3) also relevantly provides that development for the purpose of the recycling of construction and demolition material, or the disposal of virgin excavated natural material (within the meaning of Schedule 1 to the Protection of the Environment Operations Act 1997) or clean fill, may be carried out by any person with consent on land on which development for the purpose of industries, extractive industries or mining may be carried out with consent under any environmental planning instrument. The proposed compositing use is deemed to satisfy the above description and as such is permissible with consent. The remaining reprocessing activities in relation to concrete, brick material meets the provisions specified within cl. 121(3) and as such are also permitted with development consent. There are no specific or further considerations provided within SEPP Infrastructure to guide assessment in relation to these uses.

The proposed development does not feature within the table to Schedule 3 and therefore is not considered traffic generating development pursuant to cl. 104. Nevertheless the application has been referred to the RMS who have advised that they have no objection to the proposal subject to limiting traffic generated by the development to the movements specified within the EIS and SIDRA modelling information. Conditions are proposed to address this requirement.

Eurobodalla Local Environmental Plan 2012 (ELEP 2012)

The property is subject to the ELEP 2012 as per the Land Application Map specified at cl.1.3.

The area subject of the application is zoned RU1 Primary Production as identified on the Land Zoning Map specified within cl.2.2 of ELEP 2012. The proposed works are defined as an "extractive industry" and "resource recovery facility". An extractive industry is specified as a permissible use within the RU1 zone table. The resource recovery facility is permissible by virtue of cl.121 of SEPP (Infrastructure). Clause 7(4) of the Mining SEPP also relevantly provides that on land on which an extractive industry is being carried out the processing of extractive material and processing of construction and demolition waste or of other material that is to be used as a substitute for extractive material can also be carried out with development consent.

The use of the land for the continued extractive activity is considered an essential form of primary industry and is considered appropriate use of the land given the resources it contains and its isolation from urban areas. The proposal incorporates substantive mitigation measures for maintaining the environmental quality of the area and the visual impact from outside the site or from accessible public vantage points is not considered significant. The location of a resource recovery activity on the property is considered an efficient use of the land and have a measurable reduction in the waste stream to authorized landfill locations. It is for the aforementioned reasons that the proposal is deemed consistent with the zone objectives.

Clause 8 of the Mining SEPP provides that where an extractive industry is permissible with development consent under a Local Environmental Plan (LEP), development may be carried out with consent without the provisions of the LEP having to be satisfied and they have no effect in determining whether or not development for that purpose may be carried out on that land.

The main clauses of relevance to the assessment of the application are considered to be cl. 4.3 (Height), cl. 5.10 (Heritage), cl. 6.4 (Earthworks), cl. 6.6 (Biodiversity) and cl. 6.7 (Riparian Lands and Watercourses).

Height
The subject land is not identified on Council's Height of Buildings Map and as such the proposal is deemed satisfactory with provisions at cl. 4.3(2) of the ELEP 2012. The site is visually distant and isolated from any sensitive adjoining land uses and the proposal does not comprise any elements which would give rise to an incompatibility with the objectives at cl. 4.3.

Heritage
Clause 5.10 seeks to conserve the environmental heritage of Eurobodalla, heritage significance of heritage items and conservation areas, archaeological sites and to conserve Aboriginal objects and Aboriginal places of heritage significance.

The site is not identified on the Heritage map as containing a heritage item, being situated in a heritage conservation area or containing an Aboriginal Place of Heritage Significance. Consequently the proposal is assessed as satisfactory with regard for the objectives and requirements at cl. 5.10 of the ELEP 2012. It is noted that an Aboriginal site has been recorded within close proximity to the proposed development as a result of the due diligence undertaken as part of the preparation of the EIS. The assessment of any impact on Aboriginal Heritage is undertaken at the likely impacts section of this report and found to be satisfactory subject to adoption of mitigation measures as amended by the Office of Environment and Heritage.

Earthworks
Prior to granting of consent for earthworks Council is required to take into consideration the matters specified at cl. 6.4(3). The matters to be taken into consideration are varied however generally relate to disruption of drainage features, soil stability, likely future use of the land, amenity of adjoining properties, water quality and any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

Comment: Given the inflexibility in extractive resource locations and the existing use of the property for comparable activity, the use of this site for the extractive industry is considered appropriate. A comprehensive assessment of the potential impacts associated with the development has been carried out within the EIS and Water Quality Management Strategy. The EIS sufficiently demonstrates that the proposed development will not impact on environmentally sensitive areas.

The proposed mitigation measures are assessed as both reasonable and satisfactory to mitigate the impacts of the development and will be the subject of monitoring and regulation by the NSW EPA.

Biodiversity

The objective of cl. 6.6 is to maintain terrestrial and aquatic biodiversity. The subject site is identified on Council's maps as likely to contain Extant Native Vegetation. Before determining a development application for development on land to which the clause applies, Council is required to consider any adverse impact of the proposed development on native ecological communities, the habitat of any threatened species, populations or ecological community, regionally significant species of fauna and flora or habitat, and habitat elements providing connectivity.

Comment: Consent has been requested for the clearing of 4.24 hectares of native vegetation in order to accommodate the proposed expanded extraction activity. The EIS and supplementary biodiversity addendum statements have provided a substantive account of existing biodiversity values on the property. A 7 part test of significance has been undertaken for hollow dependent fauna known to exist within 10km of the development and also for River Flat Eucalypt Forest on the property. The applicant has also offered to offset the loss of vegetation by securing an area of 13.18 ha of native vegetation elsewhere on the property. The proposed biodiversity management measures and offsetting area will achieve satisfactory mitigation of potential impacts associated with the development. Council is therefore satisfied pursuant to the requirements at cl. 6.6(4) that, subject to adoption of those measures, the development will have acceptable and manageable biodiversity impact.

Riparian Lands and Watercourse

The objective of cl. 6.7 is to protect and maintain water quality within watercourse, stability of the bed and banks of watercourse, aquatic and riparian habitats and ecological processes within, and continuity and connectivity between, waterways and riparian areas. Although a riparian watercourse exists along the northern boundary of the property, this is not depicted on the Riparian Lands and Watercourse Map and pursuant to the provisions at cl. 6.7 (2) the clause is not applicable to the development. Riparian considerations have been undertaken against the likely impacts of the development section of this report.

<u>Planning for Bushfire Protection</u>

The property is identified on the Bushfire Prone Land Map as being bush fire prone land. Pursuant to section 79BA of the EPA&A Act, Council is required to be satisfied that the development conforms to the specifications and requirements of the Planning for Bushfire Protection 2006 as amended 2009 (PBP). For the subject proposal compliance with the aims and objectives of PBP are required only.

The aims of PBP are stated as

> *"to use the NSW development assessment system for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bush fire, while having due regard to the development potential , on-site amenity and protection of the environment."*

The objectives of PBP are:

(i) Afford occupants of any building adequate protection from exposure to bush fire;
(ii) Provide defendable space around buildings;

(iii) Provide appropriate separation between a hazard and buildings, which in conjunction with other measures, prevent direct flame contact and material ignition;
(iv) Ensure that safe operational access and egress for emergency service personnel and residents is available;
(v) Provide for ongoing management of bushfire protection measures, including fuel loads in the asset protection zone; and
(vi) Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting).

The proposal relates to the expansion of an existing quarry which has suitable existing access to and from the site that is capable of accommodating bush-fire tankers and personnel. The site has adequate supply of water for bush-fire fighting purposes. The EIS indicates that fire and bushfire risk is currently managed by the Eurobodalla Quarry Emergency Response Procedure. Council is satisfied that the risks associated with bushfire can be appropriately managed so as to meet the stated aims and objectives of planning for bushfire.

Parking and Access Code

Council's parking and access code do not specify minimum parking requirements for extractive industries or resource recovery facilities. The existing operation is required to have 8 car-parking spaces, however currently has only 3 employees. The EIS states that as a result of the proposed development it is envisaged to increase employees to a total of four (4). The proposal does not seek to permit public access to the quarry or resource management activities. On-site retail sale is not proposed and will be prohibited by conditions. There is substantial area within the quarry to accommodate the existing 8 car-parking space requirement and no additional parking is deemed necessary. A condition to maintain a minimum of 8 spaces is recommended.

6.0 THE LIKELY IMPACTS OF THE DEVELOPMENT

The EIS and supplementary statements provide a detailed analysis of the likely impacts of the proposal. The appraisal of these matters is considered satisfactory and it is agreed that many of these likely impacts can be carefully managed by the suggested mitigation measures or additional conditions of approval as recommended by referral agencies. The likely impacts considered of increased importance are addressed in further detail below.

Soil and water management and downstream hydrological impacts

The existing quarry and the proposal will discharge surface runoff via controlled sediment basins and other water quality management systems indirectly to Swamp Creek. Swamp Creek is situated along the northern boundary of the property. The discharge points (Sediment Basin 3) are located at their closest approximately 60m from the creek bank. It is proposed to fence the riparian zone adjacent the creek, exclude stock from entering the area and permit natural regeneration. A separate leachate collection pond is to be installed to the west of the compost activity and is sized to cater for the intended processing capacity and runoff volume from a 10 year ARI 24 hour storm.

The Initial Water Quality Management Strategy states that sediment basins have been designed and sized to account for a 5 day 95th percentile rainfall depth and nominates this as a conservative approach necessary for the proposed long term operation of the site. This strategy has been reviewed by the EPA who have advised that in further discussions with the proponent it has been agreed that the proposal will be designed to be capable of capturing 140mm which is equivalent to a minimum 1 in 2 year ARI 24 hour storm event which entails larger capacity basins. These can be

achieved on site and Council has since received an amended Water Quality Management Strategy which aligns with those recommendations. The EPA have issued General Terms of Approval in relation to these matters and will form conditions in the event of Development Approval. By issuing these conditions, Council is of the understanding that the EPA are satisfied that the proposed development will incorporate appropriate safeguards to avoid potential offences under the Act. The EPA have specified monitoring procedures within their terms of approval and are the appropriate regulatory authority to remedy any such offence. DPI Fisheries are also satisfied. Council is satisfied that it has been adequately demonstrated that water quality and stormwater impacts occurring as a result of the proposal can be appropriately managed.

Riparian Buffer

In determining the required vegetated buffer to Swamp Creek, consideration has been given to DPI – Water's riparian guidelines Strahler system of classification. Swamp Creek is considered a third order stream requiring a minimum buffer of 30 metres from the top of bank of the stream (either side). Consideration has also been given to comments received from DPI Fisheries who initially requested a buffer of 100m based on the sensitivity of the receiving waters. The applicant has revised their proposal to afford a buffer of 60m and has justified the lesser distance required by Fisheries on the basis that the quality of the provided riparian buffer will be enhanced as a result of the proposal, by fencing the land, excluding livestock and allowing regeneration to occur. Fisheries have advised that this is acceptable subject to enhancement and regeneration of the land within the buffer or extension of the buffer to the east. The land will be the subject of a conservation agreement and active rehabilitation plan and as such will meet Fisheries requirements. Council is also satisfied as the distance is in excess of both the 30m distance which would be required under the Strahler system of calculation and also all buffer distances specified in Council's LEP. It is recommended that Council adopt Fisheries conditions alongside proposed EIS mitigation measures.

Traffic

The existing quarry and approved concrete batching operation utilise a haul route which exit to via an unnamed Council road to the south of the property onto Nerrigundah Mountain Road. Vehicles travel east and cross Tyrone Bridge before turning left onto Eurobodalla Road. Vehicles then travel 9.2 kilometres along Eurobodalla Road before arriving at the Princes Highway intersection at Bodalla. The proposed development seeks approval to utilise the existing approved haul route. The expansion proposes to alter the total extraction of the quarry to a maximum 175,000 tonnes per annum, but will maintain the maximum daily truck movements from the quarry operations to 1400 tonnes per day. This entails that although the maximum daily movements remain the same, they could theoretically occur on a more frequent basis. As daily traffic movements to and from the site do not increase significantly additional road safety upgrades are not considered warranted.

Additional traffic movements will be generated from the proposed resource recovery and composting operations. These operations create potential impacts at terms of traffic movements causing traffic delays, and in damage the Council's road network. Council previously required some upgrading of the haul route to the Princes Highway to improve road safety. These upgrades were required with the original quarry development consent.

The local road network pavements are not designed for the heavy vehicle traffic generated by the development and as such with the agreement of the quarry owners/operators, Council has an existing deed of agreement for roadworks contributions to maintain the pavement in a suitable condition. To manage the additional impacts on the road pavement from the different operations as a result of the proposed development the deed of agreement would require amendment.

The mechanism to best achieve this outcome is provided by Section 93F of the Environmental Planning and Assessment Act 1979 (the Act) through a voluntary planning agreement (VPA). Council has received written confirmation from the applicant offering to enter into a Voluntary Planning Agreement along the lines of the existing deed of agreement, i.e. based on per tonne extracted or delivered. Section 1.3 of the Eurobodalla Quarry Response to Council Letter notes that there will be an additional maintenance levy for incoming vehicle loads. Section 93I (3) of the Act allows Council to impose a condition of consent requiring a VPA so long as the terms of that agreement are consistent with an offer made by the developer prior to the determination of the DA.

The applicant provided an updated traffic impact assessment, including SIDRA modelling of the Eurobodalla Road and Princes Highway intersection. The SIDRA analysis indicates the intersection level of service is maintained at Level of Service (LOS) A. RMS have not indicated any requirements for upgrading the intersection. As such Council does not consider an upgrade of the intersection is warranted.

Council is satisfied that the traffic generated by the development can be adequately accommodated within the existing road network.

Noise

The EIS provides a detailed account of anticipated noise related impacts associated with operational equipment, periodic blasting and transport. In summary the noise levels associated with the existing operation are expected to continue, albeit at a greater distance from sensitive receivers than existing operational areas.

Comment: It is noted that the existing quarry has operated for a period in excess of 10 years with a good management record. The safeguards and mitigation measures proposed within the EIS and addendums have been reviewed by Council and relevant stakeholders and are considered both reasonable and satisfactory to ensure the operation takes place with limited impacts to adjoining land uses. Operational Noise and overpressure levels associated with blasting have been reflected in the EPA General Terms of Approval and will be the subject of monitoring and recording conditions administered under the EPA licence.

Rehabilitation

The EIS has provided a rehabilitation strategy which outlines objectives for rehabilitation of the property which include the provision of a stable landform resistant to erosion, to rehabilitate and revegetate the worked quarry site, such that pre-development habitat values are reinstated or improved, introduce measures to reduce weed infestation and to preserve downstream water quality. Whilst the rehabilitation strategy is brief, the intent to rehabilitate the property to a suitably vegetated and stable state is acknowledged. Section 80A (6) of the EPA&Act 1979 provides circumstances in which Council may impose a condition in relation to security. It has been held by the land and Environment Court (Charalambous v Ku-ring-gai Council [2007] NSWLEC 510) that the only circumstances in which a Council may impose a bond are those identified in s80A(6) and no other. The circumstances do not provide for the imposition of a bond to ensure rehabilitation works are completed.

Conditions of consent are recommended which require the submission of a detailed rehabilitation plan prior to commencement of work.

Aboriginal Heritage

The applicant has carried out a detailed due diligence assessment (Appendix E of the EIS) in accordance with the Due Diligence Code of Practice. In summary, the assessment indicates that the terrain features within the expansion areas are assessed as having archaeological sensitivity based on their proximity to Swamp Creek and the presence of hill and spur crests. A field inspection undertaken as part of the due diligence found one Aboriginal stone artefact scatter at the northern end of a spur crest, located just outside the proposed expansion boundary. This has since been registered on the Aboriginal Heritage Information Management System (AHIMS) (Item 62-3-0637).

The due diligence provides some deliberation in relation to a 2001 study of the property which identified a stone artefact which possibly could have been situated within the northern portion of the expansion area, however there were discrepancies in the recorded location of the item. The item could not be located upon a visual inspection and the site had not recorded on AHIMS. The report concludes that given the uncertainty of the location of that site, the development proceed with caution and that works cease if any objects suspected of being Aboriginal in origin are discovered during work. Mitigation measures include the requirement to fence the known site and a requirement for all staff to undertaken Aboriginal Heritage Induction prior to commencement of expansion works.

Comment: The due diligence assessment and conclusion is considered to be a rational assessment with mitigation measures to ensure adverse impact to known items and any unexpected finds can be avoided. The application and statements have been referred to Office of Environment and Heritage who have provided recommended conditions to strengthen the mitigation measures for Aboriginal Cultural Heritage in the event of approval. Subject to the adoption of those conditions in place of mitigation measures AH1 to AH6 the proposal is not considered likely to have an adverse impact on any known items of Aboriginal Heritage.

7.0 THE SUITABILITY OF THE SITE FOR THE DEVELOPMENT AND THE PUBLIC INTEREST

The site overlays a high quality extractive resource. Adverse impacts can be readily managed with appropriate conditions of consent. The quarrying of the material is likely to bring social and economic benefits to the area. The resource recovery operation is considered to have co-location benefits and is of a scale which is unlikely to generate any amenity impacts which cannot be adequately addressed through adoption of the proposed mitigation measures. The site is considered suitable and the proposal is considered to be in the public interest.

8.0 CONSULATATION WITH STATE AUTHORITIES AND COUNCIL DEPARTMENTS

Council is required to seek representation from various State Government Authorities in the assessment of a Designated Development application. Following is an outline of their requirements and comments from Council staff where appropriate.

Environment Protection Authority (EPA)

The Department: The proposal is for Integrated Development and requires licencing from the EPA under Chapter Three of the Protection of the Environment Operations Act. The Development Application, EIS and supplementary documents were forwarded to the EPA for review in accordance with the Act and Regulations. The EPA have responded with General Terms of Approval for the

quarry and resource management facility and it is a requirement that they are included on any consent.

The EPA is the appropriate regulatory authority under the Protection of the Environment Operations Act for such matters as:

- Pollution of waters;
- Waste;
- Noise and blasting;
- Air pollution (dust and odour);
- Stormwater Management; and
- Leachate.

Comment: That general terms of approval in relation to these matters have been provided is demonstration that the EPA considered the likely impacts to be within acceptable limits. It is recommended that the General Terms of Approval are adopted as conditions of consent.

Department of Planning and Environment

The Department: Section 80(9) of the Act provides that Council must not determine an application for Designated Development until the Department of Planning and Environment has had the opportunity to consider the submissions received by Council during the exhibition period. The Department acknowledges the information submitted to date by Council as required by cl. 80(9) and considers that there are no issues of state or regional significance that apply to the proposal. Any General Terms of Approval provided by the Environment Protection Authority (EPA) should be incorporated into any development consent granted by the Council. It further requests that a copy of any determination be forwarded.

Comment: The comments are noted. EPA General Terms of Approval will be incorporated into conditions of approval. In the event of approval, a copy of the consent will be issued to all government agencies and the Department.

Other Government Departments

Clause 77 of the Regulations requires that Council notify any public authority that, in the opinion of Council, may have an interest in the determination of the development application. Responses from those public authorities are summarised below.

Roads and Maritime

The Department: RMS has reviewed the additional information provided (including the SIDRA modelling for the intersection of Eurobodalla Road/Princes Highway, Bodalla) and notes that the the intersection of Eurobodalla Road/Princes Highway, Bodalla is an existing public junction, has no previous accident history, has no history of delays and based on the SIDRA modelling provided will not result in adverse delays at the intersection. As such, based on its assessment, RMS will not object to the DA in principle. It is however recommended that the following comments be included in the conditions of any development consent issued:

1. The operation of the approved development must not exceed the processing limits as specified in the submitted Environmental Impact Statement (i.e. 175,000 tonnes per annum for quarrying activities, 15,000 tonnes per annum for resource recovery activities and 5,000 tonnes per annum for composting activities);

2. The maximum number of truck movements associated with the approved development must not to exceed the maximum numbers as specified in the Environmental Impact Statement dated 17 December 2016 prepared by NGH Environmental and Eurobodalla Quarry Expansion SIDRA Modelling Assessment dated 15 August 2017 prepared by ISG Projects; and

3. A record of daily truck movements to/from the site and their associated destination must be kept by the owner/operator and provided to either Council or Roads and Maritime Services upon request.

Comment: The comments provided by the RMS are noted. The suggested conditions appear reasonable and will be incorporated in any consent issued to the proposal.

Office of Environment and Heritage

The Department: OEH have provided recommended conditions of consent for biodiversity which include a requirement for a constraints map to be included in the EMP clearing showing the offset area, a requirement to protect the offset area in perpetuity through a conservation agreement and mitigation measures to be implemented as described in the EMP. In relation to Aboriginal cultural heritage, OEH provided a review of the submitted due diligence and provided conditions in the event that Council decide to determine the application.

Comment: The comments provided by the Department are noted. The suggested conditions are assessed to be reasonable and are reflected in recommended conditions of consent.

Department of Primary Industries – Fisheries

The Department: On 2 February 2017 the Department advised that there were no objections to the proposed development subject to the imposition of 8 conditions including a condition to enlarge the riparian buffer zone to 100m. The applicant responded by providing an increased buffer distance to the creek from 40m to 60m and permanent fencing proposed. A subsequent response from Fisheries have advised that this is acceptable subject to enhancement and regeneration of the land within the buffer or extension of the buffer a further 250m to the east which is fenced and allowed to regenerate naturally.

Comment: The comments provided by the Department have been considered. Mitigation measures and conditions will ensure the buffer area is fenced and will be the subject of a conservation agreement with enhancement and rehabilitation requirements.

Department of Primary Industries – Water

The Department: DPI Water have advised that for the purposes of the Water Management Act 2000, a controlled activity approval and therefore general terms of approval are not required for the development as presented. The Department acknowledge that the quarry expansion proposes to maintain a 60 metre buffer along the creek which exceeds DPI Water guidelines and is supported. DPI Water notes that the proposed buffer is to provide filtering of discharges from basins and as such, the buffer should be appropriately managed to provide for maximum buffering capacity. In this regard, the proponent should ensure that there are stable drainage paths for return flow to Swamp Creek and it would be preferable for grazing to be restricted from the buffer zone. The Department also advised that the proposed water quality control dams/sedimentation basins are considered to

be special purpose dams which are exempt from the property harvestable right calculations. Therefore the capacity of these dams is in excess of the property harvestable right volume. In addition, reuse of water from these structures is not subject to licensing. DPI Water has no objection to the DA and no further action from DPI water is necessary.

Comment: The comments from the Department are noted. The applicant has provided mitigation measures which address the considerations raised by the department.

Department of Industry - Lands

The Department: The Department of Lands advice that they have no objection to the proposal.

Eurobodalla Council Internal Department Referrals

Environmental Assessment Officer – Advice received that no significant impact is likely to occur on individual threatened species, Endangered Ecological Communities or Endangered Populations as a result of the development as proposed, provided it is approved with the recommended conditions of consent.

Comment: The conditions recommended by the Environmental Assessment Officer largely relate to mechanisms to enable the conservation offsetting proposed. Conditions are considered reasonable.

Environmental Health Department – Has provided advice that the department is satisfied subject to conditions which seek to ensure that the facility is managed in accordance with the Environment Protection Licence and documentation submitted in support of the development application.

Comment: Noted. Relevant conditions of consent will address these matters.

Development Engineering Department – Advice provided the measures the water quality management strategy by Southeast Engineering and Engineering issue B dated 5/4/17 are generally consistent with industry guidelines. Subject to ensuring those measures are installed and maintained in accordance with the report, the environmental risks should be adequately managed to an acceptable level.

Advice is also offered in relation to transport related impacts. The engineer encourages an amendment to the existing deed of agreement to cater for additional traffic movements associated with the operation. The engineer also provides advice that as the daily traffic movements to and from the site do not increase significantly, additional road safety upgrades are not considered warranted.

Comment: Comments in relation to water quality are noted. The applicant is prepared to enter into a Voluntary Planning Agreement to extend the existing deed of agreement to the proposed works. Conditions are recommended.

9.0 PUBLIC NOTIFICATION AND SUBMISSIONS

The proposal was publicly exhibited and notified in accordance with Section 79(1) of the Act. No submissions were received from the public during that period.

DRAFT CONDITIONS OF CONSENT

10.0 CONCLUSION

The proposal has been considered against the statutory and non-statutory controls which are applicable to the site and development. The development is assessed as an environmentally sound and justifiable development. Identified environmental and amenity impacts associated with the proposal can be adequately addressed through implementation of safeguard and mitigation measures. Monitoring of such measures will be carried out by the EPA. The EPA's General Terms of Approval are also included as a condition of consent.

The applicant is willing to enter into a voluntary agreement with Council in relation to the potential impacts associated with vehicle load on Council's road network along the lines of the existing agreement which is currently in place. This is acceptable to Council.

It is recommended that Development Application No. 366/17 be approved subject to the following conditions:

This notice of determination of the development application issued under the Environmental Planning & Assessment Act 1979 contains the following conditions for the purposes of ensuring:

- That the proposed development:
  (a) achieves the objectives of the Environmental Planning and Assessment Act, 1979;
  (b) complies with the provisions of all relevant Environmental Planning Instruments;
  (c) is consistent with the aims and objectives of Council's Development Control Plans, Codes and Policies;

- That the relevant public authorities have been consulted and their requirements met, or arrangements made, for the provision of services to the satisfaction of those authorities;

- That the protection of the amenity and character of land adjoining, and in the locality of the proposed development;

- Any potential adverse environmental, social or economic impacts of the proposed development is minimised;

- That all traffic, car parking and access requirements arising from the development are addressed; and

- That the development does not conflict with the public interest.

GENERAL CONDITIONS

1. ***Approved plans***
   The development must be carried out in accordance with the following stamped approved plans and documentation, or as modified by any conditions of this consent, or as noted in red by Council on the approved plans.

Council Stamp No.	Document title	Date of document	Prepared by
366/17	Environmental Impact Statement – Eurobodalla Quarry Expansion and Resource Recovery Activities	December 2016	NGH environmental

366/17	Letter and response to Council Letter of 22 February 2017	11 May 2017	NGH environmental
366/17	Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations	November 2017 – Appendix C	Southeast engineering and environmental
366/17	Biodiversity Addendum: Eurobodalla Quarry	May 2017	NGH environmental
366/17	Appendix C Revised Mitigation Measures	Undated (submitted as Appendix C to letter dated 11 May 2017)	NGH environmental
366/17	Letter in response to additional information for OEH with Attachment 1 – Assessments of Significance and Attachment 2 – Updated Biodiversity Measures	28 July 2017	NGH environmental
366/17	Untitled plan indicating a reduction in quarry footprint	Stamped Date Received 14 November 2017	NGH environmental

Note: *Any alteration to the plans and/or documentation may require the lodgement of an application to modify the consent under s96 of the Environmental Planning and Assessment Act (EPA Act) 1979, or a fresh development application. Your Principal Certifying Authority should be consulted prior to <u>any</u> works contrary to this consent being carried out.*

Where there is an inconsistency between the documents approved with this consent and the following conditions, the conditions shall prevail to the extent of that inconsistency. [2.05]

2. ***Clarification of plan***
Appendix C of the Environmental Impact Statement is amended by the plan stamped dated received 14 November 2017.

3. ***Voluntary Planning Agreement***
Prior to the commencement of works or use, the applicant is to enter into a Voluntary Planning Agreement (VPA) in accordance with the offer made to Council to extend the existing Deed of Agreement for Eurobodalla Quarry to the works approved under this application. The costs associated with the preparation of the VPA are to be entirely at the expense of the applicant/beneficiary of the consent.

4. ***Sediment Basin and Leachate Pond Design Plan***
Prior to the commencement of works or use, final sediment basin and leachate pond design plans are to be prepared by a qualified practicing geotechnical or civil engineer with corporate membership of Engineers Australia or who is eligible to become a corporate member and has appropriate experience and competence in the related field.

The design is to detail the sediment basin and leachate pond dimensions, batters and cross section, and location in relation to the adjoining properties and the 60m riparian buffer. The Plan details are also to confirm method of construction, compaction and stability. Spillway structures must be rock armoured, incorporate a minimum 5.0 metre setback from any property boundary and be designed to prevent any scouring impacts.

5. ***Conservation Offset Mechanism to be finalised***
Prior to the commencement of works or use the applicant is to submit to Council, and finalise, a suitable mechanism for obtaining the proposed 'Offset Area' within Figure 2 of the Biodiversity Assessment Addendum prepared by NGH environmental, dated May 2017. The conservation offset mechanism shall also incorporate a 60 m riparian zone between Swamp Creek and the edge of the quarry footprint and undertake revegetation within areas containing pasture. This is to be achieved by:

   a) Conservation agreement (in accordance with the Biodiversity Conservation Act 2016) prepared in perpetuity and prepared in accordance with NSW Biodiversity Conservation Trust recommendations. The conservation agreement shall not be eligible for stewardship payments and shall be registered on title; or

   b) Environmental Management Plan (EMP) prepared by a suitably qualified Ecologist and at no cost to Council. Any such EMP shall, at minimum meet the ecological objectives outlined within section 2.2.3 'Biodiversity Offsets' of the Biodiversity Assessment Addendum prepared by NGH environmental, dated May 2017.

   The measures to achieve the above shall be required to be registered on the registered property title as a 'restriction as to user' burdening all affected allotments subject to offset.

6. ***Rehabilitation Plan***
Prior to the commencement of works or use, a detailed rehabilitation plan shall be prepared by a suitably qualified consultant addressing the rehabilitation of the site for the purposes of ensuring at the end of extractive and resource recovery operations, the site is left in an ecologically healthy and functioning state. The plan is to be submitted to the satisfaction of Council and be prepared in accordance with the objectives and framework specified within the rehabilitation strategy (Environmental Impact Statement, Appendix G).

7. ***Environment Protection Authority (EPA) General Terms of Approval***
Prior to the commencement of works or use the applicant is to obtain a licence/ licence variation for the premises under the Protection of the Environment Operations Act 1997 from the Environment Protection Authority (EPA). The General Terms of Approval for this licence (dated 22 June 2017) are attached to this consent. The General Terms of Approval are conditions of this consent.

8. ***Quarry Extraction Limitation***
Extraction and removal of the quarried material from the site is limited to 175,000 tonnes in any one year and for a maximum period of 30 years commencing from the date the applicant obtains the licence variation to operate the premises from the Environment Protection Authority. Extraction and removal of the quarried material shall not exceed 1400 tonnes in any one day.

9. ***Resource Recovery Limitation***
The volume and processing of resource recovery material is limited to the type and quantity identified within Section 3.4.1 and 3.4.2 of the Environmental Impact Statement. This provides a combined maximum of 15,000 tonnes per annum of concrete waste, asphalt, brick and VENM and a maximum of 5000 tonnes of organic material to be accepted onto the site per annum with no more than 2000 tonnes of organics to be held on site at any one time. Resource recovery operations are to cease 30 years from the date the applicant obtains the licence variation to operate the premises from the Environment Protection Authority.

10. ***Implementation of Mitigation Measures***
All Mitigation Measures detailed within:

(a) Table 1, Appendix C Revised Mitigation Measures attached to the letter from NGH Environmental dated 11 May 2017 (attached)

(b) As amended by Attachment 2 – Updated Biodiversity Measures attached to the NGH environmental letter dated 28 July 2017 (attached); and

(c) A.5.3 'Hollow bearing tree removal protocol' from the Biodiversity Addendum prepared by NGH environmental, dated May 2017 (attached).

shall be reflected in the final Environmental Management Plan and shall be implemented.

11. ***Environmental Management Plan***
A constraints map is to be included in the final Environmental Management Plan clearly showing the offset area as shown in Figure 2 - Offset Area in Part A.2 of the Biodiversity Addendum.

12. ***Department of Primary Industry – Fisheries Requirements***

(a) Final design and location of proposed vegetated dispersal path (section 3.2 EMP) for the sediment basin is to be provided to DPI Fisheries for comment prior to any works commencing.

(b) Final design and location of the sediment and leachate ponds are to be provided to DPI Fisheries for comment prior to any works commencing.

(c) A Water Quality Monitoring Plan is to be prepared (in consultation with DPI Fisheries) and implemented. The plan must include provisions for periodic and event based sampling (i.e. rainfall exceeding 25mm in 24 hours) and testing regime and include analysis to verify that water emanating from the site, including both the sediment and leachate ponds, meets the ANZECC parameters;

(d) Environmental safeguards (e.g. silt curtains, sediment fences, booms etc.) are to be installed and maintained throughout the proposal in accordance with "Managing Urban Stormwater: Soils and Construction" (4th Edition Landcom, 2004, aka the Blue Book) to ensure that there is no escape of turbid plumes into the adjacent aquatic environment;

(e) Spill kits suitable for the containment of fuel and oil spills must be kept on site; and

(f) DPI Fisheries (1800 043 536) is to be immediately notified of any fish kills in the vicinity of the works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by DPI Fisheries.

13. ***Limitation of Public Access***
Public access to the extractive industry and resource recovery activities is not permitted as part of this consent.

14. ***Composting Activity***
Only Category 1 Organics (as defined in the NSW EPA Document 'Environmental Guidelines - Composting and Related Organics Processing Facilities 2004) shall be accepted for composting at the facility. The composting facility shall be operated in accordance with the Environmental Management Plan and Stormwater Management Plan and composted

material must meet the requirements of Australian Standard AS4454.2012: Compost, soil conditioners and mulches prior to being sold.

15. ***Clearing of native vegetation***
    Approval for the removal of native vegetation is restricted to within areas illustrated as 'extraction areas' and 'stockpile sites' illustrated on Figure 6-7 'Vegetation communities, survey quadrats and habitat features at the subject site' within the 'Environmental Impact Statement Eurobodalla Quarry Expansion Resource Recovery Activities' prepared by NGH environmental dated December 2016.

16. ***Pre-clearance surveys***
    Pre-clearance surveys shall be carried out prior to the clearing of vegetation on the site. These surveys shall be carried out by a suitably qualified ecologist in accordance with Section 3.3.2 of the Environmental Management Plan specified at Appendix H of the 'Environmental Impact Statement - Eurobodalla Quarry Expansion Resource Recovery Activities' prepared by NGH environmental dated December 2016.

17. ***Riparian Buffer***
    Prior to, and during works or use a 60m wide riparian buffer measured from the top of high bank of Swamp Creek is to be maintained for the entire length of the quarry footprint. No quarrying operation, infrastructure or excavated material is to be placed within the buffer zone. Additional works to enhance and revegetate the proposed 60m riparian zone are to be undertaken as per the conservation offset requirements.

18. ***Aboriginal Heritage (Office of Environment and Heritage)***

    (a) The Aboriginal site 'Eurobodalla Quarry AS1' (AHIMS # 62-3-0637) must be avoided during any development activities.

    (b) If Aboriginal site 'Eurobodalla Quarry AS1' (AHIMS # 62-3-0637) cannot be avoided as a result of the quarry development - an Aboriginal Heritage Impact Permit (AHIP) will be required.

    (c) To ensure Aboriginal site 'Eurobodalla Quarry AS1' (AHIMS # 62-3-0637) is not impacted the following measures must be implemented:

        (i) The location of the site must be included on all site maps and operational plans for the existing quarry and proposed expansion area.

        (ii) The site must be fenced to prevent inadvertent disturbance. A buffer of at least 10m should be included. The fencing must be undertaken in consultation with a qualified archaeologist.

        (iii) The Environmental Management Plan (EMP) must include a requirement for monitoring the protection of the site.

        (iv) Quarry staff must undertake an Aboriginal Heritage Induction prior to the commencement of the expansion works, particularly prior to any work in the proposed expansion north of Eurobodalla Quarry.

    (d) An Aboriginal Heritage Unexpected Finds Management Plan must be prepared and implemented, as part of the Environmental Management Plan (EMP), prior to the commencement of any work under DA 366/17 or other approval.

    (e) Any activity proposed outside of the current assessment area must be subject to an Aboriginal heritage assessment.

(f) If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) may be required.

19. ***Operation***
The facility must be operated in accordance with the conditions of the NSW EPA Environment Protection Licence.

20. ***Hours of Operation***
All operational work and haulage to and from at the premises must only be conducted between Monday to Friday 7am to 5pm and Saturday 7am to 12pm. No work to be carried out on Sundays and Public Holidays.

21. ***Parking***
A minimum provision of 8 car-parking spaces is required on the subject land. Parking spaces are to be clearly marked.

22. ***Maximum Truck Movements***
The maximum number of truck movements associated with the approved development must not to exceed the maximum numbers as specified in the Environmental Impact Statement dated 17 December 2016 prepared by NGH Environmental and Eurobodalla Quarry Expansion SIDRA Modelling Assessment dated 15 August 2017 prepared by ISG Projects.

23. ***Record of Truck Movements***
A record of daily truck movements to/from the site and their associated destination must be kept by the owner/operator and provided to either Council or Roads and Maritime Services upon request.

24. ***Plant and Machinery***
All plant and equipment installed at the premises or used in connection with the licensed activity:

(a) must be maintained in a proper and efficient condition; and

(b) must be operated in a proper and efficient manner.

25. ***Blasting Procedure (neighbour Notification)***
In addition to the blasting procedure outlined in the Environmental Impact Statement, verbal or written advice of intended blasting shall be given to adjoining landowners at least 48 hours prior to each blast.

26. ***Time of Blasting***
Blasting operations on the premises may only take place between 9am and 5pm Monday to Friday inclusive. No Blasting shall take place on Sundays or Public Holidays.

27. ***Advertising Signs***
No advertising sign and/or structure other than that which is permissible without consent is to be erected as part of the approved development until a formal application has been submitted to Council and a development consent has been issued. [17.01]

28. ***Rehabilitation***

    Any requirements and management measures specified within the rehabilitation plan are to be undertaken at the timeframes detailed within that plan. Upon cessation of the activity, or the operational period approved under this consent, whichever occurs first, the site is to be rehabilitated in accordance with the rehabilitation plan.

Attachment (i):
EPA General Terms of Approval

Protection of the Environment Operations Act 1997

General Terms of Approval - Issued

Notice No: 1553093

Eurobodalla Shire Council

PO Box 99

SHELLEE HOLLIS

Trading as EUROBODALLA QUARRY

Attention: Mr David Sheehan

Notice Number	1553093
File Number	DOC17/13292
Date	22-Jun-2017

Re: Development Application No 366/17 for quarry expansion and resource recovery facility at Lot 1 DP 1165095, Nerrigundah Mountain Road Eurobodalla

Issued pursuant to Section 91A(2) Environmental Planning and Assessment Act 1979

I refer to the development application and accompanying information provided for DA 366/17 (the proposal) received by the Environment Protection Authority (EPA) from Eurobodalla Council (Council) on 11 January 2017. I refer also to the additional information provided to the EPA on 11 May 2017 and correspondence between the EPA and Mr Troy Hollis (the proponent) on 20 June 2017.

The EPA has reviewed the information provided and has determined that it is able to provide General Terms of Approval for Council's consideration. The General Terms of Approval for this proposal are provided at **Attachment A**. **Attachment B** lists the Mandatory Conditions for all EPA Licences. If Council grants development consent for this proposal these conditions should be incorporated into the consent.

These general terms relate to the development as proposed in the documents and information currently provided to EPA. In the event that the development is modified either by the applicant prior to the granting of consent or as a result of the conditions proposed to be attached to the consent, it will be necessary to consult with EPA about the changes before the consent is issued. This will enable the EPA to determine whether its general terms need to be modified in light of the changes.

General Terms of Approval - Issued

Notice No: 1553093

The EPA notes that the proponent agreed to design the proposal to be capable of capturing 140mm, which is equivalent to a minimum 1 in 2 year ARI 24 hour storm event at the commencement of this project. The proponent has also agreed to improve the ability to increase the capacity of stormwater capture during the life of the proposal as additional void area becomes available for stormwater capture. As the project progresses the capacity of the void area as a secondary stormwater capture will increase, and the proponent will work towards a total stormwater capture capacity of a 1 in 5 year ARI 24 hour storm event.

The proposed development requires the addition and modification of conditions on the Environment Protection Licence that the quarry currently operates under (EPL 11776). In this regard, if consent is provided for the proposed development the licensee will need to apply to the EPA for a licence variation.

Thank you for discussing this matter with the EPA. If you have any questions, or wish to discuss this matter further please contact Carlie Armstrong or myself on (02) 6229 7002.

Yours sincerely

.....

Matthew Rizzuto

Acting Unit Head

South East - Queanbeyan

(by Delegation)

General Terms of Approval - Issued

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Attachment A - General Terms of Approval

Administrative conditions

A1. Information supplied to the EPA

A1.1 Except as expressly provided by these general terms of approval, works and activities must be carried out in accordance with the proposal contained in:

- the development application 366/17 submitted to Eurobodalla Council and forwarded on to the EPA on 11 January 2017
- *Environmental Impact Statement: Eurobodalla Quarry Expansion and Resource Recovery Activities* (December 2016) and supporting documents relating to the development
- Correspondence from the proponent to the EPA on 20 June 2017 (EPA reference DOC17/13292-16)

A2. Fit and Proper Person

A2.1 The applicant must, in the opinion of the EPA, be a fit and proper person to hold a licence under the Protection of the Environment Operations Act 1997, having regard to the matters in s.83 of that Act.

Limit conditions

L1. Pollution of waters

L.1.1 Except as may be expressly provided by a licence under the Protection of the Environment Operations Act 1997 in relation of the development, section 120 of the Protection of the Environment Operations Act 1997 must be complied with in and in connection with the carrying out of the development.

L1.2 Controlled discharges from sediment basins 1 - 4 must not exceed a 90th percentile Total Suspended Solids (TSS) concentration of 8mg/L and a 100th percentile TSS concentration of 25mg/L.

L2. Waste

L2.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except the wastes expressly referred to in the column title "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

L2.2 Any waste received at the premises must only be used for the activities referred to that waste in the column titled "Activity" in the table below.

This condition does not limit any other conditions in this licence

Waste	Activity	Volume
Garden and landscaping organics (Grass, leaves, plants, loppings, branches, tree trucks and stumps)	Composting	<5,000 tonnes (combined)
Untreated timber (Sawdust, shavings, timber offcuts, crates, pallets, wood packaging)	Composting	
Concrete waste	Resource recovery	</= 15,000 tonnes
Asphalt waste	Resource recovery	
Brick waste	Resource recovery	
Virgin Excavated Natural Material (VENM)	Resource recovery	

L3. Noise limits

L3.1 Noise generated at the premises must not exceed LAeq(15 minute) 35 dB(A) at the nearest residents most affected by noise from the premises at any time

L3.2 The noise emission limits identified in condition L3.1 apply under meterorological conditions of:

- wind speeds up to 3m/s at 10 metres above ground level; and
- temperature inversion conditions of up to 3°C/100m.

L3.3 Noise from the premises is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling where the dwelling is more than 30m from the boundary to determine compliance with condition L3.1

Definition

LA10(15 minute) is the sound pressure level that is exceeded for 10% of the time when measured over a 15 minute period.

Note: Noise measurement

For the purpose of noise measures required for this condition, the LA10 noise level must be measured or computed at any point the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling where the dwelling is more than 30m from the boundary over a period of 15 minutes using "FAST" response on the sound level meter.

For the purpose of the noise criteria for this condition, 5dBA must be added to the measured level if the noise is substantially tonal or impulsive in character.The location or point of impact can be different for each development, for example, at the closest residential receiver or at the closest boundary of the development. Measurement locations can be:

1 metre from the facade of the residence for night time assessment;

at the residential boundary;

30 metres from the residence (rural situations) where boundary is more than 30 metres from residence.

Hours of operation

L3.4 All construction and operational work at the premises must only be conducted between Monday to Friday 7am to 5pm and Saturday 7am to 12pm. No work is to be carried out on Sundays or Public Holidays.

L3.5 The following activities may be carried out at the premises outside the hours specified in condition L3.4:

- the delivery of materials as requested by Police or other authorities for safety reasons;
- emergency work to avoid the loss of lives, property and/or to prevent environmental harm

L3.7 The hours of operation specified in conditions L3.4 and L3.5 may be varied with written consent if the EPA is satisfied that the amenity of the residents in the locality will not be adversely affected.

L4. Blasting

Overpressure

L4.1 The overpressure level from blasting operations on the premises must not:

Exceed 115dB (Lin Peak) for more than 5% of the total number of blasts over a period of 12 months; and

Exceed 120dB (Lin Peak) at any time,

The airblast overpressure values stated above apply when the measurements are performed with equipment having a lower cut-off frequency of 2Hz or less. If the instrumentation has a higher cut off frequency then a correction of 5dB should be asses to the measured value. Equipment with a lower cut-off frequency exceeding 10Hz should not be used for the purpose of measuring airblast overpressure.

Ground vibration (ppv)

L4.2 Ground vibration peak particle velocity from the blasting operations at the premises must not:

Exceed 5mm/s for more than 5% of the total number of blasts over a period of 12 months; and

Exceed 10mm/s at any time,

when measured at any point within 1 metre of any affected residential boundary or other noise sensitive location such as a school or hospital.

Time of blasting

L4.3 Blasting operations on the premises may only take place between 9am and 5pm Monday to Friday inclusive.

L4.4 The hours of operation for blasting operations specified in this condition may be varied if the EPA, having regard to the effect that the proposed variation would have on the amenity of the residents in the locality, gives written consent to the variation.

Frequency of blasting

L4.5 Blasting at the premises is limited to 1 blast each day on which blasting is permitted.

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Operating conditions

O1. Odour

O1.1 The applicant must comply with section 129 of the Protection of the Environment Operations Act 1997. Section 129 of the Act states that the licensee must not cause or permit the emission of any offensive odour from the premises.

Note: The POEO Act states that no offensive odour may be emitted from particular premises unless potentially offensive odours are identified in the licence and the odours are emitted in accordance with conditions specifically directed at minimising the odours are permitted. No condition in any issued licence will identify a potentially offensive odour for the purposes of Section 129 of the POEO Act.

O2. Dust

O2.1 Activities occurring at the premises must be carried out in a manner that will minimise emissions of dust from the premises.

O2.2 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

O3. Stormwater management

O3.1 Stormwater capacity must be capable of capturing a 2 year ARI 24 hour storm event which is equivalent to 140mm.

O4. Leachate

Leachate barrier system

O4.1 The material processing or storage area of the facility must have a leachate barrier system designed in accordance with *Composting and Related Organics Processing Facilities* (DECC 2004).

Leachate collection system

O4.2 The material processing or storage area must have an appropriately designed leachate collection and management system. The leachate collection and management system must be designed in accordance with *Composting and Related Organics Processing Facilities* (DECC 2004). The design of the leachate storage system must include, but is not limited to, the following requirements:

- Leachate must be collected and stored in a dam that is lined with a minimum of 900mm compacted clay to meet a permeability standard of $1X10^{-9}$m/s. The clay liner must cover the entire floor to top water level. The sides should generally not exceed a gradient of 1:3
- The leachate dam must be capable of at least accepting the run-off or leachate generated by any 1 in 10 year, 24 hour period storm event without overflowing. This storm event is equivalent to 229mm

O4.3 All leachate and contaminated stormwater must be retained on the premises

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Monitoring and recording conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, in relation to the development or in order to comply with the load calculation protocol must be recorded and retained as set out in conditions M1.2 and M1.3.

M1.2 All records required to be kept by the licence must be:

in a legible form, or in a form that can readily be reduced to a legible form;

kept for at least 4 years after the monitoring or event to which they relate took place; and

produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected: the date(s) on which the sample was taken;

the time(s) at which the sample was collected;

the point at which the sample was taken; and

the name of the person who collected the sample.

M2 Blasting

M2.1 To determine compliance with conditions L4.1 and L4.2:

(a) Airblast overpressure and ground vibration levels must be measured at the most affected residence or other noise sensitive receiver for all blasts carried out in or on the premises.

(b) Instrumentation used to monitor compliance must meet the requirements of Australian Standard 2187.2 of 1993.

(c) The results of the blast monitoring required by this condition must be submitted to the EPA at the end of each reporting period.

Note: The location or point of impact can be different for each development. Measurements should be taken within the grounds of 'noise sensitive sites' (e.g. residences, hospitals, schools etc). Measurement locations can be:

At the residential boundary; or

30 metres from residences in rural situations where the boundary is more than 30 metres from residences.

Airblast overpressure levels should not be measured within 3.5 metres of any building.

Ground vibration levels should not be measured with the longest dimension of the foundations of a building or structure away from such building or structure.

Reporting conditions

R1.1 The applicant must provide an annual return to the EPA in relation to the development as required by any licence under the Protection of the Environment Operations Act 1997 in relation to the development. In the return the applicant must report on the annual monitoring undertaken (where the activity results in pollutant discharges), provide a summary of complaints relating to the development, report on compliance with licence conditions and provide a

calculation of licence fees (administrative fees and, where relevant, load based fees) that are payable. If load based fees apply to the activity the applicant will be required to submit load-based fee calculation worksheets with the return.

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Attachment B – Mandatory Conditions for all EPA licences

Administrative conditions

Other activities

(To be used on licences with ancillary activities)

This licence applies to all other activities carried on at the premises, including:

- **Composting (below 5,000 tonnes non-putrescible organics received per annum and less than 2,000 tonnes of organics received from offsite on site at any time), and**
- **Waste Storage (exempt from scheduled activity as per Resource Recovery Exemption for excavated natural material, recovered asphalt pavement and recovered aggregate)**

Operating conditions

Activities must be carried out in a competent manner

Licensed activities must be carried out in a competent manner.

This includes:

a. the processing, handling, movement and storage of materials and substances used to carry out the activity; and

b. the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

Maintenance of plant and equipment

All plant and equipment installed at the premises or used in connection with the licensed activity:

a. must be maintained in a proper and efficient condition; and

b. must be operated in a proper and efficient manner.

Monitoring and recording conditions

Recording of pollution complaints

The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

The record must include details of the following:

- the date and time of the complaint;
- the method by which the complaint was made;
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- the nature of the complaint;

- the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and

if no action was taken by the licensee, the reasons why no action was taken.

The record of a complaint must be kept for at least 4 years after the complaint was made.

The record must be produced to any authorised officer of the EPA who asks to see them.

Telephone complaints line

The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

This condition does not apply until 3 months after this condition takes effect.

Reporting conditions

Annual Return documents

What documents must an Annual Return contain?

The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

a. Statement of Compliance; and

b. Monitoring and Complaints Summary.

A copy of the form in which the Annual Return must be supplied to the EPA accompanies this licence. Before the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

Period covered by Annual Return

An Annual Return must be prepared in respect of each reporting, except as provided below

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Where this licence is transferred from the licensee to a new licensee,

a. the transferring licensee must prepare an annual return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and

b. the new licensee must prepare an annual return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an annual return in respect of the period commencing on the first day of the reporting period and ending on

a. in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or

b. in relation to the revocation of the licence – the date from which notice revoking the licence operates.

Deadline for Annual Return

The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

Notification where actual load can not be calculated

(Licences with assessable pollutants)
Where the licensee is unable to complete a part of the Annual Return by the due date because the licensee was unable to calculate the actual load of a pollutant due to circumstances beyond the licensee's control, the licensee must notify the EPA in writing as soon as practicable, and in any event not later than the due date.

The notification must specify:

a. the assessable pollutants for which the actual load could not be calculated; and

b. the relevant circumstances that were beyond the control of the licensee.

Licensee must retain copy of Annual Return

The licensee must retain a copy of the annual return supplied to the EPA for a period of at least 4 years after the annual return was due to be supplied to the EPA.

Certifying of Statement of Compliance and Signing of Monitoring and Complaints Summary

Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:

a. the licence holder; or

b. by a person approved in writing by the EPA to sign on behalf of the licence holder.

A person who has been given written approval to certify a Statement of Compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review this licence.

Notification of environmental harm

Note: The licensee or its employees must notify the EPA of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act

Notifications must be made by telephoning the EPA's Pollution Line service on 131 555.

The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Written report

Where an authorised officer of the EPA suspects on reasonable grounds that:

a. where this licence applies to premises, an event has occurred at the premises; or

b. where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,

and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

The request may require a report which includes any or all of the following information:

a. the cause, time and duration of the event;

b. the type, volume and concentration of every pollutant discharged as a result of the event;

c. the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; and

d. the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;

e. action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

f. details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event;

g. any other relevant matters.

The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

General conditions

Copy of licence kept at the premises or on the vehicle or mobile plant

A copy of this licence must be kept at the premises or on the vehicle or mobile plant to which the licence applies.

The licence must be produced to any authorised officer of the EPA who asks to see it.

The licence must be available for inspection by any employee or agent of the licensee working at the premises or operating the vehicle or mobile plant.

Attachment (ii):
Table 1, Appendix C Revised Mitigation Measures

ATTACHMENT 2 – UPDATED BIODIVERSITY MEASURES

EMSP 03 – BIODIVERSITY MANAGEMENT	
Responsible person	• Quarry Operator • Quarry staff
Objectives	• Avoid impacts to biodiversity where possible, or effectively mitigate and minimise impacts where avoidance is not possible. • Rehabilitate the worked quarry site, such that pre-development habitat values are reinstated or improved in the long term.
Procedures/Requirements	<u>BIODIVERSITY (FAUNA) CONSTRUCTION MANAGEMENT PROTOCOL</u> • The following protocols will be implemented to mitigate impact to native fauna: ○ Preclearance surveys are to be carried out by a suitably qualified ecologist prior to the clearing of native vegetation at the site, regardless of the time of year. ○ Pre-clearance surveys (including primarily Anabat, spotlighting and stagwatching survey techniques) are to be undertaken by a suitably qualified ecologist to confirm if the individual hollow-bearing trees are being used by threatened fauna. These surveys are to be undertaken (immediately) prior to the proposed clearing (i.e. less than 48 hours prior to clearing). Occupied trees are not to be cleared until it can be demonstrated that no threatened fauna are occupying them. ○ Where possible, avoid clearing hollow-bearing trees during the breeding season for the main fauna types that may be present in the area. For most species, this is during the summer period. ○ Pre-clearance surveys of all trees (including non-hollow-bearing trees) is also to be completed to ensure that no koalas are present within the development footprint. ○ The staged felling protocol provided in Section 3.3.2 of Appendix H of the EIS (and included further below for reference) will be implemented for the removal of all hollow-bearing trees. ○ A suitably qualified ecologist with experience in fauna handling should be engaged to be present on-site during the removal of hollow-bearing trees and ground habitat. Only a licenced wildlife carer or ecologist are to carry out any fauna handling. ○ A licenced wildlife carer or ecologist must be present during the removal of any burrows, specifically wombat burrows, and where possible, a pre-clearance survey should occur to confirm whether any (wombat) burrows to be removed are currently occupied. This would involve the use of a small flexible inspection camera capable of being inserted at least 5 m into the burrow. ○ If any wombat burrows are found to be occupied, then a process is to be implemented to ensure that the burrow is empty prior to removal. This is likely to involve monitoring of the burrow, and when confirmed empty (i.e. when the animal is seen leaving the burrow, and the inspection camera used to confirm it is empty of any other individuals), a wire net should be installed across the opening of the burrow to prevent any animals re-entering the burrow. The net is to remain in place until the burrow has been removed. ○ Any large sections of hollow-bearing trees (including either trunks or major branches/limbs) that have been felled and are still relatively intact, should be collected and stored for later translocation into adjacent habitats as an offset for the removal of the hollows in the first instance. ○ Collection/salvage and translocation of high value ground dwelling fauna habitat (such as larger fallen timber logs, hollow logs) into adjacent areas (outside of the development footprint).

VEGETATION & WATER QUALITY MANAGEMENT

- Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, para-webbing or similar.
- A 60 metre buffer strip between the proposed works boundary and the top bank of Swamp Creek should be established and maintained to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC. Stockpiling, dumping, access tracks and stormwater control and treatment structures such as earth bunds and sediment dams should not be located within the buffer strip.
- The buffer strip should be permanently fenced at the boundary with the works site to exclude works vehicles and machinery and stock. The fencing should allow gate access for ongoing management, including revegetation, impact monitoring and weed control.
- Forest vegetation within the buffer strip should be allowed to regenerate naturally or actively restored using planting of indigenous tree, shrub and groundlayer species. Any planting undertaken should include the regionally uncommon herb *Desmodium rhytidophyllum* in drier parts of the site.
- The diversion bunds should be surfaced with topsoil and stabilised with a suitable non-invasive grass species as soon as possible. Sediment fencing should be installed between the bunds and the buffer strip until the bund walls have been stabilised with vegetation cover.
- Discharges from the sediment dams should not be released into the River-flat Eucalypt Forest EEC. Releases should be a dispersed, energy-dissipated flow through at least 20 metres of dense grassland before entering the community or the creek. The release site should be monitored for soil stability and flow concentration.
- No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.
- Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.

SOIL MANAGEMENT

- Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera*. Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection.
- During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation.
- Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil.
- Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas.

	REHABILITATION • The Rehabilitation Strategy provided at Appendix G of the EIS should be used to guide the preparation of a detailed Rehabilitation Plan. The strategy requires that the pre-development habitat values be reinstated or improved at the site in the long term.
Information/References	• Environmental Impact Statement, Eurobodalla Quarry expansion and resource recovery activities (NGH Environmental, 2016).

Attachment (iii):
Attachment 2 – Updated Biodiversity Measures

APPENDIX C REVISED MITIGATION MEASURES

The revised set of mitigation measures is provided in the table below. New or amended mitigation measures are identified in ***bold italics.***

Table 1 Revised mitigation measures from the EIS

No.	Mitigation measure
Surface hydrology and water quality	
WQ1	*The WMP that has been prepared for the proposed quarry expansion would be implemented. The aim of this plan is to ensure that all runoff captured by the site is adequately contained onsite.*
WQ2	*Construct stormwater management controls in accordance with the WMP to ensure that all 'clean water' is diverted around the site using clean water diversion bunds and 'dirty water' from the site is captured within the sediment basins.* ***This will require:*** o ***Providing drainage for haul roads as required, particularly for roads around the outer edge of the quarry works area.*** o ***Diversion of runoff away from stockpiles, particularly stockpiles of finer materials.*** o ***For concentrated flow paths, use appropriate erosion and sediment control measures to limit erosion; refer to section 5.4.3 and drawings SD 5.4, SD 5.5, SD 5.6 and SD 5.7 of the Blue Book (Landcom, 2004).*** o ***Limit cut floor grades to as low as possible to limit erosion and allow for sediment collection.*** o ***During quarry operation and expansion, as much as possible, use the quarry void as a water collection and settling/sedimentation area to provide additional control over the sediment basins to ensure their performance.*** o ***Pump collected runoff from internal ponding to sediment basins as required.***
WQ3	Ensure that surface waters are diverted around the composting pad, and that all surface water from the composting pad is diverted into the leachate pond for storage.
WQ4	***Sediment basins shall be constructed in accordance with the sizing and parameters outlined within the WQMS (Southeast Engineering and Environmental, 2017).***
WQ5	The site sediment basins are to be drawn down as soon as possible following a rain event to enable them to capture runoff from the next rainfall event. The cleaned water should be pumped to a location which allows for broad dispersed flow across a long, vegetated buffer to Swamp Creek.
WQ6	Review the post closure drainage and water management of the site once the quarry has been exhausted and final levels are known. If a depression is left on completion of the work, some regrading may be required to drain the site.
WQ7	Prior to discharge, water from the sediment basin would be tested and treated in accordance with the measures contained in the EMP and the EPL. Water would be flocculated if required. ***As recommended by the WQMS, the criteria for discharge from sediment basins is:*** o ***Average Total Suspended Solids discharge concentrations must be 8mg/L with an allowance of discharges up to 25mg/L in 10% of volumetric discharge.***
WQ8	The leachate management controls described in ***Section 4.8 of the WQMS*** **must** be implemented to minimise the potential impacts to surface water quality particularly through the following: o Installation, monitoring and maintenance of leachate and stormwater management controls (barriers, collection and storage systems). o Diversion of surface water run-on around the composting pad. o Maintaining capacity in the leachate pond to enable the capture of runoff from the compost pad during the next rainfall event.

	o ***Disposal of leachate through reuse on site in dust suppression and to maintain moisture content in compost, windrows and stockpiles.***
WQ9	***Should leachate disposal offsite be required, the EPA must first be consulted to determine whether this activity would be permitted and if so, what the licensing and discharge requirements would be.***
WQ10	Ensure all chemicals, fuels and oils kept on site are stored in accordance with manufacturer's recommendations and in a bunded or sealed area. The volume of this bunding will be greater than 110% of the volume of the largest container.
WQ911	Manage accidental spills of fuel and any other chemicals in accordance with the measures contained within the EMP (Section 4.2.2: Pollution Incident Response Procedure).
WQ12	Empty fuel, oil, lubricant and chemical containers are to be removed from the site and disposed of at a facility that is able to accept the waste.
WQ13	Monitor activity associated with the sediment basins with every significant rainfall event.
WQ14	During and following each discharge from the sediment pond, inspect the points of discharge for sediment deposits. If sediment deposits are observed, discharging should be ceased immediately. The water should be retreated and re-tested prior to further discharging.
WQ15	Monitor and inspect diversion swales to ensure they remain stable and are not contributing any sediment.
WQ16	Maintain a regular supply of flocculants on site and store in accordance with manufacturer's recommendations.
WQ17	Silts would periodically be removed from the sediment basin and reused in the production of quarry products.
Soil and landforms	
SL1	***Ideally, topsoil stripping will done when the soil is moist and Eurobodalla Quarry should consider wetting the soil prior to stripping. Topsoil will not be stripped during rain events.***
SL2	***Stockpile topsoil for reuse in accordance with Drawing SD4-1 from the Blue Book (Landcom 2004), including temporary erosion and sediment control measures such as earth banks and sediment fences. If long term stockpiling of topsoil is required (ie. greater than three montsh), stockpiles shall not be more than 2 metres high and have a batter slope of not more than 2:1 to preserve biological viability and reduce soil deterioration.***
SL3	***Stockpiles will be placed in areas so as to avoid impediment of natural localised drainage lines and minimise the likelihood of water ponding against the stockpile.***
SL4	Spill kits would be stored onsite and staff trained in their use.
SL5	If any signs of contaminated soils are discovered (e.g. smell, discolouration, suspect rubbish), the site would be marked and the soil replaced to cover the contamination. The soil would be analysed without delay to determine the type of contamination and an appropriate management plan would then be developed and followed.
SL6	A detailed Rehabilitation Plan would be developed by a qualified person, in accordance with the Rehabilitation Strategy provided in Appendix G of this EIS. Aims of rehabilitation will be to provide a stable landform that is resistant to erosion, to preserve downstream water quality through adequate management of site surface water runoff and minimising weed infestation.
SL7	The Rehabilitation Plan would include input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).
SL8	Respread topsoil immediately following the closure and regrading (if required) of each worked section of the quarry. The quarry floor and benches would then be revegetated and rehabilitated as soon as possible.
SL9	Monitor revegetated areas to ensure good strike rates with revegetated areas.
SL10	Monitor rehabilitated areas to ensure they remain stable and free from erosion.

SL11	Repair any erosion - regrading to ensure an even surface and diversion of surface runoff around disturbed areas and if required use jute or mulch and reseed locally.
Biodiversity	
B1	Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, parawebbing or similar.
B2	The existing riparian vegetation along Swamp Creek would be permanently fenced to prevent impacts to the River Flat Eucalypt Forest EEC. The fencing should exclude stock from the riparian vegetation and allow access for ongoing management, including impact monitoring and weed control.
B3	A 50 metre buffer strip should be maintained between the proposed works boundary and the top bank of Swamp Creek to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC.
B4	If stock grazing is to be carried out within the 50m buffer strip, grazing management practices (such as rotational grazing) should be implemented, to control grazing impacts and to ensure that naturally regenerating vegetation is not adversely affected.
B5	The following Biodiversity (fauna) Construction Management Protocol included must be implemented to mitigate impacts to native fauna: • Avoidance of clearing hollow-bearing trees during the breeding season for the main fauna types that may be present in the area. • For most species, this includes avoidance of clearing hollow bearing trees in summer period. • If the above timing restrictions are not feasible, then a targeted pre-clearance survey (including primarily Anabat, spotlighting and stagwatching survey techniques) are to be undertaken by an ecologist to confirm if the individual hollow-bearing trees are being used by threatened fauna. These surveys are to be undertaken (immediately) prior to the proposed clearing (i.e. less than 48 hours prior to clearing). Occupied trees are not be cleared until it can be demonstrated that no threatened fauna are occupying them. • ***Pre-clearance surveys of all trees (including non-hollow bearing trees) is also to be completed to ensure that no koalas are present within the development footprint.*** • The staged felling protocol provided in ***Section 3.3.2 of the Eurobodalla Quarry Environmental Management Plan*** will be implemented for the removal of all hollow-bearing trees. • An experienced fauna spotter should be engaged to be present on-site during the removal of hollow-bearing trees and ground habitat. • The fauna spotter should also be present during the removal of any burrows, specifically wombat burrows, and where possible, a pre-clearance survey should occur to confirm whether any (wombat) burrows to be removed are currently occupied. ***This would involve the use of a small flexible inspection camera capable of being inserted at least 5 m into the burrow.*** • ***If any wombat burrows are found to be occupied, then a process is to be implemented to ensure that the burrow is empty prior to removal. This is likely to involve monitoring of the burrow, and when confirmed empty (i.e. when the animal is seen leaving the burrow, and the inspection camera used to confirm it is empty of any other individuals), a wire net should be installed across the opening of the burrow to prevent any animals re-entering the burrow. The net is to remain in place until the burrow has been removed.*** • Any large sections of hollow-bearing trees (including either trunks or major branches/limbs) that have been felled and are still relatively intact, should be collected and stored for later translocation into adjacent habitats as an offset for the removal of the hollows in the first instance. • Collection/salvage and translocation of high value ground dwelling fauna habitat (such as larger fallen timber logs, hollow logs) into adjacent areas (outside of the development footprint).
B6	Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.
B7	Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera.* Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the

	site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection.
B8	During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation.
B9	Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil.
B10	Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas.
B11	No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.
B12	***Pre-clearance surveys of all trees (including non-hollow-bearing trees) is also to be completed to ensure that no koalas are present within the development footprint.***
With the implementation of the biodiversity management measures above, it is considered that impacts would be avoided where possible and effectively mitigated, where avoidance is not possible. All areas disturbed by the works would eventually be subject to a detailed Rehabilitation Plan. The Rehabilitation Strategy to guide development of the plan is provided at Appendix G of the EIS and requires that the pre-development habitat values be reinstated or improved at the site in the long term. A such, this ensures an overall 'maintain environmental values' objectives has been met and therefore further offsets are not proposed.	
Aboriginal Heritage	
AH1	If work on the quarry expansion is to proceed, the site Eurobodalla Quarry AS1 ***must*** be fenced to prevent inadvertent disturbance. A buffer of at least 10m should be included.
AH2	If any work was to extend beyond the proposal boundary in the vicinity of the site Eurobodalla Quarry AS1, an Aboriginal Heritage Impact Permit ***must*** be obtained. This would require undertaking an Aboriginal Cultural Heritage Assessment (ACHA) including Aboriginal consultation under the Guides and Codes of practice provided by OEH.
AH3	Staff ***must*** undertake an Aboriginal Heritage Induction prior to the commencement of the expansion works, particularly prior to any work in the proposed expansion north of Eurobodalla Quarry.
AH4	An Aboriginal Heritage Unexpected Finds Management Plan ***must*** be established for Eurobodalla Quarry.
AH5	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) may be required; and
AH6	Any activity proposed outside of the current assessment area ***must*** also be subject to an Aboriginal heritage assessment.
Historic Heritage	
HH1	Should an item of historic heritage be identified, works in the vicinity of the find would cease. The Heritage Division (NSW Office of Environment and Heritage) would be contacted prior to further work being carried out in the vicinity of the find.
Traffic and Transport	
TT1	Traffic management protocols would be developed and required for all Eurobodalla Quarry Drivers. The protocol would be made available to all regular suppliers. They would aim to further reduce risks encountered on the haulage

	network, specifically, between the quarry site and the Eurobodalla Road/ Princes Highway intersection. Protocols would include: o The speed limit of 40km/hr shall be adhered to for any unsealed section of the haul route. o Specifying any higher risk periods, such as the timing of the local bus connection. o Requirements to report hazardous conditions, such as pot holing, when they appear, to the road administrator.
T2	***A specialist would be engaged to complete SIDRA modelling of the Eurobodalla Road/ Princes Highway intersection if any increase to current Eurobodalla Quarry traffic volumes is proposed in this location.***
Noise	
N1	All equipment used on site would be in good condition and good working order.
N2	Vehicles would be kept properly serviced and fitted with appropriate mufflers.
N3	Where reasonable and feasible, activities that generate high noise levels would be substituted with alternative processes that generate less noise.
N4	Works will be restricted to: o 7am to 6pm Monday to Friday o 7am to 12pm on Saturdays o No work on Sundays or public holidays.
N5	A complaints register would be maintained and noise and vibration complaints would be responded to promptly.
Air quality	
AQ1	During dry, windy periods: o A water cart shall be made available and used to dampen unsealed sections of the haul routes, stockpiles and loading pads. o Visual monitoring of dust generation will be undertaken and quarrying activities will be limited if dust generation becomes unmanageable.
AQ2	A speed limit of 40km/h shall be adhered to for any unsealed section of the haulage route.
AQ3	All blast holes would be stemmed with aggregate to avoid creating excessive dust during blasting.
AQ4	Vehicles and motorised equipment would be maintained so that emissions are minimised.
AQ5	Vehicles and machinery will be switched off when not in use, rather than leaving them to idle.
AQ6	A complaints register would be maintained and air quality complaints would be responded to promptly.
Waste Management	
W1	Green waste from vegetation clearing would be mulched at the site for composting, or used in the management of soil and water.
W2	Topsoil stripped from the proposal area would be stockpiled for onsite landscaping and rehabilitation.
W3	A Waste Management Plan (WMP) would be prepared for the resource recovery, recycling and composting activities. The WMP would include, but not be limited to the following measures: o All incoming wastes would be subject to visual inspection prior to unloading, during unloading and after unloading, to determine waste acceptability. NCW is either: ▪ Not unloaded and the load is rejected prior to tipping; or ▪ Rejected following tipping, reloaded and the driver instructed to remove the load from the site.

	o Wastes would be delivered to designated locations at the hardstand area. o A waste rejection register would be maintained to detail the types and quantities of non-conforming wastes rejected from the site, including the reasons for the waste rejection.
Social and economic impacts	
SE1	Nearby residents will be notified of the proposal and feedback sought.
SE2	A complaints register would be maintained and complaints would be responded to promptly.
Hazards and risks	
H1	Operate the quarry in accordance with the Eurobodalla Quarry Mine Safety Management Plan.
H2	All staff would be trained in the safe operation of machinery on site.
H3	All staff would be trained in the use of fire-fighting equipment.
H4	No hot works would be undertaken onsite during total fire ban days.
H5	All equipment used on site would be maintained in good condition and good working order.
H6	The Eurobodalla Quarry Emergency Response Procedure will be updated to reflect the new extraction areas and new activities occurring onsite.
H7	A copy of the Emergency Response Procedure will be available at the site office at all times and would be implemented in the event of an emergency (eg. bushfire).
H8	Signage will be provided to clearly indicate the location of and directions to the waste receivals area.
H9	Composting will generally be carried out in accordance with the NSW Office of Environment and Heritage's *Environmental Guidelines for Composting and Related Organics Processing Facilities* (DEC, 2004).
H10	The composting process outlined in Section 3.5 of this EIS would be implemented.

Attachment (iv):
A.5.3 Hollow Bearing tree removal protocol

A.5.3 Hollow-bearing tree removal protocol

Requirement	Responsibility
1. Prior to clearing trees/other vegetation	
• The hollow-bearing trees (HBTs) must be physically marked (i.e. spray paint or tape). The location of HBT's are shown in Figure 2.	Quarry manager.
***2*. Clear non hollow-bearing trees and other vegetation**	
• Check for animals in the zone of disturbance before any vegetation clearing commences.	Clearing contractor.
• Non-HBTs and other vegetation immediately surrounding a HBT should be cleared the day prior to clearing the HBT.	Clearing contractor.
• Wait at least one night before removing HBTs (in accordance with the steps below).	Clearing contractor.
3. Clear hollow-bearing trees	
• A suitably qualified fauna spotter/catcher must be present during the clearing of all HBTs to look for signs of animal movement in the tree to be cleared. The spotter should be able to communicate directly with the plant operator.	Ecologist or experienced fauna spotter
• Prior to felling a HBT, use an excavator to hit the trunk of the tree as high up the tree as possible several time. Wait at least 30 seconds and observe for any signs of fauna occupying a hollow. Repeat this process several times.	Clearing contractor directed by ecologist or experienced fauna spotter.
• If taking down the tree in stages, remove non-hollow bearing limbs first. Then remove hollow-bearing limbs.	Clearing contractor directed by ecologist or experienced fauna spotter.
• Once the hollow-bearing limb or HBT are on the ground, the spotter must check each hollow for signs of wildlife before the next limb/tree is removed.	Ecologist or experienced fauna spotter.
4. Handling wildlife	
• Direct contact with wildlife should be avoided wherever possible.	Ecologist or experienced fauna spotter.
• Any uninjured wildlife must be encouraged to leave the site.	Ecologist or experienced fauna spotter.
• If wildlife is injured, WIRES or similarly qualified and licensed personnel should be contacted to collect and treat any injured individuals.	Ecologist or experienced fauna spotter.

COUNCIL ASSESSMENT REPORT ATTACHMENT 1 – ENVIRONMENTAL IMPACT STATEMENT

Environmental Impact Statement

EUROBODALLA QUARRY EXPANSION AND RESOURCE RECOVERY ACTIVITIES

DECEMBER 2016

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EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) has been prepared by NGH Environmental to assess the potential environmental impacts associated with the proposed expansion of the existing Eurobodalla Quarry and operation of a resource recovery facility at the quarry site ('the proposal'). The existing Eurobodalla Quarry is located approximately 7.5 kilometres southwest of the town of Bodalla in the Shire of Eurobodalla, NSW.

The proposal is classified as a Designated Development under the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and is to be assessed under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The EIS will support a Development Application for the proposal, with the Eurobodalla Shire Council (ESC) being the consent authority.

The objectives of the proposal are to:

- Expand the existing Eurobodalla Quarry to be capable of extracting materials over a period of at least the next 30 years.
- Continue to provide a source of road base materials to the local Government authorities, businesses and private landowners.
- Allow the retention of three full time employment positions and increase employment by approximately one full time employee.
- Provide a resource recovery and recycling facility capable of servicing the local area, ultimately reducing the volumes of recoverable materials going to landfill.
- Maximise the utilisation of the land through vertical integration of operational activities and services.
- Minimise impacts on the natural and built environment through sensitive design and appropriate environmental management practices.

Environmental impacts were assessed using a risk assessment process. The following environmental aspects were considered to have a high environmental risk rating and were subject to more detailed assessment:

- Surface hydrology and water quality impacts.
- Soils and landforms.
- Biodiversity impacts.
- Aboriginal heritage impacts.

Other moderate and low risk environmental aspects that were assessed included waste management, noise and vibration, traffic and transport, air quality and climate, social and economic impacts, hazards and risks, groundwater impacts, visual amenity impacts and historic heritage. These aspects are considered to be highly manageable with the implementation of environmental measures coutlined within this EIS.

The proposal has been refined throughout the EIA process so as to avoid (where possible) or minimise its environmental impacts. Specific measures and plans have been developed or recommended to address the potential impacts, including:

1. An Environmental Management Plan (EMP) has been developed which outlines the systems and procedures that would be implemented as part of the proposal. The purpose of the EMP is to ensure that best-practice controls to manage potential environmental impacts are established and maintained during operation of the Eurobodalla Quarry and associated resource recovery facilities. The EMP would also ensure that all operational related

mitigation measures and safeguards from this EIS, the Conditions of Consent and Environmental Protection Licence are met.

2. A Site Water Management Plan (concept erosion and sediment control plan) to ensure that appropriate erosion and sediment controls are implemented and maintained thoughout operation.
3. A Rehabilitation Strategy, to guide the development of a more detailed Rehabilitation Plan which will have the core objectives of providing stable landforms, revegetate the worked site such that pre-development habitat values are reinstated or improved in the long term, minimising weed infestation and preserving downstream water quality.
4. A Waste Management Plan would be developed that describes how incoming wastes would be handled, treated and transported and describes the measures that would be implemented to ensure that the operation of the facility is carried out in accordance with the POEO Act 1997.

With the effective implementation of all mitigation measures set out in this document, the proposal is considered justifiable. Advantages to expanding the quarry and establishing a resource recovery facility include:

- Continued access to a locally important resource, utilising established environmental controls and practices that are known to manage environmental impacts effectively.
- Continued supply of a local quarry product will reduce the need to source and transport quarry products large distances from outside the region.
- Quarry expansion would allow Eurobodalla Quarry to continue extracting and processing quality products for sale to customers such as Council, at economical prices.
- Resource recovery and composting activities would facilitate the sustainable and efficient use of local resources.
- Impacts on municipal waste management are expected to be predominately positive, through reducing demands on local landfills and associated costs.

1 INTRODUCTION

NGH Environmental has been engaged by Eurobodalla Quarry to prepare an Environmental Impact Statement (EIS) to assess the potential environmental impacts associated with:

1. The physical expansion of the Eurobodalla Quarry
2. Increase to the maximum annual extraction rates
3. Resource recovery operations and open windrow composting.

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

The proposal is classified as a Designated Development under the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and is to be assessed under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The EIS will support a Development Application for the proposal, with the Eurobodalla Shire Council (ESC) being the consent authority.

This EIS:

- Describes the location and nature of the proposed activities at the Eurobodalla Quarry;
- Reviews the environmental impacts associated with the construction, operation, decommissioning and rehabilitation of the proposed works;
- Recommends safeguards to control and mitigate potential impacts;
- Enables the proponent to meet its obligations under relevant legislation and policies; and
- Documents the environmental assessment process of the proposal for Eurobodalla Shire Council's consideration in providing consent for the proposed works.

Under Section 79C of the EP&A Act, the proposal must be evaluated against a range of considerations including environmental planning instruments, the EP&A Regulation, the likely environmental, social and economic impacts of that development, the suitability of the site, and the public interest.

This EIS takes into account the project objectives and the requirements of the Secretary for Planning and other relevant Government agencies (Secretary's Environmental Assessment Requirements, Appendix A). It involves an analysis of the relevant environmental, economic, physical and social implications of the proposal.

1.2 PROPOSAL OUTLINE

Expansion of the quarry and extraction of materials

The proposal includes the establishment of two additional areas of extraction at the Eurobodalla Quarry site (Lot 1, DP 1165095). A large expansion would occur north-west of the existing extraction area. Another small expansion would occur on the south-western corner of the existing quarry pit. The existing approved extraction area covers an area of approximately 6.2 hectares. The proposed expansions and associated stockpile hardstand would cover an area of approximately 17.65 hectares (refer Figure 1-1).

Material to be extracted from the proposed expansion area includes basalt and rhyolite (and associated decomposed saleable material).

The proposal also includes increasing the maximum annual extraction rates from the currently approved 100,000 tonnes/year to 175,000 tonnes/year. This is to account for year-to-year variations in demand for the quarry products, and to allow Eurobodalla Quarry to extract, process and supply larger quantities of

materials during periods of higher demand. However, due to the peaks and troughs in demand for quarry products, it is anticipated that the average extraction rate would actually remain in the order of 100,000 tonnes of material per year when accounted over a 5-year period.

Resource recovery (storage, re-processing/recycling of products) and composting

Eurobodalla Quarry proposes to use existing quarry infrastructure and plant to process and recycle non-putrescible materials brought to the site such as concrete, asphalt, Virgin Excavated Natural Material (VENM), bricks and green waste. The materials would be inspected prior to acceptance at the site. Recovered/recycled material would generally be processed into road base or aggregate. Products would be available for resale and transport from the site by heavy vehicle.

Green waste would be mulched and composted onsite using an open windrow composting method. A leachate pond would be constructed to capture leachate runoff from the composting pad. The composted material would be available for sale as landscaping supplies.

Hardstand stockpile and processing area

The proposal includes the construction of a hardstand area east of the proposed new extraction area. The hardstand would be used for processing and stockpiling of extracted quarry materials. The resource recovery activities and composting would also be undertaken on the new hardstand.

1.3 EUROBODALLA QUARRY DEVELOPMENT HISTORY

1.3.1 Location and existing operations

The existing Eurobodalla Quarry is located approximately 7.5 kilometres southwest of the town of Bodalla in the Shire of Eurobodalla, NSW. The Quarry is located on a property known as 'Elizabeth Farm' (Lot 1 DP 1165095). The site is accessed via Nerrigundah Mountain Road which joins Eurobodalla Road to the east.

The existing quarry activities include:

- Extraction of basalt material, using blasting techniques (maximum 100,000 tonnes/year)
- Crushing and screening of extracted materials (maximum 100,000 tonnes/year)
- Transport of materials from the site (maximum 1,400 tonnes in one day)
- Concrete batching

Materials being extracted from the existing quarry include weathered basalt (used in the construction and sealing of roads throughout the region) and basalt aggregates used for concrete production and general construction (eg. gabion, rock armour).

Materials produced by the Eurobodalla Quarry are used extensively across the Eurobodalla Shire by Roads and Maritime Services, Local Government, National Parks and Wildlife Services, private landowners and developers. The annual extraction rates of the quarry are provided in Table 1-1.

There are currently two separate extraction areas operating at the Eurobodalla Quarry site. The original quarry extraction area (approved in 2002) and an extension to this area (approved in 2008), are located on the western boundary of the property. A separate extraction area (approved in 2013), occurs approximately one kilometre east of the original quarry extraction area. The existing approved extraction areas are shown in Figure 1-1 and total 9.66 hectares.

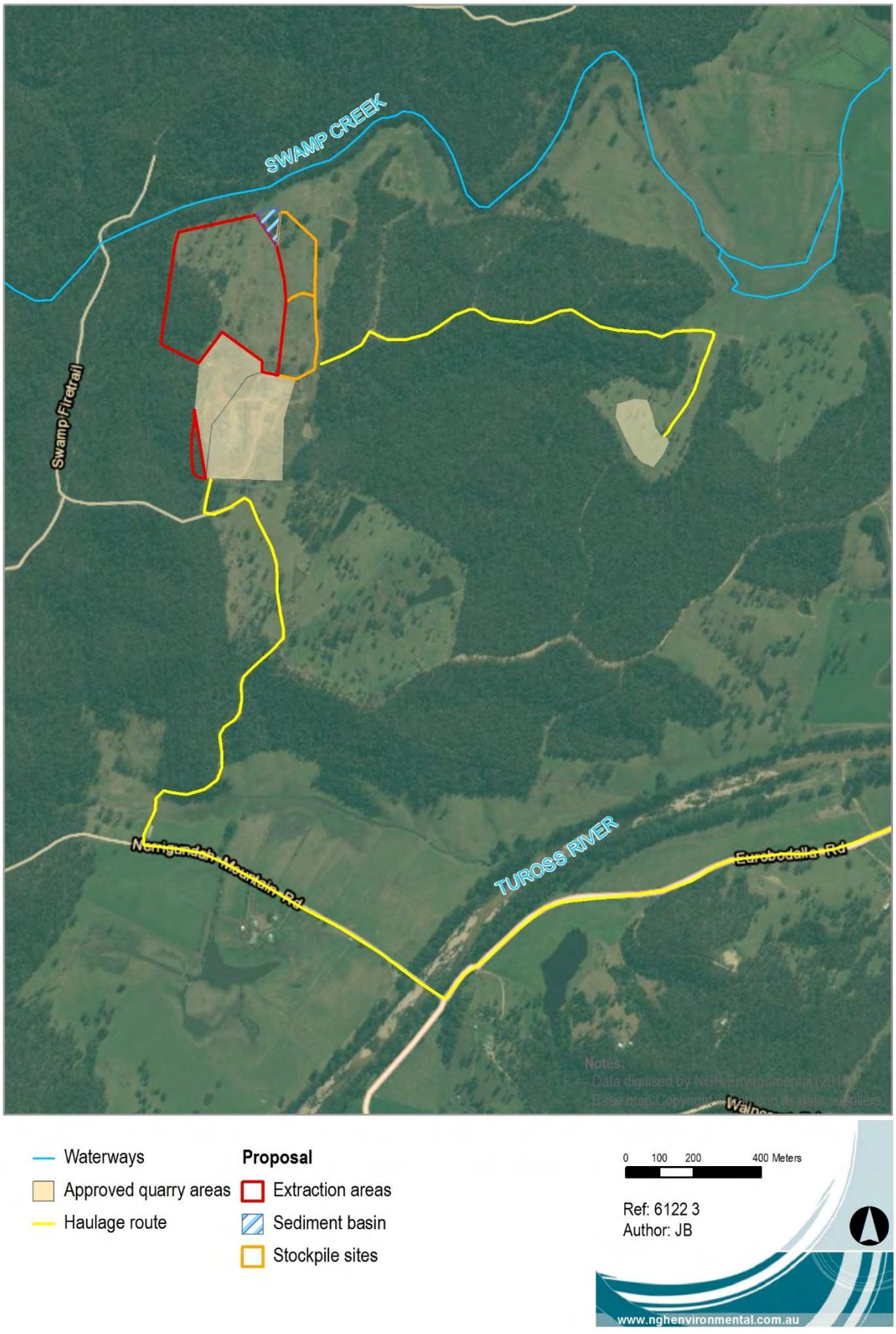


Figure 1-1 Overview of the existing and proposed areas of extraction at the Eurobodalla Quarry

The Quarry operates under an Environment Protection Licence (EPL 11776). The existing operations involve the following 'scheduled activities' under Schedule 1 of the POEO Act:

- (16) Land-based extractive activity involving the extraction, processing or storage of more than 30,000 tonnes per year.
- (19) Crushing, grinding or separating of more than 30,000 tonnes per year.

Over the life of the existing quarry operations, over 80% of the decomposed basalt (top 3-10 metre layer) has been extracted and processed into road base material. This material has been used extensively throughout the Eurobodalla Shire for road re-sheeting projects. Annual rates of resource extraction and removal from the Eurobodalla Quarry have varied since the commencement of its operation. Rates of extraction from 2006 to 2015 are summarised in Table 1-1.

Table 1-1 Eurobodalla Quarry - approximate extraction rates from 2006 to 2015

Year	Annual extraction (tonnes)
2006	68,555
2007	33,505
2008	27,365
2009	27,785
2010	50,500
2011	35,020
2012	58,617
2013	62,454
2014	54,079
2015	30,348

Figure 1-2 View of quarry from the southern edge of the existing pit

Figure 1-3 View of quarry from western edge of the existing pit

Figure 1-4 Facing north across the existing quarry pit

Figure 1-5 View of the existing quarry pit, from the east

1.3.2 Summary of development approvals

The existing quarry operations at the Eurobodalla Quarry site were approved pursuant to DA 848/02 on 17 September 2002. Since then, a number of additional development applications have been submitted and approved by Eurobodalla Shire Council. These are summarised in Table 1-2 and detailed further below.

Table 1-2 Summary of assessments and development approvals for the Eurobodalla Quarry

Date approved & consent authority	DA number	Development	Supporting environmental assessment documentation
17 September 2002 Eurobodalla Shire Council	848/02	Hard Rock Quarry (original quarry development)	Environmental Impact Statement (Outline Planning Consultants, 2002)
8 February 2005 Eurobodalla Shire Council	572/05	Two dams	-
11 April 2007 Eurobodalla Shire Council	451/07	Concrete works and batching plant	Statement of Environmental Effects (NGH Environmental, 2006)
6 March 2008 Eurobodalla Shire Council	259/08	Extension to the existing Eurobodalla Quarry site	Statement of Environmental Effects (NGH Environmental, 2007)
31 October 2011 Eurobodalla Shire Council	M451/07	Modification concrete works and batching plant – maximum height from 8m to 18m.	-
21 August 2013 Eurobodalla Shire Council	468/13	New extraction area	Statement of Environmental Effects (NGH Environmental, 2013)

2002 - DA 848/02: Hard Rock Quarry

The original development of the Eurobodalla Quarry was 'Designated Development' under the *Environmental Planning and Assessment Act 1979.* As such, Eurobodalla Quarry commissioned the preparation of an EIS (Outline Planning Consultants, 2002). The EIS supported a Development Application (DA) to Eurobodalla Shire Council (DA 848/02). Approval of the proposed hard rock quarry development was granted by ESC on 17 September, 2002.

The original Eurobodalla Quarry development approval was for the quarrying of an area of approximately 5.57 hectares. The consent conditions allowed for the extraction and removal of a maximum of 100,000 tonnes in any one year and for a maximum period of 28.4 years commencing from the date that an EPL is obtained from the EPA. Extraction and removal of the resource shall not exceed 1,400 tonnes in any one day. Movement of heavy vehicles associated with the quarry from the quarry site to the Princes Highway is limited to between the hours of 7am and 5pm Monday to Friday and 7am and 12 noon on Saturdays. Haulage is not permitted on Sundays or Public Holidays.

EPL 11776 was obtained by Eurobodalla Quarry on 23 May 2003. Therefore, the original consent conditions for DA 848/02 allow for extraction and removal of the resource until approximately October 2031.

2007 - DA 451/07: Concrete works and batching plant

In December 2006, Eurobodalla Quarry submitted a DA to ESC for the development of a concrete works and batching plant at the site of the Eurobodalla Quarry (DA 451/07). The DA was supported by a Statement of Environmental Effects (SEE) (NGH Environmental, 2006). The DA was approved by ESC on 11 April, 2007.

2008 - DA 259/08: Extension to the existing Eurobodalla Quarry site

In 2007, NGH Environmental prepared a SEE on behalf of Eurobodalla Quarry to assess the potential environmental impacts associated with an extension of the Eurobodalla Quarry. The SEE was prepared under Part 4 of the *EP&A Act* and supported a Development Application (DA 259/08) to Eurobodalla Shire Council, the consent authority for the proposed development. The Development Application for the Eurobodalla Quarry expansion was approved by ESC on 6 March 2008. The extension area totalled approximately 2 hectares, to the north-west of the existing quarry which totalled 5.57 hectares.

2013 - DA 468/13: New extraction area

In 2013, NGH Environmental prepared a SEE on behalf of Eurobodalla Quarry to assess the potential environmental impacts associated with extraction of material at a new site on 'Elizabeth Farm' (Lot 2, DP 1165095) and delivery of that material to the processing area associated with the original quarry development. The SEE was prepared to accompany a DA submitted to ESC (DA 468/13). ESC approved the development of the new extraction area on 21 August 2013.

The approval was for a new extraction area covering 1.6 hectares and a total works footprint of approximately 1.97 hectares (including the quarry extraction site, stockpile areas, diversion banks and detention dams).

The material being extracted from this site is siltstone. This resource is being extracted for the purpose of blending it with the coarse-grade durable basalt from the main quarry. The basalt from the main quarry is not suitable for use as road base material on its own, however when blended with siltstone it provides a road base material with improved workability, compaction and durability.

1.3.3 Existing land uses and land use interactions

Existing land uses within the 'Elizabeth Farm' property include:

- Existing quarry extraction and processing activities
- Cleared agricultural land to the north and north east
- Livestock grazing
- Large forested areas on the western boundary of the property.

Land uses immediately surrounding Elizabeth Farm include:

- Large tracts of the Dampier State Forest, north and west of the property
- Rural residential properties to the south and east, including livestock grazing.

Other extractive industries operating in the wider locality include:

- Cadgee Quarry (sand and gravel extraction and processing), located approximately 10 kilometres south-west of the proposal site.
- Rewlee sand extraction operation, located approximately 1.5 kilometres south-east of the proposal site.

1.4 RESOURCE AVAILABILITY

A number of test holes have been drilled across the proposal site and around its downhill periphery to prove up material reserves. Test drilling was carried out in 2001 across the existing approved quarry site. The results from the 2001 test drilling are provided in Appendix B. Further test drilling was carried out in 2015 across the proposed quarry expansion area. The results are also provided in Appendix B, along with a map of the Drill hole locations.

Results of test drilling and test pit excavations have enabled estimates to be made of the quantities and locations of resources available across the property.

The ongoing extraction of materials from the existing quarry pit has also enabled visual observations to be made regarding the depth, location and quantity of the various resources at the site.

The estimated quantities of material available through the proposed quarry expansion include:

- 500,000 tonnes of weathered basalt (re-sheeting gravel/road base material), located between 3-12 metres depth across the proposed extraction area
- Over 1,000,000 tonnes of fresh basalt aggregate stone (for use in concrete, asphalt, sealing aggregate and drainage aggregates).
- 600,000 tonnes of low plasticity index rhyolite (road base, high grade potential DGB20)
- Over 1,000,000 tonnes of fresh rhyolite (for aggregate, gabion and rock armour stone).

The total estimated volume of material through the proposal is approximately 3,100,000 tonnes. Basalt and rhyolite are both uncommon resources in the area, making them a valuable resource.

Mapping of potential mineral and extractive resources within the Eurobodalla Shire is available on ESC Public GIS (ESC, 2016). The mapping shows identifies known extractive resources at the location of the existing Eurobodalla Quarry. An extensive area surrounding the existing quarry pit is identified as a 'transitional area', where development may conflict with current or future mining or quarrying operations.

2 OBJECTIVES OF THE PROPOSAL AND CONSIDERATION OF ALTERNATIVES

2.1 REASONS FOR THE ACTIVITY

One of the key components of the existing quarry's operations is to provide high quality road base materials for road construction. At the existing rate of extraction, it is estimated that basalt road base materials remaining in the approved extraction area at the Eurobodalla Quarry would be exhausted in the next 3 to 5 years.

Basalt is uncommon in the area, making it a valuable local resource. The expansion of the quarry would allow the Eurobodalla Quarry to continue producing basalt road base material over the next 10 to 15 years. The ability to blend this material with siltstone, a common geological resource will increase the life expectancy of locally sourced high quality road base materials that meet required Plasticity Index and grading specifications. The resource will be available for use by local and state government and private landowners, reducing the long-term need to transport materials large distances for local use.

The annual volumes of materials extracted and processed at the Eurobodalla Quarry varies in response to demand for the product. Demand for the product is heavily influenced by the number and size of road construction projects occurring in the region. Currently, the maximum volume of material that may be extracted in one year is 100,000 tonnes. The proposal includes an increase of the maximum annual extraction volume to 175,000 tonnes per year. This would allow Eurobodalla Quarry to extract and supply larger volumes of material in years where there is a higher demand associated with large road construction and maintenance projects. Extraction rates would be lower, in years when demand for the product is low. Due to the peaks and troughs in demand for quarry products, it is anticipated that the average extraction rate would actually remain in the order of 100,000 tonnes of material per year when accounted over a 5-year period.

Resource recovery operations are proposed to be carried out at the quarry site to service the local area. There are very few resource recovery facilities operating in the Eurobodalla region. It is believed that a variety of recoverable wastes are going to landfill, due to poor capability and demand to facilitate the processing and recycling of these recoverable materials. The Eurobodalla Quarry has infrastructure to process and recycle recoverable materials such as concrete, fill, soils and asphalt. This includes the processing machinery (crusher, screener) required, and a site with good road access, stormwater management infrastructure and an operation team with the required technical expertise. Materials to be recovered and processed would generally be mixed with other quarry products and sold as road base or aggregate.

As organic wastes constitute a large proportion of the waste stream going to landfill, the composting of these materials will serve to reduce the demands on local landfills and would facilitate the sustainable and efficient use of local resources.

2.2 OBJECTIVES OF THE PROPOSAL

The objectives of the proposal are to:

- Expand the existing Eurobodalla Quarry to be capable of extracting materials over a period of at least the next 30 years.

- Continue to provide a source of road base materials to the local Government authorities, businesses and private landowners.
- Allow the retention of three full time employment positions and increase employment by approximately one full time employee.
- Provide a resource recovery and recycling facility capable of servicing the local area, ultimately reducing the volumes of recoverable materials going to landfill.
- Maximise the utilisation of the land through vertical integration of operational activities and services.
- Minimise impacts on the natural and built environment through sensitive design and appropriate environmental management practices.

2.3 ALTERNATIVES AND OPTIONS CONSIDERED

2.3.1 Option 1 – Do nothing

Doing nothing would result in the continued extraction of materials under the existing development approval. The basalt road base materials available in the existing extraction area would be depleted within the next 5 years. Once the basalt resource is exhausted, Eurobodalla Quarry would not be able to supply road base materials to local government, businesses and private landowners in the local area. It is expected that this could result in a shortage of these materials in the region. Alternative supply would have to be sourced to fill local demand. This would involve transporting road base materials larger distances, increasing costs and impacts on the road network.

2.3.2 Option 2 – Expand the quarry extraction area

This would involve a large expansion of the quarry extraction area to the north west- of the main quarry in order to access additional basalt material. The quarry expansion would also allow for the eventual extraction of fresh basalt, which underlies the weathered basalt (road base) across the site. Rhyolite material occurs west of the basalt resource, which would also become available through the proposed expansion. The rhyolite would provide a very high quality road base material, as well as rock armour and aggregate. Expansion would make use of existing environmental controls and transport networks, established for the existing quarry, in an area suited to this enterprise.

2.4 JUSTIFICATION OF THE PROPOSAL

Hard rock quarries are a vital component of the growth and maintenance of infrastructure in the Eurobodalla Shire. The materials available at the Eurobodalla Quarry site are uncommon in the region. Materials produced at the Eurobodalla Quarry have been used extensively across the Eurobodalla Shire for road construction and sealing material on rural roads by Roads and Maritime Services and Local Government. At the current rate of extraction, it is estimated that basalt road base materials remaining in the approved quarry extraction area at the Eurobodalla Quarry would be exhausted in the next 3 to 5 years. Expansion of the extraction area would allow the Eurobodalla Quarry to continue producing and supplying high quality basalt road base material to Local Government (including Eurobodalla Shire Council), business owners and private landowners over at least the next 10 to 15 years. The proposal would reduce the long-term need to transport materials large distances for local use.

Expansion of the quarry would also provide access to other materials which are scarce in the local area, including fresh basalt rock and rhyolite. Fresh basalt aggregates are suitable for the production of concrete, asphalt, sealing aggregate and drainage aggregates. Rhyolite aggregates are a highly sought after material for road surfacing as they have high skid resistance. Rhyolite is also highly suitable for use as a decorative landscaping material and as gabion rock and rock armour stone. These materials have become scarcer as hard rock resources in the area have been depleted. The resources at Eurobodalla Quarry represent a quality product at economical prices for the community.

The extension of the existing quarry represents an opportunity to 'value add' to the current quarry operations. It would make use of existing infrastructure and resources already being used for the operation of the Eurobodalla Quarry (machinery, crushing plant, stormwater management infrastructure, haul routes and staff). Some native vegetation clearing would be required to establish the extension to the quarry (see Section 3). It occurs adjacent to the existing site and is therefore already subject to some indirect impacts of the existing quarry.

Increasing the maximum annual extraction volume to 175,000 tonnes per year would allow Eurobodalla Quarry to meet peak demand for their product, particularly when local and/or state governments are constructing large or multiple road projects. Ensuring a continued source of locally produced road base materials will allow local and State government authorities to carry out local road infrastructure projects in a time and cost effective manner. Extraction rates would be lower in years when demand for the product is low.

The maximum annual rate of extraction set for the Quarry in its consent conditions is 100,000 tonnes per year, or 1,400 tonnes per day. It is anticipated that Eurobodalla Quarry would extract a maximum average of 100,000 tonnes of material per year, when accounted over a 5-year period. It is not proposed to increase the daily maximum extraction rate of 1,400 tonnes per day, therefore the intensity of quarrying would not exceed that which is already approved by the consent conditions.

The Eurobodalla Quarry already has infrastructure and resources required to undertake resource recovery and recycling of materials such as concrete, fill, soils and asphalt at the quarry site. This includes processing machinery, roads, stormwater management and technical expertise. Consequently, the Eurobodalla Quarry site is a logical place to locate a resource recovery facility. Impacts on municipal waste management are expected to be predominately positive, through reducing volumes of waste going to landfill and associated costs.

As the proposal constitutes an opportunity to 'value add' to existing activities onsite, the 'do nothing' is not appropriate to realising the full economic potential of the site.

3 THE PROPOSAL

3.1 OVERVIEW OF THE PROPOSED DEVELOPMENT

This Environmental Impact Assessment accompanies a development application which seeks approval for the following key developments and activities:

- **An expansion of the quarry extraction area, including:**
  - An expansion of the quarry extraction footprint to the north and west of the approved extraction areas.
  - Excavation to a greater depth within the approved quarry footprint.
  - An increase in the annual limit of extraction and removal of resources to 175,000 tonnes per year.
  - An extension of the life of the quarry operations to 30 years from the date of approval of the current development application.
- **Construction of a hardstand area for the storage and processing of extracted materials and recovered wastes.**
- **Resource recovery and processing activities, including:**
  - Recovery and processing of a range of 'clean' (uncontaminated) non-putrescible wastes including selective inert building and construction wastes (concrete, asphalt, sand, VENM, bricks etc).
  - Composting of a limited quantity of Category 1 organics, including general garden waste, untreated timber and wood. Construction of a leachate pond to capture leachate runoff from the composting pad.

3.1.1 Proposal location

The proposal is located on a property known as 'Elizabeth Farm' (Lot 1, DP 11665095). It is located approximately 7.5 kilometres south west of the town of Bodalla (refer Figure 3-1). The proposal footprint includes areas that have been previously disturbed through agricultural activities (pasture improvement, grazing) and an area of native forest. Lands to the east of the proposal within Elizabeth Farm are predominantly used for agriculture. Extensive areas of state forests occur to the west and north of the proposal location. Areas of native forest occur across the broader locality.

The proposal site ranges between approximately 25 and 68 metres above sea level (ASL). Swamp Creek is located approximately 50 metres north of the proposed quarry expansion area. Swamp Creek flows in an easterly direction, eventually joining the Tuross River approximately 3 kilometres east of the quarry site.

3.1.2 Site layout

A site layout for the proposed development is shown in Figure 3-2. The proposed extraction areas would cover a total combined area of approximately 13.1 hectares. The proposed hardstand stockpile area would be approximately 4.55 hectares in size. The total proposal footprint covers an area of approximately 17.65 hectares.

The northern boundary of the quarry site would be no closer than 40 metres to Swamp Creek.

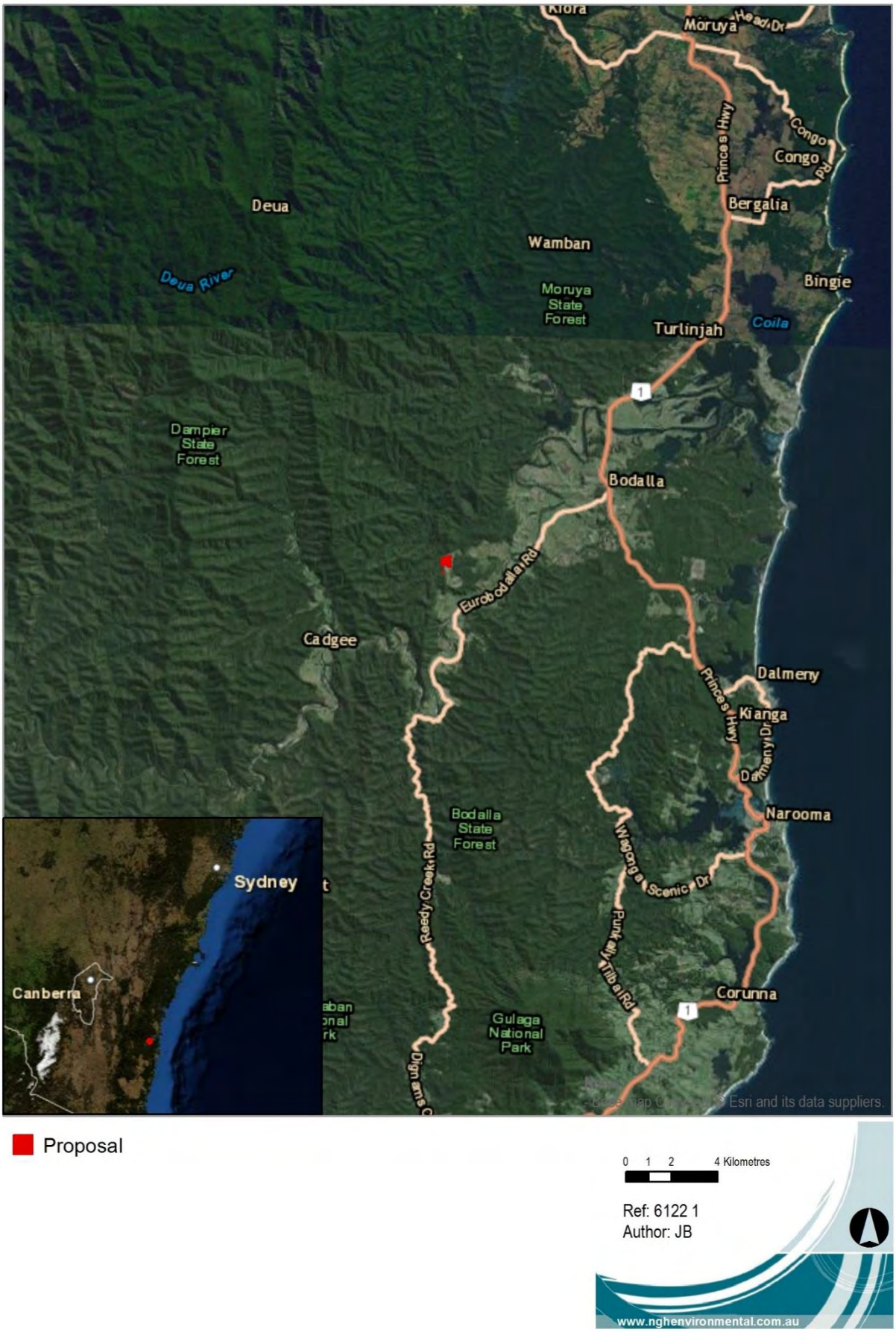


Figure 3-1 Regional overview of the proposal

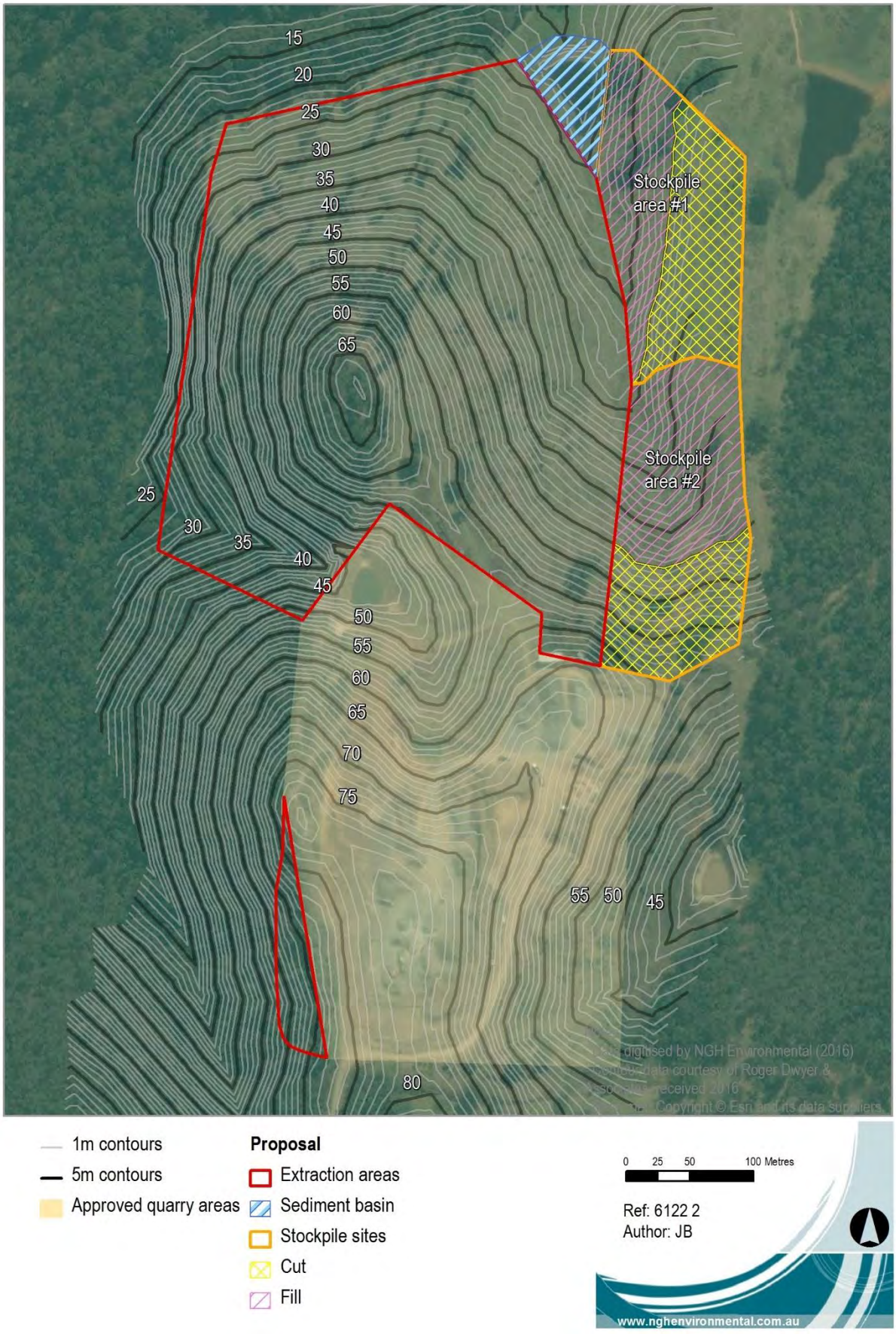


Figure 3-2 The proposal

3.2 PROPOSED QUARRYING ACTIVITIES

3.2.1 General

The proposed quarry expansion would be carried out in stages. Sequencing and staging of extraction will generally be influenced by the demand for various quarry materials at any given time. Areas of disturbance across the site will be kept to the minimum necessary while the site is progressively opened to extraction. Extraction will generally progress from the southern portion of the site (at the existing quarry pit) towards the north.

The general work methods associated with the proposed quarrying activities are summarised below:

- Preparation of the extraction expansion area
    - Installation of erosion and sediment controls, prior to development of the site
    - Removal of trees and vegetation from the expansion area
    - Stripping of topsoil and stockpiling for use during rehabilitation
    - Construction of soil and water management devices, including a sediment detention pond (this would utilise an existing dam) to manage operational impacts
- Extraction and processing of materials
    - Ripping with a bulldozer or excavator in areas where rock is sufficiently weathered
    - Drilling and blasting of fresh basalt material
    - Extraction of material using a front-end loader/excavator
    - Crushing, screening and stockpiling of materials on site
- Transportation of materials from site
    - Loading stockpiled material into haulage trucks
    - Transport of materials from the quarry site along haul routes for delivery

3.2.2 Extraction methods

Extraction methods would be the same as undertaken at the existing quarry area. Extraction methods will vary according to type of material being extracted. Where the rock is sufficiently weathered, the resource can be extracted by ripping with a bulldozer or excavator. For the extraction of hard rock, explosives would be used to dislodge and fracture the rock into a size which can be transported and handled by the quarry crushing plant. Holes would be drilled into the rock in a particular pattern having regard for such factors as hole depth, spacing, bench configuration and angle. The holes are filled with explosives, comprising a small explosive charge at the base of the hole followed up by a bulk explosive which makes up the remainder of the charge, then stemmed with aggregate at the top to minimise airblast and flyrock. Blasting then occurs.

Drillers and blasting experts would be contracted to undertake the drilling and blasting. The number of blasts per year would be dependent on the degree of weathered rock encountered during quarrying operations. It is estimated that blasting would be required every 4 to 6 months. Whenever possible, blasting would be undertaken when meteorological conditions are favourable.

3.2.3 Extraction depth and quantities

The original quarry EIS (Outline Planning Consultants, 2002) describes excavation of the pit down to RL 40 metres. The SEE for the 2007 quarry expansion (NGH Environmental, 2007) described excavation to a depth of RL 20 metres. Significant resources exist at greater depths than those which are currently approved in the consent conditions.

The current proposal includes a modification to the abovementioned approved extraction depths, to a maximum final floor depth ranging between RL 10 (at the northern most section of the proposed new extraction area) and 15 metres (at the southernmost section of the approved extraction area) (refer to Quarry Plan, Appendix C).

Average annual extraction volume would be approximately 100,000 cubic metres with a maximum annual extraction of 175,000 cubic metres. This is to account for year-to-year variations in demand for the quarry products, and to allow Eurobodalla Quarry to extract, process and supply larger quantities of materials during periods of high demand. Due to the peaks and troughs in demand for quarry products, it is anticipated that the average extraction rate would be in the order of 100,000 tonnes of material per year when accounted over an approximate period of 5 years. At this rate of extraction, it is anticipated that sufficient resources exist to facilitate operation of the quarry for approximately 30 years.

Eurobodalla Quarry currently hold an EPL for the extraction and processing of up to 100,000 tonnes of materials at the site per annum. An application for a variation to the EPL would need to be made to increase the maximum extraction limit per annum, upon approval being granted for the proposed development.

3.2.4 Processing and crushing of extracted materials

The crushing and processing of materials would be carried out using the same techniques currently being implemented at the existing operational quarry site. Raw extracted materials would be collected by a front-end loader and transported to the crushing plant. The material would be loaded into a hopper from where it is delivered to the crusher unit. The crushing plant will reduce the size of the rock by crushing. Crushed rock would be conveyed to screens to separate the material into various sizes and product types. The screens ensure that the material meets standard maximum dimensions and grading requirements.

Processed materials would be stockpiled at designated locations on a hardstand area until transportation from the site for use in the residential and construction industry.

3.3 HARDSTAND STOCKPILE AND PROCESSING AREA

A new hardstand area would be constructed east of the proposed quarry expansion to provide an area for stockpiling and processing materials (refer Figure 3-1). This would include stockpiling and processing of materials extracted from the quarry, stockpiling and processing of waste materials brought to site as part of the resource recovery activities (see Section 3.4) and composting of green waste (see Section 3.5).

The hardstand would be constructed along a ridgeline which runs generally in a north-south direction. Due to the sloping of the ridge towards the north, the hardstand area will likely contain two large flat benched areas of different elevations.

Construction of the hardstand would involve cut and fill earthworks to achieve level working platforms. The hardstand would be constructed from compacted fill with a layer of road base on top. Eurobodalla Quarry has clay material available which may be used as fill during the construction of the hardstand, if required. Material would be compacted with earth moving equipment, such as a bulldozer, to obtain the desired level of compaction. The hardstand area would be graded towards the west, draining runoff to the sediment detention pond. Composting activities would be carried out on a compost pad constructed at Stockpile area #2. A leachate pond would be constructed to capture all surface water runoff from the composting pad (detailed further in Sections 3.5 and 3.6).

3.4 RESOURCE RECOVERY ACTIVITIES

3.4.1 General

Eurobodalla Quarry propose to undertake resource recovery activities at the proposal site. This would involve:

- Delivery of 'clean' (uncontaminated) second hand materials to the site
- Inspection of materials prior to unloading
- Unloading, sorting and stockpiling or materials prior to processing
- Solid non-compostable recyclable materials would be:
  - Processed (eg. crushing, grinding, screening)
  - Mixed and processed with other quarry products to form a saleable product
- Compostable (organic) materials such as green waste, untreated timber would be composted as per composting activities are described in detail in Section 3.5.
- Stockpiling of processed materials for eventual sale and transport from the site.

3.4.2 Waste materials accepted and waste classification

Eurobodalla Quarry proposes to receive selective General Solid Waste (non-putrescible) materials from off site, for recovery, recycling and resale. Wastes accepted at the site will be classified according to the *Waste Classification Guidelines – Part 1: Classification of Waste* (EPA, 2014).

Table 3-1 lists the types of general non-putrescible wastes that would be accepted at the site for processing and recovery. The table identifies waste classification in accordance with the *Waste Classification Guidelines,* and describes the processing and handling of each waste type.

Different wastes would be processed in different ways. Existing quarry infrastructure (e.g. crusher, screener) would be used in the processing of some materials, as identified in Table 3-1.

Table 3-1 Indicative wastes to be received at the site

Waste to be received	Waste Classification	Volume accepted and processed	Processing/ handling	Storage	Use/output
Concrete waste (including concrete batching wastes and concrete demolition wastes)	General Solid Waste (non-putrescible)	Combined maximum of up to 15,000 tonnes per annum	Materials crushed and screened into various products.	Granular material graded to various sizes and stockpiled on site.	Generally mixed with other quarry products and sold as road base. May also be sold as aggregate.
Asphalt waste	General Solid Waste (non-putrescible)		Materials crushed and screened into various products.		Generally mixed with other quarry products and sold as road base. May also be sold as aggregate.
Brick waste	General Solid Waste (non-putrescible)		Materials crushed and screened into various products.	Mixed with other materials (eg. road base) and stockpiled on site	Generally mixed with other quarry products and sold as road base.

Waste to be received	Waste Classification	Volume accepted and processed	Processing/ handling	Storage	Use/output
Virgin Excavated Natural Material (VENM), including clay, gravel, sand, soil or rock fines.	General Solid Waste (non-putrescible)		Processed into landscaping material	Sorted and stockpiled on site	Generally mixed with other quarry products and sold as road base. May also be sold as landscaping material.
Category 1 Organics (non-putrescible), garden/vegetative waste, untreated timber, wood waste (hard wood and soft wood) etc.	General Solid Waste (non-putrescible)	Up to 5,000 tonnes per annum	Mulched and composted into topsoil mix for gardens. Processing and composting of Category 1 organics is discussed further in Section 3.5.	Stored on site as mulch or compost.	Sold as landscaping material, topsoil mix for gardens.

3.4.3 Unacceptable wastes (non-conforming waste)

The following wastes, as defined under Schedule 1 of the POEO Act, would be deemed by Eurobodalla Quarry to be non-conforming wastes (NCW) and would not be accepted at the site:

- General Solid Waste (putrescible) (eg. food waste, animal waste, putrescible organics);
- Hazardous wastes;
- Liquid wastes;
- Restricted solid wastes;
- Special wastes (eg. clinical waste, asbestos, waste tyres).

Other general solid demolition wastes that would not be accepted at the site includes:

- Metal
- Plastic
- Rubber
- Plasterboard
- Glass

Signage would be provided at the delivery area clearly stating the types of waste that are not accepted at the site.

3.4.4 Waste delivery, inspection and sorting

The waste would generally be delivered to the site in bulk loads via haul trucks and skip bin trucks. The Eurobodalla Quarry would only accept pre-arranged deliveries of materials. The Quarry would not accept unexpected deliveries of any materials from the general public. The types and volumes of waste to be brought to the site would be determined before the delivery is made.

Incoming waste will be inspected in two stages:

1. A preliminary inspection of the incoming waste on the vehicle, prior to unloading from the vehicle.

2. An inspection of the incoming waste during unloading and after it has been unloaded from the vehicle, but before it is relocated to the appropriate stockpile/bin. The person delivering the waste will be required to wait until the waste has passed the inspection.

Any incoming wastes that are suspected of containing NCW or contaminants (eg. putrescible wastes, hazardous wastes, asbestos etc) will be rejected and the customer will be required to take the contaminated load out of the quarry site immediately.

Once wastes have been passed an inspection and been accepted by the quarry, they will be unloaded and sorted into designated stockpiles or bins. A range of mobile plant (eg. excavator, front-end loader) will be used to handle and process the waste and products.

Figure 3-3 provides a summary of the steps that would be carried out to determine whether a load of waste can be accepted at the site for processing.

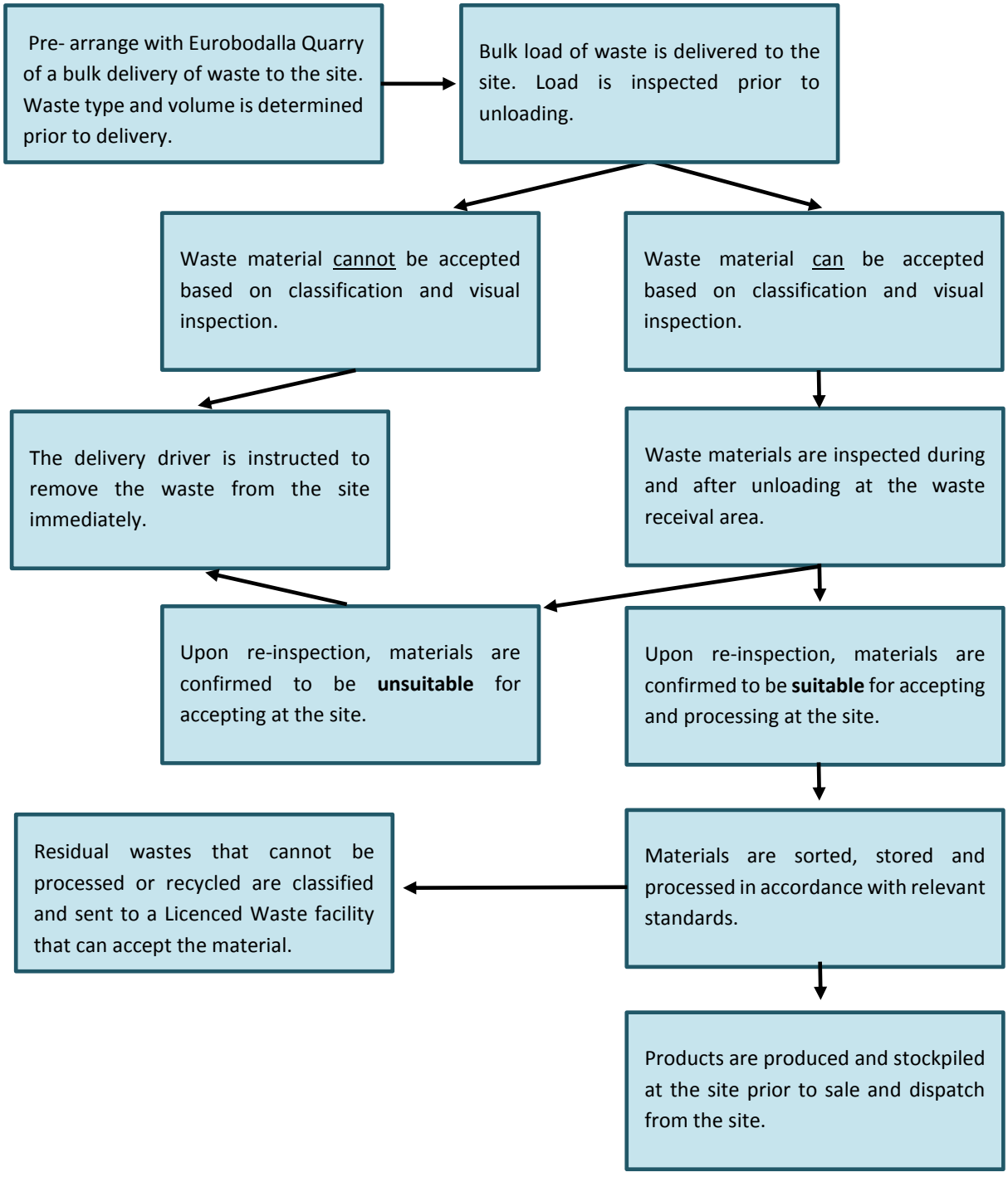


Figure 3-3 A summary of the assessment and handling/processing of waste that would be carried out at the site

3.4.5 Storage and stockpiling of waste and processed products

Storage of wastes on site will be influenced by a number of factors, including:

- Conditions of the EPL
- Conditions of the Development Approval
- Environmental management requirements
- Supply (incoming volume) and demand (for recovered materials)

Waste storage on site is temporary and subject to availability of transport and markets for end product. Inert material such as concrete, brick, soil etc would be stockpiled at a designated location on the hardstand stockpile area. Recovered/recycled material would be available for resale and transport from the site by heavy vehicle.

3.4.6 Disposal of unsuitable material

Any material that is not suitable for recycling or sale will be dealt with in accordance with the POEO Act 1997. The material that is deemed unsuitable will first be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) and based on this classification, will be transported to a licensed landfill facility that can accept such materials in order to protect human health and the environment.

3.4.7 Customers

Customers that are likely to purchase recovered materials such as road base, aggregates and landscaping materials include Roads and Maritime Services, Eurobodalla Shire Council and landscaping contractors.

3.4.8 Record keeping

Records would be kept in relation to a number of resource recovery activities and would include, but not necessarily be limited to:

- Quantity, types and origins of all wastes accepted at the site.
- The types and origins of all waste materials rejected from the site.
- The types and quantities of all recovered materials dispatched from the site.

Any specific records required under the relevant Resource Recovery Orders & Exemptions would be maintained.

3.5 COMPOSTING OPERATION AND MANAGEMENT

Eurobodalla Quarry propose to process up to a maximum of 5000 tonnes of organics per year to produce a high quality compost that meets the requirements of the following exemption and standards:

- Australian Standard AS 4454 (2003). Composts, Soil Conditioners and Mulches
- The Compost Order 2016 (Resource Recovery Order under Part 9, Clause 93 of the *Protection of the Environment Operations (Waste) Regulation 2014*.

Materials to be composted at the site would fall under Category 1 organics, as described in the NSW Office of Environment and Heritage's *Environmental Guidelines for Composting and Related Organics Processing Facilities* (DEC, 2004). Category 1 organics that would be accepted at the site for composting include:

- Garden and landscaping organics (grass, leaves, plants, loppings, branches, tree trunks and stumps)
- Untreated timber (Sawdust, shavings, timber offcuts, crates, pallets, wood packaging)

No Category 2 or Category 3 organics would be accepted at the site for composting. Acceptance of green wastes would be limited to pre-arranged bulk deliveries only. No small quantities (e.g. box trailer loads) would be accepted.

3.5.1 Detailed composting processes

Receival

Category 1 organics (eg. grass, leaves, loppings, branches, timber offcuts) would be received at the hardstand stockpile area. Loads would be visually inspected prior to unloading at the site. After a load of green wastes has passed an inspection and been accepted by the quarry, it will be unloaded and stockpiled at a designated location prior to mulching.

Mulching

Category 1 green wastes would be processed through a large mulcher to break down the material into 2-3 inch pieces. Mulched material would be transported to the designated composing pad and pushed into windrows to complete the composting process.

Composting (including monitoring, turning, watering etc)

Mulched organics would be composted using an open windrow composting method. Mulched materials would be thoroughly mixed prior to windrow pile formation. Composting activities would be undertaken within the southern portion of the proposed hardstand/stockpile area.

Mulched organics would be stockpiled in windrows approximately 2-3 metres high, 2-3 metres wide and up to 100 metres long. Moisture content should be near the water holding capacity for the material. Piles would be turned on a weekly basis to maintain temperature across the pile.

Windrows would be regularly turned using a front end loader or appropriate compost turning machinery, in accordance with appropriate guidance (AS 4454). Windrows would be monitored manually for temperature, pH and moisture levels using electronic probes. Piles would be checked, turned and resprayed after 4 – 6 weeks (according to their composition) to ensure comprehensive breakdown of feedstock. Piles would be left for a further 4– 6 weeks (also according to their composition) to ensure complete decomposition.

Screening

Composted materials would be screened to a desired particle size. Oversize particles would be returned to the next composting process. Any contaminants would be removed and disposed of.

Storage

The composted product would be stored in batches on the composting hardstand, ready for transport off site.

3.5.2 Compost leachate management

Composting would be carried out at the northern end of the proposed hardstand/stockpile area. The following management measures are proposed in relation to working surfaces, and leachate barrier, collection and storage systems:

Leachate barrier system

The compost pad would be a hardstand area constructed of a clay base (at least 600mm) topped with rolled and compressed road base and/or aggregate. The hardstand areas would be graded to direct any runoff into a leachate pond. The proposed leachate pond would be appropriately lined with clay or similar to meet a permeability standard of $1x10^{-9}$ meters per second, as required by the NSW Environmental Guidelines for Composting and Related Organics Processing Facilities (DEC 2004).

Importantly, Hydromap (2007) concluded that the quarry site is non-vulnerable with respect to the regional groundwater system.

Leachate collection system

The proposed composting process would produce minimal leachate. Any leachate would be directed over the compost pad hardstand area into the leachate pond. The leachate pond would be sized and managed to prevent overflow during significant storm events; a 2yr 30min event and a 10yr 24hr event.

On site run off would be minimised through the prevention of run on as per the controls identified in the Site Water Management Plan (Appendix F). Windrows would be shaped and oriented such that free drainage of leachate to the collection pond is permitted and ponding of leachate is avoided.

Water and leachate collected in the leachate pond would be re-used on site in the composting process and evaporated as required.

Leachate storage system

The leachate pond would be lined with a minimum of 900mm of compacted clay to meet a permeability standard of $1x10^{-9}$ meters per second. The clay liner would cover the entire floor to top water level. The sides should generally have a slope not exceeding a gradient of 1:3, to allow suitable compaction of the barrier and to facilitate subsequent testing.

Leachate collected in the pond would be used on site for dust suppression, used on site in the composting process or evaporated as required to ensure the pond has constant capacity to capture quarry runoff during subsequent rainfall events.

3.6 QUARRY SURFACE WATER MANAGEMENT

3.6.1 Surface water controls

Surface water controls and drainage works would be constructed as per the Site Water Management Plan to accommodate the expanded extraction area and hardstand area. Controls would generally include:

- Diversion bunds constructed around the perimeter of the proposal areas to divert clean run-on around the proposal site.
- Diversion bunds around the composting pad to prevent excess run-on into the leachate pond.
- Appropriate drainage across the site to minimise and prevent erosion of exposed areas.

3.6.2 Sediment detention ponds

A permanent sediment detention pond would be constructed (utilising an existing dam) to capture sediment laden runoff from the quarry extraction area and stockpile/processing areas (excluding the composting pad, which will have its own leachate collection pond).

The sedimentation basin has been designed in accordance with the Landcom (2004) Managing Urban Stormwater – Soils and Construction, Volume 1, 4th Edition ('the Blue Book'). The basin would capture fine sediments. The water would be flocculated and the treated water discharged from the site. The clarified stormwater would not be discharged from the sediment basin until the level of suspended solids is less than 50mg/L.

A Site Water Management Plan (SWMP) (Appendix F) has been prepared and this allows for compliance with Blue Book. The final landform would be designed carefully with consideration the size of the catchments upstream.

3.6.3 Compost leachate pond

A compost leachate pond would be constructed to capture leachate runoff from the compost hardstand area as outlined in Section 3.5.2 and the SWMP (Appendix F).

3.7 EQUIPMENT REQUIRED

Vehicles and equipment that would typically be required for the development and operation of the quarry include:

- Front end loaders
- Bulldozer
- Excavators
- Off-road articulated haul trucks
- Drill rig
- Mulcher
- Crusher
- Screener
- Compost turning machinery
- Staff vehicles
- 30 tonne truck and dog trailers

3.8 ACCESS AND TRANSPORT

Access to the proposed expansion areas would be via the existing unsealed entry off Nerrigundah Mountain Road. New internal unsealed roads would be constructed to provide access to the new extraction area. Unsealed internal haul roads would be constructed to the proposed expansion areas, including the hardstand and open pits (refer to Quarry Plan, The internal roads would be approximately 80 metres in length and 8 metres wide. The roads would be built and maintained to the required width for the safe and efficient operation of the quarrying and resource recovery activities.

30 tonne trucks would transport quarry products from the site throughout the year. Frequency of truck movements would be influenced by the demand for quarry products. Material extraction and transport would typically be higher at times when ESC is undertaking large road construction projects or road maintenance activities. The maximum daily truck movements (1400 ton/day) as specified in the original conditions of consent would not be exceeded.

Trucks would deliver waste materials to the site for processing and recycling. Loads would be delivered to the proposed hardstand/stockpile area. Frequency of deliveries would depend on customer demand.

3.9 WATER REQUIREMENTS

Water would be occasionally required for dust suppression during the construction and operation phases of the proposed quarry. A water cart would be utilised along access roads during very dry times. Water may also be used for vehicle and plant cleaning. Water would be sourced from the onsite sediment dams.

The Eurobodalla Quarry are licenced to extract up to 100ML of water from Swamp Creek for industrial use. Details of the water access licence are provided in Section 4.15.

3.10 TIMING, OPERATION HOURS AND DURATION

As per the existing quarry consent conditions, the hours of operation and haulage would be restricted to 7am to 5pm Monday to Friday and 7am to 12pm (noon) on Saturday. No work would be undertaken on Sundays or public holidays.

The existing quarry consent conditions allowed for the operation of the quarry for a period of 28.4 years commencing from the date that an EPL is obtained from the EPA. EPL 11776 was obtained by Eurobodalla Quarry on 23 May 2003. Therefore, the existing consent conditions for DA 848/02 allow for extraction and removal of the resource until approximately October 2031.

It is estimated that the proposed expansion of the Eurobodalla Quarry would generate sufficient resources to facilitate operation of the quarry for approximately 30 years. Therefore, Eurobodalla Quarry propose to extend the operational life of the quarry to 30 years from the date of development approval.

Operation of the quarry is planned to take place as soon as possible subject to the appropriate approval being granted and suitable weather.

3.11 ENVIRONMENTAL MANAGEMENT PLAN

The EMP (Appendix H) outlines the systems and procedures that would be implemented as part of the proposal to ensure that best-practice controls to manage potential environmental impacts are established and maintained during operation of the Eurobodalla Quarry and associated resource recovery facilities. It also ensures that all operational related mitigation measures and safeguards from this EIS, the Conditions of Consent and Environmental Protection Licence are met.

Additionally, the Environmental Management Plan provides information on specific site management issues relating to potential environmental impacts from the quarry development.

3.12 REHABILITATION

The Secretary's Environmental Assessment Requirements (SEAR's) for this proposal require the EIS to include:

> *'… a detailed rehabilitation plan for the site'.*

This EIS provides a Rehabilitation Strategy (refer Appendix G) which includes recommendations and a framework for preparation of a Rehabilitation Plan. The Rehabilitation Plan itself is proposed to be prepared after consent, in accordance with the strategy.

3.13 DEVELOPMENT SUMMARY

Table 3-2 provides a description of the key aspects of the proposed development and a comparison with the existing approved development and operations.

Table 3-2 Existing and proposed development/operations summary

Component	Existing operations	Proposed operations
Annual extraction limit	100,000 tonnes per annum	175,000 tonnes per annum
Annual processing limit	100,000 tonnes per annum	175,000 tonnes per annum
Daily extraction and removal limit	1,400 tonnes per day	No change
Plant equipment	Mobile crusher Mobile screener Front end loader 30 tonne haul trucks Drill rig Water cart	Additional plant would include: • Mobile mulcher • Compost turning machine
Hours of operation	Monday to Friday: 7am to 5pm Saturday: 7am to 12pm Sundays: No work Public holidays: No work	No change
Period of resource extraction	Existing consent is for a period of 28.4 years commencing from the date that an EPL is obtained from the EPA. EPL 11776 was obtained by Eurobodalla Quarry on 23 May 2003. Therefore, the consent currently allows for the extraction and removal of the resource until approximately October 2031.	Eurobodalla Quarry are seeking to extract and remove the resource for a period of 30 years from the date of approval of the current development application.
Depth of resource extraction	Original quarry development (DA 848/02): • RL 40m AHD Quarry extension (DA 259/08): • RL 20m AHD	Eurobodalla Quarry are seeking approval to extract materials to a maximum depth of RL 15 metres in the southernmost section of the existing quarry pit and RL 10 m at the northernmost section of the proposed quarry pit. The finished quarry floor would be graded such that water flows to the north towards the permanent sediment dam.

Component	Existing operations	Proposed operations		
Infrastructure	Access road to the site Internal access roads Sediment dams Site shed Stockpile area Concrete batching plant Parking area	Additional infrastructure would include: • A new hardstand stockpile area, to be used for: - Stockpiling and processing extracted quarry materials - Stockpiling and processing wastes brought to the site - Composting of green waste - Plant parking • Increase capacity of an existing farm dam, for use as a sediment detention pond. • Construct a leachate pond adjacent to the composting pad • Construct fencing around the northern periphery of the proposed quarry site.		
Waste materials accepted and processed General Solid Waste (non-putrescible)	N/A	**General Solid waste**	**Volume**	**End products**
		Green Waste - Category 1 Organics (non-putrescible)	<5,000 tonnes per annum	Composted into soil mix
		Other waste • Concrete • Asphalt • Bricks • VENM	Up to 15,000 tonnes per annum, combined	Processed into road base materials and/or aggregates.

4 STATUTORY REQUIREMENTS

4.1 PLANNING CONTEXT

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and associated regulations and environmental planning instruments provide the framework for assessing environmental impacts and determining planning approvals for developments in NSW.

The proposed works have been assessed under Part 4 of the EP&A Act. The assessment also considers the requirements of the *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

4.2 *ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 AND ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATION 2000*

The proposal will be assessed under Part 4 of the EP&A Act. Pursuant to Section 77A of the EP&A Act the proposal is identified as 'designated development' as it is identified in Schedule 3 of the EP&A Regulation as an 'extractive industry'. Schedule 3 of the EP&A Regulation lists categories of developments which are designated in New South Wales.

Clause 16 of Schedule 3 pertains to crushing grinding or separating works and relevant triggers for the development include:

- Clause 16 (1)(a) relates to works that have an intended processing capacity of more than 150 tonnes per day or 30,000 tonnes per year.
  The Eurobodalla Quarry has an intended processing capacity of more than 150 tonnes per day and more than 30,000 tonnes per year.

Clause 19 of Schedule 3 pertains to extractive industries and relevant triggers for the proposal include:

- Clause 19 (1)(a) identifies developments that obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per year.
  The Eurobodalla Quarry currently extracts and processes for sale, more than 30,000 cubic metres of extractive material per year.
- Clause 19 (1)(b)(i) identifies developments 'that disturb or will disturb a total surface area of more than 2 hectares of land by clearing or excavating and (iii) storing or depositing overburden, extractive material or tailings.
  The proposal would disturb a surface area of more than 2 hectares of land by clearing and excavating.
- Clause 19 (1)(c)(iv) on land that slopes at more than 18 degrees to the horizontal.
  The land within the proposal area slopes at more than 18 degrees to the horizontal.

Pursuant to Section 91 of the EP&A Act the proposal is defined as 'integrated development' as it is proposed to extract, process or store more than 30,000 tonnes of extractive material annually.

Clause 32 of Schedule 3 pertains to waste management facilities or works and relevant triggers for the proposal include:

- Clause 32 (1)(d)(i) relates to waste management facilities or works that store, treat, purify or dispose of waste or sort, process, recycle, use or reuse material from waste and that are located within 100 metres of a natural water body.
  The proposal would be located within 100 metres of Swamp Creek.

As the proposal is a 'designated development', an EIS is required. This EIS has been prepared in line with Schedule 2 of the EP&A Regulation and addresses the obligations of the consent authority under section 79C of the EP&A Act.

4.3 *STATE ENVIRONMENTAL PLANNING POLICY (MINING, PETROLEUM PRODUCTION AND EXTRACTIVE INDUSTRIES) 2007*

The aims of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) are to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.

Clause 7 of the Mining SEPP states:

Development for any of the following purposes may be carried out only with development consent:

(a) Extractive industry on land on which development for the purposes of agriculture or industry may be carried out.

Therefore, the proposed works require development consent under this SEPP from Eurobodalla Shire Council. On 17 March 2016, a pre-lodgement meeting was held with Eurobodalla Shire Council to inform them of the intentions of Eurobodalla Quarry to make application and to seek their early input. The existing assessments, scope of the new assessment and key issues likely to arise were discussed.

In accordance with Part 3 of the Mining SEPP, this EIS has assessed the proposal for its:

Compatibility with existing land uses	Section 1.3.3 and Section 6.14
Impact on surface water and groundwater resources	Section 6.2 and Section 6.4
Impact on threatened species and biodiversity	Section 6.5
Impact on air quality/greenhouse gas emissions	Section 6.10
Resource recovery efficiency/re-use, recycling, waste	Section 6.11
Transport	Section 6.8
Rehabilitation	Appendix G

As the proposal is not State Significant Development as defined under the *State Environmental Planning Policy (State and Regional Development) 2011*, the requirements of Part 4AA of the Mining SEPP, relating to development on Biophysical Strategic Agricultural Land are not applicable to this proposal.

4.4 STATE ENVIRONMENTAL PLANNING POLICY NO. 33 – HAZARDOUS AND OFFENSIVE DEVELOPMENT

In this Policy, potentially hazardous industry refers to a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk to human health, life or property or to the biophysical environment. This includes a hazardous industry and a hazardous storage establishment.

A potentially offensive industry is a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.

Noise, dust, waste water control and increased traffic have potential to affect surrounding lands during the operation of plant and equipment. These issues have been investigated in Section 6 of this EIS. The site is remote from residential dwellings (approximately 1.3 km) and given the existing land uses onsite and on allotments adjacent to the site, these impacts are considered to be low and manageable. The potential impacts associated with the quarry expansion are well understood, given that quarrying has been carried out at the site since 2002. Requirements for managing impacts area also well understood.

The proposed quarry would be designed to avoid significant risk to human health, life or property or to the biophysical environment. The potential risks to the environment would be reduced through design measures and through the implementation of operational control measures and it is considered that the proposal does not constitute a potentially hazardous industry. The proposal is not anticipated to be categorised as potentially offensive industry.

4.5 STATE ENVIRONMENTAL PLANNING POLICY NO. 44 – KOALA HABITAT PROTECTION

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) applies to all LGAs listed on Schedule 1 of the policy, except land dedicated under the *National Parks and Wildlife Act 1974* (NPW Act) or the *Forestry Act 1916*.

The proposal is located within the Eurobodalla LGA which is listed in Schedule 1 of SEPP 44. Impacts are considered in in Section 6.5.

4.6 STATE ENVIRONMENTAL PLANNING POLICY NO. 55 – REMEDIATION OF LAND

This policy aims to provide for a Statewide planning approach to the remediation of contaminated land and to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or the environment. Specifically, this policy aims to ensure that:

- Contamination and remediation are considered in zoning or rezoning proposals and development applications.

- Remediation works are permissible and only require consent where they have the potential for significant environmental impacts (Category 1). In all other cases, no consent is required (Category 2). Local government authorities are notified before and after remediation takes place.
- Remediation is carried out to appropriate standards.

There are no existing occurrences of contaminated land (refer Section 1) within the proposal site and the nature of the site means that contamination is unlikely. As such, remediation is not required. Operational commitments for the proposed new activities would ensure no contaminants are brought to the site, or if they are, that they are managed in accordance with the *Protection of the Environment Operations Act 1997* (refer Section 4.7).

4.7 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the Office of Environment and Heritage (OEH), Environment Protection Authority (EPA) branch. It sets the framework for environment protection during both the construction and operation of a development or scheduled activity.

Scheduled Activities are defined in Schedule 1 of the POEO Act and include the premise-based activities that apply to the project, as listed in Table 4-1.

Table 4-1 Scheduled Activities relevant to the proposal

Clause/ Activity	Relevant Clauses	Requirements for the proposal
Clause 19 Extractive activities	1) This clause applies to the following activities: ***land-based extractive activity***, meaning the extraction, processing or storage of extractive materials, either for sale or re-use, by means of excavation, blasting, tunnelling, quarrying or other such land-based methods. ***water-based extractive activity***, meaning the extraction of extractive materials, either for sale or re-use, by means of dredging or other such water-based methods. 2) In this clause, extractive materials means clay, sand, soil, stone, gravel, rock, sandstone or similar substances that are not minerals within the meaning of the Mining Act 1992. ***Land-based extractive activities*** are declared to be a scheduled activity if it meets the following criteria: • Involves the extraction, processing or storage of more than 30,000 tonnes per year of extractive materials.	The Eurobodalla Quarry currently holds an EPL which allows for the land-based extraction of a maximum of 100,000 tonnes of material per annum. It is proposed that this limit be raised to 175,000 tonnes per annum, to allow Eurobodalla Quarry to increase rates of extraction and processing in years when demand for the product is high. **The EPL would need to be modified to reflect this.**
Clause 16 Crushing, grinding or separating	1) This clause applies to crushing, grinding or separating, meaning the processing of materials (including sand, gravel, rock or minerals, but not including waste of any description) by crushing, grinding or separating them into different sizes.	The Eurobodalla Quarry currently holds an EPL which allows for the crushing, grinding and separating of a maximum of 100,000 tonnes of material per annum. It is

	2) The activity to which this clause applies is declared to be a scheduled activity if it has a capacity to process more than 150 tonnes of materials per day or 30,000 tonnes of materials per year.	proposed that this limit be raised to 175,000 tonnes per annum, to allow Eurobodalla Quarry to increase rates of material processing in years when demand for the product is high. **The EPL would need to be modified to reflect this.**
Clause 34 Resource recovery	1) This clause applies to the following activities: ***recovery of general waste***, meaning the receiving of waste (other than hazardous waste, restricted solid waste, liquid waste or special waste) from off site and its processing, otherwise than for the recovery of energy. ***recovery of hazardous and other waste***, meaning the receiving of hazardous waste, restricted solid waste or special waste (other than asbestos waste or waste tyres) from off site and its processing, otherwise than for the recovery of energy. ***recovery of waste oil***, meaning the receiving of waste oil from off site and its processing, otherwise than for the recovery of energy. ***recovery of waste tyres***, meaning the receiving of waste tyres from off site and their processing, otherwise than for the recovery of energy. The ***recovery of general waste*** is declared to be a scheduled activity if it meets the following criteria: • Involves having on site at any time more than 2,500 tonnes or 2,500 cubic metres, whichever is the lesser, of waste. • involves processing more than 120 tonnes of waste per day or 30,000 tonnes of waste per year.	The proposal would involve the recovery of general waste, however it would not involve the recovery of hazardous and other waste, recovery of waste oil or recovery of tyres. The proposal would involve the recovery of an average of 10,000 cubic metres of general waste per year. The proposal would not involve the processing or more than 30,000 tonnes of general waste per year. The proposal would not involve having on site at any one time more than 2,500 tonnes or 2,500 cubic metres of general waste. **The recovery of waste would not be a scheduled activity under this clause and no EPL would be required for this activity.**
Clause 41 Waste processing (non-thermal treatment)	(1) This clause applies to the following activities: ***non-thermal treatment of general waste***, meaning the receiving of waste (other than hazardous waste, restricted solid waste, liquid waste or special waste) from off site and its processing otherwise than by thermal treatment. ***non-thermal treatment of hazardous and other waste***, meaning the receiving of hazardous waste, restricted solid waste or special waste (other than asbestos waste or waste tyres) from off site and its processing otherwise than by thermal treatment.	The proposal would involve the processing of more than 12,000 tonnes of *general waste* at the site per year, including an average of 10,000 tonnes of non-organic general waste and less than 5,000 tonnes of organic general waste per year. **The EPL would need to be modified to include this Scheduled Activity.**

	non-thermal treatment of liquid waste, meaning the receiving of liquid waste (other than waste oil) from off site and its processing otherwise than by thermal treatment. ***non-thermal treatment of waste oil***, meaning the receiving of waste oil from off site and its processing otherwise than by thermal treatment. ***non-thermal treatment of waste tyres***, meaning the receiving of waste tyres from off site and their processing otherwise than by thermal treatment The ***non-thermal treatment of general waste*** is declared to be a scheduled activity if the premises are outside the regulated area and: a) involves having on site at any time more than 2,500 tonnes or 2,500 cubic metres of waste, or b) involves processing more than 12,000 tonnes of waste per year	
Clause 42 Waste Storage	1) This clause applies to ***waste storage***, meaning the receiving from off site and storing (including storage for transfer) of waste. 3) The activity to which this clause applies is declared to be a scheduled activity if: a) more than 5 tonnes of hazardous waste, restricted solid waste, liquid waste or special waste (other than waste tyres) is stored on the premises at any time, or b) more than 5 tonnes of waste tyres or 500 waste tyres is stored on the premises at any time (other than in or on a vehicle used to transport the tyres to or from the premises), or c) more than the following amounts of waste (other than waste referred to in paragraph (a) or (b)) are stored on the premises at any time: i. in the case of premises in the regulated area—more than 1,000 tonnes or 1,000 cubic metres, ii. in the case of premises outside the regulated area—more than 2,500 tonnes or 2,500 cubic metres, or d) more than the following amounts of waste (other than waste referred to in paragraph (a) or (b)) is received per year from off site: i. in the case of premises in the regulated area—6,000 tonnes, ii. in the case of premises outside the regulated area—12,000 tonnes. 4) For the purposes of this clause, 1 litre of waste is taken to weigh 1 kilogram.	The proposal would not involve the storage of hazardous waste or waste tyres at the premises. The proposal is situated outside the regulated area, and may The proposal may involve the storage of more than 2,500 tonnes or 2,500 cubic metres of waste (other than hazardous waste, restricted solid waste, liquid waste, special waste or tyres) at the site at any time. The proposal would receive from off site more than 12,000 tonnes of waste (other than hazardous waste, restricted solid waste, liquid waste, special waste or tyres) per year. **The EPL would need to be modified to include this Scheduled Activity.**
Clause 12 Composting	1) This clause applies to ***composting***, meaning the aerobic or anaerobic biological conversion of organics into humus-like products: a) by methods such as bioconversion, biodigestion or vermiculture or	The proposed composting would be located outside the regulated area and would only receive organics from outside the regulated area.

	b) by size reduction or organics by shredding, chipping, mulching or grinding. 2) The activity to which this clause applies is declared to be a scheduled activity if: a) Where it takes place inside the regulated area, or takes place outside the regulated area but receives organics from inside the regulated area (whether or not it also receives organics from outside the regulated area): i. It has on site at any time more than 200 tonnes of organics received from off site, or ii. It receives from off site more than 5,000 tonnes per year of non-putrescible organics or more than 200 tonnes per year of putrescible organics. b) Where it takes place outside the regulated area and does not receive organics from inside the regulated area: i. it has on site at any time more than 2,000 tonnes of organics received from off site, or ii. it receives from off site more than 5,000 tonnes per year of non-putrescible organics or more than 200 tonnes per year of putrescible organics. 3) For the purposes of this clause, 1 cubic metre of organics is taken to weigh 0.5 tonnes.	The site would not receive more than 5,000 tonnes per year of non-putrescible organics. The site would not receive any putrescible organics. The site would not have on it at any one time, more than 2,000 tonnes of organics received from off site. **An EPL would not be required for this activity.**

Clauses 34, 41 & 42 of Schedule 1, respectively relate to resource recovery, waste processing (non-thermal treatment) and waste storage activities. These activities require an Environmental Protection Licence unless an exemption in accordance with Clause 51(3) of the Protection of the Environment Operations (Waste) Regulation 2014 provides otherwise. Refer to Section 4.8 below for further information.

The Eurobodalla Quarry would not accept hazardous waste, restricted solid waste, liquid waste, special waste or tyres. Operational commitments for the proposed new activities would ensure no contaminants or non-conforming wastes are brought to the site, or if they are, that they are managed in accordance with the *POEO Act 1997*.

The POEO Act makes it an offence to pollute waters, described as a change in the physical, chemical or biological characteristics of the water, without a licence. Quarry operations will be conducted in accordance with the Blue Book to ensure compliance with this Act.

The EPL stipulates a range of conditions for the management of waters. Eurobodalla Quarry operations would continue to operate under the conditions stipulated in the EPL. A Soil and Water Management Plan would be prepared to ensure that the existing and proposed quarry operations are conducted in accordance with the Blue Book and in compliance with this Act.

4.8 *PROTECTION OF THE ENVIRONMENT OPERATIONS (WASTE) REGULATION 2014*

The EPA may issue resource recovery orders and resource recovery exemptions under the 2014 Waste Regulation. Resource recovery orders apply to generators and processors of waste. Resource recovery

exemptions apply to consumers of the resource. Both contain conditions that must be met to satisfy the order/exemption and may include specifications, requirements on how to re-use or apply the waste, record keeping, reporting and other requirements.

The general orders and exemptions that may be applicable to the project are listed in Table 4-2 below.

Table 4-2 Resource recovery orders and exemptions which may apply to the proposal

Order /Exemption	General conditions
Excavated natural material	The chemical concentration or other attributes of the excavated natural material listed in the order must not be exceeded. The excavated natural material can only be applied to land as engineering fill or used in earthworks. ENM handling, processing and testing requirements are outlined in detail in the order.
Excavated public road material	The excavated public road material can only be applied to land within the road corridor for public road related activities including road construction, maintenance and installation of road infrastructure facilities. This order does not apply to the land application of excavated public road material on any land outside the road corridor. The excavated public road material cannot be applied on private land.
Reclaimed asphalt pavement	The reclaimed asphalt pavement can only be: - Applied to land for road related activities including road construction or road maintenance activities, being: a. Use as a road base and sub base b. Applied as a surface layer on road shoulders and unsealed roads c. Use as engineering fill material. - Used as an alternative raw material in the manufacture of asphalt.
Recovered aggregate	The chemical concentration or other attribute of the recovered aggregate listed in the order must be met. The recovered aggregate can only be applied to land for road making activities, building, landscaping and construction works. This approval does not apply to any of the following applications: - Construction of dams or related water storage infrastructure, - Mine site rehabilitation, - Quarry rehabilitation, - Sand dredge pond rehabilitation, - Back-filling of quarry voids, - Raising or reshaping of land used for agricultural purposes, and - Construction of roads on private land unless: a. the relevant waste is applied to land to the minimum extent necessary for the construction of a road, and b. a development consent for the development has been granted under the relevant Environmental Planning Instrument (EPI), or c. it is to provide access (temporary or permanent) to a development approved by a Council, or d. the works undertaken are either exempt or complying development.
Compost	The requirements in this order apply in relation to the supply of compost for application to land as a soil amendment. In this order, compost means any combination of mulch, garden organics, food waste, manure and paunch that has undergone composting. The processor must meet the sampling requirements as set out in the order.

4.9 NATIONAL PARKS AND WILDLIFE ACT 1974

The NPW Act aims to conserve the State's natural and cultural heritage; foster public appreciation, understanding and enjoyment of the State's natural and cultural heritage; and manage any lands reserved for the purposes of conserving and fostering public appreciation and enjoyment of the State's natural and/or cultural heritage.

The NPW Act governs the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

Section 6.5 of this EIS assesses the impact of the proposal on native flora and fauna and the requirement for further assessment and referral.

Section 6.6 and Appendix E of this EIS addresses the impact of the proposal on Indigenous heritage.

4.10 THREATENED SPECIES CONSERVATION ACT 1995

The TSC Act aims to conserve and protect certain classes of threatened, endangered and vulnerable species, populations and ecological communities.

Section 5A of the EP&A Act lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then an Assessment of Significance would be required to determine the significance of the impact. If there is likelihood for a significant impact on threatened species, populations and their habitat or on ecological communities then a Species Impact Assessment is required.

Impacts on threatened species are discussed in Section 6.5.

4.11 NATIVE VEGETATION ACT 2003

The *Native Vegetation Act 2003* (NV Act) regulates the clearing of native vegetation. Clearing is defined as cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation including native grasses and herbage. Permission to clear native vegetation must be obtained for proposals under Part 4 of the EP&A Act.

Impacts on native vegetation are discussed in Section 6.5 of this EIS.

4.12 HERITAGE ACT 1977

The NSW *Heritage Act 1977* (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines processes for approval of development which may impact items of heritage significance.

Impacts of the proposal on non-Aboriginal heritage are assessed in Section 6.7 of this EIS.

4.13 NOXIOUS WEEDS ACT 1993

This act aims to prevent the establishment, reduce the risk of spread and minimise the extent of noxious weeds. The *Noxious Weeds Act 1993* guides the management of declared noxious weeds within Local Government Areas (LGAs). Impacts are assessed in Section 6.5 of this EIS.

4.14 FISHERIES MANAGEMENT ACT 1994

The NSW *Fisheries Management Act 1994* (FM Act) provides for the protection of threatened fish and marine vegetation and is administered by the Department of Primary Industries (DPI). The FM Act aims to protect fishery resources and marine species, and conserve habitats and diversity.

The FM Act works in conjunction with the EP&A Act. If the following activities form part of a proposal, a permit from DPI under the FM Act is required:

- Aquaculture.
- Dredging or reclamation.
- Harm marine vegetation (mangrove, seagrass, seaweed).
- Obstruct free passage of fish.

Proposed extraction activities would take place in proximity to Swamp Creek. A minimum buffer of 40 metres is provided to protect this watercourse from extraction activities and indirect impacts on this watercourse are discussed in Section 6.5. Swamp Creek is mapped as Key Fish Habitat (KFH) by the NSW Department of Primary Industries (DPI). One of the objectives of the *FM Act* is to 'conserve key fish habitats'. The proposal would not disturb the watercourse and therefore would not be considered to a barrier to fish passage. It is not subject to the provisions of this Act.

As the proposal will not involve aquaculture, impacting on marine vegetation, dredging, reclamation or result in the blockage of fish passage, the proposal would not require any permits described under the FM Act.

4.15 WATER MANAGEMENT ACT 2000

Harvestable rights

Under the *Water Management Act 2000* (WM Act), an owner or occupier of a landholding within a harvestable rights area is entitled, without the need for any access licence, water supply work approval or water use approval, to do each of the following in accordance with the harvestable rights order by which the area is constituted:

a) to construct and use one or more water supply works for the purpose of capturing and storing water of a kind specified by the harvestable rights order,
b) to take and use that water.

The harvestable rights volume for the site was calculated using the on-line calculator and based on the total size of Elizabeth Farm, 420.84 hectares. The maximum harvestable right dam capacity for the property is 42.084 ML. Provided that the total holding capacity of the dams within Elizabeth Farm never exceed the harvestable rights dam volume for the property, no water access licence is required.

Water sharing plans

The WM Act provides for the sustainable and integrated management of the state's water for the benefit of both present and future generations.

Under the WM Act, DPI Water prepares a range of statutory water management plans including water sharing plans. Water Sharing Plans (WSPs) establish rules for sharing water between the environment and for uses such as town water supplies, stock watering, industry, irrigation and Aboriginal cultural uses. The rules in the plans apply for ten years and are reviewed after five years.

Water access licences entitle holders to:

- specified shares in the available water within a particular water management area (the share component); and to
- take water at specified times, rates or circumstances from specified areas or locations (the extraction component).

Separate approvals are required to install and operate a work such as a pump, dam or bore and to use water for a particular purpose, such as irrigation. Water access licence holders can only take water if:

- the water allocation account for that water access licence is in credit (either by an available water determination credit or trading allocation water); and
- the water is taken through a water supply work nominated on that water access licence.

A Water Sharing Plan exists for the *Tuross River Unregulated and Alluvial Water Sources*. The plan commenced on 1 July 2016. The water source relevant to the proposal is the Swamp Creek water source. Table 4-3 presents the water extraction and active licences for the Swamp Creek water source, identified from a search of the NSW Water Register (Department of Primary Industries (Water), 2016).

Table 4-3 Water Sources and WAL's relevant to the proposal

Water Source	Licence Category	Tenure type	Entitlement (ML/year)	Number of WALs
Swamp Creek Water Source	Unregulated River	Continuing	260	1 (Licence # 38575)

Eurobodalla Quarry also hold a Water Supply Works and Water Use Approval (Approval No. 10CA119918), nominated under WAL #38575. The approval allows for the diversion of up to 260 ML of water from Swamp Creek for Industrial and Irrigation purposes. The Approval was issued on 1 July 2016 and expires 17 January 2021.

Following the introduction of the *Tuross River Unregulated and Alluvial Water Sources* Water Sharing Plan on 1 July 2016, the Approval immediately replaced a Licence which had previously been issued under the *Water Act 1912* (Licence No. 10SL055078). Eurobodalla Quarry must comply with the conditions of the former licence until copies of the replacement approval are received.

Water will primarily be sourced from the onsite sediment detention ponds for use in dust suppression and vehicle wash down. It is unlikely that the proposal would require the extraction of water from Swamp Creek. If water were required to be diverted from Swamp Creek as part of the proposal, it would be undertaken in accordance with the Water Sharing Plan, Water Access Licence and Water Supply Works and Water Use Approval.

Controlled activities for impacts on waterfront land

The *Water Management Act 2000* (Water Management Act) superseded the *Rivers and Foreshores Improvement Act 1948* and protects rivers and foreshores and water resources in NSW by providing for the sustainable management of water resources. The Water Management Act includes provisions to control or permit works within 40m of the top of bank (replaces part of the RFIA). The proposal does not involve works within 40m of the top of bank of a waterway, therefore the provisions of the Water Management Act are not relevant.

4.16 *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999*

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. Matters of national environmental significance relevant to the proposal are:

- Wetlands of international importance.
- Nationally threatened species and ecological communities.
- Migratory species.

Significance of impacts is determined in accordance with the *Significance impact guidelines 1.1 – matters of national environmental significance* (Department of Environment, Water, Heritage and the Arts, 2006).

Where a proposal is likely to have a significant impact on a matter of national environmental significance, the proposal is referred to the Commonwealth Environment Minister via the Department of the Environment (DoE). The Minister then determines whether the proposal is a 'controlled action'. If a proposal is declared a controlled action, an assessment of the action is carried out and the Minister makes a decision to approve, approve with conditions, or not approve the proposed action.

The Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Lake George is listed as a nationally important wetland however it is not listed in the Ramsar directory, therefore approval under the EPBC Act is not required in relation to the surface water discharge from the proposal.

Impacts to threatened entities are considered in Section 6.5 of this EIS. A summary of matters of national environmental significance is included in Section 6.17. A referral is not required as part of the proposed works.

4.17 EUROBODALLA LOCAL ENVIRONMENTAL PLAN 2012

The proposal is located on land zoned RU1 – Primary Production. The objectives of the zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To minimise the visual impact of development on the rural landscape.
- To provide for recreational and tourist activities that support the agricultural, environmental and conservation value of the land.

The proposal is for the extension of a quarry extraction area, extraction of materials from the site, processing of materials at the site and resource recovery activities.

Within this land zone, extractive industries are permitted with development consent. Under SEPP (Infrastructure) 2007, resource recovery facilities[1] are permitted with consent within land use zone RU1 Primary Production (a prescribed zone).

The proposal is for a private development and would be located on private land. It would not increase the demand for public services or facilities. The proposal would not fragment or alienate resource lands. The proposal is located within a site which has been highly modified by its use as former agricultural land. To the north and west of the proposal area are extensive areas of the Dampier State Forest zoned RU3 Forestry.

[1] Meaning facilities for the recovery of resources from waste, including such works or activities as separating and sorting, processing or treating the waste, composting, temporary storage, transfer or sale of recovered resources, energy generation from waste gases and water treatment, but not including re-manufacture of material or goods or disposal of the material by landfill or incineration.

5 CONSULTATION

5.1 EUROBODALLA SHIRE COUNCIL

On 17 March 2016, a pre-lodgement meeting was held with Eurobodalla Shire Council to inform them of the intentions of Eurobodalla Quarry to make application and to seek their early input. The existing assessments, scope of the new assessment and key issues likely to arise were discussed.

5.2 OFFICE OF ENVIRONMENT AND HERITAGE

Consultation was undertaken with OEH during the preparation of the Aboriginal Heritge Due Diligence Assessment. Advice was sought from Jackie Taylor (OEH) regarding an Aboriginal object that had been recorded during a previous survey at the site, but which could not be relocated during the field assessment carried out by NGH Environmental in August 2016. Further details of this consultation are available in the Aboriginal Heritage Due Diligence Report (Appendix E).

5.3 AGENCY REQUIREMENTS

As the proposal is designated development, the Secretary's Environmental Assessment Requirements were requested and were provided on 23 December 2015. Agency requirements are summarised in Appendix A, and cross references are provided to indicate where the requirements have been addressed within this EIS.

6 ENVIRONMENTAL ASSESSMENT

6.1 SCOPING AND PRIORITISATION OF ISSUES

The purpose of this section of the EIS is to identify and investigate the aspects of the proposal that have the potential to generate significant environmental impacts ('significant aspects').

The risk assessment (refer below) was informed by desktop research and the site inspection. Risk is identified by considering the **consequence** of an impact, in combination with the **likelihood** of this impact occurring. The risk rating is a factor of likelihood and consequence.

High risk ratings have been investigated by specialist reports/specialist input. Measures to minimise and mitigate risks of impacts for each of the high-risk aspects have been developed so as to reduce the resultant risk ('residual risk') to an acceptable level. Medium and low risks are considered highly manageable and are investigated by site inspection and desktop review. The order of the assessment follows logical groupings (ie. surface water, soils ground water) and not necessarily the risk assessment order below.

Table 6-1 Risk assessment

Aspect	Likelihood	Consequence	Risk rating	Residual risk rating after implementation of management measures
Surface hydrology and water quality	Likely	Moderate	High	Low
Soils and landforms	Likely	Moderate	HIgh	Low
Biodiversity impacts	Likely	Moderate	HIgh	Low
Heritage (Aboriginal) impacts	Likely	Moderate	High	Low
Waste management	Possible	Moderate	Medium	Low
Noise and vibration impacts	Possible	Moderate	Medium	Low
Traffic and transport impacts	Possible	Moderate	Medium	Low
Air quality and climate	Possible	Moderate	Medium	Low
Social and economic impacts	Possible	Moderate	Medium	Low
Hazards and risks	Possible	Moderate	Medium	Low
Groundwater impacts	Unlikely	Moderate	Medium	Low
Visual amenity	Unlikely	Minor	Low	Low
Heritage (historic)	Unlikely	Minor	Low	Low

6.2 SURFACE HYDROLOGY AND WATER QUALITY

6.2.1 Methodology

Due to the high risk rating identified for this environmental aspect, the following assessment was prepared with specialist input from soil conservationist, Michial Sutherland. Specialist advice was sought in the preparation of a Site Water Management Plan (SWMP), which is included as part of the proposal, Appendix F.

6.2.2 Existing environment

Drainage

The proposed new extraction area is partially situated on a forested hill which falls steeply to the west and south-west where water drains towards Swamp Creek. The northern and eastern slopes of the forested hill generally range between 20-25%.

The majority of the proposed new extraction area is located on cleared land which generally slopes in north and north-easterly directions towards Swamp Creek. A drainage line carries surface water north in the proposed hardstand area. A farm dam is located at the base of the drainage line, approximately 100 metres south of Swamp Creek. Topography of the site is shown in Figure 3-1.

Receiving waterways

Swamp Creek, a tributary of the Tuross River, is located approximately 50 metres north of the proposed northern boundary of the quarry expansion area. Swamp Creek flows in an easterly direction, eventually joining the Tuross River approximately 3 kilometres east of the proposal site.

Stormwater management – existing quarry

Wastewater from the existing quarry is collected onsite in sediment detention dams around the quarry pit and within the floor of the quarry pit itself. Water is only released from the dams after total suspended solids have been tested and are found to be less than 50mg/L. Pond water is flocculated if necessary, prior to release. Diversion bunds have been constructed to divert clean runoff away from the existing quarry pit.

6.2.3 Potential impacts

The proposed quarry expansion area is located on an elevated hill with steep slopes generally in the order of 20-25%. The northern boundary of the proposed extraction area is situated approximately 50 metres from the top bank of Swamp Creek. The principle risks to surface waters would be from erosion of soils and transport of sediment off site and into the nearby Swamp Creek and contamination of surface waters from the composting of green waste.

Potential surface water quality impacts

During site preparation and quarry operation, the main risk to water quality is the export of sediment and suspended solids from the site. Impacts associated with sediment export can include:

- Smothering of the benthos and benthic organisms by sediment leading to a change in the aquatic communities and a decline in sensitive taxa.

- Particulate phosphorus, bound to sediment, contributing to the mass of nutrients in a waterway and potentially contributing to algal blooms.
- Adding sediment to a waterway, disturbing its geomorphological balance and potentially resulting in scouring of banks to widen the channel and maintain conveyance capacity.

There is a very low risk to water quality from spillage of fuels or chemicals during operation. Only small volumes of fuels and chemicals would be stored on site and storage would be in accordance with the Australian Standard. The Environmental Management Plan contains measures to reduce any impacts that may occur as a result of hydrocarbon spills and leaks.

The composting activities are expected to generate minimal amounts of leachate runoff. However, nutrient rich runoff from the composting area would have the potential to result in contamination of surface waters. All water from the composting pad would be captured within the leachate pond, and reused on site in the composting process or used in dust suppression.

Stormwater management strategy

The proposal has been carefully planned to avoid stormwater runoff impacting on surface waters. The 40 metre buffer to the top of bank of Swamp Creek north of the proposal site means the proposal would not trigger the riparian management components of the WM Act. The proposal does not seek to extract and then use any water from a watercourse.

The proponent has approval for the construction of a 20ML dam on the site. An existing dam would be expanded to act as a sediment basin to capture sediment laden runoff and allow treatment of the water prior to discharge. The holding capacity of the dam would not exceed the approved 20ML. No water access licenses would be required under the WM Act.

The principle water quality objective for the proposal is to limit the discharge of suspended solids to less than 50 mg/L as defined in the Blue Book (Landcom 2004). If compliance with the Blue Book is achieved, compliance with the POEO Act is also inferred.

The proponent's staff have a strong appreciation of both environmental and surface water management issues. These staff would operate the quarry in accordance with both the Blue Book (Landcom 2004) and the Eurobodalla Quarry Environmental Management Plan (Appendix H) and SWMP (Appendix F).

Provided that the Site Water Management Plan and measures outlined in the Environmental Management Plan are implemented, it is likely that the proposal would have a neutral effect on water quality in both the short and long term.

Hydrological impacts

The proposal would result in changes to the topography of the land, and alterations to the hydrological patterns. Material would be extracted from the proposed quarry expansion area over a period of about 30 years. The final floor of the proposed extraction will achieve a maximum depth of RL 10 metres AHD. The worked face of the quarry would be benched to provide surfaces which will retain topsoil and moisture and encourage growth of vegetation. Runoff would be collected in appropriately sized basins for retention of suspended solids. Stabilised discharge points would be located in appropriate areas to release clean water from the site.

Water requirements

Provided that the sediment dams do not exceed the maximum harvestable rights of the site, no water access licence is required and we assume little to no impact on creek morphology is likely. To ensure the

success of any newly revegetated areas, water from the sediment basins may be used to irrigate newly vegetated areas.

Eurobodalla Quarry hold a WAL and Water Supply Works and Water Use Approval for the extraction of water from Swamp Creek for industrial use. Should there be insufficient water available in the water contained within the quarry floor or sediment detention pond, water may be pumped from Swamp Creek for the purposes of dust suppression. The water would be extracted in accordance with the relevant WSP, WAL and Water Supply and Water Use Approval.

The proposal would require water to maintain the required level of moisture in the compost rows. This would be sourced from the leachate pond or from the sediment pond.

6.2.4 Safeguards and mitigation measures

Stormwater management

- The SWMP that has been prepared for the proposed quarry expansion would be implemented (Appendix F). The aim of this plan is to ensure that all runoff captured by the site is adequately contained onsite.
- Construct stormwater management controls in accordance with the SWMP to ensure that all 'clean water' is diverted around the site using clean water diversion bunds and 'dirty water' from the site is captured within the sediment basin.
- Ensure that surface waters are diverted around the composting pad, and that all surface water from the composting pad is diverted into the leachate pond for storage.
- The site sediment basins are to be drawn down as soon as possible following a rain event to enable them to capture runoff from the next rainfall event. The cleaned water should be pumped to a location which allows for broad dispersed flow across a long vegetated buffer to Swamp Creek.
- Review the post closure drainage and water management of the site once the quarry has been exhausted and final levels are known. If a depression is left on completion of the work, some regrading may be required to drain the site.

Water Quality

- Prior to discharge, water from the sediment basin would be tested and treated in accordance with the measures contained in the EMP and the EPL. Water would be flocculated if required. Water would not be discharged from the sediment basin until the level of suspended solids is less than 50mg/L.
- The leachate management controls described in Section 3.5.2 of this EIS would be implemented to minimise the potential impacts to surface water quality particularly through the following:
    - Installation, monitoring and maintenance of leachate and stormwater management controls (barriers, collection and storage systems)
    - Diversion of surface water run-on around the composting pad
    - Maintaining capacity in the leachate pond to enable the capture of runoff from the compost pad during the next rainfall event.
- Ensure all chemicals, fuels and oils kept on site are stored in accordance with manufacturer's recommendations and in a bunded or sealed area. The volume of this bunding will be greater than 110% of the volume of the largest container.
- Manage accidental spills of fuel and any other chemicals in accordance with the measures contained within the EMP (Section 4.2.2: Pollution Incident Response Procedure).

- Empty fuel, oil, lubricant and chemical containers are to be removed from the site and disposed of at a facility that is able to accept the waste.

Sediment control monitoring and management

- Monitor activity associated with the sediment basins with every significant rainfall event.
- During and following each discharge from the sediment pond, inspect the points of discharge for sediment deposits. If sediment deposits are observed, discharging should be ceased immediately. The water should be retreated and re-tested prior to further discharging.
- Monitor and inspect diversion swales to ensure they remain stable and are not contributing any sediment.
- Maintain a regular supply of flocculants on site and store in accordance with manufacturer's recommendations.
- Silts would periodically be removed from the sediment basin and reused in the production of quarry products.

6.3 SOIL AND LANDFORMS

6.3.1 Methodology

As for surface hydrology, due to the high risk rating identified for this environmental aspect, the following assessment was prepared with specialist input from soil conservationist, Michial Sutherland. Specialist advice was sought in the preparation of a Site Water Management Plan, which is included as part of the proposal, Appendix F.

6.3.2 Existing environment

Regional landform

Regionally, the Eurobodalla Quarry site lies in an area comprising undulating to steep hills and ridges bounded to the south and to the east by the Tuross River valley. The hills form the eastern edge of the Southern Tablelands plateau. There are two distinct topographies in the district, including the highly undulating, mountainous forested areas and the lowland cleared farming country.

The valley to the south of the site is relatively narrow, but widens to the east where it meets the narrow coastal plain near Bodalla. Floodplains are not extensive in the area due to the narrow valleys and narrow coastal plains.

Site topography

The proposed new extraction area is located immediately north and north-west of the existing quarry pit. The site is partially situated on a small forested rise which has a maximum elevation of approximately 70 m ASL. Slopes on the southern and western sides of the hill are generally between 25-35% with the land falling steeply into a drainage line that flows towards Swamp Creek. Slopes on the northern and eastern sides of the hill generally range between 20-25%. At the northern boundary of the proposed extraction area the land is approximately 25 metres ASL.

A drainage line occurs through the middle of the land clearing immediately north of the existing quarry pit. The slope along the drainage line is generally less than 10%. A farm dam is situated at the base of the

drainage line near the north eastern corner of the proposed new extraction area. The proposal includes the construction of a hardstand area, generally along the base of this drainage line.

A proposal outline map provided at Figure 3-1 shows the topography within and around the proposal site.

Site geology

The Eurobodalla Quarry is located on the eastern limb of the Budawang syncline, a north-south geological formation that stretches from south of the Tuross River in a narrow band (3-10km wide) up into the lower parts of the Shoalhaven region (Outline Planning Consultants, 2002).

Rocks at the quarry site are steeply dipping interbedded Devonian sedimentary rocks (the Merimbula group) underlain by Middle to late Devonian Comerang Volcanics. The sediments are conglomerates, sandstones and shales. The volcanics are major rhyolites, major basalts with minor andesites and some lavas are vesicular. All are dipping steeply at approximates 80 degrees west toward the synclinal axis. Rocks are cemented with ferruginous and siliceous material (Hydromap 2007).

The basalt and rhyolite are of prime importance for the present and future supply of quarry rock to the region. When fresh, the rock is grey/black in colour and can change to a redder colour when weathered.

Soil and subsoil conditions

The soil parent material includes a fusion of basalt and rhyolite with quartz and mudstones. Soils within the proposal area and immediate surrounds include Yellow Podzolics (typically over rhyolite material), and Red Podzolics with mudstone, Brown Earths and Alluvial Black Earths in valley areas.

Subsoil materials and their properties are highly variable due to the range and complexity of parent materials. Total depth of soil varies greatly due to bedrock geology and degree of weathering. Soils underlain by rhyolite bedrock tend to be shallower than those soils overlying a basalt bedrock (Outline Planning Consultants, 2002).

Land capability

Land and soil capability mapping of the proposal site indicates very severe to extreme limitations (OEH, 2016). The steeper portions of the site are not capable of sustaining most land uses. Remaining areas of the site would only be capable of sustaining low impact land uses such as low intensity grazing.

The Eurobodalla LEP 2012 maps the proposal site as Class 4 and Class 5 agricultural land. Class 4 agricultural land is suited to grazing but not cultivation. Overall level of production is comparatively low due to major environmental constraints. Class 5 agricultural land is not suited for agriculture or only light grazing. Agricultural production, if any, is low due to major environmental constraints (such as slope and erosion hazard).

Contamination potential

The land within the proposal area has previously been used for cattle grazing on improved pastures. No intensive agriculture has been carried out on the quarry site or surrounds.

Acid sulfate soils

The land has no potential for acid sulfate soils.

6.3.3 Potential impacts

The primary adverse impact to soils at the site is the risk of erosion and sedimentation occurring as a result of the quarry operations, both the initial clearing and top soil removal, and then the routine extraction activities. Activities that may expose soils and leave them susceptible to the erosive forces of wind and rain include the following:

- Vegetation clearing at the location of the new extraction area.
- Construction of the new hardstand/stockpile area, including cut and fill earthworks.
- Expanding the size of an existing dam, to be used as the main sediment pond.
- Stockpiling of topsoil during extraction activities for reuse in rehabilitation.
- Movement of vehicles across areas of bare ground such as within the quarry site and along unsealed access roads.

Soils would be progressively exposed in extraction areas, for access tracks, stockpile areas, areas of equipment and parking. The footprint of the proposal covers and area of 17.65 hectares. Stockpiles may be in place for long periods, as material is stored for later use.

Use of fuels and lubricants can result in spills which affect the soil health and its ability to support vegetation. Measures to be implemented in the event of a fuel, oil or chemical spill at the site have been included in the Environmental Management Plan (Appendix H).

The proposal would alter the landform of the area during extraction activities. The site would be progressively rehabilitated to a safe, stable non-polluting landform compatible with the surrounding land use by implementing the measures in Section 6.2 such as limiting the final form batters to 1 in 4 to facilitate rehabilitation. Any adverse impact on landform as a result of the operation would be addressed during the rehabilitation phase.

A Site Water Management Plan (SWMP) has been developed for the proposal which shows the location of erosion and sediment controls and sediment basins at the site (Appendix F). An Environmental Management Plan provides further guidance on the management of soils at the site (Appendix H).

A Rehabilitation Strategy has been developed for the quarry (Appendix G) which includes recommendations and a framework for preparation of a detailed Rehabilitation Plan. The Rehabilitation Plan itself is proposed to be prepared after consent, in accordance with the Strategy. Aims of rehabilitation will be to provide a stable landform that is resistant to erosion, to preserve downstream water quality through management of site runoff and minimising weed infestation.

6.3.4 Safeguards and mitigation measures

The works are to be carried out in accordance with the Environmental Management Plan (Appendix H). Specific safeguards and mitigation measures to control erosion and sedimentation at the site are discussed in Section 6.3.2 of this EIS. Additional measures that may be implemented at the site to minimise impacts on soils and landforms include:

Topsoil management

- Strip and stockpile topsoil for reuse in accordance with Drawing SD4-1 from the Blue Book (Landcom 2004). Where there is sufficient space, stockpiles shall not be more than 2 metres high. Ideally stripping will done when the soil is moist and Eurobodalla Quarry should consider wetting the soil prior to stripping.

Spill /contamination management

- Spill kits would be stored onsite and staff trained in their use.
- If any signs of contaminated soils are discovered (e.g. smell, discolouration, suspect rubbish), the site would be marked and the soil replaced to cover the contamination. The soil would be analysed without delay to determine the type of contamination and an appropriate management plan would then be developed and followed.

Rehabilitation

- A detailed Rehabilitation Plan would be developed by a qualified person, in accordance with the Rehabilitation Strategy provided in Appendix G of this EIS. Aims of rehabilitation will be to provide a stable landform that is resistant to erosion, to preserve downstream water quality through adequate management of site surface water runoff and minimising weed infestation.
- The Rehabilitation Plan would include input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).
- Respread topsoil immediately following the closure and regrading (if required) of each worked section of the quarry. The quarry floor and benches would then be revegetated and rehabilitated as soon as possible.
- Monitor revegetated areas to ensure good strike rates with revegetated areas.
- Monitor rehabilitated areas to ensure they remain stable and free from erosion.
- Repair any erosion - regrading to ensure an even surface and diversion of surface runoff around disturbed areas and if required use jute or mulch and reseed locally.

6.4 GROUNDWATER

6.4.1 Existing environment

Hydrogeological environment

In 2007, Hydromap Consulting Engineers and Hydrogeologists were engaged by Eurobodalla Quarry to undertake a study investigating the hydrological and hydrogeological features of the Eurobodalla Quarry site with regards to the vulnerability of the local groundwater. The study included an inspection of the Eurobodalla Quarry site.

The Hydromap (2007) report noted the following points of hydrogeological significance regarding the site:

- Tightly closed and cemented joints consistent with no seepages or springs in the fresh rock face were found on the existing quarry site and adjacent areas. This is despite the amount of high ground above the quarry site and the high local rainfall;
- Run-off after storm events is fast with no lingering baseflow stage on the quarry site and adjacent areas;
- A number of test holes have been drilled across the quarry and around its downhill periphery to 20 metres to prove up material reserves. None of the test holes encountered groundwater and none of the holes have made groundwater over the period since drilling;

- A deep test hole drilled by Eurobodalla Shire Council west of the quarry site did not encounter water while drilling (approximately 60m below the quarry);
- There can be no hydraulic head driving any potential recharge (either of rainwater or potential pollutants) downward towards the water table.
- The quarry site is considered to be non-vulnerable with respect to the main local groundwater body.

Important conclusions drawn by the Hydromap (2007) report, are:

- The groundwater level exists in excess of 80 metres below the quarry and numerous test drills to 20 metres have encountered no water, nor have they subsequently filled with water.
- This establishes the existence of a 100 metre cemented aquiclude between the quarry and the deeper groundwater, which precludes downward flow/seepage or recharge of any kind.
- With no continuous hydraulic head between the quarry and the main groundwater body, it must be concluded that the quarry site is non-vulnerable with respect to the regional groundwater system.

Groundwater dependent ecosystems

Potential Groundwater Dependent Ecosystems (GDEs) within the vicinity of the proposal site are mapped in the *Groundwater Dependent Ecosystems Atlas* (BOM, 2016) (refer Figure 6-1). The Atlas identifies two vegetation GDEs that are potentially reliant on subsurface groundwater within the western portion of the proposal site:

- Coastal Escarpment and Hinterland Dry Shrub/Fern Forest – *Eucalyptus muelleriana* (high potential for groundwater interaction)
- Southern Coastal Hinterland Shrub/Tussock Grass Dry Forest – *E. agglomerata/ E. muelleriana* (low potential for groundwater interaction)

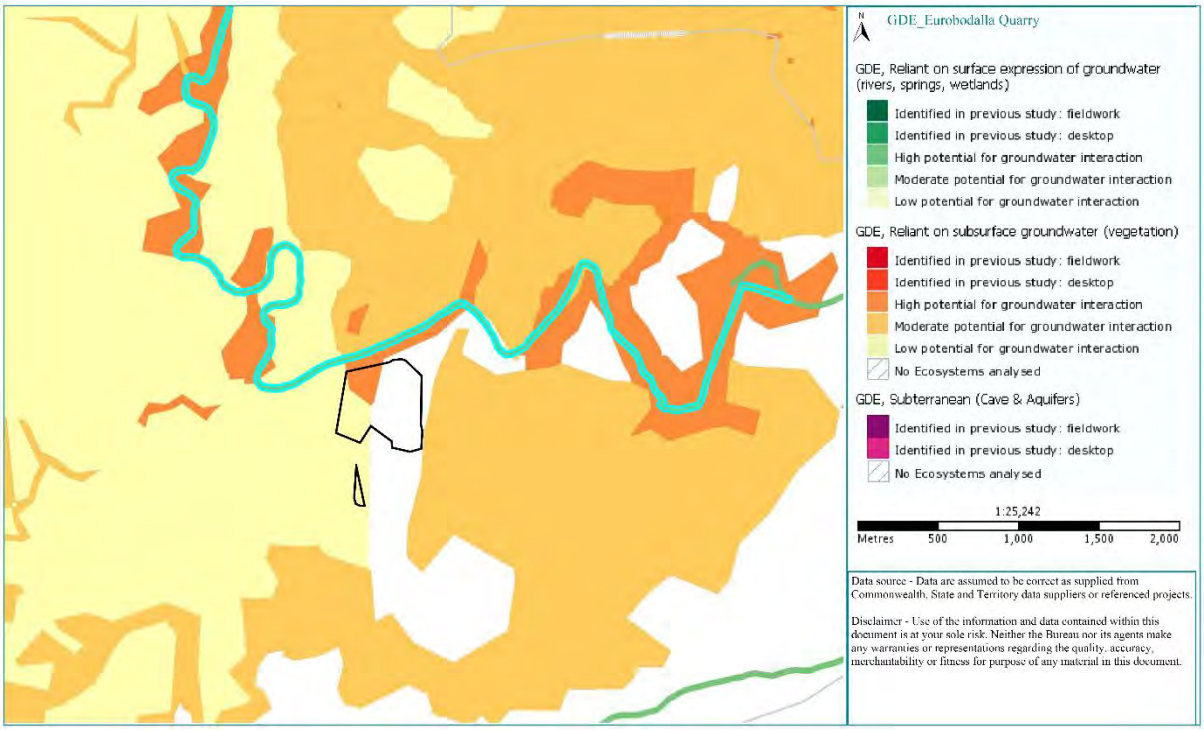


Figure 6-1 GDEs at the location of the proposal site (proposal shown in black outline) (BOM, 2016).

6.4.2 Potential impacts

Generally, ground water impacts could occur if ground water was intercepted during excavation or if leachate or other pollutants were able to seep into the ground water, in sufficient quantities over time to contaminate the ground water.

Hydromap (2007) concluded that the Eurobodalla Quarry site is not vulnerable with respect to the main local groundwater body. Furthermore, no groundwater has been encountered in a test hole drilled to a depth of 122 metres (RL -107 metres) near Swamp Creek. Therefore, it is considered highly unlikely that the quarry excavation would encounter any groundwater. The aquiclude between the quarry site and the deeper groundwater precludes any seepage or recharge of any kind. Spills of contaminants (eg. Hydrocarbons, lubricant etc) within the quarry would not present a risk to the contamination of groundwater. Similarly, there would be no risk of leachate (from composting operations) contaminating groundwater resources at the site.

Hydromap (2007) identified that rejected recharge and overland runoff could carry pollutants downhill to where there is an opportunity for this water to remotely recharge the main aquifer. All surface waters would be contained within the quarry pit and sediment ponds, preventing any polluted runoff from leaving the site. Monitoring recommendations to ensure that pollutants are not distributed via runoff to lower areas form part of the EPA licence.

The proposal would involve the removal of some areas of vegetation which are mapped as GDEs (refer Figure 6-3). The impacts of the proposed vegetation removal are assessed in Section 6.5 of this EIS. The vegetation to be removed does not constitute an endangered ecological community.

6.4.3 Safeguards and mitigation measures

No additional measures are considered to be required.

6.5 BIODIVERSITY

6.5.1 Methodology

Database searches

The Atlas of NSW Wildlife Bionet database for the Bateman and South East Coastal Ranges (Part C) CMA sub-regions, and the Commonwealth EPBC Act Protected Matters Search Tool (10 kilometre search radius) were used to identify threatened biota which may be present at the subject site. The database searches were completed on 14 July 2016. The threatened species habitat evaluation in Appendix D assesses the likelihood of occurrence of threatened species and communities identified in the searches, and their potential to be impacted by the proposed works. The DPI Noxious Weed Database was used to identify noxious weeds declared in the Eurobodalla LGA.

Literature review

Previous reports relevant to the subject site which were reviewed for this assessment included:

- A flora and fauna assessment covering the subject site undertaken by Kevin Mills and Associates (2001) for the original hard rock quarry development EIS (Outline Planning Consultants 2002), and

- A Statement of Environmental Effects for an extension to the quarry development prepared for Eurobodalla Quarry by NGH Environmental (2007).

Information on individual threatened species and communities was sourced from scientific papers, ecological reports, relevant vegetation classifications, OEH Threatened Species Profiles, EPBC Act Species Profiles and Threats (SPRAT) database and listing determinations.

Flora field survey

The flora fieldwork was undertaken on 9 August 2016 by a senior ecologist over a period of 5 hours. The survey covered the subject site which would be directly affected by the proposal; and significant native forest downslope of the site which may be affected by peripheral or off-site impacts.

Stratification

The survey area was initially stratified from aerial photography based on topography, vegetation and earlier broadscale vegetation mapping in Outline Planning Consultants (2002). The composition and boundaries of homogeneous stratification units were confirmed and mapped in the field using a handheld GPS.

Survey methods

Standard 0.04 hectare floristic sampling quadrats, supplemented with whole unit random meanders (Cropper 1993) in each stratification unit were used to survey the subject site. Quadrat data was used to provide a quantitative basis for the identification of vegetation communities. The random meander provides a more comprehensive species list, samples the full range of microhabitats and maximises opportunities for detecting rare or threatened species.

Because of the limited size of the stratification units, floristic quadrats were sited in representative rather than random locations within each unit. Better condition areas and habitats which may be associated with rare or threatened species (such as rhyolite outcrops) were subjected to more intensive survey. In addition to the subject site, riparian forest vegetation downslope of the site was also surveyed to determine vegetation type and EEC status.

The collection of vegetation structure, dominant species and physiographic data was consistent with National Vegetation Information System (NVIS) level V requirements. For both quadrats and random meanders, all native and exotic vascular plant species were identified and cover/abundances scored using a six point Braun-Blanquet scale. The scale is widely used for a variety of applications including relevant vegetation classification systems. The locations of any noxious weeds and species of conservation significance were recorded and mapped.

Survey guidelines

The Secretary's Environmental Assessment Requirements (SEARs) for the project (refer Appendix A) require the biodiversity survey methodology and effort to conform to the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC 2004). Any departure from these guidelines needs to be justified.

For vegetation survey, the guidelines require a combination of transects and plot-based surveys to provide information on vegetation boundaries, floristic diversity and threatened species. The guidelines also specify the survey effort in relation to stratification unit size and data to be collected at each survey site. The flora survey undertaken for the project is consistent with these guidelines; a comparison of survey effort with the requirements in the guidelines is provided in Table 6-2.

Table 6-2 Comparison of TBSA (DEC 2004) survey requirements and actual survey effort

Stratification unit	Area in subject site	TBSA requirement	Actual survey effort
Deua-Brogo Foothills Dry Shrub Forest	1.98 ha	1 quadrat	1 quadrat plus random meander
Southeast Coastal Gully Shrub Forest	2.26 ha	2 quadrats	2 quadrats plus random meander

Classification and nomenclature

Vegetation communities at the site were determined using the South Coast-Illawarra Vegetation Integration (SCIVI) project (Tozer *et al*. 2010) classification. This classification lists diagnostic species based on statistical fidelity to assist with community identification. For each community, estimates are provided of the minimum number of positive diagnostic species expected to occur in a 0.04 hectare sample (95% confidence). Equivalent Biometric vegetation types (OEH 2008) have also been identified.

Botanical nomenclature follows the Sydney Royal Botanic Gardens' PlantNet website, updated with revisions in Angiosperm Phylogeny Group IV (2016) and name changes accepted in the Australian Plant Census (2015) and the Australian Plant Name Index of the Australian National Herbarium.

Condition

Vegetation condition was rated according to the two point scale used in the BioBanking Assessment Methodology (BBAM) (OEH 2014):

Low condition

a) woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either:
   – less than 50% of ground cover vegetation is indigenous species, or
   – greater than 90% of ground cover vegetation is cleared

OR

b) native grassland, wetland or herbfield where either:
   – less than 50% of ground cover vegetation is indigenous species, or
   – more than 90% of ground cover vegetation is cleared.

Moderate to good condition Any native vegetation not in low condition.

Limitations

The survey focused on areas of intact native vegetation. Cleared pasture areas were not surveyed in detail, but were inspected to ascertain general composition and derivation. The survey in the riparian forest outside the subject site was limited to a quadrat to determine vegetation community and EEC status.

The winter timing of the survey meant that some species will not have been recorded, particularly spring/summer flowering geophytes and less conspicuous forbs and grasses. Based on the habitat evaluation (Appendix D), it is considered unlikely that any significant flora species will have been overlooked due to seasonal or climatic factors. Timing and effort were adequate for the identification of vegetation community, EEC status, condition and potential for threatened species.

Fauna field survey

The fauna field survey was undertaken on 9 August 2016 by a senior consultant (ecology) over a period of approximately 5 hours. The fauna study area included all land within the proposed extension area, as well as some additional survey work for hollow-bearing trees and other fauna habitats in the areas immediately adjacent to the extraction area boundary. Specifically, this additional survey area included the full length of Swamp Creek where it borders the northern site boundary, as well as the areas located up to approximately 50 metres further west of the proposed extension areas to assess the adjacent fauna habitats that may be indirectly affected by the extended extraction areas. The survey method and results are described below.

Survey methods

A variety of targeted assessments was undertaken; each discussed in detail below.

Habitat assessment

A summary assessment of the different habitat types and their quality was conducted across the subject site. Each terrestrial habitat assessment was informed by the flora survey results, and included factors such as canopy resources, ground-layer resources, vegetation structure, connectivity and existing levels of disturbance. Aquatic habitat values were also assessed as describe further below.

During the field survey, habitat quality was classified into three categories of either high, moderate or low based on the presence of certain variables. Fauna habitat quality[2] is rated on the presence of the following components:

- Diverse structure, that is, structural components at a range of stratum levels (understorey, midstorey, and canopy) and age or size classes (*e.g.* trees of different ages, fallen timber of different sizes).
- Shelter and refuge, that is, low shrub or tussock, rocky outcrops, hollow fallen logs (for ground dwelling fauna).
- Mature trees, which are more likely to bear hollows and mature hollow-bearing trees, which are more likely to bear multiple hollows of a range of sizes, including those with large internal dimensions. Mature trees also produce more foraging resources for nectar and seed eating fauna.
- Habitat complexity, including ecotones[3] between vegetation types, or areas with different management regimes, which produce a habitat mosaic. Within a habitat patch, there may be a recently disturbed area, as well as a mature area with little recent disturbance. This increases the range of foraging and shelter opportunities within a habitat.
- Key habitat components such as hollow-bearing trees (see below), known food trees for threatened species, termite mounds, and aquatic habitat variables including instream and bank habitat values.

[2] Habitat 'quality' and vegetation 'condition' classes are not interchangeable, as different criteria are used to distinguish fauna and flora values.

[3] Ecotones are transition zones, where one environment grades into another.

Hollow-bearing tree inventory

A hollow-bearing tree inventory was undertaken across the entire site area subject to the proposed expansion, including any observable trees immediately adjacent to/just outside of this area, which included covering the entire area between the site boundary and the southern embankment of the creek (a distance of at least 70 metres north of the site boundary), as well as covering an area of approximately 50 – 80 metres west of the proposed extension areas for the extraction activities (with the outer western survey boundary formed generally by the centre of the drainage gully lying to the west of the site)

The following data was recorded for mapped hollow-bearing trees: species of tree, size of tree (including diameter (DBH) and height), the number of hollows, size of each hollow (small: <5cm; medium 5-15cm; large >15 cm), and location within the site (recorded by handheld GPS).

It should be noted that all sizes were recorded as estimates. Furthermore, accurately/confidently identifying all hollows from the ground is not always possible. As such, the number of recorded hollows is likely to be an underestimate of the total number of hollows actually present. This underestimate is offset to some degree by the likely recording of hollows that are not actually a true hollow (i.e. just a small depression in the tree that appears from the ground as a hollow, but may only be a few inches deep, and therefore not a hollow in the context of a potential nesting site for arboreal fauna).

Bird surveys

Bird surveys consisted of opportunistic sightings made during the site traverse for identifying hollow bearing trees. Given the weather conditions (warm and sunny with only a slight breeze), and the total time on–site (more than 5 hours), the opportunistic records of birds is regarded as providing an appropriate level of assessment of the bird species present within the site.

Aquatic fauna surveys

Amphibians were identified by either sight or by interpretation of calls. Direct searches for amphibians was not undertaken (such as bt hand capture, looking under/within suitable micro-habitats such as under logs/rocks, or by nocturnal spotlighting).

For other aquatic fauna (primarily fish), no direct surveys (such as dip netting or fish traps) were undertaken as part of the field survey. The potential occurrence of aquatic species, including amphibians, was performed by an assessment of the aquatic habitat values present as well as with consideration of the potential occurrence of species from the database search results (listed in the results section below).

Aquatic habitat inspections

Areas of freestanding water within the study area (i.e. Swamp Creek and farm dams) were inspected to determine their suitability as habitat for threatened fish and frog species, as well as potential habitat for other species that may rely or use water as part of their habitat requirements.

Notes on the vegetation and embankments structure and condition of these aquatic habitats were recorded in the field, including the presence of large woody debris. Notes on the substrate, including presence of large rocks/boulders was also recorded. Any aquatic species either seen or heard calling from within the river were also recorded.

<u>Compliance with Survey guidelines</u>

The Secretary's Environmental Assessment Requirements (SEARs) for the project (refer Appendix A) require the biodiversity survey methodology and effort to conform to the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC 2004). Flora surveys adhered to these guidelines. For fauna surveys, it is noted that trapping, census-based surveys, spotlighting

and other targeted techniques such as Anabat surveys were not undertaken as part of this assessment. Rather, a two stage risk based approach was adopted. Stage 1 of the assessment followed a generalised assessment approach that focused primarily on opportunistic sightings of fauna as well as an assessment of the fauna habitat values present at the site (generally in accordance with Part 5.3.3 of the guidelines). This method informed the threatened species evaluations at Appendix D, which assesses the likely presence of threatened species within the site based on the habitat values observed, and assesses the likelihood of an impact to those species based on their habitat requirements and the potential impacts of the development on those habitat features. This assessment approach was also informed by the threatened species database records for the area, as well as by results of previous surveys in the locality (i.e. Mills 1995/2001, and NGH, 2007), to assist in determining the overall likelihood of threatened species occurring at the site. This evaluation of risk identifies those species for which a significant adverse impact may result. The species that have been identified as being at a moderate or high level or risk would then be subject to targeted survey, in accordance with the guidelines, or, a precautionary Assessment of Significance is undertaken (that assumes the species does occur and assesses the risk of impact as being moderate to high accordingly).

For this project, this staged risk based approach resulted in no threatened species being identified as having a moderate to high risk of occurring at the site and/or likely to be impacted by the proposed extraction works. Given that all identified threatened species were assessed as having either little likelihood of occurring within the site, or assessed as having a low probability of an impact (refer to results below), no further targeted survey were considered necessary for this assessment. Additionally, no Assessments of Significance were considered necessary for any listed threatened species.

6.5.2 Results

Database searches and habitat evaluation

Flora

The NSW Wildlife Atlas database search indicates 18 threatened flora species and 12 threatened communities for the Bateman and South East Coastal Ranges (Part C) CMA sub-regions. The Commonwealth EPBC Act Protected Matters Search Tool (PMST) indicates 6 threatened flora species and 3 threatened communities which are present, are likely to be present or may be present within 10 kilometres of the site. Database search results are provided in Appendix D.

The Threatened Species Habitat Evaluation (Appendix D) identified one flora species with potential to be present at the site based on habitat and distribution; Bodalla Pomaderris (*Pomaderris bodalla*), listed as vulnerable under the TSC Act. Marginal habitat is present at the site or in adjacent riparian habitats for Chef's Cap Correa (*Correa baeuerlenii*), Square Raspwort (*Haloragis exalata* ssp *exalata*) and Tall Knotweed (*Persicaria elatior*), which are listed as vulnerable under the TSC and EPBC Acts. The presence of these species is considered unlikely based on survey results and known distributions.

The subject site is partly located on rhyolite, which is associated with rare and threatened species in nearby Deua National Park (such as around Coondella trig) and elsewhere in the region. However, rhyolite is present at the site as smaller surface rocks in well-developed soil rather than large outcrop, boulder or platform habitats with skeletal soils associated with rare and endemic plants. No typical rhyolite species or assemblages were recorded during the survey.

The habitat evaluation also indicates the potential presence of one Endangered Ecological Community in riparian habitat adjacent to the site; River-Flat Eucalypt Forest on Coastal Floodplains of the New South

Wales North Coast, Sydney Basin and South East Corner Bioregions, listed under the NSW TSC Act. The presence of this EEC was confirmed during the survey.

Fauna

The NSW Wildlife Atlas database search results returned 83 threatened fauna species records for the Bateman and South East Coastal Ranges (Part C) CMA sub-regions. This includes 55 birds, 23 mammals, one reptile and four amphibians.

The Commonwealth EPBC Act PMST indicates 41 threatened fauna species which may be present based on habitat factors present within 10 kilometres of the site. This includes 23 birds, seven mammals, five reptiles, four amphibians and two fish species. Database search results are provided in Appendix D.

It is noted that for both the NSW Wildlife Atlas Records and the EPBC PMST, numerous results for marine and pelagic species were returned. Given the distance of the site from marine environments, and the corresponding lack of suitable habitats for these species within the site, these species have been excluded from further analysis in this report.

The Threatened Species Habitat Evaluation (Appendix D) identified 38 threatened fauna species with at least some potential to be present at the site based on habitat and distribution. None of these species were regarded as being likely to be negatively impacted on by the proposal based on the evaluations concluding that either there is only marginal habitat available within the site for these species, or that there is little likelihood of these species being present at the site (based on either or both the habitat availability and previous records for the species), or, that the consideration of the nature of the works proposed and the known species ecology resulted in a low likelihood of an impact occurring.

None of the identified threatened species returned a moderate or high likelihood of an impact occurring, and consequently, no Assessments of Significance were deemed necessary for any of the threatened species considered under this assessment.

Previous assessments

Flora

The Kevin Mills and Associates (2001) report mapped four vegetation communities at the subject site, listed below using numbering in the 2001 report:

2. River Peppermint - River Oak Tall Open Forest; *Eucalyptus elata, Casuarina cunninghamiana, Eucalyptus saligna/botryoides*
3. Blue Gum - Coast Grey Box Open Forest; *Eucalyptus saligna/botryoides, Eucalyptus bosistoana, Angophora floribunda*
4. White Stringybark Open Forest; *Eucalyptus globoidea, Angophora floribunda, Corymbia gummifera*
5. Cleared land dominated by introduced grasses with *Angophora floribunda, Eucalyptus angophoroides* and *Eucalyptus bosistoana* paddock trees.

The map of vegetation communities at the subject site provided in Kevin Mills and Associates (2001) is at Figure 6-2. Vegetation communities in the 2001 report were not identified using a state or regional vegetation classification.

The report notes that the Blue Gum - Coast Grey Box Open Forest and White Stringybark Open Forest communities intergrade at the site. The vegetation affected by the original quarry development is described as common, widespread and typical of dry ridges and moist gullies of the coastal forests in the

region. The report considered the vegetation along the gullies below the quarry site to be important because it is less common and contains plant species with more restricted distributions.

Figure 6-2 Vegetation communities at the site mapped by Kevin Mills and Associates (2001)

The 2001 survey did not detect any threatened flora species and found that the occurrence of threatened species listed at that time was unlikely. The flora assessment in the NGH Environmental (2007) Statement of Environmental Effects was largely based on the 2001 survey, with updated threatened species database searches and habitat evaluation.

Fauna

The Kevin Mills and Associates (2001) report included 22 mammal species as having been either directly observed/recorded at the site, or were included in the results as having been recorded previously by

others. This included some species considered to have potential to occur within the study area based on previous records and an assessment of habitat availability/suitability. In addition, 86 bird species, eight reptile species and six amphibian species were positively recorded at the site by Mills (in either or both the 1995 and 2001 site surveys by Mills), or reported on by the landowner.

Of the species recorded in either 1995 or 2001 by Mills, a total of four listed threatened fauna were observed at the site, including the following:

- Grey-headed Flying-fox - *Pteropus poliocephalus* (Reported by landowner)
- Large-footed Myotis - *Myotis adversus* (now more commonly listed as the Southern Myotis *M. macropus*)
- Glossy Black-Cockatoo - *Calyptorhynchus lathami*
- Powerful Owl - *Ninox strenua*

The 2001 report by Mills concluded that although there was some potential for these species to be present at the site, the proposed development was considered unlikely to result in a significant impact to these species.

The NGH Environmental Statement of Environmental Effects (2007) was largely based on the 2001 survey, with updated threatened species database searches and habitat evaluation. Based on this evaluation it was determined that the following threatened species have potential to utilise the habitats adjacent to the proposed quarry site:

- Giant Burrowing Frog V TSC, V EPBC
- Cattle Egret M EPBC
- Square-tailed Kite V TSC
- Glossy Black Cockatoo V TSC
- Varied Sittella V TSC
- Scarlet Robin V TSC
- Yellow-bellied Sheathtail-bat V TSC
- Eastern Freetail-bat V TSC
- Long-nosed Potoroo V TSC, V EPBC

The NGH assessment also concluded that there was little to no likelihood of any threatened species being impacted by the proposed quarry areas (including the 2 ha extension area as proposed in 2007) that was the focus of that assessment.

Field survey results 2016

Flora

Vegetation communities

The SCIVI vegetation communities present at the site and their conservation status, condition and composition are identified in

Table 6-3 below. The distribution of each community at the site is mapped on Figure 6-7. As noted in Kevin Mills and Associates (2001), these communities intergrade at the subject site and the mapped boundaries are an approximation. Photographs of vegetation communities at the site are provided below. The results of quadrat and random meander surveys in each vegetation community are provided in Appendix D. The native vegetation around the boundaries of the site also belong to these communities.

Table 6-3 SCIVI Vegetation communities present at the subject site

Vegetation type	Conservation status	Biometric condition	Description
DSFe32A Deua-Brogo Foothills Dry Shrub Forest Biometric equivalent: SR622	Not threatened Extant: 42,200ha Cleared: <5% Reserved: 60-70%	Moderate - good	A dry forest with open groundcover and variable shrublayer dominated at the site by *Eucalyptus consideniana* and *E. agglomerata* on the ridge crest and upper slopes.
WSFe34 Southeast Coastal Gully Shrub Forest Biometric equivalent: SR533	Not threatened Extant: 22,800ha Cleared: <15% Reserved: 25-35%	Moderate - good	A wetter forest on mid-lower slopes, gully floors and sheltered aspects dominated by *Eucalyptus saligna x botryoides* and *E. globoidea*. The understorey is variably dominated by shrubs, ferns, cycads and graminoids.
FoWp30 South Coast River Flat Forest Biometric equivalent: SR608	EEC (NSW) Extant: 8,400ha Cleared: 35-50% Reserved: <15%	Moderate - good	A wet sclerophyll forest inhabiting the narrow floodplain to the north of the subject site, beside an incised 4th order stream channel (Swamp Creek). The tree layer is dominated by *Eucalyptus elata* and *E. saligna x botryoides,* with *Casuarina cunninghamiana* in the creek channel. The variable understorey includes mesophyllic small trees, shrubs, grasses, ferns and vines.

The cleared land at the site was dominated by exotic pasture species (principally *Cenchrus clandestinus, Paspalum dilatatum* and *Trifolium repens*) at the paddock scale, with patches of native grasses and sedges (*Themeda australis, Poa labillardierei, Imperata cylindrica, Carex longebrachiata*), and scattered Bracken Fern (*Pteridium esculentum*), shrubs and small trees (*Bursaria spinosa, Commersonia fraseri, Acacia mearnsii, A. implexa*) and large paddock trees (*Eucalyptus bosistoana, E. angophoroides, Angophora floribunda*). Kikuyu is well established on long-cleared land over most of the grassland at the site. A more recently cleared area in the north-west of the site carries a higher density of paddock trees and larger patches of regenerating native grasses (*Themeda australis*) on steeper slopes. The native vegetation in this area is a depauperate assemblage derived from the adjacent forest communities. All remnant vegetation in cleared parts of the site appear to be derived from the adjacent vegetation communities included in the current survey.

Figure 6-3 Deua-Brogo Foothills Dry Shrub Forest survey quadrat

Figure 6-4 Southeast Coastal Gully Shrub Forest northern survey quadrat

Figure 6-5 Southeast Coastal Gully Shrub Forest southern survey quadrat

Figure 6-6 South Coast River Flat Forest survey quadrat

Disturbance, weeds and pathogens

The forest vegetation at the site shows evidence of past clearing and logging, including stumps, felled logs and predominantly pole and young mature age classes. Part of the pasture area was cleared and established with exotic pasture species roughly 10 years ago, leaving scattered native tree cover. The dry forest area shows evidence of burning. Evidence of recent pig and deer activity is present at the site. Cattle are grazed in the paddocks but are fenced out of forested parts of the site.

The noxious weed Blackberry (**Rubus fruticosus* sp agg) is widespread in cleared pasture areas, and is present in low abundance in the drainage line to the west of the site (including in the northern Southeast Coastal Gully Shrub Forest survey quadrat). The invasive environmental weed Tree of Heaven (**Ailanthus altissima*) is present in riparian forest along Swamp Creek to the north of the site. An advanced Tree of Heaven infestation is located at (GDA) 767694 5998896. Agricultural weeds including **Verbena bonariensis, *Sida rhombifolia* and **Sporobolus africanus* are common in the cleared paddocks.

Some Burrawang plants are chlorotic (yellowing) at the site, such as in the northern Southeast Coastal Gully Shrub Forest quadrat, indicating possible *Phytophthora cinnamomi* infection. No evidence of other pathogens was observed at the site during the field survey, including Myrtle Rust (*Uredo rangelli*).

Fauna

Fauna species

A total of 40 fauna species were recorded within the study area in 2016; listed at Appendix D. The species recorded included 28 bird species, two amphibian (frog) species, eight mammal species and two reptile species. Invertebrates were not included in the fauna survey (with no threatened invertebrates identified as possibly occurring in the study area during the desktop assessment).

No threatened fauna species were recorded during the site assessment. A summary of the fauna habitats observed within the study area and their importance to or potential to support, threatened fauna species is described below.

Fauna habitat types

Two types of fauna habitat were encountered at the site:

1. Terrestrial forest and woodland habitats
2. Aquatic habitat

Terrestrial Forest and woodland habitat

The terrestrial fauna habitats within the study area were provided by a mixture of forest and woodland, including areas of cleared agricultural land.

The forest areas of the study site, located along the northern and western property boundaries, consisted of a structurally diverse forest, containing an overstorey of mixed age trees including a reasonable portion of mature trees, a relatively dense mid-layer of small trees and shrubs, and a moderately dense groundcover of small shrubs and forbs. The forest areas are well connected to (contiguous with) larger areas of forest vegetation to the north and west of the study area (Dampier State Forest), extending further to the north-west and north-east of the site, with moderate connectivity to large patch of intact forest to the east of the site.

Riparian forest vegetation along Swamp Creek is also well connected to / contiguous with this large area of state forest across the north of the study area.

Within the forest and woodland areas that occur within the study site, there is a relatively low number of large hollow-bearing trees, with a total of 11 hollow-bearing trees recorded within the study site. This low number of hollow-bearing trees is a reflection of the fact that the age of the forested areas appears to be relatively young with most trees observed to be less than 500mm in diameter (DBH), as well as the fact that the dominant tree species was observed to be *Eucalyptus agglomerata* which is a (Stringybark) species that does not readily form tree hollows. The forested areas immediately surrounding the site were also observed to be dominated by *E. agglomerata* and similarly, was observed to have a relatively low abundance of large hollow-bearing trees. The South Coast Gully Forest along Swamp Creek similarly did not appear to support any observable hollows within the development footprint of the study area.

Given the low number of hollow bearing trees recorded in the study area, the forest habitat is likely to provide only low-moderate habitat resources for arboreal fauna and forest owls. This is reflected by the low numbers of hollow-dependent arboreal fauna recorded during the previous site assessments. Specifically, the previous 1995 and 2001 site assessments recorded the following for hollow-dependent fauna (including how/where the record was made):

- Sugar Gliders (none were directly observed within the site, although calls of this were heard along the riparian forest surrounding Swamp Creek)

- Gould's Wattled Bat ("Calls" recorded on edge of forest on quarry site. It is noted that this species often roosts communally and may use caves and manmade structures as well as tree hollows)
- Large-footed Myotis ("Calls" recorded and animal observed over pool on Swamp Creek. It is noted that this species often roosts communally and may/often uses caves and manmade structures as well as tree hollows)
- Ringtail and Brushtail Possums (both are common species and several individuals of both species were recorded along Swamp Creek. It is noted that these species may utilise tree hollows, however they are not dependent on hollows, and can build dreys (nests)).

Potential Feed Trees for Arboreal Fauna

The study site includes a variety of flowering plants that may provide food resources for a variety of animals, including nectar and seed eating birds, as well as fauna that eat the leaves of suitable feed trees, such as koalas and Yellow-bellied Gliders. For koalas, no feed tree species listed under Schedule 2 of SEPP 44 were recorded within the site, and similarly, no "Primary food tree species" listed on for the south coast region were recorded within the site. A number of "Secondary food tree species" and "Stringybark/supplementary species" were recorded within the site including:

- *Eucalyptus agglomerata* (Stringybark/supplementary species)
- *Eucalyptus bosistoana* (Secondary food tree species)
- *Eucalyptus consideniana* (Secondary food tree species)
- *Eucalyptus globoidea* (Stringybark/supplementary species)

The site is therefore not regarded as core koala habitat under SEPP44.

With regard to the Yellow-bellied Glider, no preferred sap feed trees were recorded within the site (with the possible exception of the Sydney Blue Gum x Bangalay (*E. saligna* x *botryoides*) hybrid, with *E. saligna* a noted feed tree for the Yellow-bellied Glider). No signs of feeding by the Yellow-bellied Glider (such as characteristic V-shape incisions or scars on the trunks of trees) were observed.

Habitat for Non-Arboreal Species

With regard to habitat for non-arboreal species, the study site was found to support a variety of habitat types for ground-dwelling fauna, including:

- Fallen timber
- Rock piles / Rocky outcrops
- Burrows

Each of the above listed habitat types for ground-dwelling fauna are explained in turn further below.

Fallen Timber

Fallen timber was observed at a number of locations throughout the study area (though not individually recorded and mapped). This habitat type may support important habitat (refugia) for a variety of ground-dwelling fauna including small marsupials and reptiles, although no observations were made of any threatened fauna during the survey of any of the piles of fallen timber. Nevertheless, it is assumed that at least some of these piles of fallen timber are likely to support at least some native fauna, and so management of the impacts of the proposal on these habitat features will be important. The impacts and associated mitigation measures for managing fallen timber are described further in the following sections.

Termite Mounds

Only two termite mounds were recorded within the study, and each was inspected for activity as well as signs of potential use by Rosenberg's Goanna which this species nests in (laying up to 14 eggs in the mound).

No evidence of use of any of the mounds was observed during the survey. For Rosenberg's Goanna specifically, the site is outside of the known distribution for this species which has not been previously recorded in the locality. It is therefore considered unlikely that Rosenberg's Goanna is present in the study area, and as such, the termite mounds are not regarded as providing critical or otherwise important habitat.

Burrows

Numerous burrows were observed throughout the study (though not individually recorded and mapped). The burrows observed were almost entirely Wombat burrows, with the majority of these observed within the embankments of Swamp Creek, outside of the development footprint. Unoccupied burrows may provide shelter habitat for other species, if no disused by Wombats, however no evidence of use of these burrows by other species was recorded. Mitigation measures to manage the impacts of the development on resident fauna, including wombats, is provided in section 7.

Aquatic habitat

The aquatic habitat values within the site are restricted to Swamp Creek, outside of the proposed extraction area, and to a lesser extent the farm dam located in the northern part of the extraction area.

Swamp Creek is likely to support habitat for a variety of animals, including fish, amphibians, and reptiles such as turtles, skinks and lizards.

Swamp Creek provides both riffle and pool sequences, with relatively stable banks and good water quality (based on visual and olfactory observations only, no actual water quality tests were conducted). The creek bed substrate was also observed to be of good quality with areas of both bedrock and cobble creek beds in faster flowing sections.

The riparian vegetation was in moderate condition, with the larger, mature trees comprised mainly of native species, although the understorey layers did support a number of invasive weed species, which formed a thick/dense layer of vegetation of in some places.

Aquatic or macrophytic vegetation was present along some stream bank edges, as well as in the slower flowing pool sections, providing good habitat for amphibians and reptiles as well as nursery grounds for juvenile fish.

Numerous snags, primarily occurring as fallen trees within the creek, were also observed, providing additional habitat for amphibians, fish and reptiles.

The aquatic fauna observations included some common reptiles and frogs. The creek is regarded as being unlikely to support threatened aquatic species with the aquatic species included in the database search results considered unlikely to be present in the local area. The creek may however provide foraging habitat for the Southern Myotis (*Myotis macropus,* previously listed as *M. adversus*) which is a species of Fishing Bat, and was positively identified as occurring along Swamp Creek in the north-western portion of the study area during the 2001 survey by Mills.

Wildlife corridors

No obvious fauna movement corridor occurs through the quarry extraction areas of the site, with extensive areas of contiguous forest available to the north, as well as the intact riparian forest along Swamp Creek. Primary fauna movements are therefore likely to occur further to the north or south of site, including along Swamp Creek itself.

Overall, the structural diversity, proportion of native species, the connectivity of the canopy and abundance of refuge (hollows, dense understorey, fallen timber) provides good foraging and refuge resources for small to large mammals, forest owls, birds and reptiles, however the overall quality and quantity of habitat within the site is considered to be small and of marginal quality in the context of the available habitat in the surrounding landscape, particularly to the north of the site. The habitat values within and immediately surrounding the site are also likely to be diminished to some extent by the existing quarry operations which would result in a degree of disturbance to resident fauna from mainly noise and vibration impacts,

Threatened species

Threatened and rare flora species

No threatened flora species were recorded at the subject site during the field survey. The Threatened Species Habitat Evaluation (Appendix D) identified one flora species with potential to be present at the site based on habitat and distribution; Bodalla Pomaderris (*Pomaderris bodalla*), listed as vulnerable under the TSC Act. This is a large shrub which was not detected during the field survey. On this basis, it is considered unlikely to be present at the site, and unlikely to be impacted by the proposed works. The presence of other threatened flora with marginal habitat at the subject site is also considered unlikely based on survey results and known distributions (refer Appendix D). Assessments of Significance for threatened flora are not required for this project. No rare species listed in Briggs and Leigh (1996) or NPWS (2000) for the Eurobodalla LGA were recorded at the subject site during the field survey.

Endangered Ecological Communities

No Endangered Ecological Communities listed under Commonwealth or State legislation are present at the subject site. The NSW-listed EEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is present on the narrow 20-30 metre wide floodplain beside Swamp Creek to the north of the site, approximately 20 metres from the subject site boundary. The EEC also occupies the floodplain upstream and downstream of the site. Quadrat survey data used to provide confirmation of the presence of the EEC is provided in Appendix D.

The River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions Endangered Ecological Community occurs on alluvial flats, drainage lines and river terraces on floodplains up to 250 metres above sea level within the 100 year flood zone (Scientific Committee 2004). The EEC includes parts of the SCIVI community FoWp30 South Coast River Flat Forest and has been subjected to extensive clearing for agriculture and urban development. In the Sydney – South Coast region, less than one-fifth was estimated to remain in the late 1990s (Tindall *et al.* 2004 in Scientific Committee 2004).

Threatened fauna

There were no direct observations or sightings of any threatened fauna species (under either the NSW TSC Act or the commonwealth EPBC Act) during the recent site assessment in August 2016. Notwithstanding the lack of recent observations of threatened fauna, given the previous assessments conducted and the threatened species evaluations (Appendix D) the following threatened fauna species are regarded as having some potential to occur at the site:

- Glossy Black-cockatoo

- Powerful Owl
- Grey-headed Flying-fox
- Southern Myotis

An assessment of the potential impacts to these species is provided in the further below. No aquatic threatened species are considered likely to occur in the upper reaches of Swamp Creek in the vicinity of the site. Threatened amphibian species included in the database search results are regarded as being unlikely to be present given either or both their known distribution or habitat preferences. Threatened fish species are considered unlikely to be present in this stretch of the creek. The Australian Grayling is considered to have low potential given it generally occurs in lower reaches of freshwater rivers and estuarine habitats.

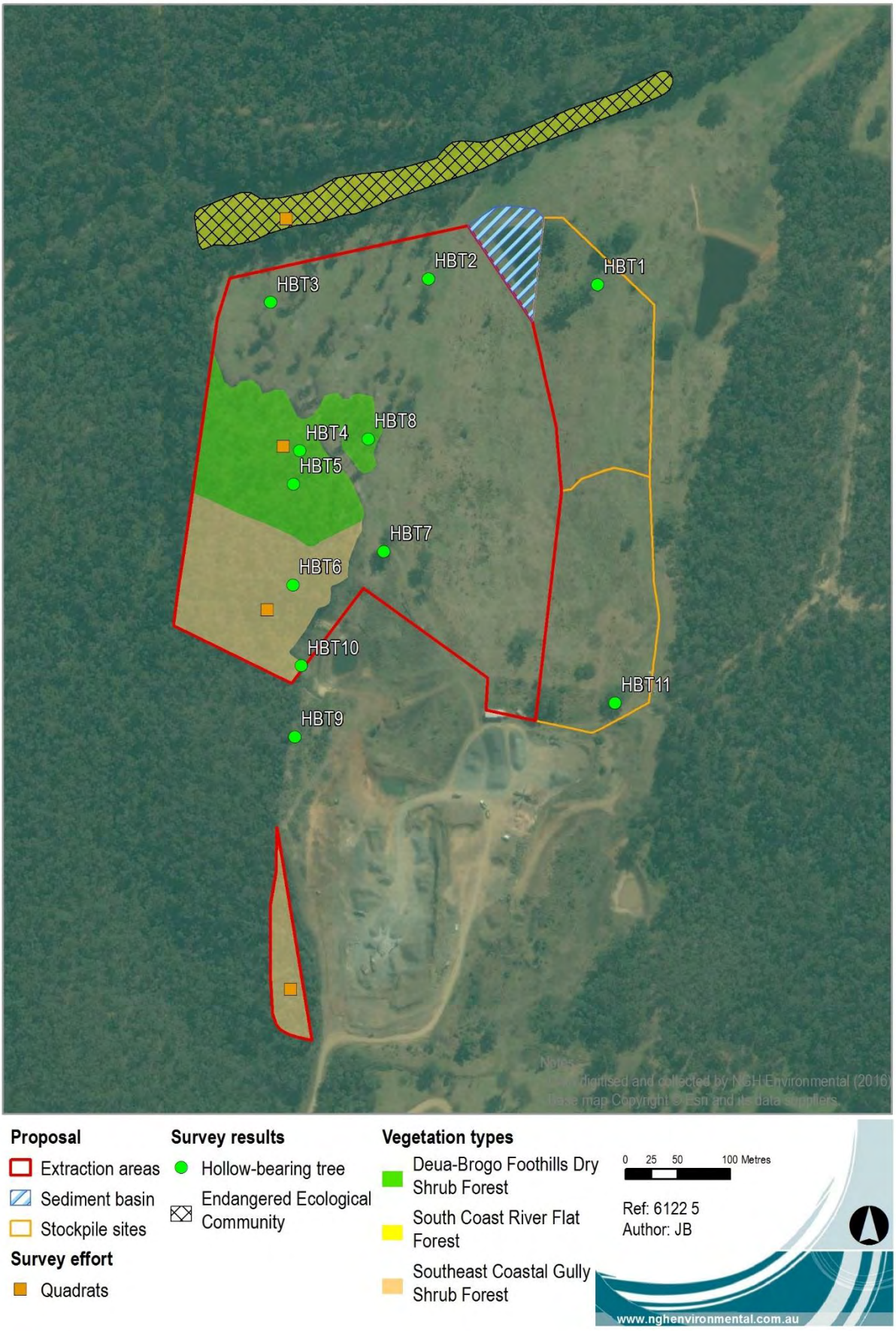


Figure 6-7 Vegetation communities, survey quadrats and habitat features at the subject site

6.5.3 Potential impacts

Loss of vegetation/flora habitat

The quarry development would result in the clearing of native vegetation and loss of flora habitat due to excavation for rock extraction, access road and parking area construction, erosion and sedimentation control works, materials stockpiling and development of recycling facilities. The area of each native vegetation unit which would potentially be affected by the proposal is shown in Table 6-4.

Table 6-4 Area of affected native vegetation communities

Vegetation community	Potential area to be cleared
DSFe32A Deua-Brogo Foothills Dry Shrub Forest	1.98 ha
WSFe34 Southeast Coastal Gully Shrub Forest	2.26 ha
Total:	**4.24 ha**

The proposal would result in the loss of 4.24 hectares of native forest communities which are relatively common in the region on all tenures, and which have been subjected to low rates of clearing. About 5% of Deua-Brogo Foothills Dry Shrub Forest and 15% of Southeast Coastal Gully Shrub Forest has been cleared for small rural development (Tozer *et al*. 2010). Both communities exceed the national adequacy target for forest reservation of 15% of the pre-1750 distribution (Commonwealth of Australia 1997).

In addition, the proposal would result in the clearing of approximately 13 hectares of pasture and open woodland derived from these adjacent forest communities. These areas are dominated by exotic pasture and agricultural weed species at the paddock scale with scattered native small tree, shrub, grass and sedge regrowth.

No endemic, rare or threatened flora species would be affected by the clearing. The proposed clearing would not significantly affect native flora species and vegetation communities at the locality or region scales.

Impact to adjacent flora habitats

Erosion and sedimentation

The development has potential to indirectly affect adjacent vegetation and habitats, including riparian and aquatic habitats associated with the fourth order (confirm) Swamp Creek located to the north of the subject site. A strip of the NSW River-Flat Eucalypt Forest on Coastal Floodplains EEC is present along this creek. There is potential for hydrological changes, erosion, sedimentation, polluted or turbid runoff from the quarry operation to affect this area and drainage lines to the west of the subject site.

The proposed development area, including access roads and erosion and sedimentation controls, would be located more than 40 metres from the top bank of Swamp Creek. The existing forest vegetation buffer along the south side of Swamp Creek at the site ranges between 10 and 40 metres wide. The EEC vegetation on the creek floodplain also varies in width within the forest buffer; it is approximately 25 metres wide at the survey quadrat location. The mapped proposal boundary is located approximately 50 metres from the top bank of the creek, and 20-40 metres from the edge of the existing riparian forest vegetation.

For the protection of water quality, the Wentworth Group (2003) prescribe riparian buffer widths of a minimum of 50-100 metres either side of the top bank of major rivers, 20-50 metres for creeks and 10-20 metres for major drainage lines. The NSW Office of Water recommends 10 metres for first, 20 metres for

second, 30 metres for third and 40 metres for fourth order streams (Office of Water 2012). The location of the proposed works boundary would be consistent with these guidelines.

With the implementation of effective erosion and sedimentation controls at the quarry development site, the 50 metre buffer would also be adequate to protect the integrity of the watercourse and the River Flat Eucalypt Forest EEC along Swamp Creek. In view of the significance of the EEC vegetation and its susceptibility to edge impacts, it is recommended that cleared areas witin this 50 metre buffer should be allowed to naturally regenerate to extend forest cover and enhance the condition of the buffer vegetation. This would involve periodic weed control, particularly for Blackberry and Tree of Heaven. It would also involve adequate stock management practices, such as rotational grazing, to limit grazing impacts, fencing saplings to protect these from stock and encourage natural regeneration to occur.

The limit of the quarry works area at the northern extent of the proposed quarry pit would be fenced prior to the commencement of any works in that area, to prevent accidental or peripheral impacts to adjacent vegetation.

Subject to effective erosion and sedimentation controls and the maintenance and enhancement of the proposed buffer strip, the proposal is unlikely to result in a significant impact to the EEC.

Groundwater impacts

The development is likely to result in reduced groundwater flows in the gully to the west of the site and in the Swamp Creek catchment. However, the quarry would occupy a relatively small proportion of the catchment and groundwater impacts are expected to be minor and highly localized, and no substantial effect on vegetation is anticipated.

Dust

The quarry operations will result in the dispersal and deposition of dust in adjacent forest areas. This impact is likely to be localized and ameliorated by rainfall. Dust is not expected to result in significant, persistent or cumulative damage to neighbouring plants and communities.

Phytophthora cinnamomi

Yellowing Burrawang (*Macrozamia communis)* plants at the site may indicate the presence of *Phytophthora cinnamomi* infection, which is listed as a key threatening process under the Commonwealth EPBC Act and in NSW under the TSC Act. *Phytophthora cinnamomi* is a microscopic soil-borne organism that attacks the roots and collar of susceptible plants. Depending upon environmental conditions and plant susceptibility, it can cause significant damage to vegetation communities and several plant species are at risk of extinction (Commonwealth of Australia 2014a). The infection also adversely affects native fauna species (Wilson *et al.* 1994 in Commonwealth of Australia 2014a).

P. cinnamomi may be spread in flowing water, local mycelial growth, vehicles, animals, walkers and movement of soil (Scientific Committee 2002). The pathogen appears to be widespread in coastal forests in NSW (Scientific Committee 2002). Dieback of *Macrozamia communis* has been observed to be widespread in coastal forests in the Eurobodalla LGA (J Miles pers comm) and the pathogen is likely to be present throughout the length of the Princes Highway (K McDougall pers comm in NGH Environmental 2015).

If the pathogen is present in undisturbed forest at the subject site, it is also likely to be present in surrounding forest areas and in local groundwater and surface water flows. Safeguards have been included in section 6.5.4 below to ensure that the pathogen is not allowed to spread outside the study area. Subject to the implementation of these measures, which include the secure stripping and storage of overburden

soil and vehicle and equipment hygiene during the quarry establishment phase, the proposal is not likely to significantly exacerbate the operation of this threatening process at the site or in the locality.

Loss of fauna habitat features

Loss of hollow bearing trees

The proposed quarry extraction expansion area would result in the loss of 11 recorded hollow-bearing trees, supporting a total of 26 (observable) hollows (refer to Hollow Bearing Tree Inventory, Appendix D). The majority of the hollows observed (14 out of the 26 recorded) were observed to be "small" hollows (openings of generally less than 5 cm), whilst only one "large" hollow was observed.

The trees were recorded in both the open/cleared (five trees) and forested sections of the site (six trees).

The impact of the removal of 11 hollow-bearing trees from the site is regarded as being unlikely to result in any large-scale or unacceptable level of impact to arboreal fauna populations in the local area. This conclusion is based on the fact the removal of only 11 trees is considered negligible in the context of their location at the outer edge of the existing remnant forest area, as well in the context of the extent of remnant forest areas surrounding the site within Dampier State Forest (and Deua National Park and Moruya State Forest beyond that) which are likely (though unconfirmed in this assessment) to support an equivalent density of hollow-bearing tree resources as that of the forested parts of the site. Additionally, the close proximity of these trees to the existing quarry extraction activities, would mean that the habitat resources provided by these hollows would be subject to some existing level of noise and vibration that would likely deter some fauna from utilising them (refer to section below for further discussion on potential impacts to native fauna as a consequence of noise and vibration impacts). As such, hollows located further away from the site are likely to be more valuable to local arboreal fauna given the reduced levels of noise and vibration that they would experience.

In considering the removal of these trees against the likelihood of occurrence and use of these trees by listed threatened fauna, it is noted that of the four threatened fauna regarded as having some likelihood of utilising the site, none of these species are likely to be adversely affected by the removal of these trees. Specifically, only two of these species are known to require tree hollows as an important component of their habitat requirements, these being the Glossy Black-cockatoo and the Powerful Owl, with the Grey-headed Flying-fox not known to utilise tree hollows, and the Southern Myotis considered to have a stronger preference for caves and disused buildings/structures as roosting habitat than hollow-bearing trees. In addition, the Glossy Black-cockatoo and the Powerful Owl both require very large tree hollows for roosting/nesting habitat. The hollow-bearing tree assessment recorded only one large sized hollow out of the 26 observed hollows across the 11 recorded hollow-bearing trees. As such, the removal of a single tree with potential to support some nesting habitat for threatened arboreal fauna is not regarded as being likely to result in an unacceptable impact.

In order to further reduce the likelihood of a negative impact from occurring as a consequence of the removal of hollow-bearing trees, certain mitigation measures have been recommended (refer to Section 6.5.4). These measures include the recommended avoidance of undertaking clearing of hollow-bearing trees during the breeding season for the main fauna types that may be present in the area (i.e. the threatened microbat, glider and owl species that may have some potential to be present in the area), or if this is not feasible, a targeted pre-clearance survey (including primarily Anabat, spotlighting and stagwatching survey techniques) to confirm if the individual hollow-bearing trees are being used by threatened fauna (immediately) prior to the proposed clearing. Occupied trees are not be cleared until it can be demonstrated that no threatened fauna are occupying them. In addition to this, the implementation

of a staged tree felling protocol, as well as the use of a fauna spotter during the removal of these trees is recommended to further reduce the risk of death or injury to arboreal fauna (whether threatened or not).

Loss of ground-dwelling habitat

The proposal will result in the loss of some habitat features for ground-dwelling fauna. This includes the removal of fallen timber log piles, some rock piles or minor rocky outcrops, and the loss of some existing burrows (primarily wombat burrows).

Whilst not individually mapped, there were at least 8 observed instances of fallen timber log piles of varying size and quality as habitat for ground-dwelling fauna. A number of these piles were observed to be comprised of smaller trees that had not developed hollow-trunk sections, and so the overall suitability of these for ground-dwelling fauna was limited. At least three of the piles were observed to be made up of larger logs, some of which appeared to have hollow trunk sections, or larger hollow branches, and as such, may provide an important habitat resource for some ground-dwelling fauna, including a number of listed threatened species that may have some potential to occur at the site. The threatened fauna species that utilise or require these habitat features and that may have some potential to occur at the site include the Southern Brown Bandicoot (eastern), the Long-nosed Potoroo and the White-footed Dunnart, although it is noted that the likelihood of these species being resident within the site or otherwise relying on the site as an important part of its home range, is considered to be low, with more abundant contiguous and more suitable habitat occurring within the remnant forest tracts to the north of the site. It is also likely that the existing noise and vibration impacts form the current quarry operations are likely to deter these species to some extent from being regular visitors in close proximity of the existing quarry (refer to section below for further discussion on potential impacts to native fauna as a consequence of noise and vibration impacts). Given this, it is considered unlikely that the fallen timber within the suite would be regularly used by these threatened fauna species, and the removal of these habitat features is not regarded as being likely to result in any impacts to these species at the local population level. In addition, mitigation measures have been proposed to reduce the likelihood of any unacceptable impacts from occurring.

In addition to the fallen timber log piles, a number of rock piles or rocky outcrops were also observed within the site. The more notable outcrops (three in total, and estimated to be more than 100m^2 in area) were all located within the existing forest remnant within western portion of the site. These rock outcrops may have some potential as habitat for common reptile species (such as skinks), and to a lesser extent frogs and invertebrates. No threatened reptile species are considered likely to occur at the site, with the only two listed threatened reptile species included in the database search results, the Broad-headed Snake and Rosenberg's Goanna, both regarded as being unlikely to occur at the site. The removal of the rock piles is therefore not regarded as being likely to result in any impacts to any threatened fauna.

Removal of wombat burrows

Numerous wombat burrows were observed throughout the study area, although the majority of these were recorded along the embankments of Swamp Creek, with only a small number of burrows observed throughout the rest of the site. These burrows are important sites for wombats, but also can be used by other species where they have been abandoned by wombats. A number of ground-dwelling fauna species are noted as using wombat burrows, including the Spotted Tailed Quoll. No evidence of any of these threatened species was recorded for the site, and it is considered unlikely that any of the wombat burrows within the expanded extraction area would be regularly used, or form an important component of the habitat for any listed threatened fauna species. Notwithstanding this, given the potential for injury or mortality to native fauna species (whether common or threatened) from the removal of these burrows, mitigation measures have been recommended in this report to reduce the likelihood of an impact occurring.

Impacts to aquatic habitats

Impacts to aquatic habitats as a consequence of the proposed expansion of the quarry extraction area are considered unlikely, and generally of a minor nature.

The proposed development will not expand into the riparian zone of Swamp Creek, with a buffer of approximately 75m to be maintained between the quarry activities and the creek. The aquatic habitat values located within the riparian zone and creek corridor would therefore be protected from any direct impacts from the quarry expansion. The establishment of erosion and sediment controls will also protect the creek and its habitats from indirect impacts associated with run-off and sedimentation from the quarry activities.

Wildlife connectivity and habitat fragmentation

As stated in Section 6.5.2 above, the site provides only limited east-west or north-south connectivity, and no notable fauna movement corridors are believed to occur through the site, with local fauna movements expected to occur within the large forest remnants of Dampier State Forest to the north, and notably, within existing moist gullies, such as along Swamp Creek. Given this, the proposed expansion of the quarry extraction area is considered unlikely to result in any impacts to wildlife connectivity, and is not regarded as being likely to result in any notable habitat fragmentation.

Impact on relevant Key Threatening Processes

Key Threatening Processes (KTPs) are listed in NSW under the TSC Act and at the Commonwealth level under the EPBC Act. KTPs of potential direct relevance to the current proposal include:

- Clearing of native vegetation (NSW and Commonwealth)
- Loss of hollow-bearing trees (NSW)
- Removal of dead wood and dead trees (NSW)
- Infection of native plants by *Phytophthora cinnamomi* (NSW and Commonwealth).

A national threat abatement plan has been developed for *Phytophthora cinnamomi*.

The assessment and mitigation of these threats have been incorporated into the impact assessment in this report. KTPs are further discussed in Assessments of Significance where relevant.

Impact to adjacent fauna habitats

Noise, Dust and Vibration

The proposal has the potential to generate substantial noise , dust and vibration during extraction activities being carried out which may impact on fauna and fauna habitats.

The potential effects of noise on fauna may include physical damage to hearing organs, interference with normal activities/behaviour including disruption to breeding patterns and reduced breeding success (such as through impaired breeding calls/communication or changed diurnal/nocturnal breeding behaviour patterns), habitat loss though avoidance of affected areas, as well as increased energy expenditure through avoidance of affected areas, and finally (though less likely), increased mortality (Dawe and Goosem 2008; Manci *et al* 1988).

Assessing impacts of noise on fauna is difficult given the lack of any current government policies, assessment criteria, or any other scientifically accepted guidelines, which is a result of the generally poor understanding of noise effects on fauna (Larkin et al 1996, Brown 2001). Specifically, an understanding of

the impacts of noise on fauna is difficult given that the behavioural/ecological responses to noise cannot be generalized across species or genera and that the assessment of impacts to one species cannot be applied to other species with any confidence, as well as the fact that even within a species, the response of one individual may not be consistent across all individuals within a species or even within a population of a given species.

Notwithstanding the above, the potential impacts of noise on fauna and fauna habitats as a consequence of the proposed extension of the existing extraction activities is expected to be minor/negligible. This is based on the fact that the existing surrounding fauna habitats are already subject to existing noise from the current operations and that the proposed extension of the quarry extraction activities is not expected to result in an increase in either noise levels or the hours/duration that the noise is made. The main impact of the extension with regards to noise will be a minor increase of the area that the noise will extend into the adjacent forest remnants that will be directly comparable and proportionate to the increase area of the extraction activities.

It is assumed that the extent of dust and vibration impacts of the proposal will similarly be of a level comparable to the existing operation, and the additional area subject to these impacts will be directly proportionate with the increased area of the proposed extension of the existing quarry. Whilst there may be some additional dust generated by the proposed extension to the existing quarry operations, the impacts of this on adjacent fauna habitats are regarded as being minor. Specifically, dust generation will be a limited short-term impact, most of the dust generated will be filtered out by existing surrounding vegetation so that habitats more than 50m from the extraction area boundary (as extended) are unlikely to experience any notable dust. Finally, dust, in and of itself, is not known to have any significant effects on terrestrial fauna. For aquatic fauna, it is expected that the existing riparian zone, to be retained, would filter out much of the generated dust.

The survey of the land adjacent to the proposed quarry extension area (up to a distance of between 50 and 80m beyond the proposed extension boundaries) observed few hollow-bearing trees (primarily given the age and species composition of these forest areas) and no other notable fauna habitats likely to provide important habitat for listed threatened species. Given this, and that local fauna populations will have already developed some level of tolerance to the existing noise, dust and vibration levels, the impacts of the proposed extension on native fauna and in particular, threatened fauna, from changes to the existing levels of noise, dust and vibration are expected to be minor in consequence. Furthermore, the density of the existing remnant vegetation bordering the site to the north and west would likely result in a high level of dampening/suppression of noise such that the distance of the incursion of noise into the adjacent forests would be minimised (although no quantitative information is available to assess how far noise will penetrate into the forest, or what level of dampening of noise the forest will provide).

This is supported by the assessment of noise impacts included in Section 6.9 below which concluded that the overall increase in noise and vibration levels from the extension would be negligible in comparison with the existing situation.

Cumulative impacts

The loss of large habitat trees or hollow-bearing trees is a long-term cost of projects such as these, because these features of the environment can take well over 100 years to form (Mackowski 1984; Wormington & Lamb 1999). The landscape surrounding the proposal site includes cleared agricultural lands as well as areas of intact forest. The clearing of native vegetation and loss of hollow-bearing trees, both of which are KTP's at State and/or Commonwealth levels, is considered a major factor in the loss of biological diversity. At least 61 per cent of the native vegetation in NSW has been cleared or highly modified since European

settlement (NSW Scientific Committee 2001), and the removal of vegetation for this project is contributing to this process. The cumulative impact of similar projects (particularly those where EECs are involved, and so not including this project) can be quite considerable given that many poorly-conserved vegetation communities have a substantial portion of their extents represented in private landholdings. Small losses of such values may accumulate over time to cause a substantial reduction in the extent of remnant patches or their intrinsic habitat values, such as hollow-bearing trees. Despite this, the region contains many large areas of well-conserved vegetation, including Dampier State Forest, Moruya State Forest and Bodalla State Forest, as well as vast tracts of land within the numerous National Parks that border these state forests (i.e. Deua, Gulaga and Kooraban National Parks).

Given the relatively minor scale of vegetation removal proposed and the availability of resources in the region, the proposal is regarded as being unlikely to reduce the overall landscape connectivity at the local or regional scale, and the cumulative impact of the development is regarded as being minor, and would not contribute significantly to cumulative vegetation losses in terms of area or impacts to biodiversity values at the locality or region scales.

6.5.4 Biodiversity safeguards and mitigation measures

- Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, parawebbing or similar.
- The existing riparian vegetation along Swamp Creek would be permanently fenced to prevent impacts to the River Flat Eucalypt Forest EEC. The fencing would exclude stock from the riparian vegetation and allow access for ongoing management, including impact monitoring and weed control.
- A 50 metre buffer strip should be maintained between the proposed works boundary and the top bank of Swamp Creek to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC.
- If stock grazing is to be carried out within the 50m buffer strip, grazing management practices (such as rotational grazing) would be implemented, to control grazing impacts and to ensure that naturally regenerating vegetation is not adversely affected (such as tree guards).
- The Biodiversity (fauna) Construction Management Protocol included at Section 3.3 of the EMP (Appendix H) is to be implemented to mitigate impacts to native fauna.
- Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.
- Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera.* Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection.
- During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before

leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation.

- Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil.
- Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas.
- No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.

With the implementation of the biodiversity management measures above, it is considered that impacts would be avoided where possible and effectively mitigated, where avoidance is not possible. All areas disturbed by the works would eventually be subject to a detailed Rehabilitation Plan. The Rehabilitation Strategy to guide development of the plan is provided at Appendix G and requires that the pre-development habitat values be reinstated or improved at the site in the long term. A such, this ensures an overall 'maintain environmental values' objectives has been met and therefore further offsets are not proposed.

6.6 ABORIGINAL HERITAGE

An Aboriginal Heritage Due Diligence Assessment was completed by NGH Environmental. The Due Diligence report is provided in full at Appendix E, and is summarized in this chapter.

6.6.1 Approach

The Due Diligence assessment was carried out in accordance with the NSW Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (OEH 2010). The Code of Practice provides a five step approach to determine if an activity is likely to cause harm to an Aboriginal object, as defined by the *NSW National Parks and Wildlife Act* (1974).

The approach of the Due Diligence assessment included the following:

- A search of the Aboriginal Heritage Information Management System (AHIMS), maintained by OEH, was undertaken on 26 July 2016. The search was undertaken for an area approximately 10km east-west by 10km north-south, centred on the Eurobodalla Quarry expansion areas being assessed.
- A review of previous archaeological studies in the Eurobodalla area.
- A field inspection was carried out by qualified Archaeologist Kirsten Bradley, with assistance from Matthew Barber (NGH Environmental) on 8th of August 2016.
- An assessment of the potential impact of the proposal on Aboriginal objects and places
- Consideration of management and mitigation measures.

6.6.2 Existing environment

AHIMS search results

The AHIMS search returned 7 Aboriginal sites and no declared Aboriginal places. Table 6-5 shows the breakdown of site type. None of the registered sites are within or adjacent to the project area. The closest registered site to the proposal area is located 2.4 km to the south-west.

Table 6-5 Summary of previously recorded Aboriginal sites in the region

Site Type	Number
Isolated Artefact	2
Artefact Scatter	2
Midden	2
Bora/Ceremonial	1
TOTAL	**7**

Regional context

A number of surveys have been undertaken within the broader region that have resulted in a rage of Aboriginal sites being recorded. Bryne (1983) developed a model of site distribution that predicted sites would be located on spurs with proximity to water sources and on flat landforms such as saddles and ridges. Treolar (2985) investigated the topographic location of open artefact scatter in the NSW South Coast, and found that the majority of sites in the study were located on relatively flat areas on ridges, spur junctions and spur crests. Furthermore, extensive field surveys of forests in the south-east of NSW were undertaken for the NSW National Parks and Wildlife Service and the Forestry Commission of NSW by Packard (1991) and Heffernan and Boot (2000). The sites recorded included opean artefact scatters, isolated finds, scarred trees and a stone quarry. The majority of the sites were located on ridges and flat slopes with less than a 10-degree gradient (Heffernan and Boot 2000).

Local context

Surveys have previously been conducted on “Elizabeth Farm” by Oakley (2001) that included the majority of the area currently being assessed for the proposed expansion of the Eurobodalla Quarry. In 2001, Oakley surveyed approximately 16 ha for the development of the Hard Rock Quarry at “Elizabeth Farm”. The survey included the area currently approved for Eurobodalla Quarry, the majority of the current proposed northern expansion area and the haul road approximately 1.2 km in length to Nerrigundah Mountain Road. No sites were identified within the proposed quarry impact area, although a single find, a potential greywacke hammer stone, was identified in a cleared area south of Swamp Creek. Oakley’s survey area was assessed to not have any potential for sub-surface material as there was no depth of deposit overlying the igneous bedrock and no constraints for the development of the original Quarry were noted.

Oakley noted that the survey area had a long history of intensive agricultural use, logging and clearing. The terrain was noted to have low potential for additional surface artefacts as the area was “too steep to contain sites, and the only flat land near a water source had been subject to land clearing and regular intensive ploughing over a long period od time” (Oakley, 2001).

The isolated find, Swamp Creek Isolated Find (SCIF) recorded by Oakley was not registered with AHIMS and a number of discrepancies have been identified between the recorded coordinates, the plotted location of

the artefact on the map and the description of the artefact location. Two possible locations for the artefact have been identified, and one of those potential locations places the isolated find within the current proposed quarry expansion area.

SCIF was initially identified following the clearing of the area over 15 years ago. The visibility in the general vicinity of SCIF during the current assessment ranged from less than 5 % to 10 %. The greywacke river stone measured 16cm x 12cm x 13cm. Some edge damage was noted as possible use wear along a single margin that was suggested to be possible evidence of drinding or hammering. However, Oakley also noted that the edge damage on the object could not be conclusively proved to be Aboriginal in origin.

Based on a review of the results of previous archaeological surveys of forested areas in the NSW South Coast and the local area, it is reasonable to predict that any sites within the current proposal area would likely share similar attributes and characteristics with those previously identified.

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* also outlines a range of landscape features that have higher potential to contain Aboriginal objects. It is necessary to also consider whether there are landscape features of undisturbed land that may contain Aboriginal objects. These include land that is:

- within 200m of water;
- located within a sand dune system;
- located on a ridge top, ridge line or headland;
- located within 200m below or above a cliff face; or
- within 20m of a cave, rock shelter or cave mouth.

The northern area of the proposed quarry expansion is situated within 200m of Swamp Creek and covers a ridge top and spur crest. The desktop and landscape assessment of the proposed expansion area therefore indicate that there are landscapes present, as defined by OEH, that have the potential to contain Aboriginal sites and there is a possibility that a previously identified object is present within the proposed expansion area that is not registered on AHIMS. Therefore, a visual inspection was undertaken.

Visual inspection of the site

The field survey examined a range of topographical variables to identify if Aboriginal heritage sites were likely to be present.

The northern expansion area consists of a hill crest and associated slopes, a first order drainage line running into Swam Creek but now dammed, and a spur line elevated above the creek. Much of the block has been cleared, although forest remains on the western side of the hill side. The hill slopes and the spur side slopes are steep with the gradient varying between 10 and 30 degrees. The hill slopes contain rocky outcrops showing a very shallow soil profile, while the spur crest is generally level, contains no rock outcrops, although soil development is also shallow.

Survey across the northern expansion block included parts of the hill crest, the steep upper and mid slopes, the drainage line and the flats adjacent to Swamp Creek. The outcrops across the hill crest and slopes were visually inspected and largely consisted of either heavily weathered basalt boulders or exposures of smaller gravels. No evidence of quarrying or Aboriginal objects were identified. Ground cover and visibility varied within the proposed northern expansion area with an average visibility of 50% in areas of exposure and less than 5% elsewhere.

The spur crest was identified as the most likely area to contain Aboriginal sites, as it was a natural access between the Swamp Creek flats and the higher ridgelines, most likely used as pathways within the coastal

hinterland. The spur was essentially level for approximately 300m from below its junction with the main ridgeline at the southern end to its termination above the creek flats at its northern end.

At the time of the survey, the spur had recently been ploughed, offering good visibility of approximately 50%. The ploughing had exposed soils consisting of a shallow 10-15cm of gravelly silty deposit overlying a gravelly clay. Soils changed colour from a red brown in the southern section to a grey brown at the northern end of the spur, which coincided with a change in the underlying bedrock from a basalt derived soil to a more shale bedrock, although basalt was scattered in the northern section as well.

One artefact scatter, **Eurobodalla Quarry AS1**, was identified on the northern extent of the spur (refer Figure 6-8). The site consisted of seven artefacts and a pebble manuport. The artefacts included a broken flake, flaked pieces, and cores. They were found within the ploughed ground, over an area of 40m x 40m on the terminal end of the spur. The site appears to be limited to this area, visibility was the same 50% at the site area as it was along the rest of the ploughed spur but no other artefacts were observed on the remainder of the spurline. By pure coincidence, the artefacts located were just outside the boundary of the proposed northern extension. Although it is possible that additional artefacts occur within the expansion area, none were found.

The side slopes of the spur were steep and the slope leading down to the north to the creek flats considered moderate. It is likely therefore, based on topographic indicators, the site is limited to the terminal end of the spur. The ground had been recently ploughed but soils were quite shallow and although it is likely that additional artefacts occur, the potential for subsurface deposits is now considered low as ploughing had disturbed the B horizon as well as the A horizon. The southern extent of the site coincides with the location of a former house, part of the original property settlement. The house was demolished many years ago but was evident by the presence of some broken bricks, pieces of metal and scattered broken crockery.

The presence of the site at this location conforms to the expected models of Aboriginal site location in the coastal hinterland (see regional context above). The previous surveys by Oakley failed to identify the spur as a potential site area.

The remaining area of the proposed northern expansion area outside the identified site was deemed to have negligible potential to contain Aboriginal objects due to the steep slopes and lack of finds, despite suitable visibility.

The survey attempted to relocate the isolated find SCIF. The area around the co-ordinates and the site description location was thoroughly investigated during the current survey, however the stone object was unable to be relocated to confirm its location.

The proposed Eurobodalla Quarry south-western expansion area consists solely of a steep slope with regenerated woodland adjacent to the quarry access track and mine cut. Ground cover and visibility within the area averaged less than 5% with dense leaf litter covering the majority of area. An exposed cut adjacent to the proposed expansion area was also visually inspected, no cultural deposits or objects were identified. Due to the steep slope, the expansion area to the south-west of Eurobodalla Quarry was deemed to have negligible potential to contain Aboriginal objects. No surface Aboriginal artefacts were identified.

Mature trees within the vicinity of the proposed Eurobodalla Quarry expansion areas were also visually inspected. They revealed no scarring that was considered to be Aboriginal in origin. For a tree to have been a mature specimen suitable for bark extraction at the time Aboriginal people were last practicing tradition ways, the tree would have to be over 100 years old. The majority of trees were either too young or did not conform in any way to the standard scarring morphology accepted for Aboriginal modification. (cf. Long 2005).

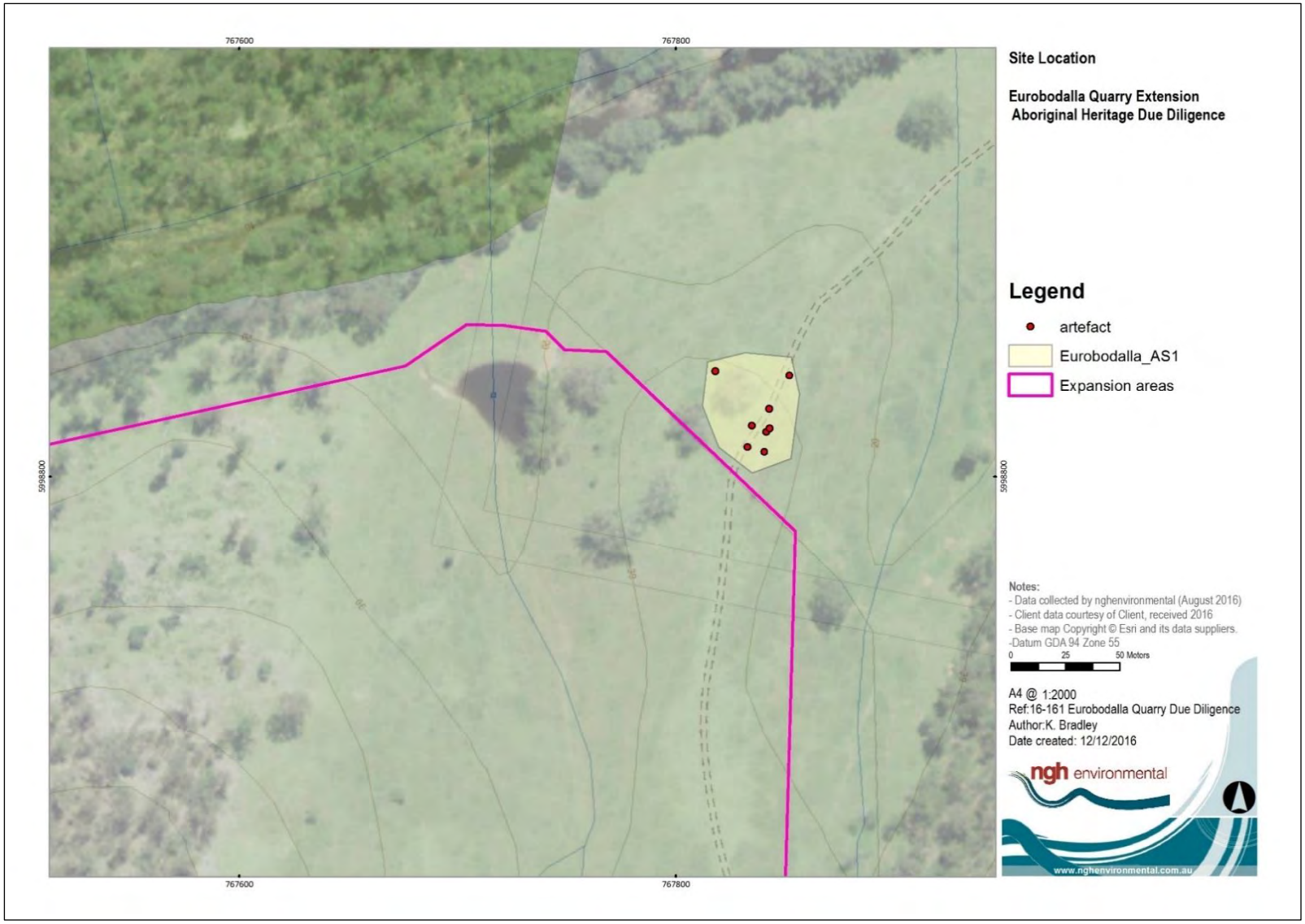


Figure 6-8 Location of Eurobodalla Quarry AS1

6.6.3 Potential impacts

The location of site Eurobodalla Quarry AS1 is just outside the proposed area of use by the quarry operation for stockpiling. If the lot boundary is the proposal boundary, then the site is unlikely to be impacted. IF the proposal extends beyond the identified proposal expansion area, then the site would be impacted. Any impact to the site could only occur after an Aboriginal Heritage Impact Permit was issued by OEH. This would require the preparation of an Aboriginal Cultural Heritage Assessment Report (ACAHR) and include consultation with the local Aboriginal community.

The current field assessment, combined with the results of the desktop research and advice from OEH have assessed the impact from the proposed expansion of Eurobodalla Quarry, outside the area of Eurobodalla Quarry AS1, as unlikely to impact Aboriginal heritage objects.

Given the unknown location of SCIF and that the site is not registered with AHIMS, works in the northern portion of the proposed expansion of Eurobodalla Quarry outside the area of Eurobodalla Quarry AS1 can procced with caution given that if any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. To ensure staff are more knowledge about Aboriginal objects it is recommended that prior to works in the northern expansion area, all individuals participate in an Aboriginal Heritage Induction and that an Aboriginal Heritage Unexpected Finds Management Plan be established (Jackie Taylor (OEH) pers. com. 30.9.2016). Works in the south-western expansion area assessed within this report can proceed with caution and do not require further assessment for Aboriginal sites and objects.

It is understood that the proposed use of the spurline on which the site has been identified, is not for quarrying but as a stockpile area. It may be possible to avoid the need to impact the Aboriginal site, if the proposed stockpile area is within the lot boundary and the proposed expansion area boundary. It is not considered necessary to avoid use of the entire spur crest as the survey did not identify any additional artefacts on the balance of the landform, despite similar visibility conditions.

However, if the proposed Eurobodalla Quarry northern expansion footprint was to expand beyond the designated assessment boundary, including the terminal end where the site is situated, then an AHIP would be required.

6.6.4 Safeguards and mitigation measures

The following safeguards and mitigation measures are based on the results of the Due Diligence assessment and an appraisal of the potential for Aboriginal artefacts and sites to occur within the proposed Eurobodalla Quarry expansion areas:

- If work on the quarry expansion is to proceed, the site Eurobodalla Quarry AS1 should be fenced to prevent inadvertent disturbance. A buffer of at least 10m should be included.
- If any work was to extend beyond the proposal boundary in the vicinity of the site Eurobodalla Quarry AS1, an Aboriginal Heritage Impact Permit must be obtained. This would require undertaking an Aboriginal Cultural Heritage Assessment (ACHA) including Aboriginal consultation. under the Guides and Codes of practice provided by OEH.
- Staff should undertake an Aboriginal Heritage Induction prior to the commencement of the expansion works, particularly prior to any work in the proposed expansion north of Eurobodalla Quarry.
- An Aboriginal Heritage Unexpected Finds Management Plan should be established for Eurobodalla Quarry.

- If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) may be required; and
- Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.

6.7 HISTORIC HERITAGE

6.7.1 Approach

A desktop study was undertaken to identify any historic heritage items or places in proximity to the proposal site, with a focus on the proposed works site (quarry site and surrounding landscape). Several heritage databases were searched on 14 July 2016 as part of this assessment. These included:

- The NSW State Heritage Inventory (SHI) (includes items on the State Heritage Register and items listed by state agencies and local government) to identify any items currently listed within or adjacent to the proposal area. The area searched was the Eurobodalla Shire LGA.
- The Australian Heritage Database (includes items on the National and Commonwealth Heritage Lists) to identify any items that are currently listed within or adjacent to the proposal site.
- The heritage schedule of the Eurobodalla Shire LEP 2012 for locally listed heritage items that are within or adjacent to the proposal site.

6.7.2 Existing environment

The results of the heritage searches listed above indicate that no known historic items or places occur on or near the site. A summary of the results of the heritage searches are illustrated in Table 6-6. Details of listed items are provided below.

Table 6-6 Summary of heritage listings in the Eurobodalla Shire LGA.

Name of register	Number of listings
World Heritage List	0
National Heritage List	0
Commonwealth Heritage List	1
NSW State Heritage Register	390
NSW State Agency Heritage Register (section 170)	8
Eurobodalla Shire Council local heritage schedule	375

State Heritage Register

The search of the NSW State Heritage Register within the Eurobodalla LGA indicated 390 listings. The majority of these listed items are located within the towns of Moruya and Tilba Tilba. Thirteen items are

located within the nearby locality of Nerrigundah. Six items are located within the nearby locality of Cadgee. None of the listed items are located within or adjacent to the proposal site.

NSW State Agency Heritage Register (Section 170)

A search of the NSW State Agency Heritage Register within the Eurobodalla LGA indicated 8 listings. These items are listed by State Agencies under s.170 of the Heritage Act. None of the items are located within or adjacent to, the proposal site.

Local Heritage Schedule Listings

A search of the Eurobodalla Shire LEP (2012) resulted in a total of 375 local heritage items being recorded within the Eurobodalla LGA. The majority of these items are concentrated in the main towns of Moruya, Narooma and Bodalla. None of the local heritage items are located near the proposal site.

6.7.3 Potential impacts

A number of heritage items were identified from the desktop study, outlined above. However, none of those items are found within the proposal site or adjacent. No potential impacts to historic heritage items have been identified or would be expected as a consequence of the proposal.

6.7.4 Safeguards and mitigation measures

While impacts to historic heritage items are considered unlikely, the following protocol for unexpected finds would be undertaken for the operational phase:

- Should an item of historic heritage be identified, works in the vicinity of the find would cease. The Heritage Division (NSW Office of Environment and Heritage) would be contacted prior to further work being carried out in the vicinity of the find.

6.8 TRAFFIC AND TRANSPORT

6.8.1 Existing environment

Previous studies

A Traffic Impact Assessment (TIA) was prepared as part of the original EIS for the Eurobodalla Quarry (Ken Rootsey and Associates, 2002). The findings of the TIA indicated that the original quarry development would have an average total of 31 movements per day, with a peak operation day of 102 movements per day. The traffic movements include employee vehicle, service vehicles and haul trucks. The TIA found that the volumes of traffic generated by the original Eurobodalla Quarry development would have minimal impacts on local roads and the community, and that those impacts would be manageable.

The number of traffic movements are likely to have gone up not down in the last 14 years. This would make the existing quarry movements a lesser proportion of the total traffic volume. Changes in road condition are discussed below.

The existing road network

The Eurobodalla Quarry is accessed from the via the Princes Highway, Eurobodalla Road, Nerrigundah Mountain Road an unnamed Council road (refer Figure 6-9).

Eurobodalla Road is currently a two lane, single carriageway sealed public road. It has a speed limit of 60 kilometres per hour for a distance of approximately 1.1 kilometres from its intersection with the Princes Highway at the township of Bodalla. The remaining length of Eurobodalla Road, up to the intersection of Nerrigundah Mountain Road, is signposted at 80 kilometres per hour. It generally has a width of 7 metres, with 1 metre shoulders. Eurobodalla Road services the hinterland farming community. It is administered by Eurobodalla Shire Council.

Nerrigundah Mountain Road is a two lane, single carriageway. Between the intersection with Eurobodalla Road and the turnoff to the Eurobodalla Quarry, Nerrigundah Mountain road is sealed and has a variable width generally between 5 and 7 metres. It has narrow shoulders and is generally in good condition. Nerrigundah Mountain Road passes over the Tuross River west of the intersection with Eurobodalla Road. The bridge over the river ('Tyrone Bridge') is a single lane, low level timber bridge. Vehicles must give way on the western approach to the bridge. At the time of writing this EIS, Eurobodalla Shire Council were carrying out a project to replace Tyrone Bridge, with a new concrete deck, with a higher deck level capable of handling higher mass vehicles. Nerrigundh Mountain Road is administered by Eurobodalla Shire Council.

The unnamed Council road is an unsealed road approximately 1.5 kilometres in length. The unnamed road is shared with the Rewlee soil extraction operation. The road is in good repair and adequately services the existing levels of quarry traffic.

Eurobodalla Quarry have made volunteer contributions to the maintenance of Eurobodalla Road and Nerrigundah Mountain Road.

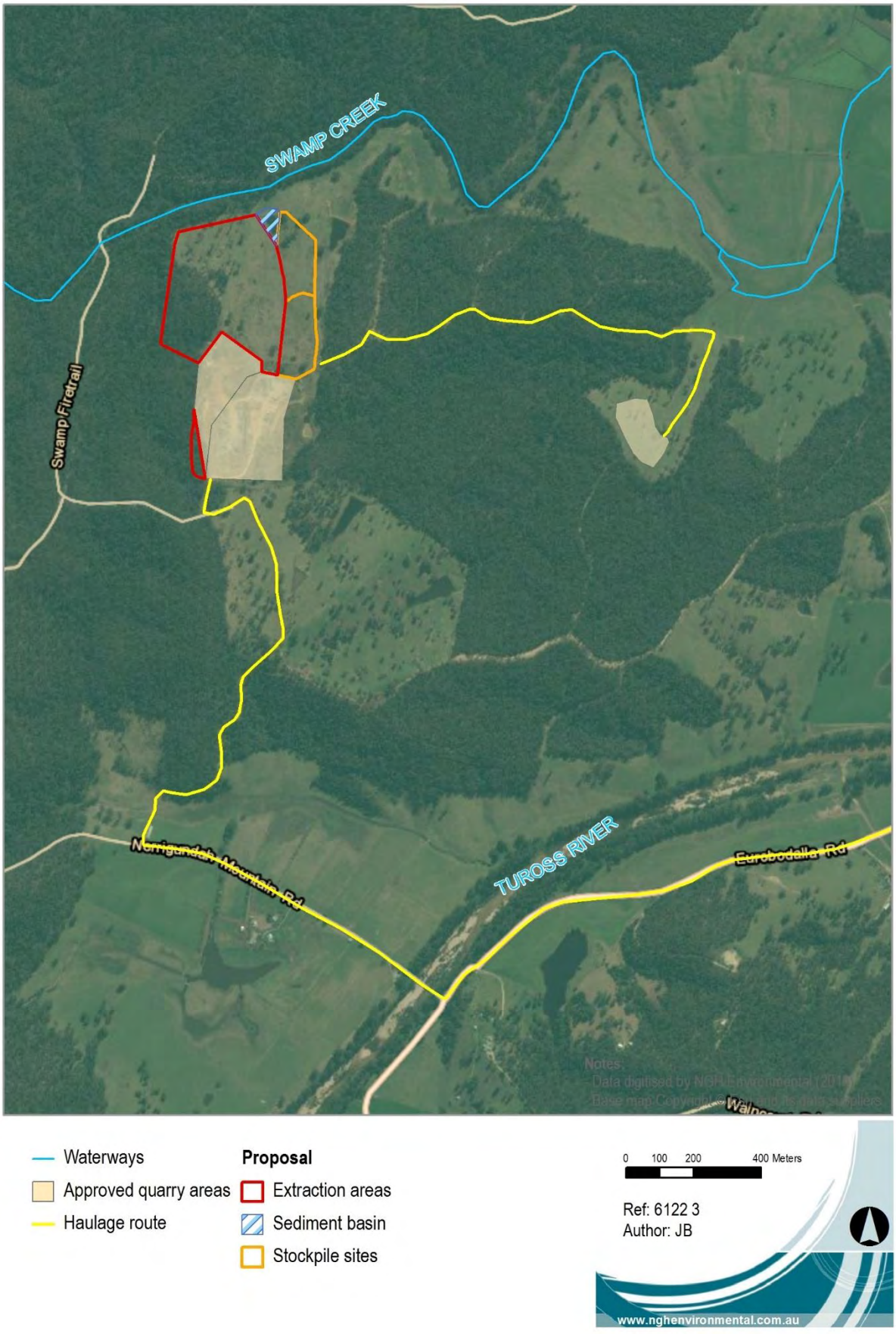


Figure 6-9 Quarry haulage route (yellow line)

Figure 6-10 Unnamed Council road

Figure 6-11 Internal access road along the southern boundary of the existing quarry pit

Figure 6-12 View west along Nerrigundah Mountain Road

Figure 6-13 View east along Nerrigundah Mountain Road

Traffic along Eurobodalla Road and Nerrigundah Mountain Road currently comprises:

- Local residential traffic.
- Local farm traffic, including trucks servicing local dairy farms.
- Trucks transporting materials from the nearby Rewlee soil extraction operation, the Cadgee Quarry and other extractive operations in the area.
- Trucks transporting forestry timber.
- A school bus route operates on both Eurobodalla Road and Nerrigundah Mountain road. One bus completes the route every school morning and afternoon.
- Light and heavy vehicle traffic associated with the existing Eurobodalla Quarry operations.

From Nerrigundah Mountain Road, the quarry is accessed via an unnamed Council road. The road is unsealed and generally has a width of 6-7 metres. Internal access roads are maintained by Eurobodalla Quarry operators.

There is no recent traffic volume data available for Eurobodalla Road or Nerrigundah Mountain Road. The Traffic Impact Assessment prepared in 2002 (Ken Rootsey & Associates) provided traffic volumes for both

these roads. The TIA reported that at the time of report preparation (2002) the AADT of Eurobodalla Road ranged from a maximum of 437 vehicles per day at the intersection with the Princes Highway, to 237 vehicles per day north-east of the intersection with Nerrigundah Mountain Road. Nerrrigundah Mountain Road had a maximum AADT of 179 vehicles per day, measures north-west of the Tuross River bridge.

Traffic volumes at Bodalla (ID Princes Highway 08062) are monitored by Roads and Maritime Services. In 2015, the average number of vehicles travelling north on the Princes Highway at Bodalla was 2,244. The number and vehicles travelling south was 2,241 (RMS, 2016).

Existing traffic generation from the Eurobodalla Quarry

Rates of extraction and product transportation currently vary according to demand for the quarry products. The Eurobodalla Quarry periodically increases extraction and transportation from the site in response to orders for large projects in the region. Examples of significant projects that the Eurobodalla Quarry has supplied quarry products for include Victoria Creek road upgrade (Roads and Maritime Services) and the Spine Road project at Batemans Bay (ESC). Peak extraction rates typically take place over a period of less than one week during supply to such projects. Extraction rates are ordinarily much lower outside of peak supply periods.

Annual extraction and transportation of materials at the Eurobodalla Quarry has fluctuated over the past 10 years (refer Table 1-1). The highest annual extraction was 68,555 tonnes in 2006. The lowest annual extraction was 27,365 in 2008. Over the 10 year period from 2006 to 2015, the average annual extraction of quarry products was 44,822 tonnes per year. This equates to an average of five truck loads (10 truck movements) per working day.

Additional traffic generated by the Eurobodalla Quarry includes light vehicles (from quarry owners and employees), service trucks (eg. Fuel tankers, mechanical repair vehicles) and traffic from subcontractors).

6.8.2 Potential impacts

Traffic and transport impacts could potentially include:

- Increased risk of collision for haulage traffic, due to increased haulage traffic
- Increased wear on road pavement, due to increased haulage traffic

Daily quarry extraction and removal limit

The existing consent conditions for the Eurobodalla Quarry limit the daily extraction and removal of products to 1,400 tonnes of material in any one day. Given that 30 tonne trucks are used to haul the product, this equates to a limit of approximately 47 truckloads of quarry product per day (94 truck movements per day). Typically, these peak production periods occur over a one to two week period and so the resulting increase in traffic generation is a short term impact only.

The current proposal does not seek to increase the maximum daily limit of resource extraction and removal from the site, which is currently 1,400 tonnes of material per day. The peak production periods would still occur over a period of up to one week and so the resulting increase in traffic generation would remain short term and is not expected to lead to a noticeable increase in traffic volumes.

Annual quarry extraction and removal limit

The existing consent conditions for the Eurobodalla Quarry allow for the extraction and removal of a maximum of 100,000 tonnes from the site per year. Over a period of one year, this maximum extraction

rate equates to an average of 350 tonnes of material removed per working day[4]. Since 30 tonne trucks are used to haul the quarry products, the current maximum annual rate of extraction averages out across the year to 11.5 truckloads per working day (23 truck movements per working day). Since operation of the quarry began, Eurobodalla Quarry have never extracted up to the maximum of 100,000 tonnes per year.

The current proposal includes increasing the maximum extraction and removal of material to 175,000 tonnes from the site in any one year. As the Eurobodalla Quarry experiences year-to-year variations in the demand for the quarry products, increasing the maximum annual extraction limit would allow Eurobodalla Quarry to supply larger quantities of materials to key customers such as ESC and RMS in years of very high demand. However, this rate of extraction would not be achieved every year.

Extraction and removal of 175,000 tonnes of quarry product over a one year period would equate to an average of 611 tonnes produced per working day (about 20 truckloads per day totalling 40 truck movements). This is well below the maximum daily extraction limit of 1,400 tonnes and this daily limit would never be exceeded following the proposed quarry expansion.

Eurobodalla Quarry anticipate that that the average annual extraction rate would be less than 100,000 tonnes of material per year when accounted over an approximate period of 5 years. The proposal is not expected to lead to a noticeable increase in traffic volumes.

Waste recovery and composting

The waste recovery and composting aspects of the proposal would generate increased traffic, as follows:

- Trucks delivering waste materials to the site
- Trucks exporting composted materials from the site to end uses
- Tucks exporting additional wastes for diposal at licensed facilities

These are additional to the quarry truck movements.

The levels of traffic generation considered in this impact assessment are based on two general scenarios of production: average production (based on a maximum of 100,000 tonnes per year or average of 350 tonnes per working day) and peak production (maximum of 1,400 tonnes per working day). Both scenarios include movements of employee, service and waste delivery vehicles to and from the site.

The anticipated levels of quarry traffic generation are provided in Table 6-7 below. Average levels of production would generate approximately 37 vehicle movements per day. Peak periods of demand, typically lasting for less than one week at a time, would generate approximately 108 vehicle movements per day.

Table 6-7 Anticipated quarry traffic generation during operation

	Average daily two-way traffic				
Quarry product demand level	**Employees**	**Service vehicles**	**Quarry haul trucks**	**Waste delivery trucks**	**Total**
Average demand (100,000 tonnes /year)	8	2	23	4	37
Peak demand periods (1,400 tonnes /day)	8	2	94	4	108

[4] Based on the quarry operating on 5.5 day working week, 52 weeks of the year.

Haul route

Eurobodalla Quarry would continue to use the same haul route that is used for the current operations. Generally, traffic would exit the quarry site via the unnamed Council road onto Nerrigundah Road. Vehicles would travel east and cross Tyrone Bridge before turning left onto Eurobodalla Road. Vehicles will then travel 9.2 kilometres along Eurobodalla Road before arriving at the Princes Highway intersection at Bodalla. Vehicles may turn left or right at this intersection depending on the destination of their delivery.

Timing of vehicles movements

As for existing operations, there would be no defined peak for truck movements, as they will be spread evenly throughout the day, other than a slight concentration in the early mornings (around 7:00am to 7:30am) as the first trucks arrive, are unloaded and then depart. This is important, as there will be no defined peak period to coincide with later peak of commuter and school traffic (8:00am to 9:00am). The local school bus would likely pass a number of trucks on each morning and afternoon run.

The impact of traffic volumes will vary along the haul route. The existing traffic volumes generally increase closer towards the town of Bodalla.

In summary, the estimated levels of traffic generation resulting from the proposal are only slightly higher than the levels that were considered in the TIA for the original quarry development (which estimated approximately 31 vehicle movements during average production and 102 vehicle movements during peak production). The additional traffic movements associated with the current proposal would be a result of increased employee numbers at the site and deliveries of waste material to and from the site as part of the resource recovery operations. The levels of quarry material extraction and removal would be less than 100,000 tonnes per year on average. Higher rates of extraction (>100,000 tonnes per annum) would only occur in years when Eurobodalla Quarry are contracted to supply materials to multiple large projects in the region. Nevertheless, daily rates of extraction and transport from site would not exceed what is currently allowed by the existing development consent (maximum 1,400 tonnes per day). Traffic movements outlined for the current proposal would not substantially increase the traffic volumes that are currently occur along the haul route. Impacts would be very minimal.

6.8.3 Safeguards and mitigation measures

- Traffic management protocols would be developed and required for all Eurobodalla Quarry Drivers. The protocol would be made available to all regular suppliers. They would aim to further reduce risks encountered on the haulage network, specifically, between the quarry site and the Eurobodalla Road/ Princes Highway intersection. Protocols would include:
    - The speed limit of 40km/hr shall be adhered to for any unsealed section of the haul route.
    - Specifying any higher risk periods, such as the timing of the local bus connection.
    - Requirements to report hazardous conditions, such as pot holing, when they appear, to the road administrator.

6.9 NOISE

6.9.1 Approach

Richard Heggie Associates Pty Ltd (2002) undertook a construction, operational and transportation noise and blasting impact assessment for the existing extraction areas, adjacent to the proposed new areas of extraction. Construction, operational and road traffic noise impacts on nearby private receivers were investigated using background noise data and modelling based on the type of the equipment that would be used.

Since the completion of this report, new guidelines and policies have been introduced for traffic and vibration. Data collected and noise modelling undertaken within the Richard Heggie Associates (2002) noise impact assessment has been used to assess the proposed works against the latest criteria. In this way, the noise impacts have now been been assessed in accordance with the *NSW Industrial Noise Policy* (INP, EPA 2000) and *NSW Road Noise Policy* (DECCW 2011). As the proposal is for a quarry, only operational noise impacts including traffic and blasting, have been assessed. The proposed works would not require any construction works, therefore construction noise impacts have not been considered in this assessment. The vehicle movements required for the waste recovery and composting are minimal and therefore have not been subject to a separate assessment.

The Richard Heggie Associates (2002) noise assessment is provided in full in Appendix I and is summarised below. Where updated, to reference new information or criteria, this is made clear in the text.

6.9.2 Existing meteorological and noise environment

Meteorological environment

Winds

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the noise source. 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 receiver at speeds up to 3 m/s for more than 30% of the time in any seasonal period (ie day, evening or night), then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Wind data was obtained from the Moruya weather station (the closest weather station to the subject site) for the period 1957 to 2002. The Moruya data was analysed to determine the frequency of occurrence of daytime winds of speeds up to 3 m/s in each season.

Seasonal wind records indicate that daytime winds of up to 3 m/s predominate in the winter from the western sector (ie southwest ±45°) for up to 20% of the time. The percentage of occurrence of daytime winds blowing from the proposed activities towards the closest residences is therefore significantly less than 20%. Further, as the frequency of occurrence of daytime winds in a seasons is below 30% then wind is not considered to be a feature of the area.

Background noise environment

The proposal is located in a rural environment adjacent to the existing Eurobodalla Quarry. The noise environment is characterised by existing quarry activities, agricultural activities including machinery and animals and traffic noise from the local roads.

The location of potential sensitive receivers with regards to the proposed quarry expansion is shown in Figure 6-14. Two receivers have been considered in this assessment 'Tyrone' 1.3 km south of the proposed quarry expansion and 'Rewlee' 2.2km south east of the proposed quarry expansion. An additional residence is located to the south-southeast of the quarry, 'Euroma', however it has been described as acoustically shielded by a ridgeline running northeast-southwest.

It can be seen that the proposed expansion areas are in all cases located further from these receivers than the existing operational areas.

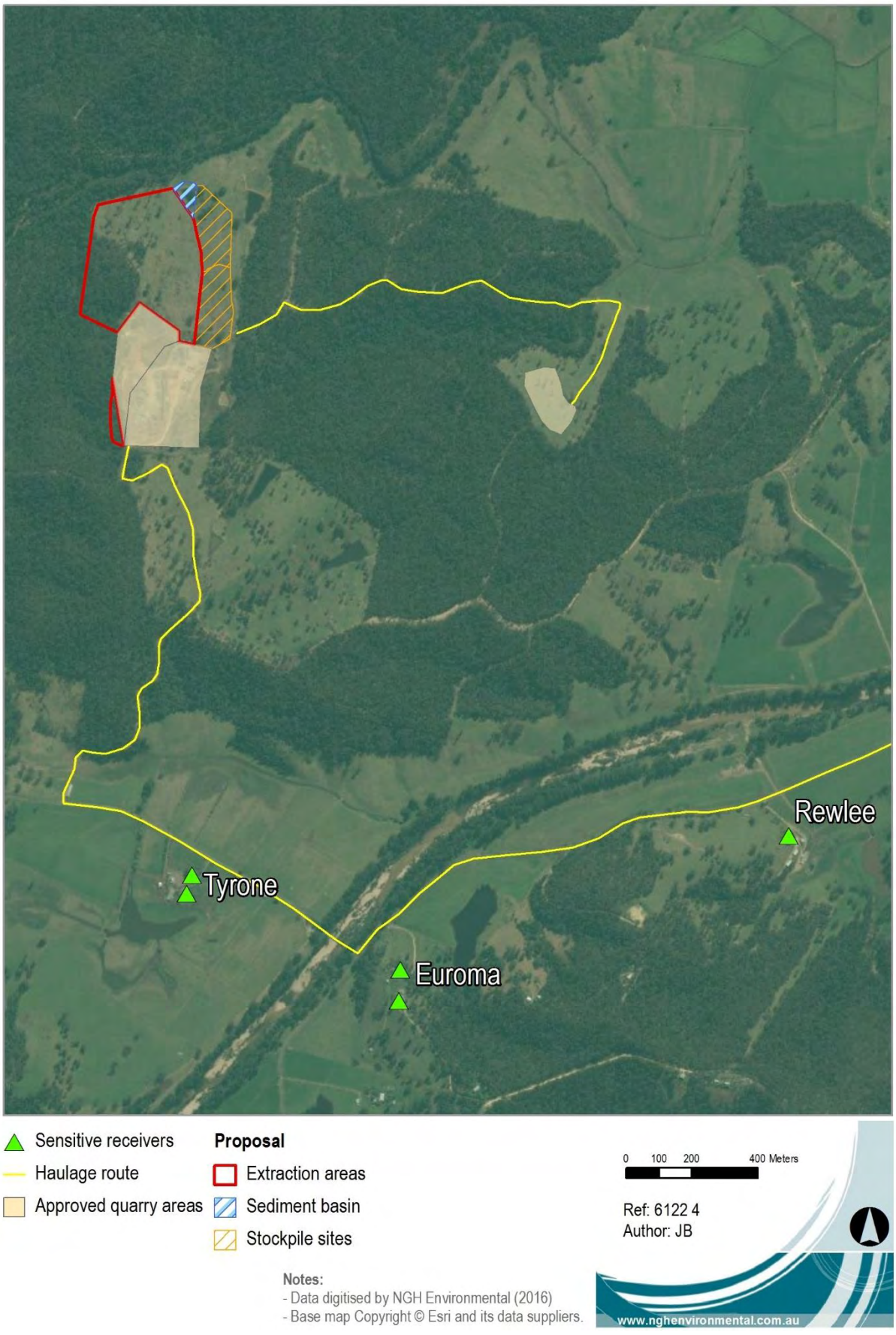


Figure 6-14 Sensitive receivers, 2016

These identified potential sensitive receivers surrounding the proposed quarry expansion are all classified as rural under the NSW INP (EPA 2000). It was assumed that the background noise levels would be consistent with that representative of residences in a rural environment, day time, evening and night time background noise levels at 30dB(A) and under. This provides the most precautionary (quietest) assumption, in modelling noise impacts.

6.9.3 Operational noise assessment

Background noise

The assumed minimum background noise level for the rural area is 30dB(A), in accordance with the NSW INP (EPA, 2000).

Criteria

The NSW INP (EPA, 2000) specifies noise criteria relating to intrusive noise impacts and noise level amenity. The assessment criteria under the NSW INP (EPA, 2000) for the proposed Eurobodalla Quarry expansion is outlined in Table 6-8.

Table 6-8 NSW Industrial Noise Policy project-specific criteria

Assessment Criteria	Project Specific Criteria
Intrusive	Rating background level + 5dBA
Amenity	INP based on recommended LAeq noise levels for rural residential properties.

The proposed operation of the quarry would only occur during daytime hours. The resulting daytime intrusive and amenity noise emissions criteria are in Table 6-9.

Table 6-9 Operation noise emission assessment criteria

Period	Intrusiveness criterion L_{Aeq} (15 minute)	Amenity Criterion $L_{Aeq\ (daytime)}$
Daytime – 7.00am to 6.00pm	30 + 5 = 35 dBA	50 dBA

Prediction of noise emissions

In order to determine the operational noise impact of the quarry assessed in the Richard Heggie Associates Pty Ltd (2002) noise assessment, a computer model was developed to incorporate the significant noise sources and the intervening terrain to the closets potential affected residential properties. The computer model was prepared using RTA Technology's Environmental Noise Model, which was developed in conjunction with NSW EPA. One operational scenario of the new quarry was assessed for the two nearest residential receivers, 'Tyrone' and 'Rewlee'.

The operation of proposed quarry expansion, being assessed in this EIS, would be similar to the operational scenario assessed in the Richard Heggie Associates Pty Ltd (2002) report, including potential receivers, equipment, topological features and meteorological conditions. Therefore, the modelling results have been used to determine the noise emissions during operation of the proposed quarry expansion.

The operational scenario included operating all the plant and equipment listed below, concurrently in order to stimulate the overall maximum potential noise emissions. Reduction factors of 7dBA and 8dBA were applied to convert the predicted maximum overall noise emissions to an $L_{Aeq(15min)}$ level.

Operational scenario plant and equipment modelled in the 2002 assessment and still current for the proposed expansion include:

- Semi-trailer on the haul route
- Grader
- Haul truck
- Compactor
- Front-end loader
- Processing plant
- Excavator
- Water truck
- Blasthole drill
- Dozer

The modelling has taken into account meteorological conditions including calm and isothermal conditions.

Impact assessment

The predicted noise levels for the worst case scenario based on the description of operation (including the use of all plant and equipment concurrently, see above) for the quarry expansion is presented in Table 6-10.

Table 6-10 Predicted LAeq 15 min Operational Noise Levels at receiver locations, dB(A).

Receiver	Intrusiveness Criteria	Amenity Criteria	Intrusiveness Emission $L_{Aeq\ (15\ minute)}$	Comply with criteria?
			Calm & isothermal conditions	
Tyrone	35 dBA	50 dBA	16 dBA	Yes
Rewlee			15 dBA	Yes

The results presented above indicate that the noise emissions from the operational quarry comply with the nominated noise criteria at all sensitive receiver locations. The new expansion areas, being located marginally further from the existing operational areas, will therefore also comply, with a greater margin. On this basis, remodelling noise impacts was not considered to be warranted.

6.9.4 Traffic Noise Assessment

Criteria

Road traffic noise criteria is identified according to the road category, project type and period of day within the *NSW Road Noise Policy* (DECCW 2011). The criteria, provided in the table is based on the requirement of additional traffic during the day on existing local roads for land use developments. The existing local roads the proposed quarry expansion would utilise includes Nerrigundah Mountain Road and Eurobodalla Road.

Table 6-11 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver	Assessment criteria dB(A) Day 7am-10pm
Local roads: 6. Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1\ hour)}$ 55

Impact Assessment

The estimated vehicles movements for the quarry during average and peak production scenarios are outlined in Table 6-12. This includes the existing quarry extraction operations plus the estimated additional vehicles movements associated with the proposal (primarily, waste delivery trucks). It is likely the peak demand periods would last for one week or less.

Table 6-12 Estimated cumulative average daily traffic for the quarry

	Average daily two-way traffic				
Quarry product demand level	Employees	Service vehicles	Quarry haul trucks	Waste delivery trucks	Total
Average demand (100,000 tonnes extraction/year)	8	2	23	4	37
Peak demand periods (1,400 tonnes extraction/day)	8	2	94	4	108

In comparing the estimated average daily traffic for the quarry including vehicle movements for the quarry expansion in Table 6-12 with the estimated traffic movements for the quarry assessed in the Richard Heggie Associates Pty Ltd (2002) report (Table 6-13), there is a slight increase in estimated traffic movements. The proposed quarry expansion would result in an additional 4 light vehicles and 2 heavy vehicles per day during both periods of demand. This would be a worst case scenario and result in a small increase in traffic movements compared to what was assessed for the quarry within Richard Heggie Associates Pty Ltd (2002) report. Therefore, the assessment of the proposed new quarry within the Richard Heggie Associates Pty Ltd (2002) report was used to determine the potential road traffic noise impacts for the proposed quarry expansion.

The potential road traffic noise impacts for the proposed new quarry assessed in the Richard Heggie Associates Pty Ltd (2002) report, was determined by the predicting the future peak hourly traffic noise levels on the local roads when the new quarry was operating. Table 6-13 to Table 6-15 outline the existing traffic movements, proposed quarry traffic movements and combined total future hourly traffic movements for the local roads.

Table 6-13 Existing traffic movements

Existing Daily Traffic (AADT)				Existing Hourly Traffic (Based on 10% of AADT)			
Average		Coincident peaks		Average		Coincident peaks	
Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
141	38	141	149	14	4	14	15

Table 6-14 Proposed Quarry Traffic Movements

Daily Quarry Contribution (AADT)				Hourly Quarry Contribution (Based on 10-hour day)			
Average		Peak		Average		Peak	
Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
6	25	6	96	1	2	1	10

Table 6-15 Total future hourly traffic movements

Average Existing + Average Quarry		Average Existing + Peak Quarry		Peak Existing + Average Quarry		Peak Existing + Peak Quarry	
Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
15	6	15	14	15	17	15	25

Richard Heggie Associates Pty Ltd (2002) predicted noise traffic noise using the US EPA's method that takes into account the L_{Amax} vehicle noise levels (light and heavy), receiver offset distance, pass by duration, vehicles speed, ground absorption (based on ration of soft ground and average height of propagation, number of hourly vehicle movements, receiver height, truck exhaust height and the height and location of any intervening barriers.

The traffic noise levels predictions at the potentially most affected receivers adjacent to Nerrigundah Mountain Road and Eurobodalla Roads are present in Table 6-16.

Table 6-16 Predicted LAeq(1hour) traffic noise levels (dBA)

Receiver	Assessment criteria dB(A) Day 7am-10pm	Offset distance (RL)	Average Existing + Average Quarry	Average Existing + Peak Quarry	Peak Existing + Average Quarry	Peak Existing + Peak Quarry	Comply with criteria?
Nerrigundah Mountain Road	55	93m (RL 19.0m)	44	47	48	49	Yes
'Tyrone' Nerrigundah Mountain Road		162m (RL 23.0m)	40	43	44	46	Yes
Eurobodalla Road		17m (RL 18.3m)	52	55	56	58	No, exceedances 1-3 dBA

Receiver	Assessment criteria dB(A) Day 7am-10pm	Offset distance (RL)	Average Existing + Average Quarry	Average Existing + Peak Quarry	Peak Existing + Average Quarry	Peak Existing + Peak Quarry	Comply with criteria?
Eurobodalla Road		19m (RL 27.1m)	51	55	56	57	No, exceedances 1-2 dBA
Eurobodalla Road		53m (RL 20.5m)	45	48	49	51	Yes
Eurobodalla Road		105m (RL 44.0m)	41	44	45	46	Yes
'Euroma' Eurobodalla Road		130m (RL 49.2m)	39	43	43	45	Yes
'Rewlee' Eurobodalla Road		170m (RL 23.7m)	37	41	42	43	Yes

The predicted traffic noise levels along Nerrigundah Mountain Road during all traffic periods comply with the criteria. Additionally, four out of the six receivers along Eurobodalla Road during all traffic periods comply with the criteria.

It can be seen from the predicted future traffic noise levels, there would be minor exceedances, 1-3dBA, for two receivers along Eurobodalla Road only during two scenarios:

- Peak existing traffic and average quarry traffic movements
- Peak existing traffic and peak quarry traffic movements

The predicted traffic noise at these two receivers along Eurobodalla Road, would not exceed the criteria during average existing traffic and quarry movements and average existing traffic movements and predicted peak quarry traffic movements.

It is considered the proposed quarry expansion would result in a slight increase of traffic movements per day, an additionally 4 light vehicles and 2 heavy vehicles, including factoring in traffic related to the waste recovery and composting activity. Due to the slight increase, it is unlikely the predicted noise levels would be much greater than those predicted for the quarry.

The predicted traffic noise levels would likely continue to comply with the assessment criteria for receivers along Nerrigundah Mountain Road and the four receivers along Eurobodalla Road. This is due to the noise levels already being 4 to 18 dBA below the criteria. The proposed vehicles movements for the quarry expansion are unlikely to generate a noise level that would increase greater than 4 dBA due to the minor changes in the number vehicle movements.

For the two receivers along Eurobodalla Road, it is likely minor exceedances would still occur during peak existing traffic and average quarry traffic movements and peak existing traffic and peak quarry traffic movements. It is also likely there would be a minor exceedance as a worst case scenario during average existing and peak quarry traffic movements. During average existing and average quarry traffic movements, the noise levels would likely still comply with the criteria due to the amount of decibels below the criteria, 3 dBA.

Therefore, the proposed quarry expansion may result in traffic noise exceedances for two residences along Eurobodalla Road during these periods:

- Peak existing traffic and average quarry traffic movements
- Peak existing traffic and peak quarry traffic movements
- Average existing traffic and peak quarry traffic movements

The potential impacts are not considered substantial with the minor exceedances of 1-3 dBA. Also the peak period of the quarry and existing traffic would be temporary (typically occurring over periods of less than one week) and limited to daytime hours. With the implementation of mitigation measures, specifically the development of a complaints protocol, the potential impacts are considered manageable.

6.9.5 Blast emissions impact assessment

Proposed blasting practice

The method of extraction at the proposed quarry expansion would be the same as outlined in the Richard Heggie Associates Pty Ltd (2002), which was for the existing quarry. A summary of the indicative blast design details is outlined in Table 6-17.

Table 6-17 Typical blast design details

Blast Design Parameter	Typical Dimension
Bench height	Up to 15m
Sub-drill	0.5m
Stemming (using 14mm aggregate)	1.5m
Blasthole dimeter	89mm
Blasthole inclination (to vertical)	10^{o}
Blasthole spacing	2.8m
Burden	2.5m
Maximum Instantaneous Charge (MIC)	108kg (for 15m bench)

Criteria

Blasting emissions have been assessed against different criteria relating to structural damage and human comfort levels.

Structural and building damage

The *Australian Standard 2187.2-2006 Explosives – Storage and Use, Part 2* recommends limits for controlling cosmetic damage to structures. Cosmetic damage is defined in the standard as:

> *"The formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces; in the addition, the formation of hairline cracks in the mortar joints of brick/concrete construction."*

The Australian Standard 2187.2-2006 provides criteria for the likelihood of building damage to occur from air blast overpressure and ground vibration. Sources of vibration, which are considered in the standard include blasting (carried out during mineral extractions or construction excavation), demolition, piling, ground treatments (compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The Australian Standard 2187.2-2006 describes that from Australian and overseas research, damage has not been found to occur at airblast levels below 133 dB(linear). The probability of damage increases as the airblast levels increase above this level. Windows are the building element currently regarded as most sensitive to airblast, and damage to windows is considered as improbable below 140 dB(linear). Therefore, a limit of 133 dB(linear) is recommended as a safe level that will prevent structural/architectural damage from airblast.

The Australian Standard 2187.2-2006 recommends limits (guide values) for transient vibration that is judged to result in a minimal risk of cosmetic damage to residential building and industrial buildings. This limits are based on the British Standard 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2 and provided in Table 6-18.

Table 6-18 Transient vibration guide values – minimal risk of cosmetic damage

Line	Type of building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures - Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures - Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Human comfort

EPA recommends blasting overpressure and ground vibration be assessed in regards to human comfort levels in accordance with ANZECC Guidelines "Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration". The guidelines outline the following criteria:

- The recommended maximum level for airblast is 115 dBLinear.
- The level of 115 dBLinear may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dBLinear at any time.
- The recommended maximum level for ground vibration is 5 mm/s (peak particle velocity (ppv)).
- The ppv level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

- Blasting should generally only be permitted during the hours of 0900 hrs to 1700 hrs Monday to Saturday. Blasting should not take place on Sundays and public holidays.

Impact Assessment

Blast emissions levels for the proposed blasting practice use for the assessed quarry and applies to the proposed quarry expansion being assessed within this EIS, were predicted using a formula given in the ICI Blasting Guide. The predicted level of blast emission is determined using the relationship between distance from the quarry boundary to potentially affected properties and the peak vector sum (PVS) ground vibration and peak airblast. Table 6-19 outlines the predicted levels of blast emissions for a 108kg MIC for each sensitive receiver.

Table 6-19 Predicted levels of Blast emissions for a 108kg MIC

Receiver	Distance (m)	PVS ground vibration (mm/s)	Peak Airbalst (dB Linear)
Tyrone	1280	0.5	106
Euroma	1640	0.4	103
Rewlee	2175	0.2	100

Structural and building damage

In regards to the Australian Standard 2187.2-2006 transient vibration guide values, the predict ground vibrations caused by blasting at all receivers (0.2-0.5mm/s) would be below the minimal risk criteria for causing cosmetic damage to all types of buildings (15-50mm/s). Additionally, the peak airblast at all receivers would be below the recommended 133 dB(linear) limit to prevent structural/architectural damage.

Human comfort

At all receivers the predicted levels of blast emissions comply with the recommendations outlined in ANZECC Guidelines, specifically:

- The predicted peak airblast at all receivers is a between 100-106 dBLinear, which is below the recommended maximum level of 115 dBLinear.
- The predicted ground vibration at all receivers is between 0.2-0.5mm/s which is below the recommended 5 mm/s.

In summary, the predicted blast emissions for the proposed quarry expansion would comply with the criteria for structural damage and human comfort.

6.9.6 Safeguards and mitigation measures

Safeguards and mitigation measures required to minimise noise emissions of the proposal include:

- All equipment used on site would be in good condition and good working order.
- Vehicles would be kept properly serviced and fitted with appropriate mufflers.

- Where reasonable and feasible, activities that generate high noise levels would be substituted with alternative processes that generate less noise.
- Works will be restricted to:
    - 7am to 6pm Monday to Friday
    - 7am to 12pm on Saturdays
    - No work on Sundays or public holidays.
- A complaints register would be maintained and noise and vibration complaints would be responded to promptly.

6.10 AIR QUALITY

6.10.1 Approach

This section investigates the potential for the Eurobodalla Quarry to result in impacts to air quality. An Air Quality Impact Assessment was prepared for the original Eurobodalla Quarry development in March 2002 (Richard Heggie Associates, 2002). The report was prepared with reference to the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2001).

Information contained within the Air Quality Impact Assessment has been reviewed to inform the assessment of potential air quality impacts associated with the current proposal.

6.10.2 Existing environment

Existing air quality

The air quality in the Eurobodalla Shire is generally good and is typical of that found in a rural setting in NSW due to the relatively low population and distance from industrial pollution sources. Local air quality can be affected by exhaust emissions from traffic, agricultural practices (mainly dairy, vehicles and plant traveling on unsealed roads), operation of the existing Eurobodalla Quarry (vehicles and plant travelling on unsealed roads, excavation and stockpiling) and other extractive industries operating in the region.

A search of the National Pollutant Inventory revealed that there are 5 facilities which reported air emissions to the Inventory in the 2014/15 reporting period, including:

- Avcar Air Pty Ltd Aero Refuellers, Moruya, NSW.
- Caltex Petroleum Services, Caltex Energy NSW Moruya Depot, NSW.
- Downer EDI Works Mogo, NSW.
- Elgas Batemans Bay, NSW.
- Eurobodalla Shire Council, Northern Water Treatment Plant, Batemans Bay, NSW.

Episodic events such as bushfire, dust storms and drought during dry times may produce short term adverse effects on local air quality through the generation of dust. Agricultural activities can also temporarily affect air quality during activities such as cultivation, fertiliser application, harvesting or slashing. Impacts are generally worsened during windy periods with greater dispersion of air pollutants.

Climate

Weather and climate can influence the degree of impact resulting from developments such as quarries. Works carried out in periods of high winds or during long periods of dry weather have greater potential to generate dust which can impact air quality.

The closest Bureau of Meteorology (BOM) weather monitoring site in the vicinity of the subject site is the Moruya Heads Pilot Station (Station No. 069018). This station is situated north-west of the Eurobodalla Quarry site. While some variations would be expected in translating the data from the met station site to the quarry area, the sites are within a reasonable distance of each other.

According to Weatherzone (2016), the recorded mean maximum temperatures in the area vary from 17.1ºC (July) to 25.3 ºC (January) and the mean minimum temperatures vary from 4.0 ºC (July) to 16.1 ºC (February). The area has a mean annual rainfall of 809.2mm. The month of mean highest rainfall is March (106.7mm) and the lowest is July (55.1mm).

According to the BOM (2016), the annual mean 9am wind speed is 12.8 km/h, with the highest wind speeds in November and lowest in March. The high November 9am winds predominantly come from a north easterly direction, with southerly winds being the next most frequent. The annual mean 3pm wind speed is 22.6km/h, with the highest wind speeds in November and lowest wind speed in June. The high November 3pm winds predominantly come from a north easterly direction (BOM 2016).

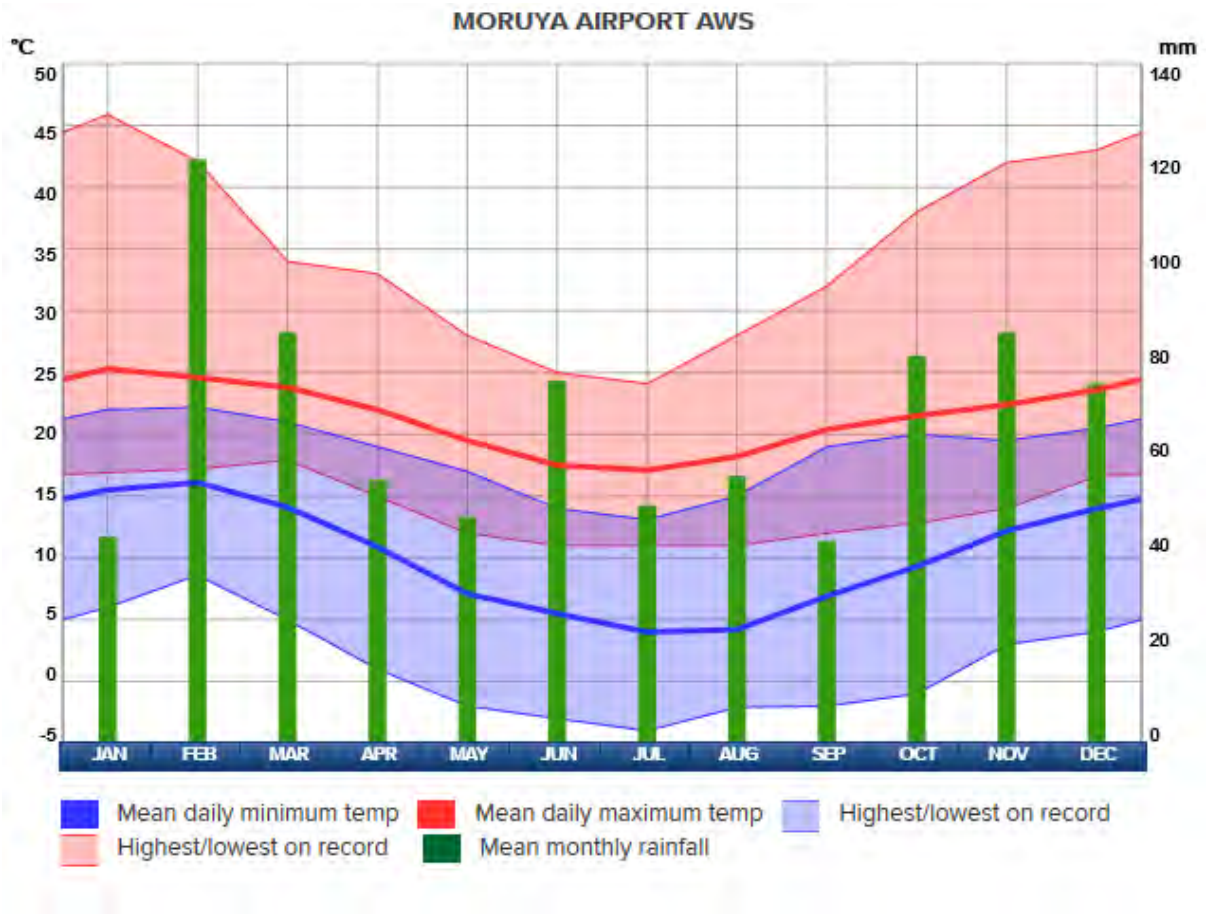


Figure 6-15 Climate chart for Moruya Airport (Weatherzone 2016).

Receivers

There are five sensitive receptors (residences) within approximately 2 kilometres of the proposal (refer Figure 6-14). There are several other residential receptors in the locality, located further away from the proposal. The two closest sensitive receptors are located approximately 1.4 kilometers south of the proposal at 'Tyrone', off Nerrigundah Road. Two residential receptors are located south of the Tuross River at 'Euroma' and another is located approximately 2 kilometres directly east of the proposal site. Other receivers in the area include vehicles travelling along Nerrigundah Mountain Road.

Immediately to the south of the proposed quarry, towards the nearest residential receptor, the land rises approximately 30 metres over a distance of 200 metres, and subsequently levels out for a distance of approximately 350 metres before falling at a gradient of 1: 10 for 600 metres to the closest residence. As such, the site topography hinders the transport of airborne particulate towards the nearest residential receptors (Richard Heggie Associates, 2002).

No new recievers (dwellings, schools, other public buildings) have been located closer than this residence, since the 2002 assessment was completed.

Quarry past performance

Since the commencement of the Eurobodalla Quarry operations, no complaints regarding air quality impacts have been received. In accordance with the Eurobodalla Quarry's EPL, activities at the quarry are carried out in a manner that minimizes dust or emissions of dust from the premises. Trucks entering and leaving the premises and carrying loads are covered at all times (except during loading and unloading). The EPL does not require any formal air quality monitoring to be undertaken.

6.10.3 Potential impacts

The proposal would result in the emission of air pollutants from sources that already generate pollution at the site:

- Dust generated through activities such as soil stripping, material extraction and loading.
- Dust generated from wind erosion of the open quarry pit and of stockpiles.
- Dust generated during use of the impact crusher and screening plant (including for crushing and screening recovered concrete and other wastes).
- Dust generated as a result of vehicle movements along unsealed areas within the proposal site.
- Dust generated during haulage of material into and out of the site.
- Odour from composting or resource recovery.
- Vehicle and machinery exhaust emissions.

Dust and particulate matter

An Air Quality Impact Assessment was prepared by Richard Heggie Associates (2002) to inform the preparation of the original EIS (Outline Planning Consultants, 2002). The Air Quality Impact Assessment used pollutant dispersion modelling appropriate to the quarrying activities that were being assessed. The Assessment included modelling of key quarrying activities with the potential to generate air pollution including: stripping, drilling, blasting, excavation, loading, unloading, processing, crushing, vehicle movement (including haulage) and wind erosion. The key emissions assessed were dust, total suspended solids (TSP) and Particulate matter (PM_{10}).

A worst case scenario was used in the modelling. The modelling was based on full time operation of the quarry: 5.5 day working week (10 hours per day), for 50 weeks per year. The modelling assumed conservatively high levels of site activity (eg. the model assumed one blast per day, rather than one blast per 6 to 8 months which is the realistic frequency of blasting). The modelling did not take into account any dust mitigation measures.

In summary, the Air Quality Impact Assessment (Richard Heggie Associates, 2002) for the original quarry development found that during full time operation of the quarry:

- Levels of dust generation and deposition would be acceptable (within the assessment criteria) for all applicable years of operation of the quarry.
- TSP levels would be acceptable for all applicable years of quarry operation.
- PM_{10} emissions would be negligible at the nearest residential receptors for all applicable years of operation.

Dust and particulate matter would continue to be generated at the Quarry site through continued extraction and processing activities and also as a result of the additional proposed activities (resource recovery and processing, composting).

Dust generation at the site would primarily be mitigated by restricting the disturbance footprint of exposed bare soil areas by extracting from isolated cells that are progressively rehabilitated. Stabilisation of the site as soon as possible post extraction would minimise the loss of soil that may occur through erosive processes. Generally the generation of dust during extraction operations is expected to be low given the low number of machinery that would be working at the site.

The greatest production of dust would result from the use of the crushing and screening equipment. Crushing would be an intermittent operation based on demand for the product. Most crushing equipment now have built in suppressors to minimise dust impacts.

Dust may be generated during the turning of compost windrows. However, due to the moist nature of the feedstock and the composting processes very little particulate emission would be expected to occur. Transfer of feedstock to compost rows would be undertaken after the feedstock had been sprayed with water, minimising potential for particulate matter to be mobilised. Similarly, rows would be kept covered except when turned, when moisture levels would enable very little particulate emission.

Dust and emissions have a higher potential to travel and spread during periods of high winds. Based on weather data, the highest mean wind speeds are recorded in the afternoons (3pm) during spring months. This is when dust and emissions are more likely to potentially impact on sensitive receptors.

Due to the relatively large distance to residences, site topography and landscape characteristics, these impacts are unlikely to be noticeable to any local residents and would have a minimal impact on the surrounding area, with any impact mainly restricted to the immediate vicinity of the works.

Odour

DEC 2004 described potential odour issues at composting facilities. Odour problems associated with composting and related organics processing facilities can be traced to problems with one or more of the following four processes: process control; containment of odorous areas; odour control technology; and siting.

Under aerobic conditions the main gaseous product of composting and mulching is carbon dioxide. MinChem 2011 describes the cause and standard approach to managing odour associated with anaerobic composting as follows:

> *Odours tend to be produced during the anaerobic decomposition of organic materials by bacteria, which thrive in low oxygen conditions. Traditionally to overcome this condition the system of composting involves the periodic turning of piles of organic matter with mechanical equipment (e.g. front end loaders or specialised windrow turner) to assist in aeration/oxygen supply, inter alia.*

High peak odour emissions at composting and related organics processing facilities generally occur during mixing and aeration procedures, such as preparation of the feedstock, and during turning of biodegrading organics. Category 1 organics are not likely to generate odour when received at the facility.

Due to the relatively large distance to residences, site topography and landscape characteristics, odour impacts are unlikely to be noticeable to any local residents in the area. Impacts would mainly be restricted to the immediate vicinity of the composting pad.

Greenhouse gas emissions

The following activities would result in the generation of greenhouse gases:

- Operation of vehicles and machinery on site during resource extraction and processing
- Operation of haulage trucks and delivery vehicles
- Composting activities

DEC 2004 describes potential greenhouse gases (GHGs) at composting facilities. The emission of methane to the atmosphere is reported as the principal greenhouse impact of concern for composting and related organics-processing facilities, because methane has more than 20 times the greenhouse warming potential of carbon dioxide. Only the carbon dioxide released by the use of fossil fuels (e.g. diesel and petrol) during transporting and processing of compost contributes to global warming, because the carbon dioxide produced during the composting process would have been released in the longer term by the natural decay of the organic materials that are being turned into compost. The well managed composting of organics will not produce methane, so this activity can contribute to a reduction of global warming by keeping organics out of landfill (DEC 2004).

6.10.4 Safeguards and mitigation measures

Mitigation measures are currently in place for existing gravel pit operations, to minimise air quality related impacts. These are also considered applicable to this current proposal and include:

- During dry, windy periods:
  - A water cart shall be made available and used to dampen unsealed sections of the haul routes, stockpiles and loading pads.
  - Visual monitoring of dust generation will be undertaken and quarrying activities will be limited if dust generation becomes unmanageable.
- A speed limit of 40km/h shall be adhered to for any unsealed section of the haulage route.
- All blast holes would be stemmed with aggregate to avoid creating excessive dust during blasting.
- Vehicles and motorised equipment would be maintained so that emissions are minimised.
- Vehicles and machinery will be switched off when not in use, rather than leaving them to idle.

Additionally, to monitor the potential for odour to affect recievers,

- A complaints register would be maintained and air quality complaints would be responded to promptly.

6.11 VISUAL AMENITY

6.11.1 Existing environment

Lands immediately surrounding the existing Eurobodalla Quarry to the north, east and south are predominately used for agriculture. Extensive areas of the Dampier State Forest occur immediately west of the existing quarry. Forested areas also occur immediately to the east and across the broader locality.

Views towards the existing quarry from nearby residences are screened by topographical landscape features and forest vegetation. The closest rural residence to the works area is approximately 1.3 kilometres from the site, south of Nerrigundah Mountain Road. Additional residences are located south of Eurobodalla Road and the Tuross River. The quarry cannot be seen from Nerrigundah Mountain Road. Fleeting glimpses of the existing quarry site can be seen from Comerang Road, approximately 2.5 kilometres from the existing quarry (Outline Planning Consultants, 2002).

The proposed new extraction area and stockpile hardstand would be located immediately north of the existing quarry pit. The proposal site is situated on land with a northerly aspect, draining towards Swamp Creek which is bordered by the Dampier State Forest to the north (refer Figure 6-16). The proposal would not be visible from any residences.

Dust, large machinery and heavy and large vehicle traffic are associated with the operation of the quarry.

Figure 6-16 Facing north across the proposed new extraction area towards the Dampier State Forest.

6.11.2 Potential impacts

The proposed quarry expansion would be bounded by the existing quarry site to the south and forested areas to the east, west and north past Swamp Creek. There are no nearby residences or neighbouring farms that would have views to the proposal site.

Glimpses of the Eurobodalla Quarry are visible from Comerang Road to the north. Traffic levels on this road would be low, and visual amenity impacts associated with the view of the proposal from the road would be negligible to low, in the context of the existing quarry pit.

6.11.3 Safeguards and mitigation measures

Measures for dust suppression have been included in Section 6.10 of this EIS.

No additional mitigation measures are considered to be required.

6.12 WASTE MANAGEMENT

6.12.1 Existing environment

Legal requirements for the management of waste are established under the POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under Section 134 of the POEO Act. Littering is an offence under Section 145 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The proposal's resource management options would be considered against a hierarchy of the following order:

(i) Avoidance of unnecessary resource consumption,

(ii) Resource recovery (including reuse, reprocessing, recycling and energy recovery),

(iii) Disposal.

Waste management at the proposal site will aim to follow this hierarchy. The proposal will involve the recovery of wastes generated internally as well as wastes brought onto the site for processing.

The existing operations at the Eurobodalla Quarry produce limited quantities of waste. Waste streams generated at the site include:

- General waste and litter from quarry employees
- Empty chemical and hydrocarbon drums
- Hydrocarbon wastes

Other wastes streams are generated at the site, which are recovered and used in the production of saleable materials. Solid concrete wastes from the batching plant are crushed and used in the production of road base. Surplus topsoils are stockpiled and reused on site for landscaping and rehabilitation.

6.12.2 Potential impacts

Construction

Construction of the proposal has potential to produce general construction wastes, including spoil from earthworks, construction materials and litter from construction workers. Spoil from excavations is to be reused onsite. Topsoil would be stockpiled and used in landscaping and rehabilitation.

Given the small confined nature of the proposed facility, the distance to receivers, including waterways, potential waste impacts during construction are considered to be low and manageable with implementation of mitigation measures.

Operation

The proposal involves the operation of a resource recovery facility. Non-putrescible wastes would be accepted to the site for processing and recovery, including selective inert building and construction wastes (concrete, asphalt, sand, soil, bricks etc) and uncontaminated category 1 organics would be accepted for composting.

Local amenity could be impacted by litter generated by the facility (e.g. general waste, contaminants brought in with waste deliveries). The proposed operation and management controls would reduce the potential for this to occur, particularly through the following:

- Visual inspection of all incoming waste deliveries
- Rejection of materials which are unable to be accepted at the site (non-conforming wastes)
- Provision for collection, storage and removal of all non-conforming wastes (NCW) which, from time to time, may be discovered after bulk waste loads have been accepted

Potential secondary impacts related to the processing of Category 1 organic wastes at the proposed facility include soil, water and air pollution impacts and these are addressed in Sections 6.2, 6.2 and 6.4. Generally, the proposal has been designed to meet the *Environmental Guidelines for Composting and Related Organics Processing Facilities* (DEC 2004), which would minimise potential for pollution caused while processing organic wastes on site.

Impacts on municipal waste management are expected to be predominately positive, through reducing volumes of waste going to landfill and associated costs.

Waste generated during operation would be low and manageable with implementation of mitigation measures.

6.12.3 Safeguards and mitigation measures

- Green waste from vegetation clearing would be mulched at the site for composting, or used in the management of soil and water.
- Topsoil stripped from the proposal area would be stockpiled for onsite landscaping and rehabilitation.
- A Waste Management Plan (WMP) would be prepared for the resource recovery, recycling and composting activities. The WMP would include, but not be limited to the following measures:
    - All incoming wastes would be subject to visual inspection prior to unloading, during unloading and after unloading, to determine waste acceptability. NCW is either:
        - Not unloaded and the load is rejected prior to tipping; or
        - Rejected following tipping, reloaded and the driver instructed to remove the load from the site.
    - Wastes would be delivered to designated locations at the hardstand area.
    - A waste rejection register would be maintained to detail the types and quantities of non-conforming wastes rejected from the site, including the reasons for the waste rejection.

6.13 SOCIAL AND ECONOMIC IMPACTS

The SEARs for the project require an assessment of the likely social and economic impacts of the development, including consideration of both the significance of the resource and the costs and benefits of the project.

6.13.1 Potential impacts

Significance/importance of the resource

The proposal would extend the operational life of an important local quarry which has operated since 2002. Materials produced at the Eurobodalla Quarry are used extensively across the Eurobodalla Shire for road construction and maintenance of rural roads by Roads and Maritime Services and Local Government.

The materials available at the Eurobodalla Quarry site are uncommon in the region. It is estimated that 500,000 tonnes of weathered basalt (re-sheeting gravel/road base) material is available across the proposed extraction expansion area. The ability to blend this material with siltstone, a common geological resource, will increase the life expectancy of locally sourced high quality road base materials that meet the required Plasticity Index and road grading specifications.

Expansion of the quarry would provide access to other materials which are scarce in the local area, including fresh basalt rock (approximately 1,000,000 tonnes), low plasticity index rhyolite (600,000 tonnes) and fresh rhyolite (1,000,000 tonnes). Fresh basalt aggregates are suitable for the production of concrete, asphalt, sealing aggregate and drainage aggregates. Low plasticity rhyolite is a highly sought after material for road surfacing having high skid resistance. Fresh rhyolite is also highly suitable for use as a decorative landscaping material and as gabion rock and rock armour stone.

These materials have become scarcer as hard rock resources in the area have been depleted. The resources at Eurobodalla Quarry represent a quality product that can be extracted and processed for sale to customers at economical prices. The continued operation of the quarry will reduce haulage requirements for local projects.

Expansion of the quarry would make use of the environmental controls and transport networks already established for the existing quarry, and at a site that is well suited to this enterprise. Low numbers of receivers and a proven environmental record demonstrate the certainty with which continuing operations can be undertaken with regard to managing environmental impacts.

At the existing rate of extraction, it is estimated that basalt road base materials remaining in the approved extraction area at the Eurobodalla Quarry would be exhausted in the next 3 to 5 years. If resources became exhausted at the Eurobodalla Quarry, key customers such as the Eurobodalla Shire Council and National Parks and Wildlfie Services would probably need to source road base materials from outside the region, resulting in longer haul distances, increased costs and impacts to the road network. The proposal would allow the continued operation of an important local quarry.

Employment

The proposal would enable the family owned Eurobodalla Quarry to remain a viable business over approximately the next three decades. Eurobodalla Quarry currently employs approximately three full time workers. The proposal would increase employment by approximately one full time position. Associated subcontracted work would also increase.

Benefits of resource recovery and composting

There are very few resource recovery facilities operating in the Eurobodalla region. It is believed that a variety of recoverable wastes are going to landfill, due to poor capability and demand to facilitate the processing and recycling of these recoverable materials. The proposal would provide a resource recovery and recycling facility capable of servicing the local area, ultimately reducing the volumes of recoverable materials going to landfill. Incorporation of recycling and resource recovery activities at the Eurobodalla Quarry site would maximise the utilisation of the land through vertical integration of operational activities and services.

As organic wastes constitute a large proportion of the waste stream going to landfill, the composting of organics at the Eurobodalla Quarry will serve to reduce the demands on local landfills and would facilitate the sustainable and efficient use of local resources.

Amenity impacts

Amenity impacts such as noise, air quality and visual amenity have been addressed in Sections 6.8, 6.9, 6.10 and 6.11 respectively. Due to the relatively large distance to the nearest residences, site topography and landscape characteristics, these impacts are unlikely to be noticeable to any local residents and would have a minimal impact on the surrounding area, with any impact mainly restricted to the immediate vicinity of the works.

6.13.2 Safeguards and mitigation measures

- Nearby residents will be notified of the proposal and feedback sought.
- A complaints register would be maintained and complaints would be responded to promptly.

6.14 HAZARDS AND RISKS

6.14.1 Potential impacts

Quarry operations

Quarries, by their nature, are hazardous due to the activities that are required to occur on site during operation. Hazards associated with the existing and proposed quarrying operations at Eurobodalla Quarry include the following:

- Risks to traffic travelling along roads adjacent to the open quarry pit.
- Risk of injury to workers through the operation of heavy machinery.
- Risk of landslide and collapse of quarry pit walls.
- Risk of fire ignition resulting from failure of plant and equipment on site, or other activities (eg. welding, cigarette butts).
- Risks associated with the sediment dams at the site (ie. drowning risk).
- Environmental hazards such as hydrocarbon spills from equipment.
- Risks to public travelling on the road network (this has been addressed in Section 6.8 and is not discussed again in this section) or entering the site.

The operation of plant machinery runs an inherent risk of injury to the operators and any personnel that may be present at the site. Existing risks to workers are, and would continue, to be managed through the

implementation of the Eurobodalla Quarry Mine Safety Management Plan (MSMP) and Emergency Response Procedures, which include processes such as site inductions, appropriate training, policies and procedures specific to quarry operations. The additional extraction areas do not present any new risks compared to existing operations.

The risk of landslide or collapse of quarry pit walls is low but may be heightened during periods of wet weather. Battering of slopes would reduce the risk of this occurring. If necessary, additional stabilisation of higher banks may be achieved by introducing a bench across the battered slope. The proposal would result in materials being extracted to a greater depth and the number of benches required will increase. The additional extraction areas do not present any higher risk than existing operations.

Forested areas within and adjacent to the Eurobodalla Quarry are mapped as Bush fire Prone Land (BFPL) - Vegetation Category 1 (with a 100 metre vegetation buffer). BFPL is land that has been identified by local council which can support a bush fire or is subject to bush fire attack. Vegetation category 1 is the most hazardous vegetation category and contains the most dense vegetation. The proposal will require clearing of some Category 1 vegetation. The proposal would not present any higher fire risks than existing operations.

Fire and bushfire risks are currently managed by the Eurobodalla Quarry Emergency Response Procedure. There is a low potential for the activities at the quarry to cause bushfire. The local bushfire season generally occurs between October and March, but is extended in some years. Fire hazards at the site include:

- The use of heavy machinery:
    - Heavy machinery has ignition risks through heat sources such as energised wiring and turbochargers which could spark fire.
    - Hot exhaust mufflers have the potential to cause vegetation fire although this risk would only occur during the vegetation clearing phase of the works.
    - Fuels and lubricant for plant and equipment are flammable substances. The risk is increased when these materials are stored onsite.
- Hot works such as welding, use of an oxygen/acetylene torch for cutting metal, use of a grinder.
- The storage of flammable materials (however, would be minimal).

As part of the existing operations at the Quarry, firefighting equipment is made available in all mobile machinery and all staff are aware of the equipment and trained in its use. Fire risks are heightened during the local bushfire season but are considered manageable with the implementation of appropriate measures. Hot works are not be undertaken on total fire ban days.

Environmental hazards as a result of the quarry activities mostly relate to the risk of hydrocarbon spills and leaks and their leaching into the soils, groundwater or nearby drainage courses. A Pollution Incident Response Procedure exists for the site (refer to EMP, Appendix H. The procedure would be implemented in the event of any spills at the site.

Other environmental hazards, such as noise and air pollution may be generated. Impacts associated with these aspects are discussed in Section 6.9 and Section 6.10 respectively.

Resource recovery and composting

There would be a number of hazards and risks associated with the proposed resource recovery operations at the site:

- Potential for hazardous or contaminated materials to be brought to the site within bulk deliveries.
- Risk of contaminating other quarry products if contaminated materials are processed at the site without detection.
- Risks associated with delivery of materials to the site by the public (operation of vehicles at the active quarry site).

Risks associated with the receival of contaminated or hazardous waste would be minimised through the development and implementation of a Waste Management Plan which provides documented procedures for checking, monitoring and recording of waste deliveries to the site.

Hazards and risks associated with the proposed composting operations include:

- Risk of ignition of composing materials which produce biogases.
- Biogas (methane and carbon dioxide) produced by the composting process may be a health risk to humans.
- Production of composting leachate, which may adversely quality of receiving waters if it discharges from the site.

Decomposition of most organics in the absence of oxygen yields biogas – a mixture of approximately 65% methane and 35% carbon dioxide. Uncontrolled emission of biogas can pose a fire risk. However, the risk of the proposed facility producing a fire risk is considered low as the composting will occur in open windrows and will not be carried out in a confined environment.

6.14.2 Safeguards and mitigation measures

Measures relating to waste management have been provided in Section 6.12. Measures relating to the management of traffic at the site have been provided in Section 6.8.

Additional safeguards and mitigation measures to manage hazards and risks include:

- Operate the quarry in accordance with the Eurobodalla Quarry Mine Safety Management Plan.
- All staff would be trained in the safe operation of machinery on site.
- All staff would be trained in the use of fire-fighting equipment.
- No hot works would be undertaken onsite during total fire ban days.
- All equipment used on site would be maintained in good condition and good working order.
- The Eurobodalla Quarry Emergency Response Procedure will be updated to reflect the new extraction areas and new activities occurring onsite.
- A copy of the Emergency Response Procedure will be available at the site office at all times and would be implemented in the event of an emergency (eg. bushfire).
- Signage will be provided to clearly indicate the location of and directions to the waste receivals area.
- Composting will generally be carried out in accordance with the NSW Office of Environment and Heritage's *Environmental Guidelines for Composting and Related Organics Processing Facilities* (DEC, 2004).
- The composting process outlined in Section 3.5 of this EIS would be implemented.

6.15 LAND USE

6.15.1 Existing environment

Existing land uses within the 'Elizabeth Farm' property include:

- Existing Eurobodalla Quarry extraction and processing activities
- Cleared agricultural land to the north and north east
- Livestock grazing
- Large forested areas on the western boundary of the property.

Land uses surrounding Elizabeth Farm include:

- Large tracts of the Dampier State Forest west and north of the property
- Residential dwelling located approximately 1.4 kilometres south of the existing main quarry site, and additional residential dwellings further south of this.
- Agricultural land.

6.15.2 Potential impacts

The key impact with regard to land use is related to grazing activities. The proposal would reduce the area available for grazing as stock would be excluded from the quarry site (including the extraction area and the stockpile areas), both during operations and in the post operation phase after rehabilitation has occurred. Grazing would continue to occur in other areas of Elizabeth Farm in the long term.

6.15.3 Safeguards and mitigation measures

Safeguards and mitigation measures relating to land rehabilitation have been included in Section 6.3. A Rehabilitation Strategy has been prepared and is included at Appendix G.

No additional measures relating to land use are considered necessary.

6.16 CUMULATIVE IMPACTS

Cumulative impacts, for the purpose of this assessment, relate to the potential interaction with other activities in the local area and the combined potential effects of different impact areas of the proposal.

In terms of land-use impacts, such as the loss of agricultural land to mining or the loss of native vegetation or threatened entities, the impact of the proposal is substantially lessened given the degraded nature of the proposal site. The site has previously been utilised by the forestry industry and evidence of that operation is still very visible at the site. Nonetheless, mitigation measures that ensure the area of disturbance is kept to the minimum necessary and the site is progressively rehabilitated would assist in minimising any cumulative land-use impacts.

During operation of the quarry, activities at the site would result in a number of the environmental impacts assessed in this EIS occurring concurrently with each other. Noise impacts would be generated at the same time that air quality may be impacted by dust, for example. Each impact has been considered to be highly manageable with the implementation of appropriate safeguards. Given the location of the proposed operation, cumulative impact from combined activities at the site are not expected to have any adverse effect on nearby sensitive receivers, adjoining landowners or people in vehicles travelling along nearby roadways.

A Rehabilitation Plan would be prepared in accordance with the Rehabilitation Strategy (Appendix G). Disturbed land will be rehabilitated to a condition that is self-sustaining, and which provides a long-term low maintenance site.

6.17 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

6.17.1 Summary of MNES searches

Table 6-20 presents a summary of searches for MNES within 10km of the proposal site, made using the Commonwealth Department of Sustainability, Environment, Water, Population and Communities' online Protected Matters Search tool (completed on 14 July 2016).

Table 6-20 MNES summary

Matter of National Environmental Significance	Items within 10km of site	Potential for impact?
World Heritage properties	None	Nil
National Heritage Places	None	Nil
Wetlands of International Significance	None	Nil
Great Barrier Reef Marine Park	None	Nil
Commonwealth Marine Areas	None	Nil
Threatened Ecological Communities	Two	Assessed in Section 6.5 and Appendix D. Significant impacts would not occur.
Threatened Species	18	Assessed in Section 6.5 and Appendix D. Significant impacts would not occur.
Migratory Species	12	Assessed in Section 6.5 and Appendix D. Significant impacts would not occur.

There is low likelihood of significant impact to MNES with the implementation of the safeguards developed in this EIS. Referral to the Commonwealth is not considered to be required.

6.18 PRINCIPLES OF ECOLOGICALLY SUSTANABLE DEVELOPMENT

The *Protection of the Environment Administration Act 1991* outlines a number of principles of ecologically sustainable development (ESD). These are presented and discussed in relation to the proposal, below.

6.18.1 The precautionary principle

According to the precautionary principle, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be seen as a reason not to protect the environment. The

use of the precautionary principle implies that proposals should be carefully evaluated to identify possible impacts and assess the risk of potential consequences.

The precautionary principle has been observed in the assessment of conservation values and environmental threats and impacts throughout this EIS. A cautious approach has been adopted in relation to the potential use of habitat by threatened species. Habitat evaluation was utilised to determine the likelihood of the threatened species to occur and be impacted by the proposed development. The approached assumed that threatened species could occur within the proposal site if the species is known or predicted to occur in the area and habitat and site conditions are appropriate, even if the species was not detected.

The development of mitigation measures and safeguards to manage impacts aims to reduce the risk of serious and irreversible impacts on the environment. Generally, throughout this assessment, there has been found to be a low level of uncertainty in regard to all factors assessed.

6.18.2 Inter-generational equity

The principle of inter-generational equity requires the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The proposal would involve low levels of use of finite resources, and contribute minimally to climate change. Based on the avoidance of environmental constraints and quarry design and operational procedures which aid rehabilitation, it is considered that the development is justified and would be ecologically sustainable within the context of the above ESD principles, in as much as is practicable. Resource recovery, recycling and composting activities would serve to reduce the demands on local landfills and would facilitate the sustainable and efficient use of local resources. This finding is subject to the implementation of mitigation measures contained in this EIS.

6.18.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity are a fundamental consideration of ESD.

The impacts of the proposal on local populations of threatened species, threatened communities and their habitats have been assessed in detail in Section 6.5. The proposal site has been reduced to remove an area of land which was found to be native vegetation during preparation of the biodiversity assessment (4.24 hectares). The activity is not likely to have a negative impact on long term biological or ecological diversity, subject to the implementation of mitigation measures contained in this EIS.

6.18.4 Appropriate valuation of environmental factors

This principle requires that "*costs to the environment should be factored into the economic costs of a project".* This EIS has examined the environmental consequences of the proposal and identified mitigation measures for factors which have the potential to experience adverse impacts. Requirements imposed in terms of implementation of these mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

7 SUMMARY OF MITIGATION MEASURES

Table 7-1 Summary of mitigation measures

No.	Mitigation measure
Surface hydrology and water quality	
WQ1	The SWMP that has been prepared for the proposed quarry expansion would be implemented (Appendix F). The aim of this plan is to ensure that all runoff captured by the site is adequately contained onsite.
WQ2	Construct stormwater management controls in accordance with the SWMP to ensure that all 'clean water' is diverted around the site using clean water diversion bunds and 'dirty water' from the site is captured within the sediment basin.
WQ3	Ensure that surface waters are diverted around the composting pad, and that all surface water from the composting pad is diverted into the leachate pond for storage.
WQ4	The site sediment basins are to be drawn down as soon as possible following a rain event to enable them to capture runoff from the next rainfall event. The cleaned water should be pumped to a location which allows for broad dispersed flow across a long, vegetated buffer to Swamp Creek.
WQ5	Review the post closure drainage and water management of the site once the quarry has been exhausted and final levels are known. If a depression is left on completion of the work, some regrading may be required to drain the site.
WQ6	Prior to discharge, water from the sediment basin would be tested and treated in accordance with the measures contained in the EMP and the EPL. Water would be flocculated if required. Water would not be discharged from the sediment basin until the level of suspended solids is less than 50mg/L.
WQ7	The leachate management controls described in Section 3.5.2 of this EIS would be implemented to minimise the potential impacts to surface water quality particularly through the following: o Installation, monitoring and maintenance of leachate and stormwater management controls (barriers, collection and storage systems) o Diversion of surface water run-on around the composting pad o Maintaining capacity in the leachate pond to enable the capture of runoff from the compost pad during the next rainfall event.
WQ8	Ensure all chemicals, fuels and oils kept on site are stored in accordance with manufacturer's recommendations and in a bunded or sealed area. The volume of this bunding will be greater than 110% of the volume of the largest container.
WQ9	Manage accidental spills of fuel and any other chemicals in accordance with the measures contained within the EMP (Section 4.2.2: Pollution Incident Response Procedure).
WQ10	Empty fuel, oil, lubricant and chemical containers are to be removed from the site and disposed of at a facility that is able to accept the waste.
WQ11	Monitor activity associated with the sediment basins with every significant rainfall event.

WQ12	During and following each discharge from the sediment pond, inspect the points of discharge for sediment deposits. If sediment deposits are observed, discharging should be ceased immediately. The water should be retreated and re-tested prior to further discharging.
WQ13	Monitor and inspect diversion swales to ensure they remain stable and are not contributing any sediment.
WQ14	Maintain a regular supply of flocculants on site and store in accordance with manufacturer's recommendations.
WQ15	Silts would periodically be removed from the sediment basin and reused in the production of quarry products.
Soil and landforms	
SL1	Strip and stockpile topsoil for reuse in accordance with Drawing SD4-1 from the Blue Book (Landcom 2004). Where there is sufficient space, stockpiles shall not be more than 2 metres high. Ideally stripping will done when the soil is moist and Eurobodalla Quarry should consider wetting the soil prior to stripping.
SL2	Spill kits would be stored onsite and staff trained in their use.
SL3	If any signs of contaminated soils are discovered (e.g. smell, discolouration, suspect rubbish), the site would be marked and the soil replaced to cover the contamination. The soil would be analysed without delay to determine the type of contamination and an appropriate management plan would then be developed and followed.
SL4	A detailed Rehabilitation Plan would be developed by a qualified person, in accordance with the Rehabilitation Strategy provided in Appendix G of this EIS. Aims of rehabilitation will be to provide a stable landform that is resistant to erosion, to preserve downstream water quality through adequate management of site surface water runoff and minimising weed infestation.
SL5	The Rehabilitation Plan would include input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).
SL6	Respread topsoil immediately following the closure and regrading (if required) of each worked section of the quarry. The quarry floor and benches would then be revegetated and rehabilitated as soon as possible.
SL7	Monitor revegetated areas to ensure good strike rates with revegetated areas.
SL8	Monitor rehabilitated areas to ensure they remain stable and free from erosion.
SL9	Repair any erosion - regrading to ensure an even surface and diversion of surface runoff around disturbed areas and if required use jute or mulch and reseed locally.
Biodiversity	
B1	Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, parawebbing or similar.
B2	The existing riparian vegetation along Swamp Creek would be permanently fenced to prevent impacts to the River Flat Eucalypt Forest EEC. The fencing should exclude stock from the riparian vegetation and allow access for ongoing management, including impact monitoring and weed control.

B3	A 50 metre buffer strip should be maintained between the proposed works boundary and the top bank of Swamp Creek to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC.
B4	If stock grazing is to be carried out within the 50m buffer strip, grazing management practices (such as rotational grazing) should be implemented, to control grazing impacts and to ensure that naturally regenerating vegetation is not adversely affected.
B5	The Biodiversity (fauna) Construction Management Protocol included at Section 3.3 of the EMP (Appendix H) is to be implemented to mitigate impacts to native fauna.
B6	Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.
B7	Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera.* Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection.
B8	During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation.
B9	Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil.
B10	Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas.
B11	No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.
With the implementation of the biodiversity management measures above, it is considered that impacts would be avoided where possible and effectively mitigated, where avoidance is not possible. All areas disturbed by the works would eventually be subject to a detailed Rehabilitation Plan. The Rehabilitation Strategy to guide development of the plan is provided at Appendix G and requires that the pre-development habitat values be reinstated or improved at the site in the long term. A such, this ensures an overall 'maintain environmental values' objectives has been met and therefore further offsets are not proposed.	
Aboriginal Heritage	
AH1	If work on the quarry expansion is to proceed, the site Eurobodalla Quarry AS1 should be fenced to prevent inadvertent disturbance. A buffer of at least 10m should be included.
AH2	If any work was to extend beyond the proposal boundary in the vicinity of the site Eurobodalla Quarry AS1, an Aboriginal Heritage Impact Permit must be obtained. This would require

	undertaking an Aboriginal Cultural Heritage Assessment (ACHA) including Aboriginal consultation. under the Guides and Codes of practice provided by OEH.
AH3	Staff should undertake an Aboriginal Heritage Induction prior to the commencement of the expansion works, particularly prior to any work in the proposed expansion north of Eurobodalla Quarry.
AH4	An Aboriginal Heritage Unexpected Finds Management Plan should be established for Eurobodalla Quarry.
AH5	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) may be required; and
AH6	Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.
Historic Heritage	
HH1	Should an item of historic heritage be identified, works in the vicinity of the find would cease. The Heritage Division (NSW Office of Environment and Heritage) would be contacted prior to further work being carried out in the vicinity of the find.
Traffic and Transport	
TT1	Traffic management protocols would be developed and required for all Eurobodalla Quarry Drivers. The protocol would be made available to all regular suppliers. They would aim to further reduce risks encountered on the haulage network, specifically, between the quarry site and the Eurobodalla Road/ Princes Highway intersection. Protocols would include: o The speed limit of 40km/hr shall be adhered to for any unsealed section of the haul route. o Specifying any higher risk periods, such as the timing of the local bus connection. o Requirements to report hazardous conditions, such as pot holing, when they appear, to the road administrator.
Noise	
N1	All equipment used on site would be in good condition and good working order.
N2	Vehicles would be kept properly serviced and fitted with appropriate mufflers.
N3	Where reasonable and feasible, activities that generate high noise levels would be substituted with alternative processes that generate less noise.
N4	Works will be restricted to: o 7am to 6pm Monday to Friday o 7am to 12pm on Saturdays o No work on Sundays or public holidays.
N5	A complaints register would be maintained and noise and vibration complaints would be responded to promptly.
Air quality	

AQ1	During dry, windy periods: o A water cart shall be made available and used to dampen unsealed sections of the haul routes, stockpiles and loading pads. o Visual monitoring of dust generation will be undertaken and quarrying activities will be limited if dust generation becomes unmanageable.
AQ2	A speed limit of 40km/h shall be adhered to for any unsealed section of the haulage route.
AQ3	All blast holes would be stemmed with aggregate to avoid creating excessive dust during blasting.
AQ4	Vehicles and motorised equipment would be maintained so that emissions are minimised.
AQ5	Vehicles and machinery will be switched off when not in use, rather than leaving them to idle.
AQ6	A complaints register would be maintained and air quality complaints would be responded to promptly.
Waste Management	
W1	Green waste from vegetation clearing would be mulched at the site for composting, or used in the management of soil and water.
W2	Topsoil stripped from the proposal area would be stockpiled for onsite landscaping and rehabilitation.
W3	A Waste Management Plan (WMP) would be prepared for the resource recovery, recycling and composting activities. The WMP would include, but not be limited to the following measures: o All incoming wastes would be subject to visual inspection prior to unloading, during unloading and after unloading, to determine waste acceptability. NCW is either: ▪ Not unloaded and the load is rejected prior to tipping; or ▪ Rejected following tipping, reloaded and the driver instructed to remove the load from the site. o Wastes would be delivered to designated locations at the hardstand area. o A waste rejection register would be maintained to detail the types and quantities of non-conforming wastes rejected from the site, including the reasons for the waste rejection.
Social and economic impacts	
SE1	Nearby residents will be notified of the proposal and feedback sought.
SE2	A complaints register would be maintained and complaints would be responded to promptly.
Hazards and risks	
H1	Operate the quarry in accordance with the Eurobodalla Quarry Mine Safety Management Plan.
H2	All staff would be trained in the safe operation of machinery on site.
H3	All staff would be trained in the use of fire-fighting equipment.
H4	No hot works would be undertaken onsite during total fire ban days.
H5	All equipment used on site would be maintained in good condition and good working order.

H6	The Eurobodalla Quarry Emergency Response Procedure will be updated to reflect the new extraction areas and new activities occurring onsite.
H7	A copy of the Emergency Response Procedure will be available at the site office at all times and would be implemented in the event of an emergency (eg. bushfire).
H8	Signage will be provided to clearly indicate the location of and directions to the waste receivals area.
H9	Composting will generally be carried out in accordance with the NSW Office of Environment and Heritage's *Environmental Guidelines for Composting and Related Organics Processing Facilities* (DEC, 2004).
H10	The composting process outlined in Section 3.5 of this EIS would be implemented.

8 LIST OF APPROVALS AND LICENCES

The following approvals would be required to carry out the proposed works:

- Development consent – Eurobodalla Shire Council
- A modification to the Environment Protection Licence

9 JUSTIFICATION AND CONCLUSION

Eurobodalla Quarry's proposal to expand the Eurobodalla Quarry pit and to undertake Resource Recovery activities, including composting, is to be assessed under EP&A Act, with the Eurobodalla Shire Council being the consent authority. The proposal is a designated development and this EIS has been completed to address the proposal specific SEARs.

This EIS reviews the environmental impacts associated with the expansion of the Eurobodalla Quarry and the establishment and operation of resource recovery activities and open windrow composting.

High risk environmental impacts that have been reviewed and assessed in this EIS include:

- Soil and landforms
- Surface water and hydrology
- Biodiversity impacts

Specific mitigation measures have been committed to as part of the approval of the project to address these impacts:

- A Site Water Management Plan has been developed to ensure that surface water controls are designed appropriately to collect all surface water runoff from the site for treatment.
- A Rehabilitation Plan, to manage the progressive stabilisation of landforms abd revegetation to resist erosion and weed infestation.
- An Environmental Management Plan has been prepared which incorporates the mitigation measures from this EIS and provides a framework for environmental monitoring and reporting at the quarry site.
- A commitment has been made to prepare a Waste Management Plan that describes how the waste will be handled, treated and transported and describes the measures that will be implemented to ensure that the operation of the facility is carried out in accordance with the POEO Act 1997.

On balance, the impacts are considered manageable and justified. Advantages to expanding the quarry include:

- Continued access to a locally important resource, utilising established environmental controls and practices that are known to manage environmental impacts effectively.
- Continued supply of a local quarry product will reduce the need to source and transport quarry products large distances from outside the region.
- Expansion would allow Eurobodalla Quarry to continue extracting and processing quality products for sale to customers such as Council, at economical prices.

The benefits of establishing resource recovery and composting facilities at the site include:

- Resource recovery and composting activities would facilitate the sustainable and efficient use of local resources.
- Impacts on municipal waste management are expected to be predominately positive, through reducing demands on local landfills and associated costs.

With the effective implementation of mitigation meaures contained in this EIS, the identified impacts are not considered significant and the development is justified.

10 DECLARATION

This Environmental Impact Statement provides a true and fair assessment of the proposed expansion of the Eurobodalla Quarry and carrying out of resource recovery activities, in relation to the potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal. This statement has been prepared in accordance with clauses 72 and 73 and Schedule 2 of the E*nvironmental Planning and Assessment Regulation 2000*.

Environmental Impact Statement prepared by

Name: Alana Gordijn, NGH Environmental

Qualifications: Bachelor of Science

Address: 17/27 Yallourn st, Fyshwick, ACT 2609

Proponent

Applicant name: Troy Hollis (Eurobodalla Quarry)

Applicant address:

Land to be developed: As shown in the Environmental Impact Statement (Section 3.1.2).

Environmental Impact Statement

An Environmental Impact Statement is attached.

Certificate

I certify that I have prepared the contents of this Environmental Impact Statement and to the best of my knowledge:

(i) the statement has been prepared in accordance with Schedule 2 of the NSW *Environmental Planning and Assessment Regulation 2000*;

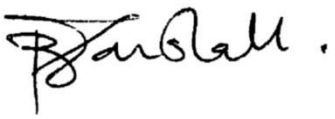
(ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates; and

(iii) that the information contained in the statement is neither false nor misleading.

Name: Alana Gordijn, primary author

Date: 17/12/2016

Name: Brooke Marshall



Date: 17/12/16

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12 GLOSSARY

AADT	Annual Average Daily Traffic
AHIMS	Aboriginal heritage information management system
ASL	Above sea level
AWS	Automatic weather station
BOM	Australian Bureau of Meteorology
EMP	Environmental management plan
CMA	Catchment Management Authority
Cwth	Commonwealth
DA	Development Application
DECCW	Refer to OEH
DP&I	(NSW) Department of Planning and Infrastructure
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIA	Environmental impact assessment
EPA	Environment Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
EPL	Environment Protection Licence
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ESC	Eurobodalla Shire Council
ESD	Ecologically Sustainable Development
FM Act	*Fisheries Management Act 1994* (NSW)
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
INP	Industrial Noise Policy
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
KFH	Key Fish Habitat
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
m	Metres
ML	Megalitres
NCW	Non-conforming Waste

NES	Matters of National environmental significance under the EPBC Act (*c.f.*)
Noxious Weeds Act	*Noxious Weeds Act 1993* (NSW)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
NV Act	*Native Vegetation Act 2003* (NSW)
NVIS	National Vegetation Information System
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
PMST	Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act 1997*
REP	Regional Environmental Plan
RL	Relative Level
RMS	Roads and Maritime Services
SCIVI	South Coast – Illawarra Vegetation Integration
SEARs	Secretary's Environmental Assessment Requirements
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy (NSW)
SHI	State Heritage Inventory
SIS	Species Impact Statement
sp/spp	Species/multiple species
SWMP	Site Water Management Plan
TBSA	Threatened Biodiversity Survey and Assessment
TIA	Traffic Impact Assessment
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
VENM	Virgin Excavated Natural Material
WAL	Water Access Licence
WMP	Waste Management Plan
WSP	Water Sharing Plan

EIS APPENDICES

APPENDIX A: SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

APPENDIX B: TEST DRILL RESULTS

APPENDIX C: QUARRY PLAN

APPENDIX D: BIODIVERSITY DATA AND ASSESSMENT INFORMATION

APPENDIX E: ABORIGINAL HERITAGE DUE DILIGENCE ASSESSMENT

APPENDIX F: SITE WATER MANAGEMENT PLAN

APPENDIX G: REHABILITATION STRATEGY

APPENDIX H: ENVIRONMENTAL MANAGEMENT PLAN

APPENDIX I: NOISE IMPACT ASSESSMENT (2002)

COUNCIL ASSESSMENT REPORT ATTACHMENT 2 – Response letter dated 11 May 2017 to matters raised in Council's letter dated 22 February 2017

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11 May 2017

David Sheehan
Development Assessment Officer
Eurobodalla Shire Council

Dear David,

RE – DA 366/17 for quarry expansion and resource recovery facility Lot 1 DP 1165095, Nerrigundah Mountain Road Eurobodalla

With reference to the above project, please find attached further information, addressing matters raised in your letter 22 February 2017. Key issues include:

1. Further site work, modelling and stormwater design has been undertaken to inform water quality management. Specifically:
    a. MUSIC modelling of the catchment;
    b. Confirmation of basin locations, size adequacy, sizing calculations, and other devices required to manage water containment and release;
    c. Water monitoring recommendations; and
    d. Preparation of an updated water management plan.
2. Discussion of traffic impacts, and a revision of the mitigation measures for traffic.
3. Further biodiversity surveys and assessment have been undertaken to address species and communities with potential for impact. This has included;
    a. Three nights of nocturnal surveys for hollow dependant fauna (spotlighting, call play back, anabat recording for micro bats);
    b. Assessments of significance;
    c. Further information regarding offset commitments;
    d. Further assessment and clarifications, as required, regarding potential for species to occur and be impacted by the development; and
    e. A revision of the mitigation measures for biodiversity.
4. Further details regarding resource recovery operations and sale of products from the site.
5. A revision of the mitigation measures for managing Aboriginal Heritage impacts.

A summary of our response is provided overleaf and the Water Quality and Biodiversity Addendums are appended. A number of changes are proposed to the mitigation measures provided in the EIS to address matters raised by agencies. These are discussed overleaf and a complete revised set of mitigation measures is provided in Appendix C.

We would be pleased to discuss these matters further to ensure you have all the information required to determine the application.

Yours sincerely,

Brooke Marshall | Manager, NSW SE & ACT
Certified Environmental Practitioner (CEnvP)
T (02) 6492 8333 D (02) 6492 8303 M 0437 700 915 F (02) 6494 7773

EUROBODALLA QUARRY
RESPONSE TO COUNCIL LETTER OF 22 FEBRUARY 2017

Matters are addressed in the order of the council letter.

1.1 GENERAL

It is noted that additional fees will apply as the project is considered Integrated Development.

1.2 WATER QUALITY

Overview of submissions received

Council have requested additional information regarding water quality impacts, stormwater management and sediment measures.

It is noted that key DPI Fisheries concerns were:

- Impacts on water quality and Key Fish Habitat (KFH) from ongoing quarrying and resource recovery, sediment basins, leachate from composting facility.
- Width of a riparian buffer zones adjacent to a highly sensitive KFH should be a minimum of 100 metres.
- Sensitive downstream waters (ie. protected wetlands, Batemans Marine Park). Onsite water management should be designed to achieve a neutral impact on receiving waters.
- Capacity of proposed leachate storage is not clear (2yr 30min event, or 10yr 24hr event?). Department seeking clarification on the actual size of the rainfall event that the ponds are being designed to cope with.
- Design and location of vegetated dispersal paths to be provided to DPI fisheries.

Further EPA concerns included:

- Need to demonstrate how stormwater will be managed on site to ensure the discharges from new sediment basins will meet the NSW WQO (water quality objectives).
- Basin size and discharge criteria must be developed in accordance with the NSW WQO and ANZECC guidelines.
- Demonstration of whether the discharge criteria for pollutants will maintain or restore the environmental values of the receiving waters.

It is noted a 100 metre wide riparian buffer zone could not be achieved in the design of the quarry expansion. A large volume of resources exists within this area that would be sterilised if a 100 metre buffer was retained, reducing the feasibility of the proposal. The proponent has determined the maximum achievable buffer between the development and Swamp Creek to be approximately 60 metres. This 60 metre buffer was applied to the design during the development of the WQMS, which is summarised below.

Water Quality Management Strategy

A Water Quality Management Strategy (WQMS) has been developed by Southeast Engineering and Environmental to address concerns raised by Council. The WQMS is provided in Appendix A and provides the following:

- An outline of the relevant water quality objectives (WQO's)applicable for the development proposal and receiving waters.
- An updated Water Management Plan, detailing the types of erosion and sediment controls required and their locations (including size and location of sediment basins and leachate pond).
- Detailed results of the sediment basin and leachate pond sizing calculations and the parameters applied, based on the following EPA publications:

- *Environmental Guidelines Solid Waste Landfills – second edition 2016 NSW EPA.*
- *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills (NSW DECC 2008).*

- Additional information and assessment regarding the potential water quality risks associated with the development proposal. This included undertaking MUSIC modelling (Model for Urban Stormwater Improvement Conceptualisation) to quantify pollutant loads and concentrations within receiving waters both upstream and downstream of the quarry site to estimate the potential impact of the proposal and the treatment levels that could be achieved.
- An assessment of the potential water quality impacts of the development proposal in the context of the recommended water management measures and the WQO's for the site and receiving waters.
- Additional water management mitigation measures for the development proposal in accordance with relevant environmental guidelines.

The impact assessment presented in the WQMS has adopted the WQO's for high-conservation value aquatic ecosystems of the Tuross River catchment. In addition, the WQMS has adopted the set of trigger value exceedance levels and corresponding water quality condition ratings that have were determined by ESC and OEH for ESC's Estuary Health Monitoring Program (BMT WBM, 2011).

1.3 TRAFFIC IMPACTS

It is noted that there will be an additional maintenance levy for incoming vehicle loads.

Additionally, Roads and Maritime Services have requested that Intersection modelling using SIDRA be undertaken for the junction of Eurobodalla Road and the Princes Highway. The SIDRA modelling has been requested to demonstrate that acceptable level of service is maintained, given that Eurobodalla Quarry is seeking to expand the quarry and increase the maximum annual extraction rate to 175,000 tonnes per year (currently approved at 100,000 tonnes per year).

Eurobodalla Quarry is seeking to increase the maximum annual extraction rate to enable the quarry to service large projects in the local area. The primary project that Eurobodalla Quarry anticipates to supply large quantities of materials to is Eurobodalla Shire Council's proposed Southern Water Storage Dam. Eurobodalla Quarry has held discussions with ESC over the past year regarding the supply of materials for this dam, particularly the large quantities of clay that would be required for the dam core. If Eurobodalla Quarry were to supply the required amount of materials for this project, the quarry extraction rates would potentially exceed the currently approved rate of 100,000 tonnes in one year, particularly when combined with the regular supply of quarry materials to other customers. Therefore, the proposed increase to the maximum extraction rate is primarily to allow Eurobodalla Quarry to supply to the Southern Water Storage Dam. The dam would be located on Eurobodalla Road approximately 5km from the entrance to the Eurobodalla Quarry site. Thus, the supply of materials to the dam would not require materials to be transported through the Eurobodalla Road/ Princes Highway intersection. At this time, Eurobodalla Quarry does not anticipate any increase to the truck movements through the intersection of Eurobodalla Road and the Princes Highway. On this basis, Eurobodalla Quarry does not propose to complete Intersection modelling using SIDRA as part of the current Development Application.

Should Eurobodalla Quarry anticipate an increase in the allowed truck movements through the intersection of Eurobodalla Road and Princes Highway intersection, Eurobodalla Quarry commits to engaging a specialist to complete SIDRA modelling of the intersection to determine whether an acceptable level of service would be maintained. If the modelling identified that an acceptable level of service would not be maintained, Eurobodalla Quarry would identify suitable infrastructure required to ameliorate any traffic impacts and safety impacts associated with the increased volume of trucks moving through the intersection.

An additional mitigation measure is proposed to be included to manage this issue:

- **T2 - A specialist would be engaged to complete SIDRA modelling of the Eurobodalla Road/ Princes Highway intersection if any increase to current Eurobodalla Quarry traffic volumes is proposed in this location.**

This is included in the complete revised set of mitigation measures (Appendix C).

1.4 BIODIVERSITY IMPACTS

Council require additional information to assess biodiversity impacts. A Biodiversity Assessment addendum has been prepared and is included at Appendix B. The following matters raised by Council are now addressed in the Biodiversity Assessment addendum:

- 7-part test of significance for hollow dependent fauna known to exist within 10km of the development.
- 7-part test required for River Flat Eucalypt Forest, with attention to the potential indirect impacts resulting from erosion and sedimentation.
- Loss of 11 HBTs to be discussed as a KTP and consideration given to whether the HBTs provide a key roosting/breeding habitat for hollow dependent fauna, particularly the Powerful Owl.
- Results of additional surveys including three nocturnal surveys targeting hollow dependent fauna.
- Offsetting to address the loss of 4.24 ha of native vegetation onsite.
- Clarification of the mitigation measures to address impacts of development on biodiversity.

Additionally, in consideration of OEH comments, additional information is included in the Biodiversity Assessment addendum report (Appendix B) in relation to:

- Impacts on Lowland Grassy Woodland.
- Direct or indirect impacts of clearing intact native vegetation and additional threatened species.
- Require mitigation measures for the removal of wombat burrows.

Based on additional field work and literature review and assessment, the conclusion of the revised assessment is that:

- The proposed works are not expected to result in a significant impact to any of the listed species.
- The proposed works would not significantly affect the River-flat Eucalypt Forest EEC in the study area.

Regarding the occurrence of Lowland Grassy Woodland, given the high representation of species which are diagnostic of the adjacent forest communities, the scale and ecotonal context of the site and the dominance of non-woodland eucalypts, the vegetation is not considered to be derived from the Southeast Lowland Grassy Woodland SCIVI community, and is not likely to belong to the NSW EEC or Commonwealth CEEC.

Mitigation measures have been recommended to minimise the risks associated with the project to threatened fauna and communities and include conducting the tree felling in accordance with a protocol to reduce risk of injury or death to resident fauna, as well as the implementation of WQMS and related measures in the EMP to protect the River Flat Eucalypt Forest EEC. Additional mitigation measures have been added to the Biodiversity (Fauna) Construction Management Protocol to address comments raised by OEH; specifically:

- **B5 -** The following Biodiversity (fauna) Construction Management Protocol included must be implemented to mitigate impacts to native fauna:
    - **Pre-clearance surveys of all trees (including non-hollow-bearing trees) is also to be completed to ensure that no koalas are present within the development footprint.**
    - The fauna spotter should also be present during the removal of any burrows, specifically wombat burrows, and where possible, a pre-clearance survey should occur to confirm whether any (wombat) burrows to be removed are currently occupied. **This would involve the use of a small flexible inspection camera capable of being inserted at least 5 m into the burrow.**
    - **If any wombat burrows are found to be occupied, then a process is to be implemented to ensure that the burrow is empty prior to removal. This is likely to involve monitoring of the burrow, and when confirmed empty (i.e. when the animal is seen leaving the burrow, and the inspection camera used to confirm it is empty of any other individuals), a wire net should be installed across**

the opening of the burrow to prevent any animals re-entering the burrow. The net is to remain in place until the burrow has been removed.

Regarding offsets, in accordance with the ESC request, the project now shows it can provide a clearing to offset ratio of approximately 1:3, which meets the ESC requirement (refer to Section 2.2.3 of Biodiversity Assessment Addendum). The offset will also include objectives to increase the biodiversity values of the area, including fencing off and protection of the River Flat Eucalypt Forest EEC that forms a riparian buffer to the adjoining Swamp Creek. It is proposed to exclude the offset area from any future development through an agreement made with and to the satisfaction of ESC.

1.5 RESOURCE RECOVERY/LANDSCAPING SUPPLIES

Further information was requested regarding the nature of the sale of products from the Eurobodalla Quarry (eg. details and methods of release and delivery of landscaping supply products).

Landscaping supply products will only be sold wholesale, generally to landscaping suppliers in the region. No retail sales will be made to customers from the general public and access to the Eurobodalla Quarry by the general public will not be permitted. The movement of landscaping products from the site will be undertaken in a similar manner to that which is currently undertaken for the transporting of quarried materials from the site. The specific arrangements and methods for transport and delivery of landscaping materials from Eurobodalla Quarry to its wholesale customers (ie. Landscaping suppliers) would be determined at the time of sale. Methods of delivery will depend on the type and quantity of products being sold and bought.

1.6 ABORIGINAL HERITAGE

Council noted that OEH have reviewed the Aboriginal Heritage assessment documentation that was submitted with the EIS (Due Diligence Report) and appear generally satisfied. OEH have suggested several amendments to the mitigation measures specified in the EIS, including the addition of an Aboriginal Heritage Unexpected Finds Management Plan.

The Environmental Management Plan will be updated with a revised set of mitigation measures relating to the management of Aboriginal Heritage, as follows (amended text in ***bold***):

- **AH1 -** If work on the quarry expansion is to proceed, the site Eurobodalla Quarry AS1 ***must*** be fenced to prevent inadvertent disturbance. A buffer of at least 10m ***must*** be included.
- **AH2 -** If any work was to extend beyond the proposal boundary in the vicinity of the site Eurobodalla Quarry AS1, an Aboriginal Heritage Impact Permit must be obtained. This would require undertaking an Aboriginal Cultural Heritage Assessment (ACHA) including Aboriginal consultation. under the Guides and Codes of practice provided by OEH.
- **AH3 -** Staff ***must*** undertake an Aboriginal Heritage Induction prior to the commencement of the expansion works, particularly prior to any work in the proposed expansion north of Eurobodalla Quarry.
- **AH4 -** An Aboriginal Heritage Unexpected Finds Management Plan ***must*** be established for Eurobodalla Quarry.
- **AH5 -** If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) may be required; and
- **AH6 -** Any activity proposed outside of the current assessment area ***must*** also be subject to an Aboriginal heritage assessment.

Regarding mitigation measure AH4 – An Aboriginal Heritage Unexpected Finds Management Plan would be established for the quarry following determination of DA 366/17. The plan would be established prior to the commencement of any work under DA 366/17.

As recommended by OEH, the EMP will also be updated to include a requirement for monitoring the protection of the Aboriginal site 'Eurobodalla Quarry AS1'. Appropriate records must be kept which demonstrate that the Aboriginal site has been protected, such as taking periodic photographs at the location of the Eurobodalla Quarry AS1 site.

It is noted that the Aboriginal site recording form has now been submitted for 'Eurobodalla Quarry AS1'. Operational site plans will be updated to identify the location of the Aboriginal site 'Eurobodalla Quarry AS1'.

APPENDIX A WATER QUALITY MANAGEMENT STRATEGY

[Attached separately]

Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations.

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Document Verification

Document title: Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations

Project number: 361

Prepared by: Lachlan Bain and Brogan Addison

Issue and date: B 08/05/2017

Issue to: Alana Gordijn and Brooke Marshal

Document history: Issue B 08/05/2017, Issue A – 05/04/2017

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Table of Contents

1.0 INTRODUCTION

Southeast Engineering and Environmental have been engaged to review and enhance the Water Quality Management Strategy for the proposed Eurobodalla Quarry Expansion and Resource Recovery Activities.

The purpose of this document is to add to the information provided in the Environmental Impact Statement (EIS) prepared by NGH Environmental in the following ways:

- Outline the relevant water quality objectives applicable for the development proposal and receiving waters
- Provide additional information and assessment regarding the potential water quality risks associated with the development proposal
- Develop appropriate water management measures for the development proposal in accordance with relevant environmental guidelines
- Provide an assessment of the potential water quality impacts of the development proposal in the context of the recommended water management measures and the water quality objectives for the site and receiving waters

1.1. The Proposal

A detailed description of the proposed Eurobodalla Quarry expansion can be found in Section 3 of the EIS prepared by NGH Environmental.

1.2. Feedback from Council and Agencies

The EIS was submitted to Eurobodalla Shire Council (the determining authority) in early January 2017, which was then forwarded to various state departments for comment including NSW EPA and DPI Fisheries, the feedback around site water management and water quality impacts was that the EIS did not sufficiently demonstrate how water quality impacts would be managed for the Proposal. There were specific concerns about the proposed water quality measures including the capacity of the proposed sediment basins and compost leachate pond. There was also request for demonstration as to how stormwater will be managed on site to ensure that discharges from the Proposal will meet the NSW Water Quality Objectives (WQOs). This management plan addresses these items.

1.3. Policy context and legislative framework

A brief summary of the strategic policy and guidelines that have been considered as part of the development for the Water Quality Management Strategy is provided below.

Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000)

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000), (referred to as the ANZECC water quality guidelines) form part of the National Water Quality Management Strategy and list a range of environmental values for water bodies.

Different water quality criteria are set for the water bodies based on environmental values assigned to that water body. These values include consideration as to whether the water is to be used for drinking, recreation or according to ecological values. The ANZECC water quality guidelines provide water quality criteria (scientifically-based benchmarks) for a wide range of parameters with the aim to maintain these values. The ANZECC guidelines state that "The Guidelines should not be used as mandatory standards because there is significant uncertainty associated with the derivation and application of water quality guidelines" (ANZECC, 2000, Chapter 1 Introduction). However the guidelines provide a useful measure of risks to aquatic ecosystem health.

The EPA submission to the preparation of the EIS requests that the basin size and discharge criteria; '*must be developed in consideration of the NSW WQO and ANZECC Guideline*'.

The guidelines have been used to undertake the sizing of water quality measures at the site, including basin sizing, through the use of water quality modelling. The water quality model includes the receiving waters' catchments along with the development site to assess how the in-situ water quality of the receiving waters may change, and compare with the ambient water quality guidelines. The ambient water quality concentration targets do not directly apply to discharge concentrations at the site.

There are guidelines specifically derived for the management of stormwater runoff for specific activities including the *Environmental Guidelines Solid Waste Landfills – second edition 2016 NSW EPA,* and *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills (NSW DECC, 2008),* as discussed below.

ANZECC guidelines are ambient water quality guidelines, appropriate for the monitoring of baseflows or water bodies and have been used in assessments such as the Eurobodalla Shire Council's Estuary Health Monitoring program (BMT WBM, 2011) as an indicator of existing water quality.

NSW Water Quality Objectives

The NSW Water Quality Objectives (WQOs) are consistent with the agreed national framework and are primarily aimed at maintaining and improving water quality, thereby supporting aquatic ecosystems, recreation and where applicable water supply and the production of aquatic foods suitable for consumption and aquaculture activities (DECCW, 2006).

NSW WQOs have been developed for most river catchments in the state. The receiving waters for the quarry, Swamp Creek, is a tributary of Tuross Lake, defined by the EPA as a sensitive environment, which in turn is part of the Batemans Marine Park which is also defined by the EPA as a high conservation value ecosystem. Based on the ultimate receiving waters the WQOs of relevance for potential pollutants from the Proposal are listed in Table 1.1.

In addition to these WQO trigger levels, exceedance levels assist in determining aquatic heath. Through Eurobodalla Shire Council's Estuary Health Monitoring program (BMT WBM, 2011), Council and the Office for Environment and Heritage (OEH) developed water quality condition descriptors based on the level of exceedance of trigger values. These have been adopted in this case to assist in assessing potential water quality impacts (Table 1.2).

Table 1.1 Default Water Quality Objectives for Swamp Creek

Parameter	**Measure**
Total phosphorus	25 µg/L
Total nitrogen	350 µg/L
Turbidity	6–50 NTU, although for a coastal river likely to be towards the lower end
pH	6.5–8.5

Table 1.2 Exceedance for Tuross estuary for Water Quality parameters

Percentage exceedance of trigger values	**Water quality condition rating**
0-15%	Very Good
15-30%	Good
30-50%	Fair
50-75%	Poor
75-100%	Very poor

Other Guidelines

NSW State Government agencies have developed a range of water quality management guidelines available that provide design parameters for developments such as these to provide protection for sensitive receiving waters.

Table 1.3 contains a range of recommended design events assumed for the design of water quality management measures based on relevant environmental guidelines assuming a lifespan of greater than three years and receiving environment of high conservation value.

In addition to the design criteria outlined, the water quality modelling software Model for Urban Stormwater Improvement Conceptualisation (MUSIC) has been used to provide a hypothetical (un-calibrated) comparison of the water quality in receiving waters upstream and downstream of the quarry. This provides an indication of the water quality impacts from the site through a comparison with the WQOs adopted for the receiving waters and guidance for discharge controls for the sediment basins.

Table 1.3 Minimum design criteria for water management measures for sensitive (high conservation) receiving waters.

Water management system	**Event**
Temporary drainage controls [1,2]	20y / 5% AEP
Temporary sediment controls [1,2]	20y / 5% AEP
Type F or D sediment basin [1,2]	5 day 95th %ile rainfall
Sediment basin spillway structure [1,2]	100y / 1% AEP
Leachate pond volume [3]	10y 24h duration storm

[1] Managing Urban Stormwater - Soils and Construction Volume 2E, Mines and Quarries (DECC, 2008)

[2] Managing Urban Stormwater - Soils and Construction Volume 2B, Waste Landfills (DECC, 2008)

[3] Environmental Guidelines for composting and related organics processing facilities (DECC, 2003)

2.0 SURFACE WATER MANAGEMENT

2.1. Topography and Soils

Refer to section 6 of the EIS document for descriptions of site soils and geology.

2.2. Hydrology

The existing quarry and the Proposal will discharge surface runoff via controlled sediment basins and other water quality management systems indirectly to Swamp Creek. The discharge points are located at their closest approximately 60m from the creek bank.

Upstream of the quarry, the catchment of Swamp Creek consists almost entirely of a forested catchment of about 3400ha that is managed by NSW State Forests and undergoes logging operations periodically. The landscape over this catchment is generally too steep and of poor soil type to support agricultural activities.

Downstream of the quarry, the catchment land use of Swamp Creek becomes more diverse including grazing and cropping over the alluvial areas before connection with the Tuross River approximately 4 kilometers downstream (Figure 2.1).

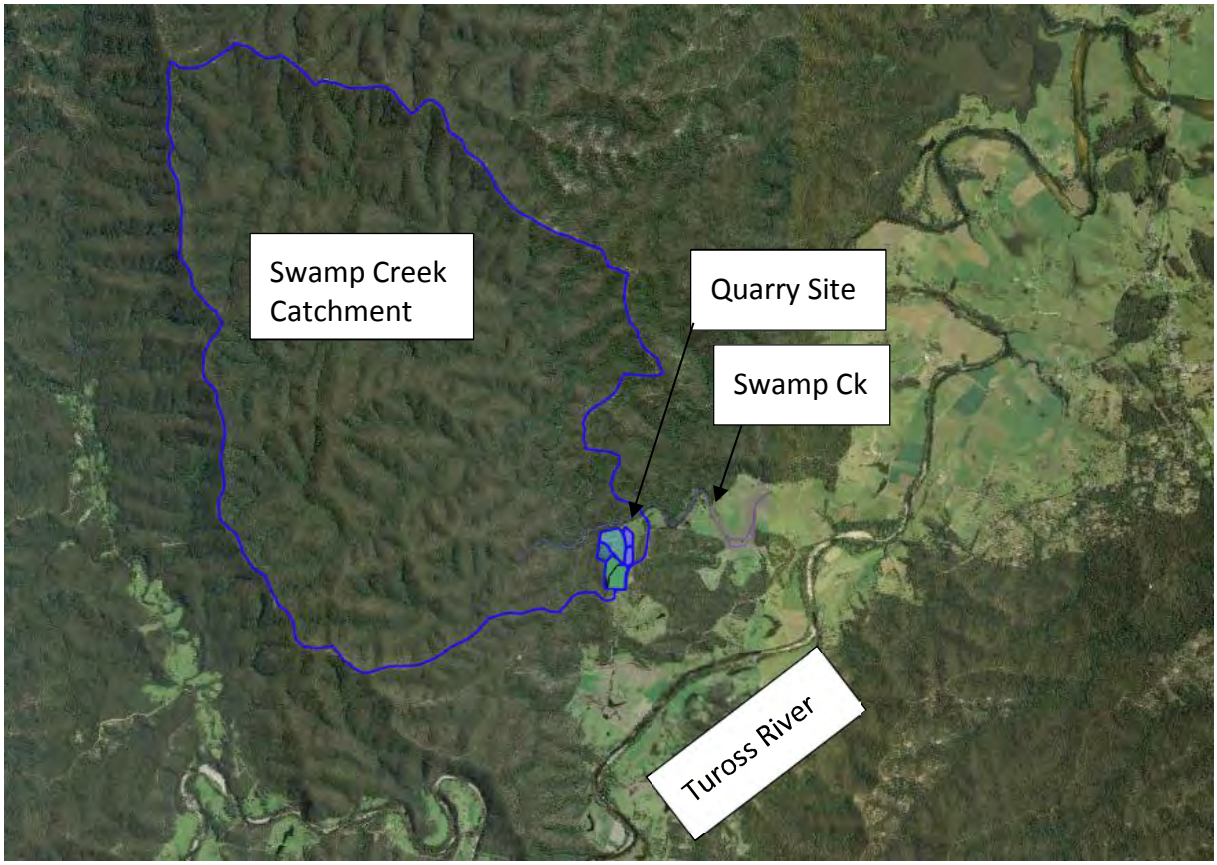


Figure 2.1 Catchment locality

2.3. Watercourse buffers and water quality

It is noted that DPI Fisheries recommended in their submission that a 100 metre buffer be provided between the quarry and the top bank of Swamp Creek. The proponent has determined that the maximum achievable buffer from the quarry boundary to Swamp Creek is 60 metres. The retention of this landscape between the quarry operations and Swamp Creek provides for flora and fauna habitat, a fauna corridor as well as informal water quality treatment that would occur between the site and Swamp Creek. Informal water quality treatment within the buffer would generally be of the form of sedimentation through slowing of flows through vegetation, and other biological and physical processes that would occur in the small flow paths between the site discharge and Swamp Creek.

Water quality modelling used in this assessment excludes the treatment processes outlined above to present a conservative approach to water quality management system sizing. Although buffers can perform useful water quality improvement functions, caution is recommended in relying on these for treatment as they are uncontrolled, and more suited to management of diffuse pollutant sources, such as grazing and cropping.

2.4. Potential Water Quality Impacts and Management Measures

The EIS has considered the broad risks to water quality and receiving waters associated with the Proposal. Comments from stakeholders such as Council, NSW EPA and NSW Fisheries reinforce this view. In order to manage this risk, operational aspects and consequences of the proposal in the context of water quality need to be considered. Key water quality risks for both the quarry operations and resource recovery operations are outlined below along with proposed mitigation measures.

2.4.1.Quarry Operations

Table 2.1 Water quality risks associated with proposed quarry

Activity	Pollutants generated	Potential receiving ecosystem impacts	Mitigation
Removal of vegetation and topsoil, stripping and removal of overburden to access new areas	Suspended solids and attached phosphorous export	Smothering of organisms, limiting light penetration in water column, nutrient contribution may increase algal concentrations. Potential to lower pH	Erosion and sediment controls, including appropriately sized sediment basins Testing and treatment of stored water prior to discharge, selecting appropriate discharge points. Protection and maintenance of a vegetated riparian buffer zone of at least 60 metres width between the quarry site and top bank of Swamp Creek. Water quality monitoring and reporting
Day to day quarry operations - removing and processing weathered basalt and clay materials	Suspended solids, attached phosphorous and other minerals, potential pH changes	Smothering of organisms, limiting light penetration in water column, nutrient contribution may increase algae concentrations. Potential to lower pH	Erosion and sediment controls, including appropriately sized sediment basins Water quality monitoring and reporting

2.4.2. Resource Recovery Operations

The site will not be operated as a landfill, that is, no waste material will be buried on site. Material will either be accepted onto the site as approved material and be processed to then be sold and removed from the site, or material will be refused and will be removed from the site. The composting site will generate leachate from water percolating through, or interacting with the windrows, and other composting material stockpiles. Depending on the compost material characteristics the leachate will contain nutrients, soluble chemicals and dissolved organic matter. Available research on the typical characteristics of compost leachate suggest that nitrates and ammonia, along with COD and BOD would be the primary water quality management issues.

Table 2.2 Water quality risks associated with resource recovery operation

Activity	**Pollutants generated**	**Potential receiving water impacts**	**Mitigation**
Construction of stockpiling and compost processing area	Suspended solids and attached phosphorous export	Smothering of organisms, limiting light penetration in water column	Erosion and sediment controls, including appropriately sized sediment basins
Stockpiling and processing of general solid waste accepted onto the site. (concrete waste, asphalt waste, brick waste, clean fill)	Low to moderate risk of suspended solids depending on stockpiled material.	Smothering of organisms, limiting light penetration in water column	Site runoff management and sediment basins
Compost stockpiling and processing of category 1 compostable materials	Leachate from compost processing windrows and stockpiles including turbidity, nutrients (particularly nitrogen) and dissolved organic matter	Addition of nutrients and organic matter, potential to reduce dissolved oxygen levels and potential to increase algae concentrations	Runoff and water management to limit interaction with compost stockpiles and windrows Collection of leachate in leachate management pond sized according to guidelines (Storage of the storm volume from 10 year 24hour event). Stockpile area and leachate pond to have a leachate barrier system with a minimum permeability of 1x10-9 meters per second. Leachate treatment and water reuse on site

3.0 WATER QUALITY IMPACT ASSESSMENT

3.1. Methodology

The conceptual water quality modelling software Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.2 has been used to quantify pollutant loads and concentrations within receiving waters both upstream and downstream of the quarry site to estimate the potential impact of the Proposal. The treatment processes used in the model have been verified against extensive field data through the development of the MUSIC software, so therefore represent a good approximation of treatment levels achieved, however the environmental processes existing within the catchments and watercourses are not modelled. Additionally, no calibration with receiving water conditions has been undertaken.

The model developed in this case includes a single node representing the existing forested catchment that drains to Swamp Creek along with nodes representing the quarry expansion, as well as the proposed sediment basins and leachate pond which represent the main water quality management features for the site (refer Figure 3.1 and Figure 3.2). Water reuse from the leachate pond of approximately 5.8ML/y has been assumed for the composting area as per Section 4.4. The quarry is modelled at maximum exposure, assuming the fully approved site is completely open, and that the only water quality management approaches are the final two sediment basins and the leachate pond designed as per the relevant guidelines, presenting a worst case scenario.

The model runs at a 6-minute time step including rainfall over a period from 1999 to 2010 using rainfall data from the Bureau of Meteorology station at Moruya Airport. Model input assumptions, including pollutant generation rates and output is contained in Appendix A.

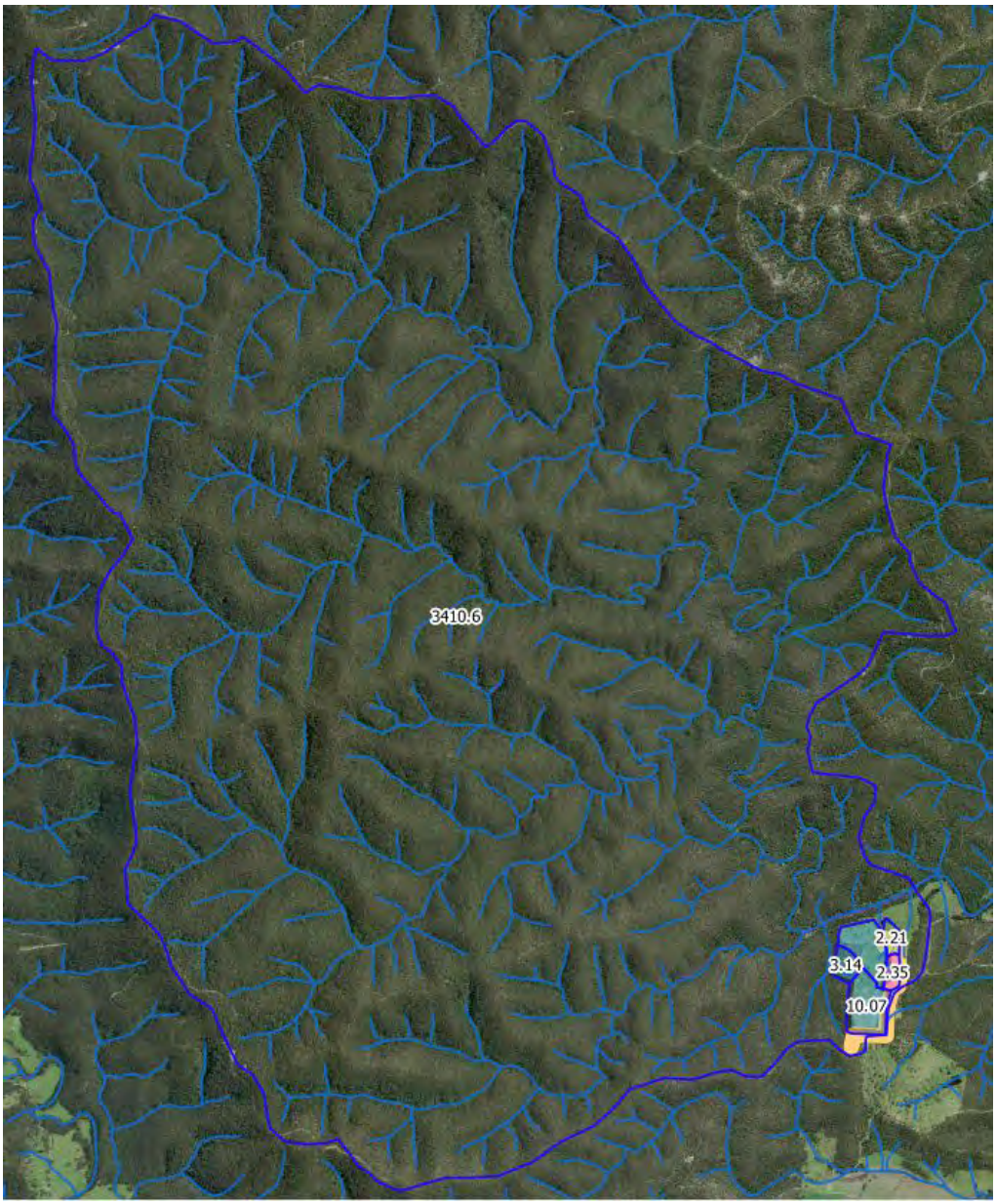


Figure 3.1 MUSIC catchments

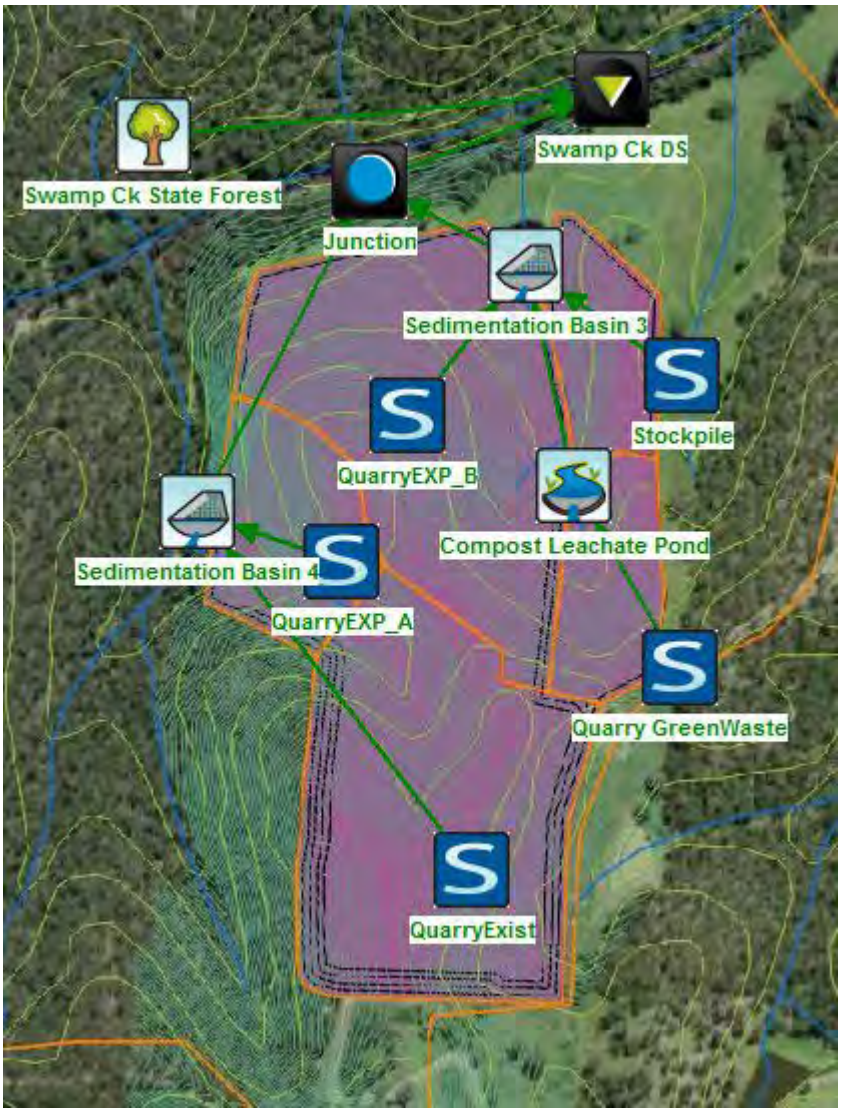


Figure 3.2 MUSIC configuration

3.2. MUSIC Output

The MUSIC is able to provide water quality reporting at each model time step, including periods without rainfall. No environmental processes within the receiving waters or the Swamp Creek forested catchment are modelled. Figure 3.3, Figure 3.4 and Figure 3.5 show the modelled pollutant concentrations within Swamp Creek upstream and downstream of the quarry discharge point for the period 1999 – 2010 as cumulative frequencies. The 15% exceedance line is shown on the figures representing the proportion of water quality samples which may exceed a trigger with the condition of the waterway still considered as 'very good' based on the Eurobodalla Shire Council and OEH classification (BMT WBM, 2011).

It is not possible to provide reporting against the NTU trigger value as a relationship between TSS and NTU has not been developed for the catchment or the site. For TP and TN modelling results are presented against the trigger values and a % exceedance of the trigger values of 15%.

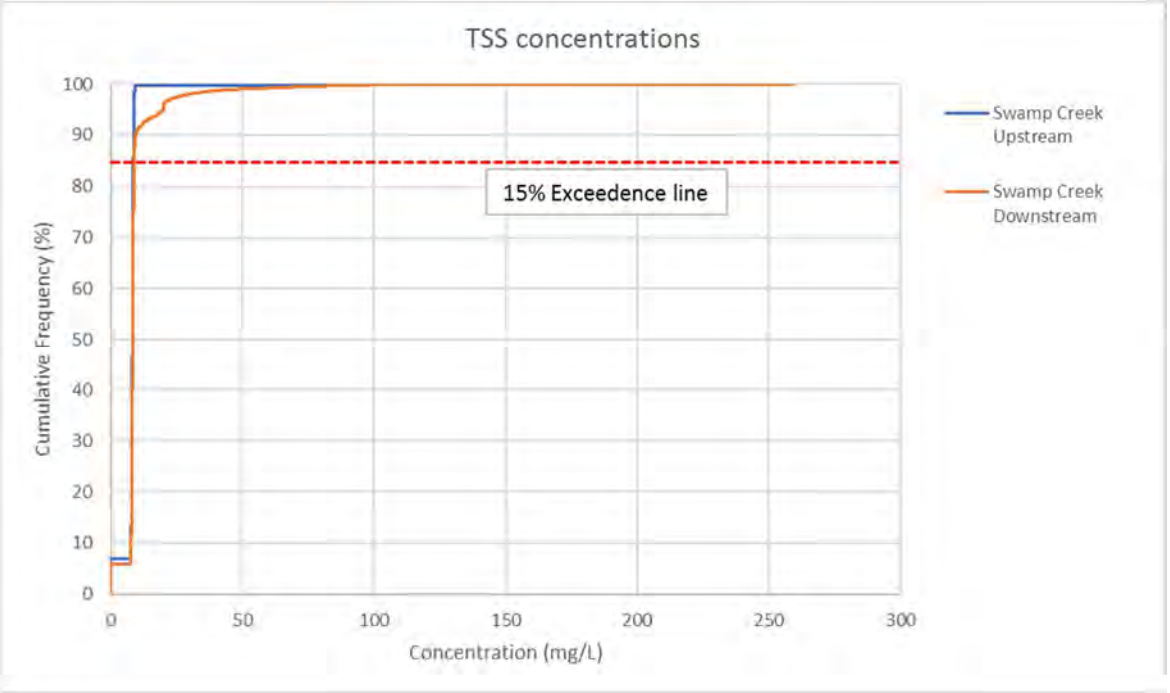


Figure 3.3 Modelled TSS concentrations upstream and downstream of quarry 1999-2010

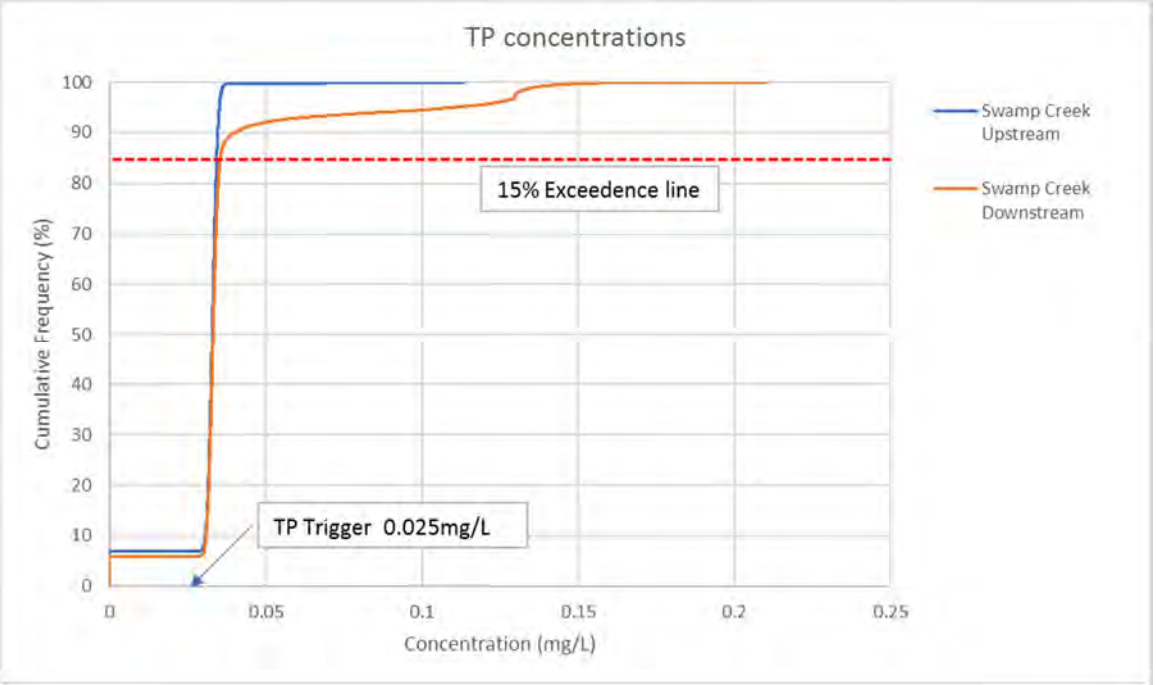


Figure 3.4 Modelled TP concentrations upstream and downstream of quarry 1999-2010

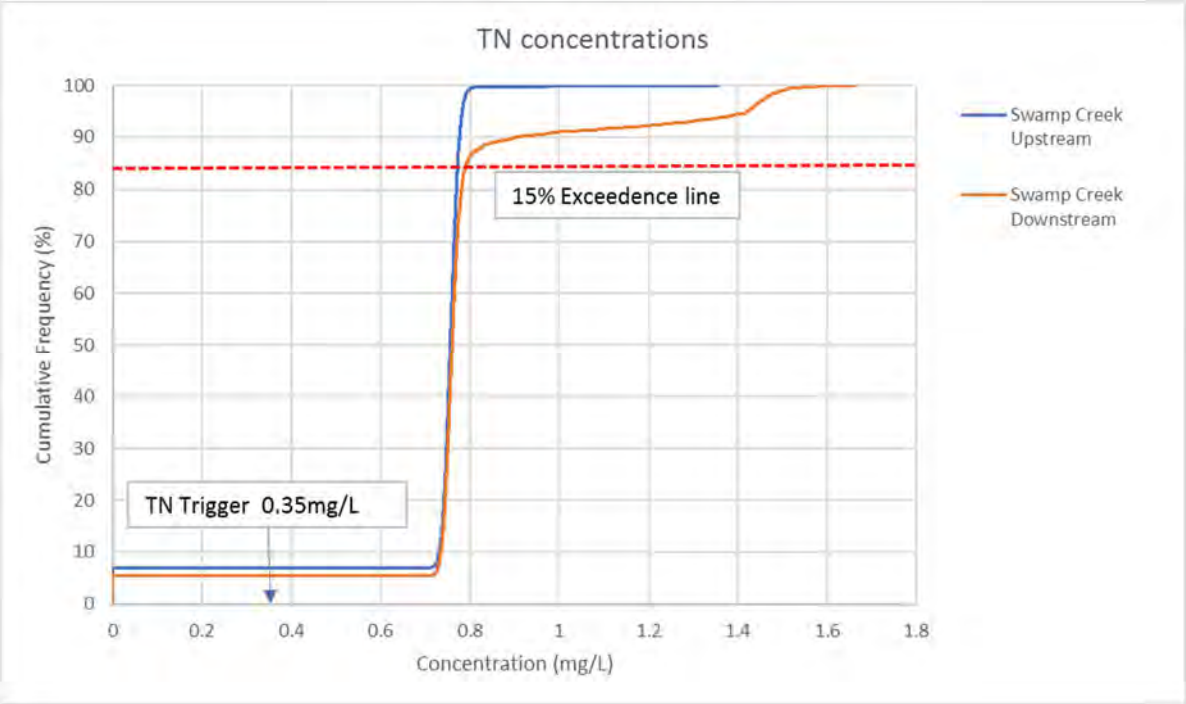


Figure 3.5 Modelled TN concentrations upstream and downstream of quarry 1999-2010

3.3. Water Quality Impact Discussion

For all three pollutants, concentrations upstream and downstream begin to vary at around the 15% exceedance point, or in other words, 85% of the time pollutant concentrations upstream and downstream of the quarry are approximately the same. If upstream pollutant concentrations were considered the benchmark, using the ESC and OEH ranking outlined in section 1, the downstream water quality would be considered 'very good' based on these model results.

The proposed water quality management measures, designed based on relevant guidelines for this type of operation discharging to sensitive and high conservation value receiving waters, are shown to be very effective. Pollutant load removals assume only the modelled processes, and excluding small scale erosion and sediment controls such as sediment fences and armoured drainage as well as the effects of the buffer between the site and receiving waters. The modelled features remove over 90% of the TSS generated and significant amounts of TP and TN (Table 3.1).

Table 3.1 Pollutant load generated and removed

Pollutant	Generated	Discharged	% Removed
Total Suspended Solids (kg/yr)	1.01E+05	8.87E+03	91.3
Total Phosphorus (kg/yr)	53	14.4	72.9
Total Nitrogen (kg/yr)	233	142	39.2

As mentioned, the model presents a worst case scenario by assuming the quarry at full operational capacity and ignores many water quality management measures such as:

- Collection and retention of runoff within the quarry pit
- Sediment and erosion controls other than sediment basins
- Full reuse of all leachate, and no overflow (in the model the leachate pond overflows about 300kL/y which would not be the case)
- Timing of sediment basin discharge during dry events
- Discharge of sediment basins onto grassed areas (buffer) providing further treatment

4.0 WATER MANAGEMENT – DETAILED MEASURES

4.1. Quarry operations and expansion sequencing

A large part of the existing quarry operation drains to the existing sediment basins to the north of the quarry pit. The proposal includes significant expansion to the north. A ridge bisects the expansion area splitting the expansion into two distinct drainage zones, one to the west, which currently drains the existing quarry operations, and one to the north, which will only become significant once excavation extends beyond the ridge.

As the expansion proceeds, the existing basins to the north of the current operational area will continue to be used. These basins should be upgraded to accommodate the volume required for the expanded works area around the existing quarry zone (Basin 1).

Prior to the excavation footprint extending beyond the existing basins construction of the lower basin should commence (Basin 4).

As the quarry operations extend further north beyond the ridge, opening up towards the northern-most catchment and/or the construction of the waste recovery area and stockpile area commences then the northernmost basin (Basin 3) will need to be constructed.

4.2. Clearing

All proposed erosion and sediment control measures will be implemented in advance of clearing and stripping operations, including the installation of sediment fencing downslope of any areas that do not drain toward water treatment areas. Sediment fencing will be installed in accordance with Managing Urban Stormwater: Soils and Construction; sediment fence SD 6-8 (Landcom, 2004).

Prior to clearing, the limits of disturbance will be marked by pegs placed at intervals on each side of the disturbed area. All operations will be planned to ensure that there is no damage to any trees outside the area being cleared. Land disturbance will be minimised by clearing the smallest practical area of land ahead of proposed excavation, or as required to install sediment basins. It is recommended that clearing of vegetation and stripping of topsoil only extend over areas that will be quarried in the near future – 3 to 4 months.

4.3. Topsoil stripping

Topsoil stripping within the proposed expansion area will, as far as practicable, be undertaken when the soil is in a slightly moist condition thus reducing damage to soil structure. The soil materials will not be stripped in wet conditions. If feasible, topsoil will be spread over quarry areas that are no longer in operation as part of quarry rehabilitation.

If longer-term stockpiling (i.e. greater than three months) is required, a maximum stockpile height of two metres and a batter slope of 2:1 will be maintained to preserve biological viability and reduce soil deterioration. Stockpiles will be placed in areas so as to avoid impediment of natural localised drainage lines and minimise the likelihood of water ponding against the stockpile. Stockpiles will be managed in accordance with vol. 1: stockpiles SD 4-1, including temporary erosion and sediment control measures such as earth banks and sediment fences.

4.4. Quarry Drainage

Parts of the quarry will contain runoff within the quarry works area, depending on excavation operations, other parts will drain directly to sediment basins. As much as possible, drainage within the quarry works area should be configured to limit the erosion of soils and other materials within the works area. This will require the following:

- Clear delineation of haul roads
- Provide drainage for haul roads as required, particularly around the outer edge of the quarry works area and ensure that erosion and sediment controls such as sediment fencing, armoured drainage and outlets are installed
- Diversion of runoff away from stockpiles, particularly stockpile of finer materials
- For concentrated flow paths use appropriate erosion and sediment controls to limit erosion where possible refer to section 5.4.3 of Managing Urban Stormwater: Soils and Construction; sediment fence SD 6-8 (Landcom, 2004) and drawings SD 5.4, SD 5.5, SD 5.6 and SD 5.7.
- Use sediment controls such as sediment fences, filter systems and armouring where feasible within the quarry works area to prevent erosion and collect sediment
- Limit cut floor grades to as low as possible to limit erosion and allow for sediment collection
- Pump collected runoff from internal ponding to sediment basins as required.

4.5. Runoff management for stockpiles and composting windrows

Site runoff over the compost processing area must be managed to limit interaction with leachate producing areas (windrows and organic material stockpiles) to keep potential pollutant streams separate.

4.6. Sediment basins

It is important to note that as excavation proceeds within the quarry, it is often the case that low points are created within the quarry where water will pond (Figure 4.1), allowing an alternate sedimentation system to be established. In these cases collected water is then pumped to the sediment basins for storage, prior to discharge. The use of the void within the quarry area is an acceptable approach to sediment management for a quarry (DECC, 2008). It is recommended that during the quarry operation, and expansion, that, as much as possible the quarry void be used as a primary settling/sedimentation area, and that collected water is pumped to the constructed sediment basins as required. This provides a level of control over the sediment basins to ensure their performance. Sediment basins shall still be constructed in accordance with the sizing and parameters outlined in this management plan.

Figure 4.1 Example of water storage within the quarry working area

Basins have been designed as wet detention basins for dispersive soils (Type D) in accordance with Landcom (2008) SD 6.4. The basins have been sized based on the 5 day 95th percentile rainfall depth, presenting a conservative approach necessary for the proposed long term operation of the site, and the sensitive nature of receiving waters. Refer to Appendix B for sediment basin calculations and assumptions.

The basin sizing assumes a worst case scenario of full exposure of the proposed quarry area, no use of the quarry void itself for sedimentation purposes and no rehabilitation during the operational phase. To allow for these possibilities, and to reduce end of line sediment basin volume where possible, it is recommended that the quarry operator apply a storage volume rate to the area exposed and create that volume, either through the use of voids within the quarry and/or combined with dedicated sediment basins. The volume rates shall be:

633m^3 sediment storage per ha disturbed area.

4.7. Sediment basin discharge control.

The average TSS concentration leaving the site in the water quality model (refer to section 5) is 8mg/L and the 90th%ile concentration is 25mg/L. It is recommended that the same concentrations apply as discharge criteria. Average discharge concentrations must be 8mg/L with an allowance of discharges up to 25mg/L in 10% of volumetric discharge. Water quality sampling and volume estimate and reporting of discharges must be undertaken.

It is recommended that a specific monitoring and reporting program be negotiated between the quarry operator and the EPA that is simple to undertake and record. It is suggested that prior to the expansion of the quarry beyond the current operational boundaries, a relationship between site sediment characteristics in terms of TSS (mg/L) and NTU be developed so that a simple visual assessment using NTU can be made to estimate TSS concentration prior to discharge.

Addition of flocculant is likely to be required to achieve discharge requirements.

4.8. Leachate management

4.8.1. Leachate Barrier

In order to limit interaction between leachate and ground or surface waters, a leachate barrier is proposed for both the composting working areas and the storage area. The compost pad would be a hardstand area constructed of a clay base (at least 600mm) topped with rolled and compressed road base and/or aggregate. The hardstand areas would be graded to direct any runoff into a leachate pond. The proposed leachate pond would be appropriately lined with clay or similar to meet a permeability standard of 1x10^{-9} meters per second, as required by the NSW Environmental Guidelines for Composting and Related Organics Processing Facilities (DEC 2004).

Importantly, Hydromap (2007) concluded that the quarry site is non-vulnerable with respect to the regional groundwater system.

4.8.2. Leachate storage

Leachate management is required for any liquid draining from the composting processing and stockpile areas. As discussed above, as much as possible, site surface runoff is to be diverted away from compost processing and stockpile zones. For the purpose of this management plan an area of 0.6 ha has been allowed for as an area producing leachate. This assumes 8 windrows of 100m Length and 6m width each, as well as 1200m^2 of compost material stockpile.

A leachate collection pond is required. The pond must have the capacity at a minimum to collect the runoff volume from a 10 year ARI, 24 hour storm, in accordance with the Environmental Guidelines for Composting and related organics processing facilities (DEC, 2003). Assuming an active composting area (composting windrows and stockpiles) of 0.6 ha a leachate collection and storage facility must have an available storage volume of 900m^3 to account for the 10 year ARI 24 hour storm event. Any modification to the leachate generation area can assume a proportional relationship between area and storage volume. The leachate collection volume shall be at a minimum 1500m^3 per hectare of leachate production area.

The leachate storage needs to be managed so that the storage volume is available when rain is forecast.

4.8.3.Leachate disposal

Leachate shall be contained within the site and disposed of through recycling on site for dust suppression and to maintain moisture content in compost , windrows and stockpiles. Using the MUSIC and 10 years of rainfall data and composting area assumptions outlined above, 3.86ML of leachate is estimated to be generated per year. Evaporation losses over the composting area are about 5.8ML per year. Water is required to offset these losses to maintain the compost windrows and stockpiles at approximately 65% moisture content. Although evaporation losses, and therefore moisture demands of the composting area exceed the volume generated, modelling shows that there is still an excess of leachate of about 370kL per year as the timing of runoff and irrigation demands (evaporation) do not always occur in similar periods. However, the remaining 370kL could easily be disposed of over the quarry site of more than 10ha over the year, or used on the windrows through careful leachate pond management and by using other storage opportunities in the quarry.

Should leachate disposal be required, an agreement with the EPA to licence any discharge is likely to be necessary, depending on leachate quality. A constructed wetland, or other passive biofiltration treatment system prior to any discharge may be a possibility, however this would need to be designed based on analysis of leachate characteristics. A rule of thumb area of 2% of the leachate generation zone has been identified as a potential treatment area to be used should a leachate discharge agreement be required.

REFERENCES

BMT WBM (2011) Eurobodalla Estuary Health Monitoring Program Review, OEH.

Department of Environment and Climate Change (DECC) (2008) Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries.

Department of Environment and Climate Change (DECC) (2008) Managing Urban Stormwater, Soils and Construction, Volume 2B Waste Landfills.

Department of Environment and Climate Change (DECC) (2003) Environmental Guidelines for composting and related organics processing facilities

Landcom (2004) The Blue Book - Managing Urban Stormwater (MUS): Soils and Construction, 4th ed.

APPENDIX A – MUSIC MODEL

Source nodes										
Location	Swamp Ck State Forest	QuarryEXP_B	Quarry GreenWaste	Stockpile	QuarryEXP_A	QuarryExist				
ID	2	3	4	8	9	10				
Node Type	ForestSourceNode	UserDefinedSourceNode	UserDefinedSourceNode	UserDefinedSourceNode	UserDefinedSourceNode	UserDefinedSourceNode				
Zoning Surface Type										
Total Area (ha)	3410.6	9.56	1	3.56	3.14	10.07				
Area Impervious (ha)	0	4.78	0.496231343	1.78	1.57	5.035				
Area Pervious (ha)	3410.6	4.78	0.503768657	1.78	1.57	5.035				
Field Capacity (mm)	80	70	70	70	70	70				
Pervious Area Infiltration Capacity coefficient - a	200	135	135	135	135	135				
Pervious Area Infiltration Capacity exponent - b	1	4	4	4	4	4				
Impervious Area Rainfall Threshold (mm/day)	1	1.5	1.5	1.5	1.5	1.5				
Pervious Area Soil Storage Capacity (mm)	120	90	90	90	90	90				
Pervious Area Soil Initial Storage (% of Capacity)	25	0	0	0	0	0				
Groundwater Initial Depth (mm)	10	10	0	10	10	10				
Groundwater Daily Recharge Rate (%)	25	10	10	10	10	10				
Groundwater Daily Baseflow Rate (%)	5	10	10	10	10	10				
Groundwater Daily Deep Seepage Rate (%)	0	0	0	0	0	0				
Stormflow Total Suspended Solids Mean (log mg/L)	1.9	3	2.15	3	3	3				
Stormflow Total Suspended Solids Standard Deviation (log mg/L)	0.2	0.32	0.31	0.32	0.32	0.32				
Stormflow Total Suspended Solids Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean				
Stormflow Total Suspended Solids Serial Correlation	0	0	0	0	0	0				
Stormflow Total Phosphorus Mean (log mg/L)	-1.1	-0.3	-0.22	-0.3	-0.3	-0.3				
Stormflow Total Phosphorus Standard Deviation (log mg/L)	0.22	0.25	0.3	0.25	0.25	0.25				
Stormflow Total Phosphorus Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean				
Stormflow Total Phosphorus Serial Correlation	0	0	0	0	0	0				
Stormflow Total Nitrogen Mean (log mg/L)	-0.075	0.34	0.48	0.34	0.34	0.34				
Stormflow Total Nitrogen Standard Deviation (log mg/L)	0.24	0.19	0.26	0.19	0.19	0.19				
Stormflow Total Nitrogen Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean				
Stormflow Total Nitrogen Serial Correlation	0	0	0	0	0	0				
Baseflow Total Suspended Solids Mean (log mg/L)	0.9	1.2	1.3	1.2	1.2	1.2				
Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.13	0.17	0.13	0.17	0.17	0.17				
Baseflow Total Suspended Solids Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean				
Baseflow Total Suspended Solids Serial Correlation	0	0	0	0	0	0				
Baseflow Total Phosphorus Mean (log mg/L)	-1.5	-0.85	-1.05	-0.85	-0.85	-0.85				
Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.13	0.19	0.13	0.19	0.19	0.19				
Baseflow Total Phosphorus Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean				
Baseflow Total Phosphorus Serial Correlation	0	0	0	0	0	0				
Baseflow Total Nitrogen Mean (log mg/L)	-0.14	0.11	0.04	0.11	0.11	0.11				
Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.13	0.12	0.13	0.12	0.12	0.12				
Baseflow Total Nitrogen Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean				
Baseflow Total Nitrogen Serial Correlation	0	0	0	0	0	0				
Flow based constituent generation - enabled	Off	Off	Off	Off	Off	Off				
Flow based constituent generation - flow file										
Flow based constituent generation - base flow column										
Flow based constituent generation - pervious flow column										
Flow based constituent generation - impervious flow column										
Flow based constituent generation - unit										
OUT - Mean Annual Flow (ML/yr)	4.70E+03	36.9	3.86	13.7	12.1	38.9				
OUT - TSS Mean Annual Load (kg/yr)	1.89E+05	3.66E+04	542	1.36E+04	1.20E+04	3.86E+04				
OUT - TP Mean Annual Load (kg/yr)	259	18.4	2.31	6.85	6.04	19.4				
OUT - TN Mean Annual Load (kg/yr)	4.04E+03	80.5	11.6	30	26.4	84.8				
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	1.09E+03	114	407	359	1.15E+03				
Rain In (ML/yr)	24429.3	68.4761	7.16275	25.4994	22.4911	72.1286				
ET Loss (ML/yr)	19840.3	31.6582	3.31152	11.789	10.3982	33.3471				
Deep Seepage Loss (ML/yr)	0	0	0	0	0	0				
Baseflow Out (ML/yr)	2788.47	0.26989	0.0282312	0.100503	0.0886459	0.284288				
Imp. Stormflow Out (ML/yr)	0	28.8809	3.02101	10.7548	9.48596	30.4215				
Perv. Stormflow Out (ML/yr)	1912.01	7.75402	0.81109	2.88748	2.54682	8.16768				
Total Stormflow Out (ML/yr)	1912.01	36.6349	3.8321	13.6423	12.0328	38.5892				
Total Outflow (ML/yr)	4700.48	36.9048	3.86033	13.7428	12.1214	38.8735				
Change in Soil Storage (ML/yr)	-111.55	-0.0870771	-0.00910846	-0.0324261	-0.0286006	-0.0917223				

TSS Baseflow Out (kg/yr)	23171.7	4.27747	0.563285	1.59286	1.40494	4.50566				
TSS Total Stormflow Out (kg/yr)	165470	36634.9	541.298	13642.3	12032.8	38589.2				
TSS Total Outflow (kg/yr)	188642	36639.1	541.862	13643.9	12034.2	38593.7				
TP Baseflow Out (kg/yr)	92.1638	0.0381229	0.00251614	0.0141964	0.0125216	0.0401567				
TP Total Stormflow Out (kg/yr)	166.614	18.3609	2.30907	6.83733	6.03068	19.3404				
TP Total Outflow (kg/yr)	258.778	18.399	2.31158	6.85153	6.0432	19.3806				
TN Baseflow Out (kg/yr)	2114.38	0.347685	0.0309549	0.129473	0.114198	0.366234				
TN Total Stormflow Out (kg/yr)	1920.68	80.1484	11.5727	29.846	26.3249	84.424				
TN Total Outflow (kg/yr)	4035.05	80.4961	11.6037	29.9755	26.4391	84.7903				
GP Total Outflow (kg/yr)	0	1093.55	114.388	407.221	359.178	1151.89				
No Imported Data Source nodes										
USTM treatment nodes										
Location	Sedimentation Basin 3	Compost Leachate Pond	Sedimentation Basin 4							
ID	5	7	11							
Node Type	SedimentationBasinNode	PondNode	SedimentationBasinNode							
Lo-flow bypass rate (cum/sec)	0	0	0							
Hi-flow bypass rate (cum/sec)	100	2	100							
Inlet pond volume	0	0	0							
Area (sqm)	3000	800	3500							
Initial Volume (m^3)	6000	0	5500							
Extended detention depth (m)	1	0.5	1							
Number of Rainwater tanks										
Permanent Pool Volume (cubic metres)	6000	1500	5500							
Proportion vegetated	0	0.1	0							
Equivalent Pipe Diameter (mm)	100	100	100							
Overflow weir width (m)	10	2	10							
Notional Detention Time (hrs)	35.8	6.74	41.7							
Orifice Discharge Coefficient	0.6	0.6	0.6							
Weir Coefficient	1.7	1.7	1.7							
Number of CSTR Cells	1	2	1							
Total Suspended Solids - k (m/yr)	8000	400	8000							
Total Suspended Solids - C* (mg/L)	20	12	20							
Total Suspended Solids - C** (mg/L)	20	12	20							
Total Phosphorus - k (m/yr)	6000	300	6000							
Total Phosphorus - C* (mg/L)	0.13	0.09	0.13							
Total Phosphorus - C** (mg/L)	0.13	0.09	0.13							
Total Nitrogen - k (m/yr)	500	40	500							
Total Nitrogen - C* (mg/L)	1.4	1	1.4							
Total Nitrogen - C** (mg/L)	1.4	1	1.4							
Threshold Hydraulic Loading for C** (m/yr)	3500	3500	3500							
Horizontal Flow Coefficient										
Reuse Enabled	On	On	On							
Max drawdown height (m)	2	1.875	1.571							
Annual Demand Enabled	On	On	On							
Annual Demand Value (ML/year)	5	5.328	5							
Annual Demand Distribution	PET	PET	PET							
Annual Demand Monthly Distribution: Jan										
Annual Demand Monthly Distribution: Feb										
Annual Demand Monthly Distribution: Mar										
Annual Demand Monthly Distribution: Apr										
Annual Demand Monthly Distribution: May										
Annual Demand Monthly Distribution: Jun										
Annual Demand Monthly Distribution: Jul										
Annual Demand Monthly Distribution: Aug										
Annual Demand Monthly Distribution: Sep										
Annual Demand Monthly Distribution: Oct										
Annual Demand Monthly Distribution: Nov										
Annual Demand Monthly Distribution: Dec										
Daily Demand Enabled	Off	Off	Off							
Daily Demand Value (ML/day)										

Custom Demand Enabled	Off	Off	Off							
Custom Demand Time Series File										
Custom Demand Time Series Units										
Filter area (sqm)										
Filter perimeter (m)										
Filter depth (m)										
Filter Median Particle Diameter (mm)										
Saturated Hydraulic Conductivity (mm/hr)										
Infiltration Media Porosity										
Length (m)										
Bed slope										
Base Width (m)										
Top width (m)										
Vegetation height (m)										
Vegetation Type										
Total Nitrogen Content in Filter (mg/kg)										
Orthophosphate Content in Filter (mg/kg)										
Is Base Lined?										
Is Underdrain Present?										
Is Submerged Zone Present?										
Submerged Zone Depth (m)										
B for Media Soil Texture	-9999	-9999	-9999							
Proportion of upstream impervious area treated										
Exfiltration Rate (mm/hr)	0	0	0							
Evaporative Loss as % of PET	100	100	100							
Depth in metres below the drain pipe										
TSS A Coefficient										
TSS B Coefficient										
TP A Coefficient										
TP B Coefficient										
TN A Coefficient										
TN B Coefficient										
Sfc										
S*										
Sw										
Sh										
Emax (m/day)										
Ew (m/day)										
IN - Mean Annual Flow (ML/yr)	51	3.86	51							
IN - TSS Mean Annual Load (kg/yr)	5.03E+04	542	5.06E+04							
IN - TP Mean Annual Load (kg/yr)	25.3	2.31	25.4							
IN - TN Mean Annual Load (kg/yr)	111	11.6	111							
IN - Gross Pollutant Mean Annual Load (kg/yr)	1.50E+03	114	1.51E+03							
OUT - Mean Annual Flow (ML/yr)	42.7	0.37	42.2							
OUT - TSS Mean Annual Load (kg/yr)	4.67E+03	19.1	4.16E+03							
OUT - TP Mean Annual Load (kg/yr)	7.26	9.83E-02	6.98							
OUT - TN Mean Annual Load (kg/yr)	71	0.834	69.5							
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	0	0							
Flow In (ML/yr)	50.9889	3.85857	50.9784							
ET Loss (ML/yr)	3.37935	0.498067	3.91133							
Infiltration Loss (ML/yr)	0	0	0							
Low Flow Bypass Out (ML/yr)	0	0	0							
High Flow Bypass Out (ML/yr)	0	0	0							
Orifice / Filter Out (ML/yr)	29.8659	0.311373	30.5257							
Weir Out (ML/yr)	12.8083	0.0583295	11.6461							
Transfer Function Out (ML/yr)	0	0	0							
Reuse Supplied (ML/yr)	4.99759	2.94481	4.95072							
Reuse Requested (ML/yr)	4.99759	5.34547	4.99759							
% Reuse Demand Met	100	55.0899	99.0622							
% Load Reduction	16.3069	90.4187	17.2751							
TSS Flow In (kg/yr)	50302.3	541.863	50628.1							
TSS ET Loss (kg/yr)	0	0	0							

TSS Infiltration Loss (kg/yr)	0	0	0							
TSS Low Flow Bypass Out (kg/yr)	0	0	0							
TSS High Flow Bypass Out (kg/yr)	0	0	0							
TSS Orifice / Filter Out (kg/yr)	1364.86	14.8259	1255.7							
TSS Weir Out (kg/yr)	3308.06	4.26445	2909.03							
TSS Transfer Function Out (kg/yr)	0	0	0							
TSS Reuse Supplied (kg/yr)	109.528	39.2281	107.339							
TSS Reuse Requested (kg/yr)	0	0	0							
TSS % Reuse Demand Met	0	0	0							
TSS % Load Reduction	90.7103	96.4769	91.7739							
TP Flow In (kg/yr)	25.349	2.31159	25.4239							
TP ET Loss (kg/yr)	0	0	0							
TP Infiltration Loss (kg/yr)	0	0	0							
TP Low Flow Bypass Out (kg/yr)	0	0	0							
TP High Flow Bypass Out (kg/yr)	0	0	0							
TP Orifice / Filter Out (kg/yr)	4.26728	0.0778677	4.29253							
TP Weir Out (kg/yr)	2.99644	0.0204275	2.68302							
TP Transfer Function Out (kg/yr)	0	0	0							
TP Reuse Supplied (kg/yr)	0.655392	0.288075	0.648626							
TP Reuse Requested (kg/yr)	0	0	0							
TP % Reuse Demand Met	0	0	0							
TP % Load Reduction	71.3451	95.7477	72.563							
TN Flow In (kg/yr)	111.305	11.6037	111.229							
TN ET Loss (kg/yr)	0	0	0							
TN Infiltration Loss (kg/yr)	0	0	0							
TN Low Flow Bypass Out (kg/yr)	0	0	0							
TN High Flow Bypass Out (kg/yr)	0	0	0							
TN Orifice / Filter Out (kg/yr)	47.2442	0.686961	47.8767							
TN Weir Out (kg/yr)	23.7736	0.14655	21.6693							
TN Transfer Function Out (kg/yr)	0	0	0							
TN Reuse Supplied (kg/yr)	7.12156	3.84897	7.04331							
TN Reuse Requested (kg/yr)	0	0	0							
TN % Reuse Demand Met	0	0	0							
TN % Load Reduction	36.1955	92.8169	37.4752							
GP Flow In (kg/yr)	1499.86	114.319	1510.15							
GP ET Loss (kg/yr)	0	0	0							
GP Infiltration Loss (kg/yr)	0	0	0							
GP Low Flow Bypass Out (kg/yr)	0	0	0							
GP High Flow Bypass Out (kg/yr)	0	0	0							
GP Orifice / Filter Out (kg/yr)	0	0	0							
GP Weir Out (kg/yr)	0	0	0							
GP Transfer Function Out (kg/yr)	0	0	0							
GP Reuse Supplied (kg/yr)	0	0	0							
GP Reuse Requested (kg/yr)	0	0	0							
GP % Reuse Demand Met	0	0	0							
GP % Load Reduction	100	100	100							
PET Scaling Factor										
No Generic treatment nodes										
Other nodes										
Location	Swamp Ck DS	Junction								
ID	1	6								
Node Type	ReceivingNode	JunctionNode								
IN - Mean Annual Flow (ML/yr)	4.79E+03	84.8								
IN - TSS Mean Annual Load (kg/yr)	1.97E+05	8.84E+03								
IN - TP Mean Annual Load (kg/yr)	273	14.2								
IN - TN Mean Annual Load (kg/yr)	4.18E+03	141								
IN - Gross Pollutant Mean Annual Load (kg/yr)	0	0								
OUT - Mean Annual Flow (ML/yr)	4.79E+03	84.8								
OUT - TSS Mean Annual Load (kg/yr)	1.97E+05	8.84E+03								
OUT - TP Mean Annual Load (kg/yr)	273	14.2								

OUT - TN Mean Annual Load (kg/yr)	4.18E+03	141								
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	0								
% Load Reduction	0.43	19.6								
TSS % Load Reduction	31.9	91.3								
TN % Load Reduction	2.17	39.8								
TP % Load Reduction	12.4	73.1								
GP % Load Reduction	100	100								
Links										
Location	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage L	Drainage L	Drainage L	Drainage Li
Source node ID	3	2	6	4	7	8	10	9	11	5
Target node ID	5	1	1	7	5	5	11	11	6	6
Muskingum-Cunge Routing	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed	Not Route	Not Route	Not Route	Not Routec
Muskingum K										
Muskingum theta										
IN - Mean Annual Flow (ML/yr)	36.9	4.70E+03	84.8	3.86	0.37	13.7	38.9	12.1	42.2	42.7
IN - TSS Mean Annual Load (kg/yr)	3.66E+04	1.89E+05	8.84E+03	542	19.1	1.36E+04	3.86E+04	1.20E+04	4.16E+03	4.67E+03
IN - TP Mean Annual Load (kg/yr)	18.4	259	14.2	2.31	9.83E-02	6.85	19.4	6.04	6.98	7.26
IN - TN Mean Annual Load (kg/yr)	80.5	4.04E+03	141	11.6	0.834	30	84.8	26.4	69.5	71
IN - Gross Pollutant Mean Annual Load (kg/yr)	1.09E+03	0	0	114	0	407	1.15E+03	359	0	0
OUT - Mean Annual Flow (ML/yr)	36.9	4.70E+03	84.8	3.86	0.37	13.7	38.9	12.1	42.2	42.7
OUT - TSS Mean Annual Load (kg/yr)	3.66E+04	1.89E+05	8.84E+03	542	19.1	1.36E+04	3.86E+04	1.20E+04	4.16E+03	4.67E+03
OUT - TP Mean Annual Load (kg/yr)	18.4	259	14.2	2.31	9.83E-02	6.85	19.4	6.04	6.98	7.26
OUT - TN Mean Annual Load (kg/yr)	80.5	4.04E+03	141	11.6	0.834	30	84.8	26.4	69.5	71
OUT - Gross Pollutant Mean Annual Load (kg/yr)	1.09E+03	0	0	114	0	407	1.15E+03	359	0	0
Catchment Details										
Catchment Name	Quarry MUSIC									
Timestep	6 Minutes									
Start Date	7/12/1999									
End Date	30/04/2010 23:54									
Rainfall Station	69148 MORUYA									
ET Station	User-defined monthly PET									
Mean Annual Rainfall (mm)	717									
Mean Annual ET (mm)	1128									

APPENDIX B – SOIL AND WATER MANAGEMENT PLAN

Site name:	**Eurobodalla Quarry**
Site location:	**Nerrigundah Road, Eurobodalla**
Precinct:	
Description of site:	**Quarry**

Site area	**Site**						**Remarks**
	1	4	3	Compost			
Total catchment area (ha)	10.07	13.21	14.03	2.35			
Disturbed catchment area (ha)	10	13.21	9.56	2.35			
Soil analysis							
Soil landscape							DIPNR mapping (if relevant)
Soil Texture Group	D	D	D	D			Sections 6.3.3(c), (d) and (e)
Rainfall data							
Design rainfall depth (days)	5	5	5	5			See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	95	95	95	95			See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	84.4	84.4	84.4	84.4			See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	10.3	10.3	10.3	10.3			See IFD chart for the site
Rainfall erosivity (R-factor)	2330	2330	2330	2330			Automatic calculation from above data

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day}$ (m^3)

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

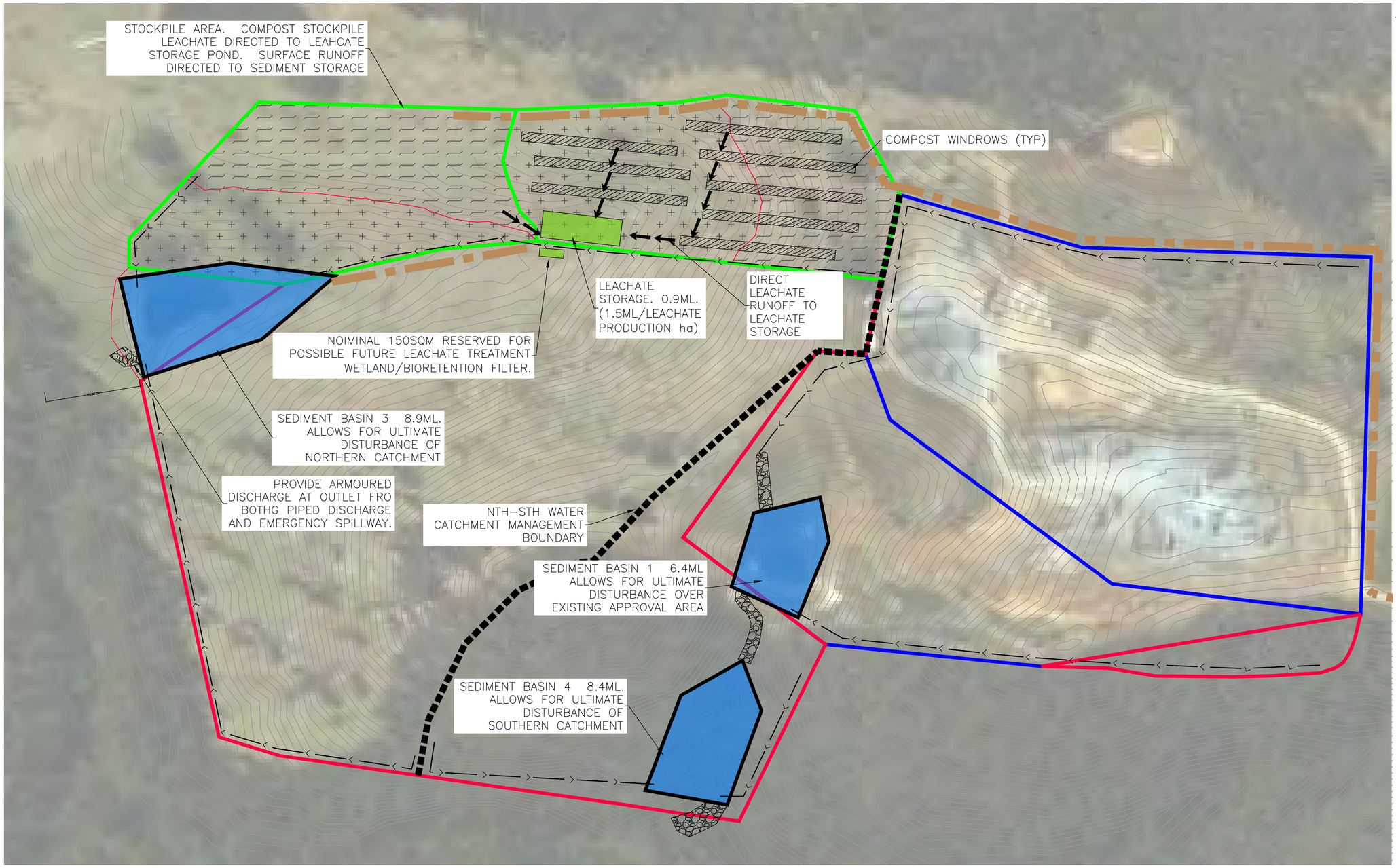
A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.50	84.4	10.07	4249.54	2125	6374.31
4	0.50	84.4	13.21	5574.62	2787	8361.93
3	0.50	84.4	14.03	5920.66	2960	8880.99
Compost	0.90	84.4	2.35	1785.06	893	2677.59



SEIDMENT BASIN AREA. CONSTRUCT ACCORDING TO SD 6.4. REFER SHEET 2.

APPROXIMATE CUT AND FILL OVER RESOURCE RECOVERY AREA

RESOURCE RECOVERY AREA

WATER DIVERSION, INDICATIVE, REFER SHEET 2.

APPROVED OPERATION AREA BOUNDARY

PROPOSED EXPANSION BOUNDARY

INDICATIVE LEACHATE DIVERSION TO LEACHATE STORAGE

FUTURE SITE ACCESS

ROCK ARMOURED FLOW TRANSFER/DISCHARGE. REFER SHEET 2.

Soil and Water Management

Refer to Managing Urban Stormwater, Sokls and Construction, Volume 1 (Blue Book), Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries, for erosion and sediment guideines, system design details and construction and maintenance procedures.

1. This plan is to be read in conjunction with the approved Water Management Plan prepared for the site
   Divert cleanwater run–on around disturbed areas.
2. Limit vegetation clearing to the minimum required.
   Remove and stockpile topsoil in accordance with guidelines and the Water Management Plan.
3. Any quarry operation area must drain to some form of sediment storage.
4. Construct sediment basin storage areas prior to commencement of quarring operations in new areas.
5. Sediment basins and collection areas to be in accordance with SD 6.4, refer to sheet 2.
6. Sediment basin sizes shown on this plan are the ultimate volumes required for disturbance of full quarry operations area, as such these sizes may not be necessary.
7. Sediment storage volume must be a minimum 633m3 per ha of disturbed quarry area.
8. Sediment storage volume may be achieved through use of quarry void or through constructed basins or a combination of both.
9. For concentrated flow paths use appropriate erosion and sediment controls to limit erosion where possible refer to sheet 2 and section 5.4.3 of Landcom and drawings SD 5.4, SD 5.5, SD 5.6 and SD 5.7.
10. Refer to Water Management Plan, and water quality monitoring plan for sediment storage effluent discharge guidelines. Undertake necessary addition of flocculant and testing prior to discharge.

Leachate Management

Refer to Environmental Guidelines for composting and related organics processing facilities (DECC, 2003) fo leachate system design and operational procedures.

1. This plan is to be read in conjunction with the approved Water Management Plan prepared for the site.
2. Construct leachate barrier over the compost processing area and within the leachate storage basin, in accordance with the Environmental Guidelines for composting and related organics.
3. Ensure that work site runoff and leachate from composting windrows and compost stockpiles are kept separate.
4. Leachate storage shall be emptied as soon as possible after rainfall through reuse of leachate for moisture addition to stockpiles, or used for dust suppression.
5. When necessary, particularly after consecutive rainfall events in colver months provide for additional temporary storage of leachate around the site.
6. Any leachate discharge mus comply with EPA requirements or licencing arrangements.

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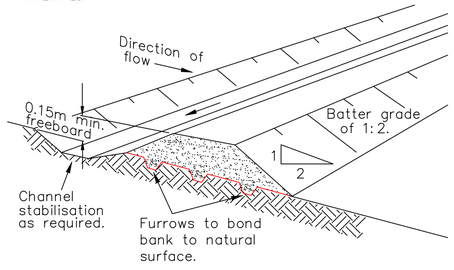
PROJECT: Eurobodalla Quarry Expansion and Resource Recovery	DRAWING TITLE: Water Management Plan				PURPOSE: EIS	
CLIENT: Eurobodalla Quarry	DRAWING NUMBER: 361-01	SCALE: NTS	SHEET: 01 /02	DESIGNED: LB	CHECKED: LB	DATE OF ISSUE: 08/05/2017

REV	DESCRIPTION	BY	DATE	REV	DESCRIPTION	BY	DATE

FLOW TRANSFER – (EROSION MANAGEMENT)

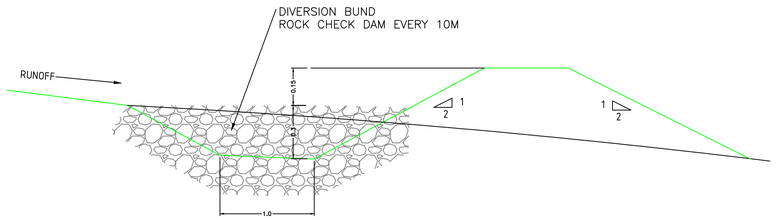
DIVERSION BANK

BUND WILL DIVERT SURFACE WATER AWAY FROM CONSTRUCTION AREAS. THE GRADE OF THE BUND MAY VARY. ROCK CHECK DAMS ARE PLACED ACROSS THE CHANNEL OF THE BUND AT MIN. 10m INTERVALS.



EARTH DIVERSION BANK DETAIL

NTS

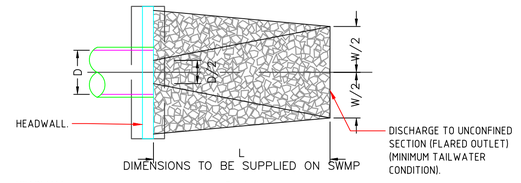


EARTH DIVERSION BANK CROSS SECTION

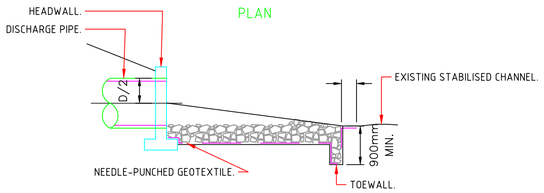
EARTH DIVERSION BANK CONSTRUCTION NOTES

1. CONSTRUCT AT A GRADIENT BETWEEN 1 AND 5%
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE – WORK AROUND THEM
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V–SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. INSTALL ROCK DAMS MIN 10m OR AS REQUIRED
7. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITH 10 DAYS OF CONSTRUCTION.
8. WHERE DISCHARGING TO ERODIBLE LANDS, ENSURE THEY OUTLET THROUGH A PROPERLY CONSTRUCTED LEVEL SPREADER.
9. CONSTRUCT LEVEL SPREADER AT A GRADIENT OF LESS THAN 1%
10. WHERE POSSIBLE, ENSURE THEY DISCHARGE WATERS ONTO STABILISED AREA

ENERGY DISSIPATER FOR PIPE DISCHARGE

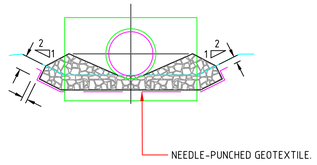


PLAN



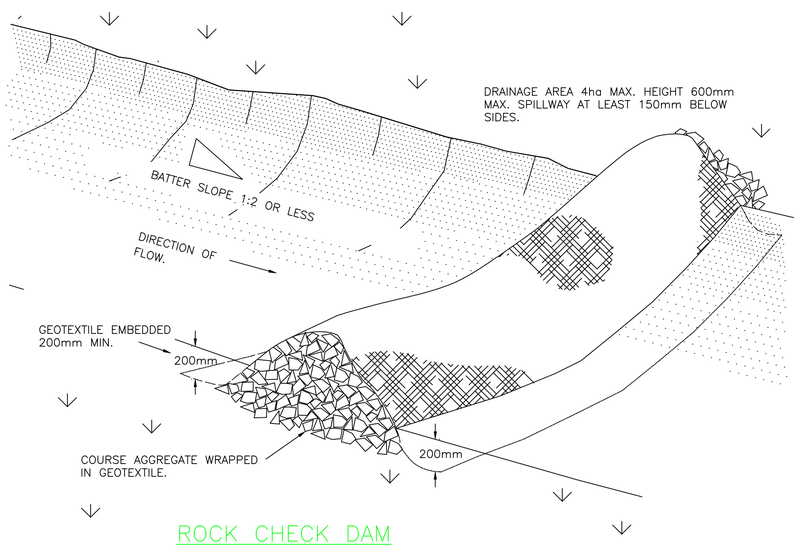
CONSTRUCTION NOTES

1. COMPACT THE SUBGRADE FILL TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL.
2. PREPARE A SMOOTH, EVEN FOUNDATION FOR THE STRUCTURE THAT WILL ENSURE THAT THE NEEDLE–PUNCHED GEOTEXTILE DOES NOT SUSTAIN SERIOUS DAMAGE WHEN COVERED WITH ROCK.
3. SHOULD ANY MINOR DAMAGE TO THE GEOTEXTILE OCCUR, REPAIR IT BEFORE SPREADING ANY AGGREGATE. FOR REPAIRS, PATCH ONE PIECE OF FABRIC OVER THE DAMAGE, MAKING SURE THAT ALL JOINTS AND PATCHES OVERLAP MORE THAN 300mm.
4. LAY ROCK FOLLOWING THE DRAWING, ACCORDING TO TABLE 5.2 OF LANDCOM (2004) AND WITH A MINIMUM DIAMETER OF 150mm.
5. ENSURE THAT ANY CONCRETE OR RIPRAP USED FOR THE ENERGY DISSIPATER OR THE OUTLET PROTECTION CONFORMS TO THE GRADING LIMITS SPECIFIED ON THE SWMP.



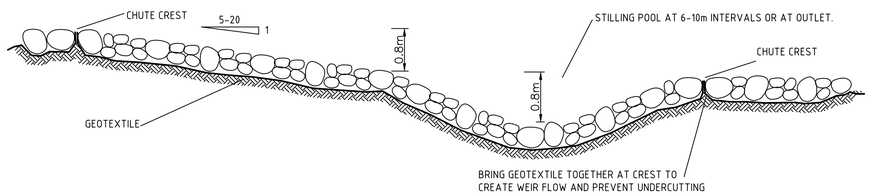
ROCK ARMOURING FLOW TRANSFER / DISCHARGE

WHERE FLOW TRANSFER GRADES EXCEED 5%, SURFACE ARMOURING (GENERALLY ROCK) IS RECOMMENDED.
ROCK ARMOURING SHOULD MATCH THE FOLLOWING SPECIFICATIONS:
1. SURFACE SHOULD BE GENERALLY SPOOTH AND FREE OF OBSTRUCTIONS
2. USE A NON WOVEN GEOTEXTILE, A64 BIDIM OR EQUIVALEN
3. USE A 150mm GRAVEL FOUNDATION BASE
4. PLACE APPROPRIATELY SIZED ROCK SUCH THAT ROCK INTERCONNECTS WELL TO CREATE A SECURE SURFACE.
5. ROCK SIZING SOULD RANGE FROM d50 ø250 FOR SLOPES OF 5% TO d50 ø800 FOR SLOPES UP TO 20%
6. ROCK DISTRIBUTION SHALL BE 0.5Xød50 FOR d15 ROCK TO 1.2Xd50 FOR D85 ROCK
7. ROCK LAYER THICKNESS IS 1.7 X d50.

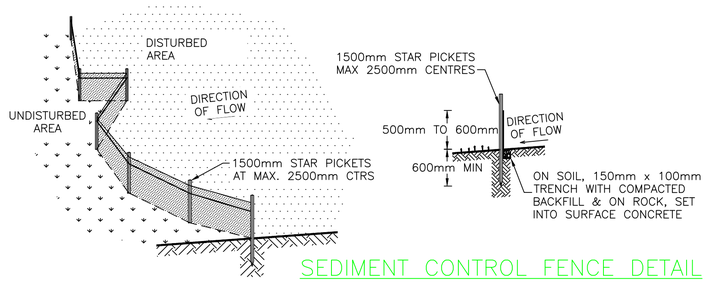


ROCK CHECK DAM

NTS



SEDIMENT COLLECTION AND RETENTION



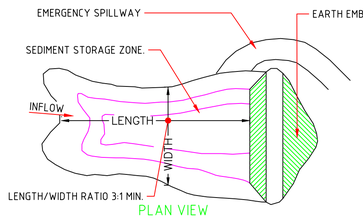
SEDIMENT CONTROL FENCE DETAIL

NTS

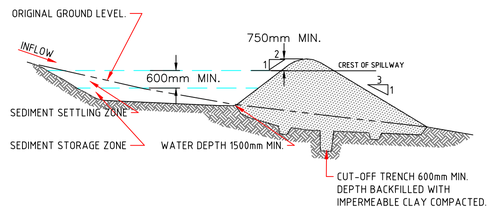
SEDIMENT FENCE CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10YR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1500mm LONG STAR PICKETS INTO THE GROUND AT 2500mm INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF–SUPPORTING GOETEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

EARTH SEDIMENT BASIN – WET (SD 6–4)



PLAN VIEW



CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT–OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

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PROJECT: Eurobodalla Quarry Expansion and Resource Recovery	DRAWING TITLE: Water Management Details				PURPOSE: EIS	
CLIENT: Eurobodalla Quarry	DRAWING NUMBER: 361-02	SCALE: NTS	SHEET: 02 /02	DESIGNED: LB	CHECKED: LB	DATE OF ISSUE: 08/05/2017

REV	DESCRIPTION	BY	DATE	REV	DESCRIPTION	BY	DATE

APPENDIX B BIODIVERSITY ASSESSMENT ADDENDUM

[Attached separately]

Biodiversity Addendum

EUROBODALLA QUARRY

MAY 2017

Document Verification

Project Title: Eurobodalla Quarry

Project Number:	Biodiversity Addendum
Project File Name:	Biodiversity Addendum EQ_Final v1.1

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final v1	3/05/17	Sam Patmore, Dave Maynard, Paul McPherson	Brooke Marshall	Brooke Marshall
Final v1.1	11/05/17	Sam Patmore	Minor changes	Minor changes

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1 OVERVIEW

Response to Request for Further Information from Eurobodalla Shire Council and Office of Environment & Heritage re: DA366/17 – Quarry Expansion at Lot 1 DP1165095 (NGH ref. 6122).

This report has been prepared to provide further information for submission in response to the Request for Further Information provided by Eurobodalla Shire Council (letter dated 22/02/2017, Ref: 06.0660) and Office of Environment & Heritage (letter dated 17/02/2017; DOC17/43741-8).

Section 2 addresses ESC matters. Section 3 addresses additional OEH matters. Section 2.2.4 of this report summarises the mitigation measures proposed to avoid biodiversity impacts. Mitigation measures were originally included in the EIS, but have now been updated to address matters raised by either Eurobodalla Shire Council or OEH and included in this response (Appendix A.5).

2 BIODIVERSITY MATTERS RAISED BY ESC

2.1 SUMMARY OF MATTERS RAISED

The Biodiversity matters raised by Eurobodalla Shire Council (ESC) as set out in their letter dated 22/02/2017, item 4, includes the following items (in summary and assigned a letter/number for ease of reference):

1. Council does not consider the fauna survey to be adequate nor the discussion about the possibility of hollow bearing trees providing a key roosting/breeding habitat hollow-dependent fauna, in particular the Powerful Owl (observed to exist onsite from previous studies). Night-time spotlighting is required to adequately survey for the presence of any nocturnal hollow-dependent threatened species (i.e. Powerful Owl, Masked Owl, threatened Microbats). Council cannot ascertain whether there is any likelihood of this fauna possibly occupying some of the 11 hollow bearing trees proposed for removal onsite.

2. Assessment of Significance (7 Part Test) for hollow-dependent fauna known to exist within 10 km of the development (as per Bionet Atlas search results) or observed at the site from past studies. The 7 Part test is to pay particular importance to the following:
    i. The loss of 11 hollow bearing trees needs to be discussed as a key threatening process with additional mitigation measures (eg. nest boxes in offset areas) proposed for the loss of a key habitat resource; and
    ii. River Flat Eucalypt Forest. In particular the potential for indirect impacts resulting from inadequate erosion and sediment control if proposed sediment basins were to fail.

3. Appropriate offsetting is required to address the loss of 4.24 ha native vegetation onsite to compensate the loss of broad scale clearing onsite and address key threatening process under Section 5A (2)(g).

    - *The Secretary's Environmental Assessment Requirements in relation to offsets to mitigate impacts of land clearing have not been considered in mitigating the loss of native vegetation. This is a requirement for major projects in NSW under Native Vegetation Reforms (i.e.: Offsetting for major projects that are seen to have high impacts). Offsetting is a measure to demonstrate mitigation for the loss of native vegetation onsite. Council would consider an offset of 1 ha lost to 3 ha conserved to be adequate for mitigating the loss of native vegetation.*

4. Note: Section 5A(2)(g) of the EP&A Act 1979 provides that land clearing is deemed a 'key threatening process' and this fact has not been discussed in a 7 part test. It is noted on page 52 (table 6-2) that 4.24 ha of clearing would be required. At present there is no demonstration of any mitigation measures to address impacts of development on biodiversity (Section 5A factors).

Set out below is a response (further information) against each matter in turn.

2.2 RESPONSE TO MATTERS RAISED BY ESC

2.2.1 Additional targeted nocturnal surveys:

Additional nocturnal fauna surveys have been conducted to address the concerns raised by ESC. The surveys involved stagwatches, spotlighting, call playback and use of Anabat bat detection units. Below is a more detailed summary of each of the further nocturnal surveys conducted.

Refer to Figure 1 at Attachment A.1 for details on the survey effort. Data results tables are provided at Attachment A.2.

Stagwatches

Stagwatches were conducted over three nights, and involved focusing spotlights on an identified hollow-bearing tree to observe for signs of fauna entering/exiting hollows. The stagwatches were conducted for a period of approximately 1.5 hours, typically commencing at sunset (prior to dark) and continuing for about 1 hour after dark. The stagwatch surveys were led by Dave Maynard (Senior Ecologist, NGH Environmental) with one assistant (Troy Hollis) and were undertaken using a 1 x 55w handheld torch and 1 x Ledlenser head torch with 350-800 Lumens. One observer was positioned at each survey point and focused on one of the identified hollow-bearing trees (HBT).

A summary of the stagwatch surveys is provided in Table 1 below which includes details of the location of each stagwatch survey, as well as the date, time. The weather conditions during each survey are generally the same as described for the spotlight surveys (given the surveys were conducted on the same evening) detailed in Table 2. The location of each traverse is shown in Figure 1.

Anabat Survey

Two Anabat bat detection units (Anabat Express Passive Bat Detector, Titley Scientific) were deployed on each of the survey nights. The units set up to coincide with the stagwatch surveys, with each unit orientated toward the hollow-bearing tree subject to the stagwatch survey so that any microbats observed leaving a hollow could be identified by correlating the time of the observed exit with the call files of the Anabat unit. A summary of the Anabat surveys is provided in Table 1, and the location of each unit deployed is shown in Figure 1.

Table 1 Summary of stagwatch and anabat surveys

Stagwatch/Anabat Survey Date	Stagwatch survey time (Start – Finish)	Observer	Anabat survey time (Start – Finish)	Location
24/03/2017 (SW1 & AB1)	18.40 – 20.10	Troy Hollis	18.30 – 22.25	Centred on tree HBT11
24/03/2017 (SW2 & AB2)	18.45 – 20.10	Dave Maynard	18.45 – 22.35	Centred on tree HBT6
27/03/2017 (SW3 & AB3)	18.40 – 20.05	Troy Hollis	18.20 – 07.40	Centred on tree HBT7
27/03/2017 (SW4 & AB4)	18.45 – 20.00	Dave Maynard	18.45 – 07.40	Centred on tree HBT5
28/03/2017 (SW5 & AB5)	18.40 – 20.10	Troy Hollis	18.28 – 22.34	Centred on tree HBT2
28/03/2017 (SW6 & AB6)	18.40 – 20.05	Dave Maynard	18.34 – 22.38	Centred on tree HBT1

Nocturnal Spotlighting

A total of three nights of spotlighting were undertaken throughout the proposed expanded extraction area. The spotlighting was undertaken by two people as random meander traverses of between 1.1 – 2.30 person hours duration, for a total combined survey effort of 5.40 person. The spotlighting surveys were led by Dave Maynard (Senior Ecologist, NGH Environmental) with one assistant (Troy Hollis). Spotlighting was undertaken using a 1 x 55w handheld torch and 1 x Ledlenser head torch with 350-800 Lumens.

The location of each traverse is shown in Figure 1. Table 2 details the date, time and weather conditions of the surveys.

Table 2 Summary of nocturnal spotlighting survey effort

Spotlight Date	Time (Start – Finish)	Temperature (^{0}C)	Cloud Cover	Moon Phase	Wind	Rain
24/03/2017 (SL 1)	21.20 – 22.35	20.3	8/8	15% (waning crescent)	Calm	Nil (but extensive in previous days)
27/03/2017 (SL 2)	21.50 – 22.25	19.2	0/8	1% (waning crescent)	Approx. 10 km/h	Intermittent light to heavy rain immediately prior but nil during survey
28/03/2017 (SL 3)	21.30 – 22.30	20.8	8/8	0% (new moon)	Calm	Nil (but extensive in previous days)

Call Playback

Call playback was undertaken during each survey night, and was conducted for a period of approximately 1 hour between the end of the stagwatch surveys and commencement of the spotlighting traverses (between 20.10 and 21.20 on the evenings of 24th and 28th of March, and between 20.10 and 22.00 on the evening of 27th March, with

an approximate 1 hour disruption in the call playback process due to the onset of rain which later eased and allowed resumption of the call playback survey).

The call playback surveys involved broadcasting through a megaphone a recorded call of a threatened species for a period of approximately five (5) minutes, then listening for a period of approximately 10 minutes for any reply calls (either by the species whose call was played, or by another species that may be responding to that call, such as a predator or prey species). Spotlights were also used during the call playback surveys to observe any species that may have been attracted by the played calls but did not respond vocally.

The target species whose calls were played included:

- Powerful Owl
- Masked Owl
- Barking Owl
- Sooty Owl
- Yellow-bellied Glider

The location of each call playback survey point is shown in Figure 1 and summarised below:

- Call Playback #1: 24/3/2017 – near HBT7
- Call Playback #2: 27/3/2017 – near HBT11
- Call Playback #3: 28/3/2017 – near HBT2

Results Summary and Conclusions

The results of the nocturnal surveys are summarised in Table 3 below. Three threatened species were recorded as being (potentially) present at the subject site; all three are microbat species. The three threatened species were all detected via Anabat, with one of the species (Eastern Cave bat) only providing a single call file, indication very low abundance at the site. The other two species (Southern Myotis and Yellow-bellied Sheath-tailed bat) may possibly be present at the site, although there is low confidence of this given the very weak call files recorded (indicating that these bats were some distance from the Anabat unit). In the case of the Eastern Cave bat and Southern Myotis, it is believed that whilst some individuals may visit the site from time to time, they are not regular inhabitants of the site, and given their preference for roosting sites (i.e. typically caves and manmade structures), are considered unlikely to use the site for roosting habitat.

Table 3 Summary of nocturnal fauna survey results

Species name	Common name	Survey method
Birds		
Aegotheles cristatus	Owlet Nightjar	SL2,
Eurostopodus mystacalis	White-throated Nightjar	SW6
Ninox boobook	Southern Boobook	CP1 (heard), CP3 (heard)
Podargus strigoides	Tawny Frogmouth	SL2,
Tyto javanica	Eastern Barn Owl	CP1 (heard),
Mammals		
Petaurus breviceps	Sugar Glider	SW2, CP3 (heard), SL3
Pseudocheirus peregrinus	Ringtail Possum	SL1,
Trichosurus vulpecula	Brushtail Possum	SW2, SL1, SL2, SL3

Vombatus ursinus	Common Wombat	SL3
Microbats		
Austronomus australis	White-striped Free-tailed bat	Anabat
Chalinolobus gouldii	Gould's Wattled bat	Anabat
Chalinolobus morio	Chocolate Wattled bat	Anabat
^Myotis macropus	Southern Myotis	Anabat (unconfirmed - number of possible calls, but very weak)
Nyctophilus spp.	A Long-eared bat	Anabat
Ozimops (Mormopterus) ridei	Ride's Free-tailed bat	Anabat
Rhinolophus megaphyllus	Eastern Horseshoe bat	Anabat
^Saccolaimus flaviventris	Yellow-bellied Sheath-tailed bat	Anabat (unconfirmed – very weak call, one pulse only)
Scotorepens orion	Eastern Broad-nosed bat	Anabat
Vespadelus darlingtoni	Large Forest bat	Anabat
Vespadelus regulus	Southern Forest bat	Anabat
^Vespadelus troughtoni	Eastern Cave bat	Anabat (one call file only on 28/3/17)

^ Threatened species

CP = Call Playback
SW = Stagwatch
SL = Spotlight

2.2.2 Assessments of Significance

The Assessment of Significance (7-part test) is relevant to species, populations and ecological communities listed on Schedules 1, 1A and 2 of the *Threatened Species Conservation Act 1995* (TSC Act) and Schedules 4, 4A and 5 of the *Fisheries Management Act 1994*. The assessment sets out seven factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). All factors must be considered and an overall conclusion made based on all factors in combination. An SIS is required if, through application of the 7-part test, an action is considered likely to have a significant impact on a threatened species, population or ecological community.

Based on the request from ESC, specifically existing records of species within 10 km of the site based on Bionet database records (OEH 2017), the candidate species (based on a known dependence on tree hollows) and communities include:

- Hollow-dependent fauna, including
    - Forest Owls (including Powerful Owl, Masked Owl, and Sooty Owl)
    - Cockatoos (including Glossy-black Cockatoo and Gang-gang Cockatoo)
    - Little Lorikeet
    - Microbat species (including Southern Myotis, Eastern Freetail Bat, Eastern False Pipistrelle, and Greater Broad-nosed Bat. Note, the Golden-tipped Bat, Eastern Bentwing-bat have been

excluded from this Assessment of Significance given they are not known to regularly use tree hollows)
    - Gliders (including Yellow-bellied Glider, Squirrel Glider and Greater Glider, including Greater Glider population in Eurobodalla LGA)
    - Other mammals (including Eastern Pygmy-possum)
- River Flat Eucalypt Forest

Note that where relevant/appropriate, species groups or guilds have been collected together into a single response for certain parts of this Assessment of Significance where the species ecology or nature of impacts are similar (i.e. for bird species that utilise large hollows (e.g. Forest Owls and Cockatoos), the nature and extent of impacts, including fragmentation of habitat, are relatively similar for each of these species and so the response for each of these species has been collected into a single response for those matters).

(a) in the case of a threatened species, whether the action proposed 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.

Forest Owls

Powerful Owl (Ninox strenua, Vulnerable – TSC Act)

This species was previously recorded at the site (Mills, 2001), however it was not detected during either the August 2016 site inspection, or during the recent March 2017 surveys, which included targeted surveys for this species (including call playback, stagwatching and general spotlighting. Refer to further information of survey methods in Section 2.2.1 of this advice).

The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation and nests in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) (OEH, 2017).

The project will result in the removal of 11 identified Hollow-bearing trees, supporting a total observed 26 hollows. Of these, only one “large” hollow (i.e. hollow entrance with opening diameter of >15cm) was observed within the development footprint (HBT06) suitable for this species. General spotlighting traverses past this tree as well as across the site more broadly did not observe this species. Additionally, call playback surveys failed to elicit a response from this species. Given this, it is considered unlikely that the species is currently utilising the site for breeding purposes, and highly unlikely that the species is occupying the single large hollow observed at the site. Based on this, the project is not likely to result in an impact to any breeding/nesting habitat. Even if the tree were being used by the species, the removal of a single large hollow is unlikely to result in a 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 Powerful Owl typically feeds on other arboreal fauna including mainly medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. These prey species also (typically) require medium to large sized hollows, and very few such animals were observed within the site. As such, the abundance of prey for Powerful Owls within the subject site is likely to be low, particularly in comparison with the relatively undisturbed large tracts of forest situated to the north of the site, which is likely to provide a greater abundance of prey items for the species. As the Powerful Owl is known to feed over wide area, the removal of approximately 4 ha of vegetation unlikely to result in a substantial reduction of prey availability. As such, the proposal is considered unlikely to result in any impacts to foraging resources for the species to the extent that the project would be 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 project will also generate noise and vibration which could extend into adjacent forest habitats off-site, which could potentially support this species (based on previous record of species from survey work completed by Kevin Mills and Associates, 2001). The extent of this disturbance (i.e. levels and distance of penetration of noise and vibration) into adjacent habitats however is not accurately known, although given that there is an existing quarry operation being undertaken at the site, it is expected that the extent of this disturbance above and beyond current noise and vibration levels would be minor, and that any locally occurring animals would already be somewhat acclimatised to this disturbance anyway. Furthermore, there is substantial forest habitats available in adjacent land to the north and west of the site within Dampier State Forest, so that should noise and vibration impacts cause disturbance to individuals or breeding pairs, there is ample habitat available for them to move further away from the site. As such, the minor increase in the extent of noise and vibration impacts into adjacent habitats is considered unlikely to result in any impacts to the species to the extent that the project would be 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.

Masked Owl (Tyto novaehollandiae, Vulnerable – TSC Act)

Similar to the Powerful Owl, addressed above, the Masked Owl roosts in large tree hollows (or sometimes caves) for nesting, and usually in moist eucalypt forested gullies. The typical diet consists of tree-dwelling and ground mammals, especially rats, and often hunts along the edges of forests, including roadsides. Breeding pairs of this species have large home-ranges of 500 to 1000 hectares (OEH, 2017). The species has been recorded only once within 10 km of the site, in 1997 (Bionet OEH, 2017) approximately 2.5 km west of the site.

As noted above for the Powerful Owl, the project will result in the removal of one identified large hollow (HBT06). The species was not observed during any previous study of the site by Kevin Mills (2001), or NGH (2005, 2016) and was not observed during the recent targeted surveys of the site which included general spotlighting and call playback (at a spot less than 100m from HBT06). Given this, it is considered unlikely that the species is currently utilising the site, and highly unlikely that the species is occupying the single large hollow observed at the site. Based on this, the project is not likely to result in an impact to any breeding/nesting habitat. Even if the tree were being used by the species, the removal of a single large hollow is unlikely to result in 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 Masked Owl is known to hunt along the edges of forests. As such, the site may provide potential foraging habitat for the species, although only a small number of potential prey species were recorded at the site, suggesting that food resources for the species within the site are limited. Given their large home ranges and the abundance of potential habitat within Dampier State Forest to the north and west of the site, the loss of a small area of potential marginal foraging habitat at the site is considered unlikely to result in any impacts to foraging resources for the species to the extent that the project would 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.

Indirect impacts to the species associated with noise and vibration are likely to be the same as for the Powerful Owl, noted above, and consequently, the minor increase in the extent of noise and vibration impacts into adjacent habitats is considered unlikely to result in any impacts to the species to the extent that the project would be 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.

Sooty Owl (Tyto tenebricosa, Vulnerable – TSC Act)

This species occurs primarily in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. It roosts by day in the hollow of a tall forest tree or in heavy vegetation, and hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum or Sugar Glider. Nest sites are usually in very large tree-hollows (OEH, 2017).

As noted above for both the Powerful Owl and Masked Owl, only one large hollow was observed within the impact area (tree HBT06), and the species was not recorded anywhere within or near the site during the recent targeted surveys which included general spotlighting in the vicinity of HBT06, as well as call playback (at a spot less than 100m from HBT06).

Given this, it is considered unlikely that the species is currently utilising the site, and highly unlikely that the species is occupying the single large hollow observed at the site. Based on this, the project is not likely to result in an impact to any breeding/nesting habitat. Even if the tree were being used by the species, the removal of a single large hollow is unlikely to result in a 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.

Similar to the Masked Owl, the site may provide potential foraging habitat for the Sooty Owl, although only a small number of potential prey species were recorded at the site, suggesting that food resources for the species within the site are limited. Given their large home ranges and the abundance of potential habitat within Dampier State Forest to the north and west of the site, the loss of a small area of potential marginal foraging habitat at the site is considered unlikely to result in any impacts to foraging resources for the species to the extent that the project would 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.

Indirect impacts to the species associated with noise and vibration are likely to be the same as for the Powerful Owl, noted above, and consequently, the minor increase in the extent of noise and vibration impacts into adjacent habitats is considered unlikely to result in any impacts to the species to the extent that the project would be 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.

Cockatoos

Gang-gang Cockatoo (Callocephalon fimbriatum, Vulnerable – TSC Act)

This species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests in the spring and summer period, whilst in autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas, and often found in urban areas. This species also favours old growth forest and woodland attributes for nesting and roosting, where it nests in medium, to large hollows that are at least 10 cm in diameter (OEH, 2017).

Based on the above, the species is unlikely to inhabit the site during the spring/summer period, although it could potentially be present during the autumn/winter period. Surveys at the site have been conducted in August (2016) and March (2017) which would coincide with the species potential occurrence. The species is conspicuous and readily identified if present. No evidence of the species presence at the site has been made during any surveys of the site. As such, it is considered unlikely that the species is a regular inhabitant of the site. Importantly, the species typically breeds in the summer months at the higher elevations of the ranges, and so it is considered highly unlikely that the species would use the site for breeding habitat.

The site may provide potential foraging habitat for the species, however given the abundance of potential foraging habitat within Dampier State Forest to the north and west of the site, and the highly mobile nature of the species, the loss of a small area (circa 4 ha) of potential foraging habitat at the site is considered unlikely to result in any impacts to foraging resources for the species to the extent that the project would 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.

Indirect impacts to the species associated with noise and vibration are likely to be the same as for the Powerful Owl, noted above, and consequently, the minor increase in the extent of noise and vibration impacts into adjacent habitats is considered unlikely to result in any impacts to the species to the extent that the project would be 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.

Glossy-black Cockatoo (Calyptorhynchus lathami, Vulnerable – TSC Act)

This species inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. The species is dependent on large hollow-bearing eucalypts for nest sites (OEH, 2017).

Potential food trees species were observed to be sparsely distributed and in low abundance within the site and as such, the site provides limited potential foraging habitat for the species. Additionally, as with the forest owl species discussed above, given the species relies on large hollows, and that only one large hollow was observed within the development footprint, the project is not likely to result in an impact to any breeding/nesting habitat. The species was not recorded at the site during any of the site surveys conducted since 1995, and even if the species did occur at the site, the removal of a single large hollow is unlikely to result in a 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.

Indirect impacts to the species associated with noise and vibration are likely to be the same as for the Powerful Owl, noted above, and consequently, the minor increase in the extent of noise and vibration impacts into adjacent habitats is considered unlikely to result in any impacts to the species to the extent that the project would be 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.

Little Lorikeet (*Glossopsitta pusilla*, Vulnerable – TSC Act)

The Little Lorikeet forages primarily in the canopy of open Eucalyptus forest and woodland where it feeds mostly on nectar and pollen, and occasionally on native fruits such as mistletoe. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity of food resources. It typically roosts in treetops, often distant from feeding areas, but nests in proximity to feeding areas if possible, typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Hollow entrances are normally small (3 cm) and usually high above the ground. Nest sites are often used repeatedly for decades, suggesting that preferred sites are limited, and riparian trees are often chosen. The species is gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries (OEH, 2017).

The species has previously been recorded only twice within 10 km of the site within Bodalla State Forest in 2013 and in 2015, and more than 8 km east, southeast of the site (Bionet, OEH 2017). As the species is relatively conspicuous (being gregarious and travelling/feeding in flocks) it is likely that it would have been identified previously at the site during the numerous surveys conducted at the site since 1995, especially considering the (breeding) site fidelity displayed by the species. In addition, the recorded hollow-bearing trees within the development footprint were typically rough-barked species, and not situated within a riparian zone. As such, the sites provides very limited preferred nesting habitat for the species, with more suitable potential habitat prevalent within Swamp Creek and other riparian zones in the broader area.

Given the above considerations, the species is regarded as being unlikely to rely on the site for important nesting or foraging habitat, although it could visit the site from time. This limited use of the site suggests that the removal of a small number of hollow-bearing trees, and the associated clearing of a small area of native vegetation (circa 4 ha) compared with the thousands of hectares of potential habitat available in Dampier State Forest to the north, and Bodalla State Forest to the south (where the species has been previously recorded) is unlikely to result in any impacts to the species to the extent that the project would 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.

Indirect impacts to the species associated with noise and vibration are likely to be the same as for the Powerful Owl, noted above, and consequently, the minor increase in the extent of noise and vibration impacts into adjacent habitats is considered unlikely to result in any impacts to the species to the extent that the project would be 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.

Microbats

Southern Myotis (Myotis macropus, Vulnerable – TSC Act)

The Southern Myotis is known as a "fishing bat" that forages over streams and pools catching insects and small fish by raking their feet across the water surface. The species generally roosts in groups of 10 – 15, typically close to water, and normally in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.

The species was reportedly present at the site in the Kevin Mills study (Mills, 2001), but was not recorded during the recent targeted surveys at the site which included deployment of Anabats (refer to description of methods provided in Section 2.2.1 of this advice), although the call analysis provided by Dr Greg Richards noted that there were suspected calls of this species but were too weak to confidently identify (suggesting possibly that the calls were made by bats foraging along the creek, some distance from where the Anabats had been deployed). The species has was not included in the Bionet database records as having been previously recorded within 10 km of the site (Bionet, OEH 2017). Even if the calls were confidently identified as belonging to this species, it still could not be confidently assumed that the species roosts within the site, and that the calls recorded may have been from foraging individuals.

As noted above, this species typically uses caves, mine shafts, storm water channels, buildings, beneath bridges and other manmade structures for roosting, although hollow-bearing trees have also been known to provide roosting habitat. As the species typically roosts communally in groups of 10-15, roosting habitat (such as a tree hollow) would need to be large enough to accommodate a communal group of this size, although it is acknowledged that the size of the hollow entrance need only be large enough to accommodate the entrance/exit of a single individual at a time, and so small hollows could potentially be suitable. Although not confirmed as present at the site, and particularly, not confirmed as using any of the 11 identified hollow-bearing trees subject to removal, the presence of the species at the site, including its use of one or more of the 11 identified hollow-bearing trees cannot be discounted.

Local populations or breeding colonies of this species typically occur in relatively small clusters where each male establishes a territory and excludes other males, forming a harem of females during each breeding period. In southern NSW, the species breeds only once, with young born in November/December. Individuals are typically torpid during winter, remaining in roosts separate form breeding sites.

In order for the project to have an 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 project would need to result in the complete removal of all suitable roosting habitat in the area, as well as result in the entire loss of multiple communal groups in the area. Given the project proposes the removal of only 11 hollow-bearing trees, none of which have been confirmed to support the species, and that the species typically prefers caves or man-made structures, the project is regarded as being unlikely to impact on multiple potential roosting sites for the species. In addition to this, the proposed mitigation measures will avoid removal of hollow-bearing trees during the important breeding period, and the hollow-bearing trees will be felled in accordance with a tree clearing protocol which will further help to minimise risks to this and other hollow-dependent species.

Foraging habitat for the species is restricted primarily to Swamp Creek which is not expected to be impacted by the proposal.

The species is not known to be particularly susceptible to noise and vibration, and is known to occupy bridges which can be susceptible to noise and vibration impacts. The project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation. It is unlikely to adversely affect any local breeding population for the species.

Given the above considerations, the project is not expected to result in 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.

Eastern Freetail Bat (Mormopterus norfolkensis, Vulnerable – TSC Act)

This species typically occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures, and usually solitary but has also been recorded roosting communally. The species has previously been recorded only once within 10 km of the site, in Bodalla State Forest in 1995, approximately 6 km south, southeast of the site (Bionet, OEH 2017). The species was not recorded in any previous surveys of the site, and was not identified by Anabat analysis during the recent targeted surveys. Based on the lack of records of the species, it is considered unlikely that the species occurs at the site, and any (unknown) occurrence is likely to consist of only a small number of individuals. As such, the project is unlikely to form important roosting habitat for the species, with substantial areas of relatively intact forest to the north (Dampier State Forest) and south (Bodalla State forest), likely to provide more suitable habitat for the species. Given this, the proposed removal of only 11 hollow-bearing trees, is unlikely to result in impacts to any more than a small number of individuals, and as such, is considered unlikely 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 project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation. The species is not known to be particularly susceptible to noise and vibration and it is considered unlikely that the project would adversely affect the life cycle of any local breeding population of the species in terms of noise or vibration.

Eastern False Pipistrelle (Falsistrellus tasmaniensis, Vulnerable – TSC Act)

This species prefers moist habitats, with trees taller than 20 m, where it generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Females are pregnant in late spring to early summer, and the species hibernates in winter (OEH, 2017). The species has previously been recorded only once within 10 km of the site, in Bodalla State Forest in 2005, more than 3 km southeast of the site (Bionet, OEH 2017). The species has not been previously recorded at the site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included the deployment of two Anabats over three nights (refer to survey methods for a full description of total survey effort). Given this, the species is regarded as being unlikely to utilise the site on a regular basis.

Although not specifically identified in the available scientific literature on this species, as with many other microbats, it is likely that the species utilises hollows with small entrances. The project impacts include the removal of 15 identified small hollows within 10 trees. Given the low probability of occurrence, and the relatively low number of potential breeding sites removed (in comparison with the assumed abundance of similar resources in Dampier and Bodalla State Forests to the north and south of the site), the project is considered unlikely 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 project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation. The species is not known to be particularly susceptible to noise and vibration and it is considered unlikely that the project would adversely affect the life cycle of any local breeding population of the species in terms of noise or vibration.

Greater Broad-nosed Bat (Scoteanax rueppellii, Vulnerable – TSC Act)

This species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. The species usually roosts in tree hollows, but has also been found in buildings. It forages after sunset, typically flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m, and tends to favour open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects. Little is known of its reproductive cycle, however a single young is born in January. Prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young (OEH, 2017).

The species has previously been recorded three times within 10 km of the site, including two records in Bodalla State Forest south of the site, the nearest being approximately 3 km south-east of the site in 2005, and the other more than 9 km southwest of the site in 2001, with the third record being located in Dampier State Forest approximately 7 km north, northwest of the site (Bionet, OEH 2017). The species has not been previously recorded at the site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included the deployment of two Anabats over three nights (refer to survey methods for a full description of total survey effort). Given this, the species is regarded as being unlikely to utilise the site on a regular basis.

Given the species tends to forage along creek and river corridors and within open forest and woodland habitats, the development site is not regarded as being likely to provide suitable foraging habitat for this species.

As the species forms communal maternal breeding sites, assuming the species was present at the site, potential impacts to the species would be greatest during the summer breeding period. Felling of trees outside this period would avoid impacts to a maternal breeding group/colony, and based on this scenario, the project would be unlikely 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 project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation. The species is not known to be particularly susceptible to noise and vibration and it is considered unlikely that the project would adversely affect the life cycle of any local breeding population of the species in terms of noise or vibration.

Gliders

Yellow-bellied Glider (Petaurus australis, Vulnerable – TSC Act)

This species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. In the south of its range, forest type preferences typically include moist coastal gullies and creek flats to tall montane forests. The species feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. The species extracts sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. The species dens, often in family groups of two – six individuals, in medium to large sized hollows of large trees. The species is very mobile and occupies large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources (OEH, 2017).

The project site is regarded as providing only marginal suitable habitat for the species. Preferred habitats of moist gullies and creek flats to tall montane forests are present elsewhere in the region, but not within the development footprint. Additionally, no preferred feed trees were recorded within the site (with the possible exception of the Sydney Blue Gum x Bangalay (*E. saligna* x *botryoides*) hybrid, with *E. saligna* a noted feed tree for the Yellow-bellied Glider), and no signs of feeding by the species were observed. Suitable large hollows were also scare within the development footprint, with only one large hollow recorded, and only four trees observed to support medium-sized hollows, with only 10 medium-sized hollows observed in total. Further, of the four trees observed to support

medium-sized hollows, only three of these were large trees (i.e. >15 m in height; HBT04 was the fourth tree and only 14 m in height and 30 cm trunk diameter, DBH, and regarded as generally unsuitable for the species).

The species has been recorded numerous times to the east of the site, with the nearest record approximately 5 km to the east, northeast of the site, whilst only two records of the species within 10 km of the site, have been made to the west of the site. All of the records within 10 km of the site are situated within Dampier and Bodalla State Forests (Bionet, OEH 2017). The species has not been previously recorded at the site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included three nights of spotlighting and call playback.

Given the above, the species is regarded as being unlikely to rely on the site for important foraging or nesting habitat. The lack of suitable feed trees and the proposed removal of only three trees supporting potentially suitable denning habitat suggest that the project is highly unlikely 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 project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation. It is considered unlikely that the project would adversely affect the life cycle of any local breeding population of the species in terms of noise or vibration.

Squirrel Glider (Petaurus norfolcensis, Vulnerable – TSC Act)

This species inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey in coastal areas. It tends to prefer mixed species stands with a shrub or Acacia midstorey. It lives in family groups of a single adult male, and one or more adult females and offspring. The species requires abundant tree hollows for refuge and nest sites. It's diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.

The site supports only marginal suitable habitat for the species. The forest areas were observed to be relatively young, with most trees less than 50 cm DBH, and a low abundance of hollow-bearing trees. The species has previously been recorded only twice within 10 km of the site, including a record in Bodalla State Forest south of the site, the nearest being more than 3 km south of the site in 1997, and the other more than 9 km southwest of the site in Dampier State Forest in 2000 (Bionet, OEH 2017). The species has not been previously recorded at the site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included three nights of nocturnal spotlighting. Given this, and the low abundance of hollow-bearing trees, the species is regarded as being unlikely to utilise the development site on a regular basis, or to rely on the site for important foraging or nesting habitat. The low abundance of hollow-bearing trees and lack of records of the species suggests that the project is highly unlikely 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 project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation. It is considered unlikely that the project would adversely affect the life cycle of any local breeding population of the species in terms of noise or vibration.

Greater Glider (Petauroides volans, Vulnerable – EPBC Act) and also Greater Glider population in Eurobodalla LGA (Endangered – TSC Act; Vulnerable – TSC Act)

This species feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. It shelters during the day in tree hollows and will use up to 18 hollows in their home range, occupying a relatively small home range with an average size of 1 to 3 ha. Individuals are usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent, and are very loyal to their territory (OEH, 2017). There is no overlap of home ranges between adult males (McKay, 1995). The species is the largest of the gliding possums and requires relatively large hollows for denning sites.

The species has been previously recorded numerous times within 10 km of the site, although only two nearby (i.e. less than 5 km) exist, both within Bodalla State Forest, approximately 3 km south of the project site. For the Eurobodalla LGA Population, the project site is noted as being at the very western edge of the known distribution of the population (based primarily on vegetation mapping rather than recorded distribution). The species has not been previously recorded at the site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included three nights of nocturnal spotlighting. Given this, the species is regarded as being unlikely to utilise the site on a regular basis, or to rely on the site for important foraging or nesting habitat. The low abundance of suitable hollows and the fact that male territories do not overlap, suggest that even if the species was present at the site, it is likely to support only one or two individuals at the most. The project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation.

Based on the above, the project is regarded as being unlikely 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.

Eastern Pygmy-possum (*Cercartetus nanus*, Vulnerable – TSC Act)

This species is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas, woodlands and heath appear to be preferred. The species feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, although it also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. It shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts). It appears to be mainly solitary, with each individual using several nests, and males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. It frequently spends time in torpor especially in winter.

The species has been previously recorded only once within 10 km of the site, approximately 10 km southeast of the project site within Bodalla State Forest. The species has not been previously recorded at the site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included three nights of nocturnal spotlighting. Given this, the species is regarded as being unlikely to utilise the site on a regular basis, or to rely on the site for important breeding habitat. Additionally, foraging habitat for the species is limited with no Banksias or Callistemons recorded within the project site. The project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation.

Based on the above, the project is regarded as being unlikely 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.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Gliders

Greater Glider (Petauroides volans, Vulnerable – EPBC Act) and also Greater Glider population in Eurobodalla LGA (Endangered – TSC Act; Vulnerable – TSC Act)

As stated above, this species requires large hollows, displays loyalty to a small territory, and there is no overlap of home ranges between adult males. Additionally, the site is located at the very western edge of the known distribution of the endangered Eurobodalla LGA population. The species has not been previously recorded at the

site during any of the field investigations conducted there since 1995, and in particular, was not identified during the recent targeted surveys which included three nights of nocturnal spotlighting.

Given this, the species is regarded as being unlikely to utilise the site on a regular basis, or to rely on the site for important foraging or nesting habitat. The low abundance of suitable hollows and the fact that male territories do not overlap, suggest that even if the species was present at the site, it is likely to support only one or two individuals at the most.

The project will likely result in only a minor increase in the area susceptible to existing noise and vibration impacts resulting from the current operation.

Based on the above, the project is regarded as being unlikely 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.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

River Flat Eucalypt Forest on coastal floodplains

i. The River-flat Eucalypt Forest EEC occupies alluvial flats, drainage lines and river terraces on floodplains, which are defined as level landforms within the 1:100 year flood zone. The local occurrence of the community in the study area is likely to correspond with the contiguous area of forested vegetation on the Swamp Creek floodplain to the north of the subject site. Based on topography (slope and elevation), the potential size of the local occurrence in the study area is approximately 34 hectares (refer Figure 6-2). The proposed extraction area covers a length of 400 metres along the southern edge of the Swamp Creek floodplain. The works would not involve the clearing of any of the EEC. The offsetting measures for the proposal include natural regeneration or tree, shrub and groundcover planting to extend the EEC and associated forest into the cleared paddock area within a 60 metre buffer strip. The proposal is therefore likely to positively affect the extent of the local occurrence of the community.

ii. The proposed works would be sited outside the ecological community and would not directly impact its composition. The community is located more than 50 metres from the edge of the works area, separated by a cleared paddock buffer strip (which is to be revegetated or allowed to regenerate naturally). There is a potential risk to community composition from concentrated runoff, sedimentation and nutrient pollution if stormwater and leachate control measures fail.

A Water Quality Management Strategy (WQMS) has been prepared for the proposal by a stormwater management specialist. Additional safeguards are included in this EIS and attached EMP (Appendix H of the EIS). A copy of the biodiversity management recommendations are included at Attachment A.4 of this advice. The WQMS measures include diversion bunds, sediment dams and a leachate pond. The site drainage and erosion and sedimentation controls have been designed to comply with the requirements of the Blue Book (Landcom 2004). The stormwater collected in the sediment basins would be flocculated prior to discharge as required. As recommended by the WQMS, the average total suspended solids discharge concentrations must be 8 mg/L, with an allowance of discharges up to 25mg/L in 10% of volumetric discharge. The water would be released onto stable grassland as a dispersed, energy-dissipated flow for further filtration and infiltration.

The proposed composting process is expected to produce minimal leachate. Any leachate would be directed over the compost pad hardstand area into the leachate pond. The leachate pond would be sized and managed to prevent overflow during a 10 yr 24 hr event.

Subject to the effective implementation of the WMP and related measures in the EMP, the proposed works would not be likely to affect the composition of the EEC through concentrated runoff, sedimentation and nutrient pollution. The works are also unlikely to affect the composition of the community through hydrological impacts. The quarry occupies a relatively small part of the catchment. Hydromap (2007) found that the groundwater level at the site is greater than 80 metres below the quarry. The proposal is not likely to modify the composition of the community such that its local occurrence is likely to be placed at risk of extinction

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Forest Owls (Powerful Owl, Masked Owl & Sooty Owl)

i. The proposal would reduce the extent of potential foraging habitat for all of the forest owl species by approximately 4 ha, although the overall quality of the area as foraging habitat is considered limited given the generally low observed abundance of suitable prey species within the forest areas proposed to be removed. Given the paucity of records of these species within or immediately surrounding the site and the extensive areas of similar or better habitat in the surrounding state forests to the north and south of the site, the overall extent of removal of potential foraging habitat is considered negligible in the context of the available potential foraging habitat in the locality.

   The proposal would also result in the loss of only one identified large hollow required for nesting habitat. Although no hollow-bearing tree surveys were conducted in the broader area surrounding the site, it is reasonable to assume that there would be many more large hollows available in the locality. As such, the removal of a single large hollow is unlikely to substantially reduce overall habitat availability in the local area.

ii. The proposal involves clearing of a small area (approximately 4 ha) at the edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, and the highly mobile nature of this species, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

iii. As noted above, the site is not believed to provide important breeding habitat given the paucity of records of three of the forest owl species within the site, and the presence of only one identified large hollow. The site is also not believed to provide important foraging habitat given the paucity of records of suitable prey species. These factors combined with the overall small area of the proposed clearing in comparison with the extensive areas of potentially more suitable habitat within the Dampier and

Bodalla State Forests, suggest that the development site does not provide habitat that would be important for the long-term survival of this species.

Cockatoos (Gang-gang and Glossy-black Cockatoos)

i. The proposal would reduce the extent of potential foraging habitat by approximately 4 ha. This reduction in foraging habitat is considered to be relatively minor given the (likely) abundance of similar (or better) foraging habitat resources within the surrounding State Forests, and adjoining National Parks further beyond, totalling many thousands of hectares of contiguous forest habitat. For the Glossy-black Cockatoo, the reduction in potential foraging habitat would be even less given the relatively low abundance of suitable feed (sheoak) trees within the 4 ha forest area.

   The Gang-gang Cockatoo typically breeds at higher elevations in the spring/summer, and so the proposal is unlikely to remove any breeding habitat.

   For the Glossy-black Cockatoo, the proposal would also result in the loss of only one identified large hollow that could be used by the species, although regarded as unlikely.

   Given the abundance of similar or better habitats in the State Forests to the north and south of the site, the project is considered unlikely to substantially reduce overall breeding or foraging habitat availability in the local area.

ii. The proposal involves clearing of a small area (approximately 4 ha) at the edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, and the highly mobile nature of both of these species, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

iii. As noted above, the site does not provide important breeding habitat for either species. The site is also not believed to provide an important foraging habitat area given the abundance of similar (or better) habitats in the surrounding State Forests. These factors combined with the overall small area of the proposed clearing, suggest that the development site does not provide habitat that would be important for the long-term survival of this species.

Little Lorikeet

i. The proposal would reduce the extent of potential foraging habitat by approximately 4 ha, given most of the foraging habitat for this species is restricted to the small forest area of the project site. This reduction in foraging habitat is considered to be relatively minor given the (likely) abundance of similar (or better) foraging habitat resources within the surrounding State Forests, and adjoining National Parks further beyond, totalling many thousands of hectares of contiguous forest habitat likely to be suitable as foraging habitat for this species.

   The proposal would also result in the loss of up to 10 trees supporting approximately 15 observed small hollows required for nesting habitat. Although no hollow-bearing tree surveys were conducted in the broader area surrounding the site, it is reasonable to assume that there would be many more hollows available in the locality. As such, the removal of a these hollows is unlikely to substantially reduce overall habitat availability in the local area.

ii. As with the other bird species above, given the contiguous forest to the north and west of the proposed development area and the highly mobile nature of this species, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

iii. As noted above, the site is not believed to provide important breeding habitat given the paucity of records of the species within the site, and the overall relatively low number of suitable hollows to be removed. The site is also not believed to provide important foraging habitat given the small area in comparison with much larger areas of contiguous State Forest and National Parks in the region. These factors suggest that the development site does not provide habitat that would be important for the long-term survival of this species.

Microbats (all species)

i. The proposal is not expected to result in a long-term or permanent reduction in the extent of potential foraging habitat for the microbat species. For the Southern Myotis, this species forages over water, represented by Swamp Creek which is located outside of the development footprint, and the existing farm dam which will be established in the longer term as a sediment detention basin (and thus may provide similar (low quality) foraging habitat as the existing farm dam). The other species forage predominantly in the forests and clearings. The proposal would reduce the extent of potential foraging habitat by approximately 14 ha for these species, although most of the foraging habitat for is likely to occur within the small forest area of the project site, of approximately 4 ha. The proposal is therefore not expected to greatly reduce foraging habitat for these species.

   The proposal would also result in negligible loss of potential roosting habitat for the microbat species. The project would result in the loss of up to 10 trees supporting approximately 15 observed small hollows that could be used for breeding habitat by these species. Although no hollow-bearing tree surveys were conducted in the broader area surrounding the site, it is reasonable to assume that there would be many more hollows available in the locality. As such, the removal of a these hollows is unlikely to substantially reduce overall breeding habitat availability in the local area for these species.

ii. The proposal involves clearing of a small area (approximately 4 ha) at the edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, and the highly mobile nature of the microbats, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

iii. As noted above, the site is not believed to provide important breeding habitat given the paucity of records of the species within the site, and the overall relatively low number of potential suitable hollows to be removed. The development site is also not believed to provide important foraging habitat. These factors suggest that the development site does not provide habitat that would be important for the long-term survival of this species.

Gliders (Yellow-bellied, Squirrel and Greater Gliders)

i. The proposal would reduce the extent of potential foraging habitat for these species by less than 4 ha, being the removal of the forested area in the north-western corner of the project site. Additionally, the quality of this habitat for foraging purposes is considered to be minimal given the

preferred habitats for these species were not encountered at the site such as moist gullies and creek flats to tall montane forests, and lack of preferred feed trees for Yellow-bellied Gliders.

The proposal would also result in the loss of only one identified large hollow required for nesting habitat for the Yellow-bellied and Greater Gliders, and up to 4 medium-large sized hollows within only two trees, suitable for the Squirrel Glider. Although no hollow-bearing tree surveys were conducted in the broader area surrounding the site, it is reasonable to assume that there would be many more large hollows available in the locality. As such, the removal of a single large hollow and four medium sized hollows is unlikely to substantially reduce overall habitat availability in the local area for these species.

ii. The proposal involves clearing of a small area (approximately 4 ha) at the edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, the proposed development is not expected to result in any fragmentation and no areas of important habitat for these species would become isolated from other areas of habitat as a consequence of the project.

iii. As noted above, the site is not believed to provide important breeding habitat given the paucity of records of the species within the site, and the presence of only one identified large hollow and four medium sized hollows. The site is also not believed to provide important foraging habitat given the lack of suitable food tree species for Yellow-bellied Gliders and is of only moderate value for the other glider species. These factors combined with the overall small area of the proposed clearing in comparison with the extensive areas of potentially more suitable habitat within the Dampier and Bodalla State Forests, suggest that the development site does not provide habitat that would be important for the long-term survival of these species.

Eastern Pygmy-possum

The proposal would reduce the extent of potential foraging habitat by less than 4 ha, being the forested area of the project site. Additionally, the quality of this habitat for foraging purposes is considered to be minimal given the lack of Banksias or Callistemons which are the more highly preferred feed trees/shrubs for this species.

The proposal would also result in the loss of up to 14 hollows (of all sizes) within nine trees. Although no hollow-bearing tree surveys were conducted in the broader area surrounding the site, it is reasonable to assume that there would be many more hollows available in the locality. As such, the removal of a single large hollow is unlikely to substantially reduce overall habitat availability in the local area.

i. The proposal involves clearing of a small area (approximately 4 ha) at the edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, the location of only one existing record to the southeast of the site, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

ii. As noted above, the development site is not believed to provide important breeding habitat given the paucity of records of the species within the broader locality, and the presence of only nine identified hollow-bearing trees. The site is also not believed to provide important foraging habitat

for reasons already given. These factors combined with the overall small area of the proposed clearing in comparison with the extensive areas of potentially more suitable habitat within the Dampier and Bodalla State Forests, suggest that the development site does not provide habitat that would be important for the long-term survival of this species.

River Flat Eucalypt Forest on coastal floodplains

i. Habitat for the River-flat Eucalypt Forest EEC is present to the north of the subject site on the narrow Swamp Creek floodplain. Some of this habitat area has been historically cleared to provide native and exotic pasture. There is a potential risk from the works to the habitat from concentrated runoff, sedimentation and nutrient pollution. These risks are managed through a set of structural and management measures contained in a Water Quality Management Strategy (WQMS) which has been prepared by a stormwater management specialist. Additional safeguards are included in the updated set of mitigation measures from the EIS and also in the Eurobodalla Quarry EMP. The WQMS includes a Water Management Plan (WMP), which has been has been designed by a stormwater management specialist to comply with the requirements of the Blue Book (Landcom 2004). The WMP measures include diversion bunds, sediment dams and a leachate pond; refer c (ii) above.

   Subject to the effective implementation of the WQMS, WMP and related measures in the EMP, the proposed works would not be likely to affect the area of EEC habitat through concentrated runoff, sedimentation and nutrient pollution, or through hydrological impacts. The natural regeneration or revegetation proposed for the buffer strip is intended to restore the community in cleared habitat areas, and provide a forested buffer in adjoining areas above the floodplain.

ii. The proposed works would be located outside the community and would not affect connectivity or fragmentation at the site. The regeneration or restoration of forest cover within the buffer strip between the works and existing EEC vegetation would improve local connectivity and patch size.

iii. The EEC patch in the study area potentially occupies 34 hectares along the fourth order Swamp Creek floodplain, adjacent to the Tuross River valley. In view of the high level of vegetation clearing on the lower Swamp Creek and Tuross Valley floodplain, the strong connectivity with forest vegetation in adjacent State Forest and private landholdings, and the intact condition of the stand, the EEC patch is considered to have high conservation importance. This assessment is subject to assumptions regarding patch size and condition, noting that the full extent of the local occurrence has not been confirmed or surveyed. As outlined above, the proposed works would not require clearing of the community and would not be likely to indirectly affect the community through modification, fragmentation or isolation (subject to the effective implementation of the WQMS, WMP and related measures in the EMP).

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):

No areas listed as critical habitat under the TSC Act occur in the study area for any of the hollow-dependant fauna included in this Assessment of Significance. The proposed action would therefore not adversely affect any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Forest Owls

The project has been considered against the Approved NSW Recovery Plan (DEC, 2006) for the Large Forest Owls which includes the Powerful Owl, Masked Owl and Sooty Owl. The proposed development is not inconsistent with any of the objectives of the Recovery Plan in that:

1. it does not involve or otherwise interfere with assessing the distribution and amount of high quality habitat for each species;
2. it does not involve or otherwise interfere with monitoring trends in population parameters for each species;
3. it does not involve or otherwise interfere with assessing the implementation and effectiveness of forest management actions;
4. impacts on owls and their habitats have been assessed during planning and environmental assessment processes (including this assessment), and has determined by this independent Assessment of Significance to not involve or result in a significant impact to each species;
5. further loss and fragmentation of habitat will not occur as consequence of the proposed development;
6. it does not involve or otherwise interfere with research to improve the recovery and management of the species;
7. it does not involve or otherwise interfere with raising awareness of the conservation requirements of the species amongst the broader community, or involve the community in owl conservation efforts; and
8. does not involve or otherwise interfere with the provision of organisational support and integration of the Recovery Plan with actions in other recovery plans or conservation initiatives.

Cockatoos

No Recovery Plan or Threat Abatement Plan available (for NSW Population) for this species.

Little Lorikeet

No Recovery Plan or Threat Abatement Plan available for this species.

Microbat species

No Recovery Plan or Threat Abatement Plan available for this species.

Gliders

Yellow-bellied Glider

The project has been considered against the Approved NSW *Recovery Plan for the Yellow-bellied Glider* (Petaurus australis) (NSW NPWS 2003). The proposed development is not inconsistent with any of the objectives of the Recovery Plan in that:

1. it does not involve or otherwise interfere with the co-ordination of the implementation of recovery plan actions for the Yellow-bellied Glider in NSW
2. it is not related to and will not interfere with actions to encourage and assist in improving the protection and management of the Yellow-bellied Glider and its habitat. Specifically, the project will not:
    a. remove any identified feed trees
    b. affect any known local population within highly fragmented habitats
    c. result in any change to the size and shape of habitat, and corridors in the local area
    d. result in any fragmentation of habitat
    e. reduce area requirements for the maintenance of a viable local population
3. it does not involve or otherwise interfere with the identification and monitoring of a significant population of the species

4. it does not involve or otherwise interfere with strategic research into the ecology of the Yellow-bellied Glider that is relevant to its conservation
5. it does not involve or otherwise interfere with increasing community awareness of the Yellow-bellied Glider, including encouraging community involvement in its conservation

Squirrel Glider and Greater Glider, including Greater Glider population in Eurobodalla LGA

No Recovery Plan or Threat Abatement Plan available for these species.

Eastern Pygmy-possum

No Recovery Plan or Threat Abatement Plan available for this species.

River Flat Eucalypt Forest on coastal floodplains

No Recovery Plan or Threat Abatement Plan available for this community.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Threatened arboreal fauna

Key threatening processes that are relevant to the project with regard to identified listed threatened fauna species include:

- Clearing of native vegetation
- Removal of dead wood and dead trees
- Loss of hollow-bearing trees

Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation, and increased habitat for invasive species. Dead trees and hollow-bearing trees are also used as nesting/roosting habitat for arboreal fauna.

The proposal would contribute to the removal of approximately 4 ha of native vegetation including the removal of some dead wood/trees and the loss of up to 11 hollow-bearing trees. As demonstrated above, the loss of this vegetation and the hollow-bearing trees is not expected to result in any population level impacts to any of the threatened fauna species considered in this Assessment of Significance. Recommendations have been provided to conduct the clearing in a manner that minimises the risk of death or injury to a colony or individuals of the target species.

River Flat Eucalypt Forest on coastal floodplains

The EEC determination identifies the following Key Threatening Processes (KTP) listed under the TSC Act as relevant for the community: Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change; High frequency fire; and Removal of dead wood and dead trees. The proposal would not introduce or exacerbate any of these KTPs in the community. The regeneration or restoration of forest vegetation within the buffer strip would ameliorate the impacts of land clearing and reduce risks posed by exotic grasses at the site, including Kikuyu.

Conclusion

The proposed works are not expected to result in a significant impact to any of the listed threatened arboreal fauna species considered above, and would not significantly affect the River-flat Eucalypt Forest EEC in the study area. Recommended mitigation measures (summarised in Section 2.2.4 of this advice) have been made to

minimise the risks associated with the project to threatened fauna and communities and include conducting the tree felling in accordance with a protocol to reduce risk of injury or death to resident fauna, as well as the implementation of the WQMS, WMP and related measures in the EMP to protect the River Flat Eucalypt Forest EEC.

2.2.3 Biodiversity Offsets

The comments received from ESC include that appropriate offsetting is required to address the loss of 4.24 ha of native vegetation onsite to compensate the loss of vegetation from broad scale clearing onsite and address this key threatening process. The comments further note that:

> *The Secretary's Environmental Assessment Requirements in relation to offsets to mitigate impacts of land clearing have not been considered in mitigating the loss of native vegetation. This is a requirement for major projects in NSW under Native Vegetation Reforms (ie.: Offsetting for major projects that are seen to have high impacts). Offsetting is a measure to demonstrate mitigation for the loss of native vegetation onsite. Council would consider an offset of 1 ha lost to 3 ha conserved to be adequate for mitigating the loss of native vegetation.*

Based on the comments received, an offset site has been chosen to compensate the loss of native vegetation. The offset site is located to the north and west of the quarry, and is a total of 13.18 ha in area. Refer to Figure 2, Attachment A.1 for the location and details of the proposed offset site. Table 4 details the area of each vegetation types included in the offset site.

Table 4 Summary of offset site provisions

Vegetation type	Area (ha)
Deua-Brogo Foothills Dry Shrub Forest	9.67
South Coast River Flat Forest	0.68
Southeast Coastal Gully Shrub Forest	2.81
Exotic pasture	0.02
Total	**13.18**

As can be seen from Table 4, the project will provide a clearing to offset ratio of more than 1:3, which meets the ESC requirement. The offset will also include rehabilitation objectives to increase the biodiversity values or the area, including removal of the exotic pasture area, as well as increasing the overall vegetated buffer area between the extraction area and the River Flat Eucalypt Forest EEC and adjoining Swamp Creek.

It is proposed that the offset area would be fenced-off and excluded from any future development through an agreement made with and to the satisfaction of ESC.

2.2.4 Mitigation measures

The comments received from ESC include that: “at present there is no demonstration of any mitigation measures to address impacts of development on biodiversity (Section 5A factors)”.

We list mitigation measures specific to biodiversity impacts at Section 7 of the EIS, and also addressed through management measures specific to biodiversity at Section 3.3 of the Environmental Management Plan, included at Appendix H of the EIS. The proposed mitigation measures include:

- Biodiversity (fauna) Construction Management Protocol – details the timing (i.e. seasonal) restrictions and general methodology for clearing hollow-bearing trees (including staged felling and felling in presence of fauna spotter/catcher), and reuse of large sections of hollow branches/limbs as well as collection and translocation of ground habitat such as fallen limbs and hollow logs.
- Vegetation & Water Quality Management – details the establishment of a clearing boundary and protective fencing, retention of vegetation along Swamp Creek, establishment of a vegetated buffer strip (of minimum 50 m width), controls over stock grazing, location and management of stockpiles, and control of weeds.
- Soil Management – details management of soil including ensuring soil overburden is free of weeds and diseases such as *Phytophthera*, separate stockpiling of topsoil, and stockpile management to contain run-off etc.
- Rehabilitation – details provision of a Rehabilitation Strategy (provided at Appendix G of the EIS)

Additional mitigation measures have been added to the measures included in the EIS to address comments raised by ESC or OEH. These added measures are mainly in relation to pre-clearance surveys for the Koala and Wombat burrows. A copy of the updated proposed mitigation measures relevant to biodiversity matters is included at Attachment A.5 of this advice.

In conjunction with the proposed offset described at Section 2.2.3 of this response report, these mitigation measures will limit direct and indirect impacts to biodiversity values of the site associated with the expanded extraction area.

3 BIODIVERSITY MATTERS RAISED BY OEH

3.1 SUMMARY OF MATTERS RAISED

The Biodiversity matters raised by Office of Environment and Heritage (OEH) as set out in their letter dated 17/02/2017, item 4, includes the following items (in summary):

1. Targeted surveys should be carried out for the following;
    - Giant burrowing frog
    - White-footed dunnart
    - Brush-tailed phascogale
    - Eastern Pygmy possum
    - Lowland Grassy Woodland
    - Yellow-bellied sheath tail bat
    - Eastern freetail bat
    - Eastern false pipistrelle
    - Greater broad-nosed bat
    - Golden-tipped bat
    - Powerful owl
    - Barking owl
    - Masked owl
    - Sooty owl
    - Lowland Grassy Woodland
    - Long-nosed potoroo
    - Southern brown bandicoot (eastern)
2. The proponent will need to provide an assessment of significance for the following threatened species and EEC, which have previously been identified on, or in the case of the EEC, directly adjacent to the site. These include;
    1. Glossy-black cockatoo
    2. Powerful owl
    3. Grey-headed flying fox
    4. Southern myotis
    5. Koala
    6. River-Flat Eucalypt Forest on coastal floodplains

Set out below is a response (further information) against each matter in turn.

3.2 RESPONSE TO MATTERS RAISED BY OEH

3.2.1 Further targeted surveys

As described above in the responses to the ESC further information matters, NGH Environmental undertook three nights of targeted nocturnal arboreal fauna surveys. These surveys address the survey requirements for all of the (nocturnal arboreal) species listed by OEH with the exception of ground-dwelling species listed including the Giant Burrowing Frog, White-footed Dunnart, Long-nosed Potoroo and Southern Brown Bandicoot (eastern). With regard to these four species, further targeted surveys were not undertaken as their potential presence at the site was discounted based on an evaluation of their habitat (and database

records). In support of this, an updated threatened species evaluation is provided below, which also includes other species identified by OEH on page 4 of their letter as requiring an Assessment of Significance, which has been discounted based on a lack of potential suitable habitat and/or a low probability of occurrence at the site, and specifically, a low probability that the site would be important for a local population, and as such, the project would be highly unlikely to result in any potential impacts to a local population. Note that species for which an Assessment of Significance was provided in the response to the ESC matters above or addressed further below as other species identified by OEH as requiring an Assessment of Significance are not duplicated in the updated evaluation table below.

Table 5 Updated threatened species evaluation table

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Amphibian				
Heleioporus australiacus Giant Burrowing Frog V TSC V EPBC	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Marginal within the extraction area, but present in surrounding areas such as within the riparian zones of Swamp Creek.	Possible but unlikely. The species has not been detected during any previous survey of the site since 1995. The nearest recorded locality is more than 13 km to the southeast of the site.	No. Suitable habitat is outside of the development footprint and there is considered to be a low probability of a local population of the species occurring at the site.
Aves				
Chthonicola sagittata Speckled Warbler V TSC	The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	Present but marginal within the extraction area. The more open woodland parts of the site do not support the understorey elements this species is associated with, and is not part of a large undisturbed remnant. The more closed parts of the forest are considered too dense and lack suitable grassy tussock understorey that the species is associated with.	Possible but unlikely. The species has not been detected during any previous survey of the site since 1995. The nearest recorded locality is more than 13 km to the east of the site near Dalmeny in 1990.	Very low Extent of habitat removal is small, and of marginal quality for the species. Extensive areas of potential habitat are located to the north. There is considered to be a low probability of a local population of the species occurring at the site and the species is highly mobile and capable of avoiding small scale impacts.

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Lophoictinia isura Square-tailed Kite V TSC	Square-tailed Kite is found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. It is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.	Marginal. Nesting habitat is associated with the riparian zone of Swamp Creek, outside of the development footprint. Foraging resources within the development footprint is not considered to be of particularly high value within the relatively small development footprint in contrast with the extensive state forest reserves north and west of the site.	The species has been previously recorded within 10 km of proposal site, and may be an occasional visitor for limited foraging. Nesting habitat is more likely associated with the Swamp Creek riparian zone outside of the development footprint. No nests were observed along Swamp Creek during any surveys.	Very low Nesting sites for this species are usually located along watercourses and riparian vegetation will be retained outside of development footprint. Foraging values within the site are of limited value and more widespread adjacent to the site. The species is highly mobile and capable of avoiding small scale impacts.
Hieraaetus morphnoides Little Eagle V TSC	This species prefers open eucalypt forest, woodland or open woodland. Nesting occurs in tall living trees located in remnant patches.	Present but marginal. Few living tall trees suitable for nesting are present within the expanded extraction area. Foraging resources within the development footprint is not considered to be of particularly high value within the relatively small development footprint in contrast with the extensive state forest reserves north and west of the site.	Possible but likely to be an occasional visitor for foraging only. No nesting sites were observed and suitable nesting habitat is considered limited within the development footprint, with likely more suitable habitat located adjacent to the site.	Very low No nests were observed, and there is considered to be a low probability of the species using the site for nesting purposes. Foraging resources are of a limited scale, and there is extensive available habitat elsewhere in the locality. The site is not likely to be important for any local populations of the species. The species is highly mobile and capable of avoiding small scale impacts.

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Daphoenositta chrysoptera Varied Sittella V TSC	The Varied Sittella inhabits most of mainland Australia except deserts and open grasslands. This species prefers eucalypt forests and woodlands, mallee and acacia woodland. The Varied Sittella uses upright forks in tree canopies for nesting sites. It feeds on insects gleaned from under bark.	Present but marginal. Very few large trees with dead branches and no mallee or Acacia woodland.	Possible but unlikely. The species has not been previously recorded within 10 km of the site, and not recorded during four previous site visits. Given the species displays high site fidelity, often using the same nesting cup, it is likely it would have been recorded if present.	Very low There is considered to be a low probability of the species occurring at the site. The site is not likely to be important for a local population of the species. The species is highly mobile and capable of avoiding small-scale disturbance.
Petroica boodang Scarlet Robin V TSC	The Scarlet Robin can be found from south east Queensland through to South Australia as well as Tasmania and Western Australia. The species prefers dry eucalypt forest and woodland usually with an open grassy understorey with scattered shrubs, often with abundant fallen logs/timber. Cleared areas seem to be favoured for foraging, which it typically does from a low perch, pouncing on insects on the ground.	Present but marginal. The forest areas do not provide an open grassy understorey with abundant fallen logs/timber.	Possible occasional visitor. The species has been recorded within 10 km of proposal site, however the site does not provide ideal habitat for the species, and so use of the site by this species is expected to be occasional only. It is considered unlikely that the site would be important for sustaining a local population of this species.	Very low The species is considered likely to be an occasional visitor only, and has never been recorded at the site. The site is unlikely to be important for sustaining a local population. The species is highly mobile and capable of avoiding small-scale disturbance.
Petroica rodinogaster Pink Robin V TSC	The Pink Robin can be found in rainforest and tall, open eucalypt forest with a preference for densely vegetated gullies, although it may disperse to drier habitats in winter.	Present but marginal. The development impact area does not support any rainforest or wetter gullies, although these features are present to north and west of site.	Possible occasional visitor. The nearest record of the species is approximately 15 km to the east of the site. Potential foraging habitat occurs however nesting is unlikely to occur within the development footprint, but could occur in adjacent habitats. It is considered unlikely that the site would be important for sustaining a local population of this species.	Very low The species is considered likely to be an occasional visitor only, and has never been recorded at the site. The site is unlikely to be important for sustaining a local population. The species is highly mobile and capable of avoiding small-scale disturbance.

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Lathamus discolour Swift Parrot E TSC E EPBC	The Swift Parrot breeds in Tasmania and migrates to parts of south east Australia for the winter. On the mainland, this species frequents areas where eucalypts are flowering profusely or where there are abundant lerp infestations. Favoured feed trees include: on the coast, Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*) and inland, Mugga Ironbark (*E. sideroxylon*) and White Box (*E. albens*).	Present but marginal. Tree species may be suitable but generally not highly preferred food tree species.	Possible occasional visitor only. The species breeds in Tasmania. All local records are well to the east of the site, with no previous records of the species within 10 km of the site. The species may be an irregular visitor to the site for foraging only, however as the tree species are not highly preferred feed trees, the likelihood of site use is considered to be low.	Very low No nesting will occur at the site, and foraging at the site is considered to be occasional only, with no important foraging habitat present. More suitable habitat is likely to occur in adjacent state forests. The site is not important for supporting a local population. The species is highly mobile and capable of avoiding small-scale disturbance.
Neophema pulchella Turquoise Parrot V TSC	The Turquoise Parrot lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. This species is usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Nests in tree hollows, logs or posts.	Present but marginal. Site is at outer edge of distribution, foraging habitat is of moderate value, and few suitable nesting trees.	Unlikely. The site is at the very outer edge of known distribution, although no database records of the species exist within 20 km of the site. The species is relatively conspicuous and if present, would likely have been picked during previous surveys of the site.	Very low. The species is considered likely to be an occasional visitor only, and has never been recorded at, or within 20 km of the site. The site is unlikely to be important for supporting a local population. This species may be quite tolerant of disturbance (OEH, 2017) and is highly mobile and capable of avoiding small-scale disturbances if required.
Mammalia				

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Dasyurus maculatus Spotted-tailed Quoll V TSC E EPBC	The Spotted-tailed Quoll has been recorded in a range of habitats that include rainforest, open forest, woodland, coastal heath and inland riparian forest. Hollow-bearing trees, fallen logs, small caves, abandoned wombat burrows, rock crevices, boulder fields and rocky cliffs are all example of suitable den sites.	Present. Some potential denning habitat occurs in the form of wombat burrows, although most observed burrows are along Swamp Creek, outside of the development footprint. Foraging resources are likely to be limited as the observed abundance of suitable prey items (small – medium sized mammals) is quite low at the site. Movements of the species around the site is likely to be located along the creek.	Possible, although more suitable habitat is likely to be associated with Swamp Creek and the State Forests further north. Movement corridors and denning sites are likely to be within the riparian zone of the creek, outside of the development footprint. The species has never been recorded at the site, and the majority of records are associated with the ranges to the west.	Very low Extent of suitable habitat within the site is limited, with more extensive suitable habitat located within the adjoining state forest. The site is not considered important for supporting a local population, although one or two individuals may be occasional visitors to the site. Mitigation measures have been proposed to minimise potential of impact.
Sminthopsis leucopus White-footed Dunnart V TSC	The White-footed Dunnart can be found in south eastern Australia along the coast, with the Shoalhaven River being the northern limit. It is found in a range of habitats including coastal dune vegetation, coastal forest, tussock grassland, sedgeland, heathland, woodland and forest. In NSW the species has a preference for areas with an open understorey. The species shelters in bark nests in hollows under-standing or fallen timber, piles of logs, large grass clumps and rock crevices.	Present but marginal. More favoured habitats occur in state forests to the north of the site. Nesting habitat for the species is limited with little suitable fallen timber/log piles, or grass trees present within the development footprint.	Possible. The species has been previously recorded within 10 km of proposal site, however given the generally low suitability of the site for the species, the likelihood of the site supporting a local population is considered to be very low.	Very low Extent of suitable habitat within the site is limited, with more extensive suitable habitat located within the adjoining state forest. The site is unlikely to be important for supporting a local population. The species is mainly ground-dwelling, and capable of avoiding small-scale disturbances. Mitigation measures have been proposed to minimise potential of impact.

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern) E TSC E EPBC	The Southern Brown Bandicoot is found in south eastern Australia and is limited to the east of the Great Dividing Range. During the day, the Southern Brown Bandicoot nests in shallow depressions in the ground covered by leaf litter, grass or other plant material. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees Xanthorrhoea spp., blackberry bushes and other shrubs, or in rabbit burrows.	Marginal. Understorey vegetation is generally not suitable for the species with an absence of heathy understorey. No suitable nesting habitat observed.	Possible but unlikely. The species has not been previously recorded within 20 km of the site, with most records in the far south coast region located along the coast or in the ranges. Given the lack of suitable denning habitat and the paucity of nearby records, there is a very low likelihood that the site would support or be important for a local population, and any use of the site by the species is likely to be irregular/infrequent visitation by a small number of individuals.	Very low Extent of suitable habitat within the site is limited to only some foraging habitat, with no suitable denning habitat present. The site is unlikely to be important for supporting a local population. The species is mainly ground-dwelling, and capable of avoiding small-scale disturbances.
Potorous tridactylus Long-nosed Potoroo V TSC V EPBC	The Long-nosed Potoroo can be found along the east coast of Australia from Queensland through Victoria and Tasmania. In NSW the species is generally restricted to east of the Great Dividing Range. Coastal heaths and dry or wet sclerophyll forests are the preferred habitats. Often digs holes in the ground while foraging for insects and buried fungi and hides in dense vegetation during the day.	Marginal. The understorey vegetation and soil type are not ideal for this species, with a lack of heath vegetation, or dense understorey of grass-trees sedges and ferns. The soil profile is also generally not suitable for this species.	Possible but unlikely. The habitat at the site is of marginal quality for the species, and the majority of records of the species on the south coast are located further south of the site within Gulaga and Mimosa Rocks National Parks, and Bermagui, Bodalla and Mumbulla State Forests. There is a very low likelihood that the site would support or be important for a local population, and any use of the site by the species is likely to be irregular/infrequent visitation by a small number of individuals	Very low Extent of suitable habitat within the site is limited to only some foraging habitat, with no suitable denning habitat present. The site is unlikely to be important for supporting a local population. The species is mainly ground-dwelling, and capable of avoiding small-scale disturbances, and likely to move away from development activities with noise and vibration.

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Pteropus poliocephalus Grey-headed Flying-fox V TSC V EPBC	The Grey-headed Flying-fox is generally found within 200 kilometres of the east coast from central Queensland to Melbourne, foraging for nectar and soft fruits in a wide range of forest types. The species roosts in camps, generally close to a food source.	Marginal – few suitable fruit/feeding trees observed.	Possible for foraging of a small number of individuals only, although lack of suitable fruit trees are likely to preclude regular visitation. No individuals were observed during the March 2017 nocturnal surveys or during any previous survey of the site since 1995. Importantly, there is no roosting camp within the site, and so the site does not support a local population of the species.	Very low The site supports very little suitable food trees, and no camps are present. Impacts are therefore likely to be restricted to a very minor loss of some marginal foraging habitat only, with no impact on any roosting camps.

C TSC = listed as Critically Endangered under Schedule 1 of the NSW *TSC Act 1995*
C TSC = listed as Critically Endangered under Schedule 1 of the NSW *TSC Act 1995*
E TSC = listed as Endangered under Schedule 1 of the NSW *TSC Act 1995*
E EPBC = listed as Endangered under the Commonwealth *EPBC Act 1999*

M EPBC = listed as Migratory under the Commonwealth *EPBC Act 1999*
Ma EPBC = listed as Marine under the Commonwealth *EPBC Act 1999*
V TSC = listed as Vulnerable under Schedule 2 of the *TSC Act 1995.*
V EPBC = listed as Vulnerable under the Commonwealth *EPBC Act 1999*

3.2.2 Assessments of Significance

An Assessment of Significance for species identified by OEH on page 3 of their comments letter is provided below, with the exception of those species already assessed in the response to ESC comments above, or that have been confidently determined to have no or very low probability of impact, based on a more detailed threatened species habitat evaluation in the table above. Based on this, the only additional species for which an Assessment of Significance has been provided below is the Barking Owl (*Ninox connivens*, Vulnerable – TSC Act) and the Koala (*Phascolarctos cinereus*, Vulnerable – TSC Act & EPBC Act).

With regard to the Lowland Grassy Woodland in the South East Corner Bioregion, we have assessed this community as not being present at the site. As such, an Assessment of Significance is not considered warranted for a community that is not present in or near the development impact area, and clearly for which an impact is highly improbable. Refer to Section 3.2.3 for further information on this matter.

a) in the case of a threatened species, whether the action proposed 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.

Barking Owl

This species inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. It typically roosts in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species, and nests in large tree hollows of very large, old trees. The Barking Owl preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. The species requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.

The project will result in the removal of 11 identified Hollow-bearing trees, supporting a total observed 26 hollows, although only one "large" hollow (i.e. hollow entrance with opening diameter of >15cm) was observed within the development footprint (HBT06) suitable for this species. General spotlighting traverses past this tree as well as across the site more broadly did not observe this species. Additionally, call playback surveys failed to elicit a response from this species. Given this, it is considered unlikely that the species is currently utilising the site on a regular basis, although individuals may visit the site from time to time, although even this is irregular use of the site considered to be minimal given the low observed densities of potential prey. This is supported by the paucity of records of the species in the locality with only four records of the species in Eurobodalla National Park, more than 12 km east of the site, and a single record in Wandella State Forest, more than 25 km southwest of the site.

Importantly, the site is not considered important in providing breeding habitat for more than one pair of this species, and is not considered important to support a local population of the species. Based on this, the project is not likely to result in an impact to any breeding/nesting habitat. Even if the tree were being used by the species, the removal of a single large hollow is unlikely to result in a 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.

Koala

The proposed development site does not support either *core* or *potential koala habitat* as defined under SEPP 44. The majority of records for this species are located well to the south of the site within State Forests and National Parks, with a paucity of records north of the site, and there is no evidence to suggest the site supports a viable local population, although transient individuals may visit the site from time to time given the potentially large home range of this species.

The small area of native vegetation proposed to be removed does not support any of the feed tree species listed in Schedule 2 of SEPP44, and supports two Secondary Food Tree species (*E. bosistoana* and *E. consideniana*), and two Stringybark/ Supplementary Food Tree species (*E. globoidea* and *E. agglomerata*) as listed on the OEH species profile for the South Coast region occur in the development area. The removal of this vegetation is considered unlikely to affect koalas to the extent that a viable population would be placed at risk of extinction. Impacts associated with vehicle collisions and dog attacks would not be exacerbated beyond the current situation.

Pre-clearance surveys are recommended to be undertaken immediately prior to works commencing to ensure that no individuals would be placed at risk during the tree felling operations. See Appendix A.5 of this report for details on mitigation measures proposed in relation to biodiversity impacts.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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.

N/A

d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

Barking Owl

As stated, this species inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. The proposal would therefore remove approximately 4 ha of forest vegetation and 13 ha of open, partly cleared woodland representing potential foraging habitat, although the overall quality of the area as foraging habitat is considered limited given the generally low observed abundance of suitable prey species within the forest areas proposed to be removed. Given the paucity of records of the species within or immediately surrounding the site and the extensive areas of similar or better habitat in the surrounding state forests to the north and south of the site, the overall extent of removal of potential foraging habitat is considered negligible in the context of the available potential foraging habitat in the locality.

The proposal would also result in the loss of only one identified large hollow required for nesting habitat. Although no hollow-bearing tree surveys were conducted in the broader area surrounding the site, it is reasonable to assume that there would be many more large hollows available in the locality. As such, the removal of a single large hollow is unlikely to substantially reduce overall habitat availability in the local area.

Koala

The proposed development will remove a total of 4.24 ha of intact forest vegetation. This vegetation does not meet the criteria for *potential koala habitat* as defined by SEPP44. In addition, the proposal would result in the clearing of

approximately 13 hectares of pasture and open woodland derived from these adjacent forest communities. These areas are generally dominated by exotic pasture and agricultural weed species at the paddock scale with scattered native small tree, shrub, grass and sedge regrowth. Additionally, this area does not meet the criteria for *potential koala habitat* as defined by SEPP44.

Given the above, the proposal will not remove any *core* or *potential koala habitat* as defined by SEPP44.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

Barking Owl

The proposal involves clearing of a small area (approximately 4 ha) of intact forest at the edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, and the highly mobile nature of this species, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

Koala

The proposal involves clearing of a small area (approximately 4 ha) of forest vegetation at the western edge of the existing cleared area of the property. There is no contiguous forest providing uninterrupted connectivity in an east-west or north-south direction through the proposed development area that would be severed by the project. Swamp Creek and Dampier State Forest occur to the north and west of the site which would provide the primary ecological connectivity in the local area. Based on this, the location of existing records primarily to the south of the site, and that the site itself does not provide recognised core or potential koala habitat, the proposed development is not expected to result in any fragmentation and no areas of important habitat would become isolated from other areas of habitat as a consequence of the project.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Barking Owl

As noted above, the site is not believed to provide important breeding habitat given the paucity of records of the species within the site, and the presence of only one identified large hollow. The site is also not believed to provide important foraging habitat given the paucity of records of suitable prey species. These factors combined with the overall small area of the proposed clearing in comparison with the extensive areas of potentially more suitable habitat within the Dampier and Bodalla State Forests, suggest that the development site does not provide habitat that would be important for the long-term survival of this species.

Koala

As stated, based on the lack or records of the species within or adjacent to the site, and given the lack of primary feed trees, the site does not support any *core* or *potential* koala habitat as defined by SEPP44. The habitat to be removed is therefore considered to be of limited/minor importance to the species.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):

No areas listed as critical habitat under the TSC Act occur in the study area, therefore the action proposed will not adversely affect critical habitat for the koala.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Barking Owl

N/A – no Recovery Plan or Threat Abatement Plan is available for the Barking Owl. Notwithstanding this, the project is not inconsistent with the objectives of the Approved NSW Recovery Plan (DEC, 2006) for the Large Forest Owls as noted previously in the Assessments of Significance for the other Forest Owl species identified as requiring further assessment by ESC.

Koala

The NSW government has prepared the *Recovery plan for the koala* (Phascolarctos cinereus) (DECCW, 2008). Under this plan, the recovery objectives for the koala is to reverse the decline of the koala in New South Wales, to ensure adequate protection, management and restoration of koala habitat, and to maintain healthy breeding populations of koalas throughout their current range. The specific objectives include:

Objective 1: To conserve koalas in their existing habitat.

Objective 2: To rehabilitate and restore koala habitat and populations.

Objective 3: To develop a better understanding of the conservation biology of koalas.

Objective 4: To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale.

Objective 5: To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care.

Objective 6: To manage overbrowsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat.

Objective 7: To coordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across NSW.

Given that there is little evidence to suggest that the site contains a viable population of koalas, and that the proposal would result in only a reduction habitat (not defined as either core or potential koala habitat), with more suitable habitat located elsewhere, the proposal is not regarded as being inconsistent with the objectives of the NSW Recovery Plan.

As stated previously, pre-clearance surveys would be undertaken and a fauna spotter to be employed during the vegetation clearing works to minimise the risk of death or injury to any individuals present in the site during the construction period.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Key threatening processes that are relevant to the project with regard to the Barking Owl and Koala include:

- Clearing of native vegetation
- Removal of dead wood and dead trees
- Loss of hollow-bearing trees

Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation, and increased habitat for invasive species. Dead trees and hollow-bearing trees are also used as nesting/roosting habitat for arboreal fauna.

The proposal would contribute to the removal of approximately 4 ha of native vegetation including the removal of some dead wood/trees and the loss of up to 11 hollow-bearing trees. As demonstrated above, the loss of this vegetation and the hollow-bearing trees is not expected to result in any population level impacts to any of the threatened fauna species considered in this Assessment of Significance. Recommendations have been provided to conduct the clearing in a manner that minimises the risk of death or injury to a colony or individuals of the target species.

The proposal is considered unlikely to cause a substantial increase in the operation of these key threatening processes in context of the Barking Owl and Koala.

Conclusion

Barking Owl

The proposed works are not expected to result in a significant impact to the Barking Owl. Mitigation measures have been recommended (see Section 2.2.4 of this report) to minimise the risks associated with the project to threatened fauna including conducting the tree felling in accordance with a protocol to reduce risk of injury or death to resident fauna.

Koala

It is unlikely that a viable local population of koalas occurs within the proposal site. Given the relatively discrete area of impact, if the species were to occur within the proposal site, it is unlikely that the local populations would be restricted wholly within the area to be impacted. As such, it is considered unlikely that a local population of these species would be placed at risk of extinction.

The importance of the habitat to be removed and degree of fragmentation is regarded as minimal and the proposal is considered unlikely to place a population of this species at risk.

Notwithstanding the above, pre-clearance surveys are required to mitigate impacts to any individuals of this species during the construction period and a fauna spotter is to be employed during clearing works to ensure that no individuals are placed at risk of death or injury during the clearing works.

As additional support to the above assessment, we have also considered the EPBC Referral Guidelines for the Koala (DoE 2014) which includes the 'Koala habitat assessment tool' as a means to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided in Table 6 below and has been applied in the context of the proposed development. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 6 resulted in a score of **4** and as such habitat within the study area is considered to be critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is required.

Table 6 Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	N/A
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	N/A

Attribute	Score	Inland	Applicable to the proposal?
	0 (low)	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, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ No Primary Food Tree Species are present at the site. Two species of Secondary Food Tree species (*E. bosistoana* and *E. consideniana*), and two species of Stringybark/Supplementary Food Tree species (*E. globoidea* and *E. agglomerata*) occur in the development area
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	N/A
	0 (low)	None of the above.	N/A
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	✓
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	N/A
	0 (low)	None of the above.	N/A
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	N/A
	+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, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	N/A
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence	✓ No Koala mortality is known from records or observed during the survey, however no dogs or

Attribute	Score	Inland	Applicable to the proposal?
		and have a significant dog or vehicle threat present.	vehicle threats are known to be 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 for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓ Study area is not considered a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge
Total	**4**	**Decision: Habitat is <u>NOT</u> critical to the survival of the Koala—assessment of significance not required**	

3.2.3 Lowland Grassy Woodland within the site

The NSW Lowland Grassy Woodland EEC determination states that the community is usually dominated by *Eucalyptus tereticornis*, often with *E. globoidea* and/or *Angophora floribunda*. *E. melliodora* and *E. pauciflo*ra may be locally common and other tree species including *E. baueriana, E. bosistoana* and *E. maidenii* may occur in transitional stands with adjacent communities. Similarly, the key diagnostic characteristics for the Commonwealth Lowland Grassy Woodland CEEC state that the community is typically dominated by *E. tereticor*nis and/or *Angophora floribunda*. Associated tree species include *E. globoidea* and *E. bosistoana* and *E. pauciflora* or *E. melliodora* may be dominant in some areas.

Given the high representation of species which are diagnostic of the adjacent forest communities, the scale and ecotonal context of the site and the dominance of non-woodland eucalypts, the vegetation is not considered to be derived from the Southeast Lowland Grassy Woodland SCIVI community, and is not likely to belong to the NSW EEC or Commonwealth CEEC.

Based on this, the Lowland Grassland Woodland EEC is not considered to be present at the site, and as such, an Assessment of Significance of the impacts of the development on this community is not warranted.

Scanned copies of the raw quadrat survey data sheets are included at Attachment A.3

4 REFERENCES

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APPENDIX A

A.1 ADDITIONAL NOCTURNAL SURVEY EFFORT AND RESULTS MAP

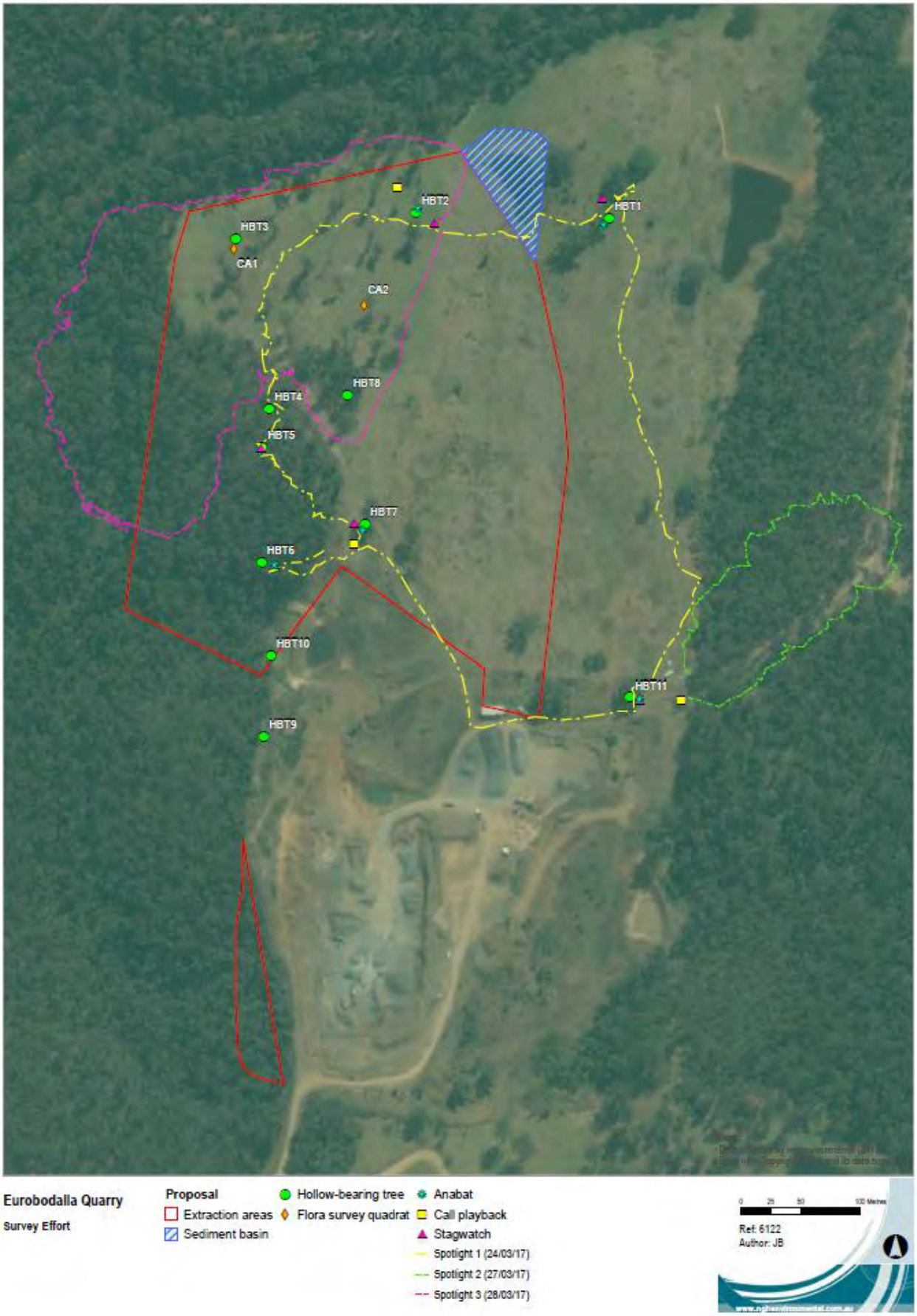

Figure 1 Survey Effort Map

A.2 PROPOSED OFFSET SITE

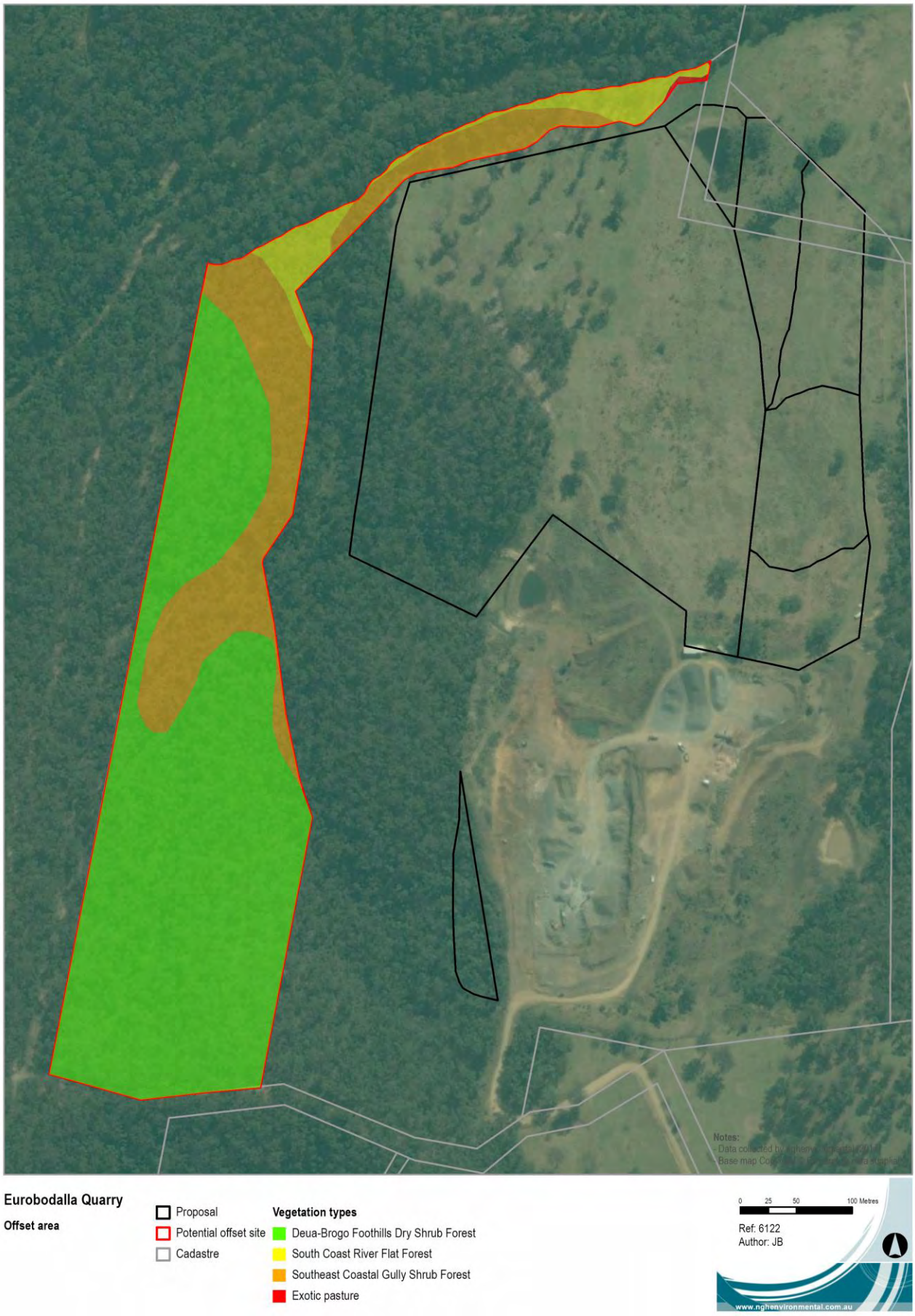

Figure 2 Offset Area

A.3 NOCTURNAL SURVEY DATA SHEETS

NOCTURNAL CALL PLAYBACK SURVEY PROFORMA

Survey Details CP1

Date of survey	24/03/2017		
Name of surveyor(s)	D. Maynard & T Hollis	Contact number	0427 947 771
Name of person identifying species	D. Maynard	Contact number	
Total effort expressed in person hours			
Active or passive search	Passive	Size of survey area (ha) or length of transect	n/a

Location Details

Location (including basic habitat) description	Brogo – Deua Foothills Forest/ South Coast Gully Forest. Predominantly young regrowth forest with occasional HBT's and YBG feed trees.

Map number		Map name	
Type of survey, eg. transect or quadrat		AMG Zone	
Start Eastings (6 digits)	WP 19	Start Northings (7 digits)	
End Eastings (6 digits)		End Northings (7 digit)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	Calm	Rain*	Nil, but extensive previous
Temperature (°C)	20.3	Moon*	20% wanning, but totally excluded by clouds
Comments			

5 mins call play and 10 min listening

Playback details		Species response			
Time (24hr)	**Call Species Name**	**Time (24hr)**	**Species name**	**No Ind**	**Comments**
20:20	Powerful Owl				
20:35	Masked Owl	20:40	Southern Boobook	1	In distance, to east of site.
20:50	Barking Owl	20:56	Masked Owl (more likely to be Eastern Barn Owl. Heard more clearly on another night).	1	Very distant, to north in vicinity of gully.

SPOTLIGHTING SURVEY PROFORMA

Survey Details SL1

Date of survey	24/03/2017		
Name of surveyor(s)	D.Maynard & T.Hollis	Contact number	
Name of person identifying species	D.Maynard	Contact number	0427 947 271
Total effort expressed in person hours		Size of survey area (ha) or length of transect (if relevant)	
Foot or vehicle survey	Foot	Number and wattage of lights	DM 350-800 Lumen LEP TH 55w Trad.

Location Details

Location (including basic habitat) description: Transect through forest area to be impacted and scattered paddock trees in previously cleared areas.

Map number		Map name	
Type of survey, eg. Point or transect		AMG Zone	
Start Eastings (6 digits)	WP 019	Start Northings (7 digits)	WP 019
End Eastings (6 digits)		End Northings (7 digit)	Track recorded on GPS
Start time (24hr)	21:20	End time (24 hr)	22:35

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	Calm	Rain*	None during survey but extensive in days prior.
Temperature (°C)	20.3°c	Moon*	Nil due to cloud, but 20% waning

Comments:

Time (24h)	Species Name	Ob type	No Indiv.	Grid reference (full AMGs)	Accuracy	Comments
21:42	Ringtail	0	1	WP 020	15m	
21:51	Common brushtail	0	1	WP 021	15m	Down toward gully.
22:12	Common Brushtail	0	1	WP 022		Young individual
22:22	Common Brushtail	0	3	WP 023		Mother & young and individual in nearby tree

OPPORTUNISTIC RECORDS

Surveyor: Troy Hollis Species identified by:

AGM Zone WP 027 Unit 643 Anabat & Stagwatch WP028
(Ab3) (SW3)

			Location description or						
Date	**Time**	**Site #**	**Easting (full 6 digits)**	**Northing (full 7 digits)**	**Species Name**	**No Ind iv.**	**Ob. type***	**MH* type***	**Comments**
Anabat start 18:20									
Stagwatch start 18:40 – 20:05									
Anabats deployed ALL NIGHT									

OPPORTUNISTIC RECORDS

Surveyor: Dave Maynard Species identified by:
Unit 504

AGM Zone WP 29 Anabat + Stagwatch WP 30
(AB4) (SW4)

			Location description or						
Date	**Time**	**Site #**	**Easting (full 6 digits)**	**Northing (full 7 digits)**	**Species Name**	**No Indiv.**	**Ob. type***	**MH* type***	**Comments**
Anabat + Stagwatch Start: 18:45									
27/03/2017	19:21	AB4	-	-	Microbat	1	0		Emerging from stag – small spout
Stagwatch end: 20:00 due to incoming rain									
Anabats deployed ALL NIGHT									

OPPORTUNISTIC RECORDS

Surveyor: Troy Hollis Species identified by:

AGM Zone WP 017 – Stagwatch & Anabat

			Location description or						
Date	**Time**	**Site #**	**Easting (full 6 digits)**	**Northing (full 7 digits)**	**Species Name**	**No Ind iv.**	**Ob. type***	**MH* type***	**Comments**
Anabat start 18:30 unit 440504									
Stagwatch start 18:40 End: 20:10									
Anabat collected 10:25 pm									
24/03 /2017	7.25				Small bat				Small bat sighted flying around area
24/03 /2017	8.10				Finch				

OPPORTUNISTIC RECORDS

Surveyor: Dave Maynard Species identified by:

AGM Zone WP 018 Stagwatch + Anabat – 20.5°c Calm Cloud – 8/8
Moon Waning 50%

			Location description or						
Date	**Time**	**Site #**	**Easting (full 6 digits)**	**Northing (full 7 digits)**	**Species Name**	**No Ind iv.**	**Ob. type***	**MH* type***	**Comments**
Anabat start – 18.45 Unit 440643									
24/03 /2017	19:21	SW2			Microbat	2	0		Observed flying through area
	17:44				Sugar glider	1	W		In vicinity, down towards gully
	20:05				Brushtail Possum	1	W		In the distance to the North
Stagwatch finish – 20:10									
Anabat Collected – 22:35									

NOCTURNAL CALL PLAYBACK SURVEY PROFORMA

Survey Details CP2

Date of survey	27/03/2017		
Name of surveyor(s)	D.Maynard & T Hollis	Contact number	
Name of person identifying species	D.Maynard	Contact number	
Total effort expressed in person hours			
Active or passive search	Passive	Size of survey area (ha) or length of transect	

Location Details

Location (including basic habitat) description

Map number		Map name	
Type of survey, eg. transect or quadrat		AMG Zone	
Start Eastings (6 digits)	WP 31	Start Northings (7 digits)	
End Eastings (6 digits)		End Northings (7 digit)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	8/8 to 1/8
Wind direction and speed*	NW 25k/h	Rain*	Intermittent light & heavy rain
Temperature (°C)	23.2°C	Moon*	Nil

Comments

Playback details		Species response			
Time (24hr)	**Call Species Name**	**Time (24hr)**	**Species name**	**No Ind**	**Comments**
20:12	Powerful Owl				
Terminated at 20:28 due to rain					
21:09	Masked owl				
21:23	Barking owl				
21:42	Sooty owl				
21:57	Yellow-bellied Glider				

SPOTLIGHTING SURVEY PROFORMA

Survey Details SL2

Date of survey	27/03/2017		
Name of surveyor(s)	D.Maynard & T Hollis	Contact number	0427 947 771
Name of person identifying species	D.Maynard	Contact number	
Total effort expressed in person hours		Size of survey area (ha) or length of transect (if relevant)	
Foot or vehicle survey	Foot	Number and wattage of lights	

Location Details

Location (including basic habitat) description

Map number		Map name	
Type of survey, eg. Point or transect		AMG Zone	
Start Eastings (6 digits)	WP 31	Start Northings (7 digits)	
End Eastings (6 digits)		End Northings (7 digit)	
Start time (24hr)	21:53	End time (24 hr)	22:25

Weather Details

At start of survey, record:		Cloud cover*	0/8
Wind direction and speed*	SW10 km/h	Rain*	Intermittent rain prior but cleared during survey
Temperature (°C)	19.2°c	Moon*	Nil

Comments

Time (24h)	Species Name	Ob type	No Indiv.	Grid reference (full AMGs)	Accuracy	Comments
21:58	Brushtail Possum	0	2	WP32		
22:05	Tawny Frogmouth	0	1	WP33		Sitting on stump
22:13	Owlet Nightjar	0	1	WP34		
22:21	Tawny Frogmouth	0	1	WP35		

SW5 + 20°c Wind E 5km/h Cloud – 6-7/8

OPPORTUNISTIC RECORDS

Surveyor: Troy Hollis Species identified by:

(unit 643)

AGM Zone WP37 Anabat WP38 Stagwatch

			Location description or						
Date	**Time**	**Site #**	**Easting (full 6 digits)**	**Northing (full 7 digits)**	**Species Name**	**No Ind iv.**	**Ob. type***	**MH* type***	**Comments**
Anabat start 18:28									
Stagwatch Start 18:40									
Stagwatch End 20:10									
Anabat End 22:34									

SW6 + AB6

OPPORTUNISTIC RECORDS

Surveyor: Dave Maynard Species identified by:

Unit 504

AGM Zone WP39 Anabat WP040 Stagwatch

Date	Time	Site #	Location description or Easting (full 6 digits)	Northing (full 7 digits)	Species Name	No Indiv.	Ob. type*	MH* type*	Comments
Anabat Start 18:34									
Stagwatch start 18:40									
From 19:10 on, quite a few bats flying through area									
28/03 /2017	19:35				White-throated Nightjar	1	0		Typical in shape, colour & flight but yellow eyeshine?
Stagwatch End 20:05									
Anabat End 22:38									

NOCTURNAL CALL PLAYBACK SURVEY PROFORMA

Survey Details CP3

Date of survey	28/03/2017		
Name of surveyor(s)	D.Maynard & T Hollis	Contact number	0427 447 771
Name of person identifying species	D. Maynard	Contact number	
Total effort expressed in person hours			
Active or passive search	Passive	Size of survey area (ha) or length of transect	

Location Details

Location (including basic habitat) description

Map number		Map name	
Type of survey, eg. transect or quadrat		AMG Zone	
Start Eastings (6 digits)	WP41	Start Northings (7 digits)	
End Eastings (6 digits)		End Northings (7 digit)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	Calm	Rain*	Nil
Temperature (°C)	21°c	Moon*	Nil

Comments

Playback details		Species response			
Time (24hr)	**Call Species Name**	**Time (24hr)**	**Species name**	**No Ind**	**Comments**
20:15	Powerful owl	20:27	Southern Boobook	1	Heard in distance to the east
20:30	Masked owl				
20:45	Barking owl				
21:00	Sooty owl				
21:15	Yellow-bellied glider	21:20	Sugar Glider	1	Heard in gully to north

SPOTLIGHTING SURVEY PROFORMA

Survey Details SL3

Date of survey	28/03/2017		
Name of surveyor(s)	D. Maynard & T. Hollis	Contact number	0427 947 771
Name of person identifying species	D. Maynard	Contact number	
Total effort expressed in person hours		Size of survey area (ha) or length of transect (if relevant)	
Foot or vehicle survey	Foot	Number and wattage of lights	1 x 55w Hand held 1 x LED Lenser head Torch – 350 -800 Lumen

Location Details

Location (including basic habitat) description

Map number		Map name	
Type of survey, eg. Point or transect		AMG Zone	
Start Eastings (6 digits)	WP041	Start Northings (7 digits)	
End Eastings (6 digits)	Tracked on GPS	End Northings (7 digit)	
Start time (24hr)	21:30	End time (24 hr)	22:31

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	Calm	Rain*	Nil but in previous days
Temperature (°C)	20.8°c	Moon*	

Comments

Time (24h)	Species Name	Ob type	No Indiv.	Grid reference (full AMGs)	Accuracy	Comments
21:34	Wombat	0	1	WP042		
21:53	Brushtail Possum	0	1	WP043		
22:04	Sugar glider	0	1	Wp044		In flight, crossed torch beam

Standard reporting codes

Cloud cover. Record cloud cover in eights of sky.

Moon. Record using the following codes. 0=None, 1=1/4 moon, 2=1/2 moon, 3=3/4 moon, 4=full moon.

Wind direction and speed. Record wind direction to nearest cardinal point. Record wind speed using the following codes. 0=calm 1= Light, leaves rustle 2= Moderate, branches move 3=Strong, tops of trees move

Rain. Record using the following codes. 0=none, 1=drizzle - light, 2=drizzle - heavy 3=heavy rain

Observation type. Use the following codes.

O	Observed (sighted)	R	Road kill	F	Tracks, scratching
W	Heard call	D	Dog kill	Z	In raptor/owl pellet
X	In scat	C	Cat kill	M	Miscellaneous
T	Trapped or netted	V	Fox kill	E	Nest or roost
H	Hair or feathers	S	Shot	Y	Bones or teeth
A	Stranded/beached	I	Fossil/sub-fossil	N	Not located

Microhabitat type. Use the following codes

AC	Flying above canopy	IB	In burrow	OB	On beach sand
BR	In/on bridge	IC	In cave	OL	On log
BU	In building	IG	In grass	OR	On rock
CK	Crevice in rock	IH	In tree hollow	OW	Over water
CL	Crevice in log	IL	In litter	RD	On road
DA	Farm/fire dam	IR	In reeds	TK	On trunk
DT	In dead tree (stag)	IS	In soil	UB	Under bark
EW	Edge of water	IT	In live tree	UC	Upper canopy
FC	In/on post or stump	IW	In water	UG	Undergrowth
FL	Flying within canopy	LC	Lower canopy	UL	Under log
GR	On ground	LS	Low shrub	UR	Under rock
HS	High shrub	MC	Mid canopy	WH	Waterhole

A.4 SCANNED QUADRAT SURVEY FIELD DATA SHEETS

Photos 5017 - 5022

Random meander and quadrat survey data sheet

Project: Eurobodalla Quarry Expansion **Survey date:** 24/3/17

RM/Quadrat ID: CA1 **RM/Quadrat size:** 20 × 20

RM duration: — **Brief site description:** Previously cleared disturbed open woodland

Location

Property	Survey unit	GPS (centre of survey area)	Access details
		WP010 Datum:	

Physical

Geology	Soil	Hydrology	Elevation	Slope	Aspect	Topographic position
% surface rock:	Rhyolite derived gravelly loam	Swamp Creek around 50m below plot	41m		WNW	lower slope

Structure and dominants (quadrat only)

Stratum	Height	Foliage cover (%)*	Dominant 1	Dominant 2	Dominant 3
Tree	18m	0 - 50% 10% of quadrat	Corymbia gummifera	—	—
Small tree	3m	0 - 60% 20% of quadrat	Acacia irrorata	Juvenile Eucalypts	—
Shrub 1	0.3m	0 - <5%	Leucopogon juniperinus	Desmodium rhytidophyllum	Hibbertia aspera
Shrub 2	—	—	—	—	—
Groundcover	0.1 - 0.5 m	50 - 80%	Axonopus fissifolius	Pennisetum clandestinum	Imperata cylindrica

* non-opaque, foliage and branches

Current land use

Cattle grazing

Age class, condition and disturbance

(including dbh, hollows, fire, grazing, introduced fauna, clearing/logging, soil disturbance/loss, salinity, nutrients, weeds, dieback)

Scattered mature trees up to 60cm DBH. Numerous young recruits

Noxious weeds

Nil

Significant and threatened species and communities

(if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Nil

Species recorded

Trees	C/A*	Forbs	C/A*	Grasses	C/A*
Corymbia gummifera	3	Desmodium gunnii	1	Rytidosperma pallidum	1
Euc. elata (juv.)	2	*Hypochaeris radicata	3	*Pennisetum clandestinum	3
Acacia implexa (juv)	1	?Gaudenia hederacea	1	Imperata cylindrica	3
Euc. botryoides x saligna (juv)	2	Dianella caerulea	1	*Axonopus fissifolius	3
		Conyza sp.	2	Themeda australis	1
		Oxalis sp.	1	*Setaria parvula	1
		*Conyza sp.	2	Entolasia stricta	2
		Geranium ? solanderi	1	Oplismenus imbecillis	2
		Dichondra repens	1	Cymbopogon refractus	2
		*Cirsium vulgare	1	Microlaena stipoides	2
		*Verbena bonariensis	1		
		Hypericum gramineum	1		
		*Plantago lanceolata	1		
Shrubs					
Acacia irrorata	3				
Ozothamnus diosmifolius	1				
Leucopogon juniperinus	2				
Persoonia linearis (juv)	1				
Hibbertia aspera	2				
Allocasuarina littoralis (heavily browsed)	1				
Breynia oblongifolia	1				
?Cassinia aculeata	1			**Graminoids**	
Bossiaea buxifolia	1			Lomandra longifolia	1
Desmodium rhytidophyllum	3			Lepidosperma laterale	1
Vines/climbers					
Hardenbergia violacea	1				
Hovea linearis	1				
Glycine clandestina	2				
Ferns					
Pteridium esculentum	3				

*Cover/abundance (C/A) scores - apply a modified Braun-Blanquet score (in bold and underlined) as follows:
r – < 4 indiv, + - >=4 & <=15 indiv, 1 - > 15 indiv <5% cover, 2 – 5 – 25% cover, 3 – 26 – 50% cover, 4 – 51 – 75% cover, 5 76 – 100% cover

Ph S036-41
Ph 42 Soil from wombat excavation

Random meander and quadrat survey data sheet

Project: Eurobodalla Quarry/Expansion **Survey date:** 27/3/17

RM/Quadrat ID: CA2 **RM/Quadrat size:** 20 × 20

RM duration: **Brief site description:** Previously cleared forest vegetation and improved pasture

Location

Property	Survey unit	GPS (centre of survey area)	Access details
		WP Ø24 Datum:	

Physical

Geology	Soil	Hydrology	Elevation	Slope	Aspect	Topographic position
Metasediments % surface rock: 25%	Gravelly Clay	Nil	43m	4%	N	Midslope

Structure and dominants (quadrat only)

Stratum	Height	Foliage cover (%)*	Dominant 1	Dominant 2	Dominant 3
Tree	16m	0 - 40% Avg. 15%	E. botryoides x saligna	Angophora floribunda	—
Small tree	—	—	—	—	—
Shrub 1	2-3m	0 - 60% Avg 10%	Acacia mearnsii	Pomaderris aspera	Ozothamnus diosmifolius
Shrub 2	0.3m	15%	Leucopogon juniperinus	Correa reflexa	—
Groundcover	0.2-0.4 m	80%	Imperata cylindrica	Cymbopogon refractus	Themeda australis

* non-opaque, foliage and branches

Lots of microlaena as well but hard to tell coverage & if dominant

Current land use

Cattle grazing

Age class, condition and disturbance

(including dbh, hollows, fire, grazing, introduced fauna, clearing/logging, soil disturbance/loss, salinity, nutrients, weeds, dieback)

Mature tree DBH 15 - 70cm. Numerous recruits in previously cleared areas, not ploughed but pasture species introduced

Noxious weeds

Nil

Significant and threatened species and communities

(if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Nil

Species recorded

Trees	C/A*
E. botryoides x saligna	3
Angophora floribunda	1

Forbs	C/A*
Veronica plebeia	2
*Hypochaeris radicata	2
Wahlenbergia gracilis	1
Dichondra repens	2
Sigesbeckia orientalis	1
*Plantago lanceolata	2
*Bidens pilosa	1
*Conyza sp.	1
Pratia purpurascens	2
Gonocarpus teucrioides	1
Unk small leaf trifoliate	2
*Chenopodium sp.	1

Grasses	C/A*
Imperata cylindrica	3
Poa meionectes	2
Oplismenus imbecillus	1
*Pennisetum clandestinum	3
Microlaena stipoides	3
Dichelachne micrantha	1
*Axonopus fissifolius	2
Eragrostis leptostachya	3
Themeda australis	3
Echinopogon ovatus	2
*Sporobolus [illegible]	1
Cymbopogon refractus	2
*Paspalum dilatatum	1
Entolasia stricta	2
? Poa labillardierei	1
Rytidosperma pallidum	1
Panicum effusum	1

Shrubs	C/A*
Acacia irrorata	2
Leucopogon juniperinus	3
Pomaderris aspera	2
Ozothamnus diosmifolius	1
Rubus parvifolius	1
Macrozamia communis	1
Persoonia linearis (seedling)	1
Hibbertia obtusifolia	1
Platysace lanceolata	1
Correa reflexa	1
Breynia oblongifolia	1
Acacia sp (seedling)	1
Acacia implexa (juv.)	1
Bursaria spinosa	1
Desmodium rhytidophyllum	2

Graminoids	C/A*
Lomandra longifolia	2
Lomandra filiformis	1
Carex inversa	2

Vines/climbers	C/A*
Kennedia rubicunda	2
Glycine tabacina	2
Billardiera scandens	1
Hardenbergia violacea	2
Geitonoplesium cymosum	1

Ferns	C/A*
Pteridium esculentum	2

*Cover/abundance (C/A) scores - apply a modified Braun-Blanquet score (in bold and underlined) as follows:
r – < 4 indiv, **+** - >=4 & <=15 indiv, **1** - > 15 indiv <5% cover, **2** – 5 – 25% cover, **3** – 26 – 50% cover, **4** – 51 – 75% cover, **5** 76 – 100% cover

A.5 RELEVANT MITIGATION MEASURES INCLUDED IN THE EIS

A.5.1 BIODIVERSITY MANAGEMENT MEASURES

The proposed biodiversity management measures for the project are included in the table below. Note that measures that have been added/modified since the submission of the EIS are shown in **bold**.

EMSP 03 – BIODIVERSITY MANAGEMENT	
Responsible person	• Quarry Operator • Quarry staff
Objectives	• Avoid impacts to biodiversity where possible, or effectively mitigate and minimise impacts where avoidance is not possible. • Rehabilitate the worked quarry site, such that pre-development habitat values are reinstated or improved in the long term.
Procedures/Requirements	<u>BIODIVERSITY (FAUNA) CONSTRUCTION MANAGEMENT PROTOCOL</u> • The following protocols will be implemented to mitigate impact to native fauna: o Avoidance of clearing hollow-bearing trees during the breeding season for the main fauna types that may be present in the area. For most species, this includes avoidance of clearing hollow-bearing trees in summer period. o If the above timing restrictions are not feasible, then a targeted pre-clearance survey (including primarily Anabat, spotlighting and stagwatching survey techniques) are to be undertaken by an ecologist to confirm if the individual hollow-bearing trees are being used by threatened fauna. These surveys are to be undertaken (immediately) prior to the proposed clearing (i.e. less than 48 hours prior to clearing). Occupied trees are not be cleared until it can be demonstrated that no threatened fauna are occupying them. o **Pre-clearance surveys of all trees (including non-hollow-bearing trees) is also to be completed to ensure that no koalas are present within the development footprint.** o The staged felling protocol provided in Section 3.3.2 of Appendix H of the EIS (and included further below for reference) will be implemented for the removal of all hollow-bearing trees. o An experienced fauna spotter should be engaged to be present on-site during the removal of hollow-bearing trees and ground habitat. o The fauna spotter should also be present during the removal of any burrows, specifically wombat burrows, and where possible, a pre-clearance survey should occur to confirm whether any (wombat) burrows to be removed are currently occupied. **This would involve the use of a small flexible inspection camera capable of being inserted at least 5 m into the burrow.** o **If any wombat burrows are found to be occupied, then a process is to be implemented to ensure that the burrow is empty prior to removal. This is likely to involve monitoring of the burrow, and when confirmed empty (i.e. when the animal is seen leaving the burrow, and the inspection camera used to**

confirm it is empty of any other individuals), a wire net should be installed across the opening of the burrow to prevent any animals re-entering the burrow. The net is to remain in place until the burrow has been removed.

- Any large sections of hollow-bearing trees (including either trunks or major branches/limbs) that have been felled and are still relatively intact, should be collected and stored for later translocation into adjacent habitats as an offset for the removal of the hollows in the first instance.
- Collection/salvage and translocation of high value ground dwelling fauna habitat (such as larger fallen timber logs, hollow logs) into adjacent areas (outside of the development footprint).

<u>VEGETATION & WATER QUALITY MANAGEMENT</u>

- Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, para-webbing or similar.
- A 60 metre buffer strip between the proposed works boundary and the top bank of Swamp Creek should be established and maintained to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC. Stockpiling, dumping, access tracks and stormwater control and treatment structures such as earth bunds and sediment dams should not be located within the buffer strip.
- The buffer strip should be permanently fenced at the boundary with the works site to exclude works vehicles and machinery and stock. The fencing should allow gate access for ongoing management, including revegetation, impact monitoring and weed control.
- Forest vegetation within the buffer strip should be allowed to regenerate naturally or actively restored using planting of indigenous tree, shrub and groundlayer species. Any planting undertaken should include the regionally uncommon herb *Desmodium rhytidophyllum* in drier parts of the site.
- The diversion bunds should be surfaced with topsoil and stabilised with a suitable non-invasive grass species as soon as possible. Sediment fencing should be installed between the bunds and the buffer strip until the bund walls have been stabilised with vegetation cover.
- Discharges from the sediment dams should not be released into the River-flat Eucalypt Forest EEC. Releases should be a dispersed, energy-dissipated flow through at least 20 metres of dense grassland before entering the community or the creek. The release site should be monitored for soil stability and flow concentration.
- No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.
- Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.

	SOIL MANAGEMENT • Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera.* Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection. • During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation. • Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil. • Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas. REHABILITATION • The Rehabilitation Strategy provided at Appendix G of the EIS should be used to guide the preparation of a detailed Rehabilitation Plan. The strategy requires that the pre-development habitat values be reinstated or improved at the site in the long term.
Information/References	• Environmental Impact Statement, Eurobodalla Quarry expansion and resource recovery activities (NGH Environmental, 2016).

A.5.2 Biodiversity values at the site

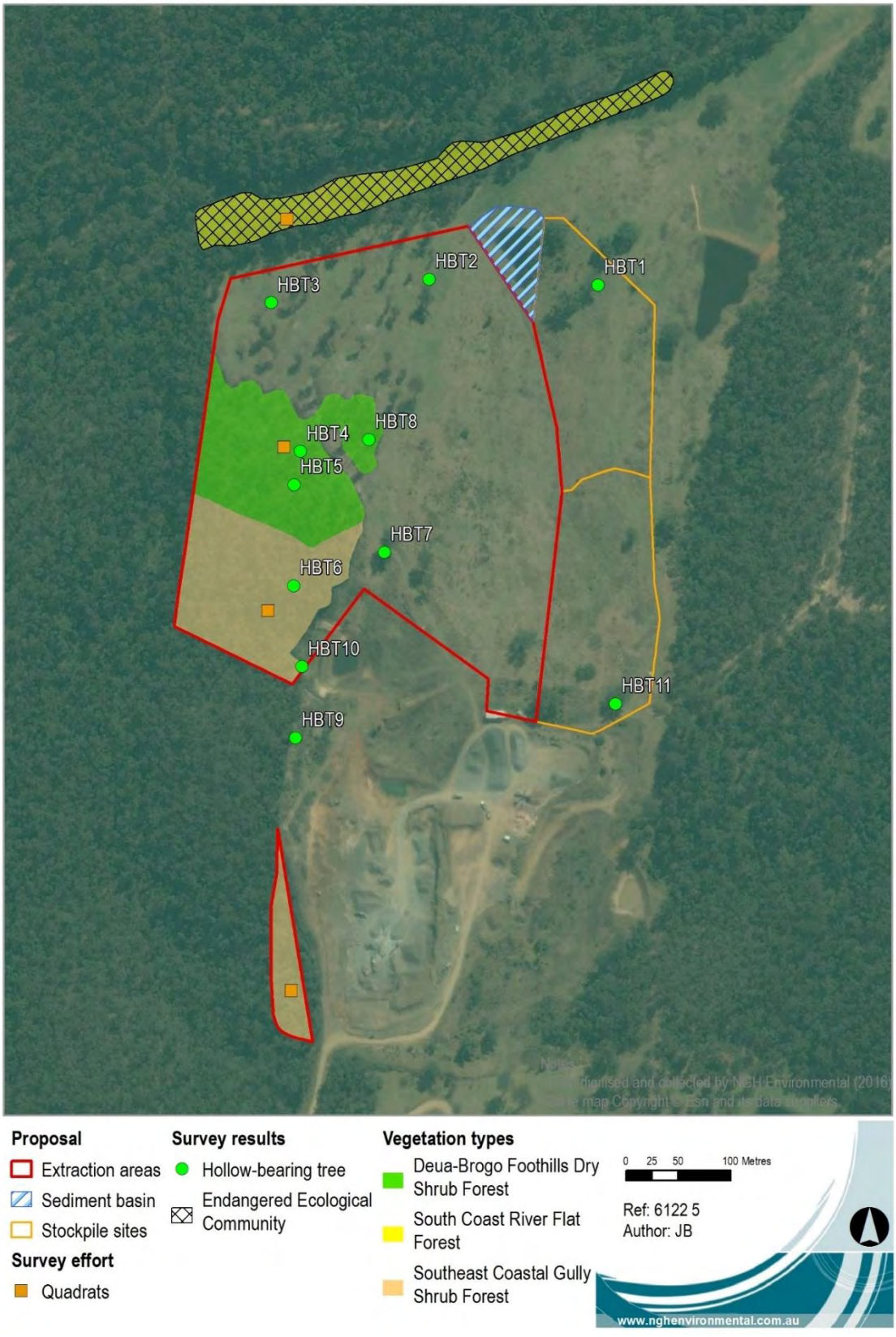

Figure 3 Biodiversity values at the site

A.5.3 Hollow-bearing tree removal protocol

Requirement	Responsibility
1. Prior to clearing trees/other vegetation	
• The hollow-bearing trees (HBTs) must be physically marked (i.e. spray paint or tape). The location of HBT's are shown in Figure 2.	Quarry manager.
***2*. Clear non hollow-bearing trees and other vegetation**	
• Check for animals in the zone of disturbance before any vegetation clearing commences.	Clearing contractor.
• Non-HBTs and other vegetation immediately surrounding a HBT should be cleared the day prior to clearing the HBT.	Clearing contractor.
• Wait at least one night before removing HBTs (in accordance with the steps below).	Clearing contractor.
3. Clear hollow-bearing trees	
• A suitably qualified fauna spotter/catcher must be present during the clearing of all HBTs to look for signs of animal movement in the tree to be cleared. The spotter should be able to communicate directly with the plant operator.	Ecologist or experienced fauna spotter
• Prior to felling a HBT, use an excavator to hit the trunk of the tree as high up the tree as possible several time. Wait at least 30 seconds and observe for any signs of fauna occupying a hollow. Repeat this process several times.	Clearing contractor directed by ecologist or experienced fauna spotter.
• If taking down the tree in stages, remove non-hollow bearing limbs first. Then remove hollow-bearing limbs.	Clearing contractor directed by ecologist or experienced fauna spotter.
• Once the hollow-bearing limb or HBT are on the ground, the spotter must check each hollow for signs of wildlife before the next limb/tree is removed.	Ecologist or experienced fauna spotter.
4. Handling wildlife	
• Direct contact with wildlife should be avoided wherever possible.	Ecologist or experienced fauna spotter.
• Any uninjured wildlife must be encouraged to leave the site.	Ecologist or experienced fauna spotter.
• If wildlife is injured, WIRES or similarly qualified and licensed personnel should be contacted to collect and treat any injured individuals.	Ecologist or experienced fauna spotter.

APPENDIX C REVISED MITIGATION MEASURES

The revised set of mitigation measures is provided in the table below. New or amended mitigation measures are identified in ***bold italics.***

Table 1 Revised mitigation measures from the EIS

No.	Mitigation measure
Surface hydrology and water quality	
WQ1	*The WMP that has been prepared for the proposed quarry expansion would be implemented. The aim of this plan is to ensure that all runoff captured by the site is adequately contained onsite.*
WQ2	*Construct stormwater management controls in accordance with the WMP to ensure that all 'clean water' is diverted around the site using clean water diversion bunds and 'dirty water' from the site is captured within the sediment basins.* ***This will require:*** o ***Providing drainage for haul roads as required, particularly for roads around the outer edge of the quarry works area.*** o ***Diversion of runoff away from stockpiles, particularly stockpiles of finer materials.*** o ***For concentrated flow paths, use appropriate erosion and sediment control measures to limit erosion; refer to section 5.4.3 and drawings SD 5.4, SD 5.5, SD 5.6 and SD 5.7 of the Blue Book (Landcom, 2004).*** o ***Limit cut floor grades to as low as possible to limit erosion and allow for sediment collection.*** o ***During quarry operation and expansion, as much as possible, use the quarry void as a water collection and settling/sedimentation area to provide additional control over the sediment basins to ensure their performance.*** o ***Pump collected runoff from internal ponding to sediment basins as required.***
WQ3	Ensure that surface waters are diverted around the composting pad, and that all surface water from the composting pad is diverted into the leachate pond for storage.
WQ4	***Sediment basins shall be constructed in accordance with the sizing and parameters outlined within the WQMS (Southeast Engineering and Environmental, 2017).***
WQ5	The site sediment basins are to be drawn down as soon as possible following a rain event to enable them to capture runoff from the next rainfall event. The cleaned water should be pumped to a location which allows for broad dispersed flow across a long, vegetated buffer to Swamp Creek.
WQ6	Review the post closure drainage and water management of the site once the quarry has been exhausted and final levels are known. If a depression is left on completion of the work, some regrading may be required to drain the site.
WQ7	Prior to discharge, water from the sediment basin would be tested and treated in accordance with the measures contained in the EMP and the EPL. Water would be flocculated if required. ***As recommended by the WQMS, the criteria for discharge from sediment basins is:*** o ***Average Total Suspended Solids discharge concentrations must be 8mg/L with an allowance of discharges up to 25mg/L in 10% of volumetric discharge.***
WQ8	The leachate management controls described in ***Section 4.8 of the WQMS*** **must** be implemented to minimise the potential impacts to surface water quality particularly through the following: o Installation, monitoring and maintenance of leachate and stormwater management controls (barriers, collection and storage systems). o Diversion of surface water run-on around the composting pad. o Maintaining capacity in the leachate pond to enable the capture of runoff from the compost pad during the next rainfall event.

	o ***Disposal of leachate through reuse on site in dust suppression and to maintain moisture content in compost, windrows and stockpiles.***
WQ9	***Should leachate disposal offsite be required, the EPA must first be consulted to determine whether this activity would be permitted and if so, what the licensing and discharge requirements would be.***
WQ10	Ensure all chemicals, fuels and oils kept on site are stored in accordance with manufacturer's recommendations and in a bunded or sealed area. The volume of this bunding will be greater than 110% of the volume of the largest container.
WQ911	Manage accidental spills of fuel and any other chemicals in accordance with the measures contained within the EMP (Section 4.2.2: Pollution Incident Response Procedure).
WQ12	Empty fuel, oil, lubricant and chemical containers are to be removed from the site and disposed of at a facility that is able to accept the waste.
WQ13	Monitor activity associated with the sediment basins with every significant rainfall event.
WQ14	During and following each discharge from the sediment pond, inspect the points of discharge for sediment deposits. If sediment deposits are observed, discharging should be ceased immediately. The water should be retreated and re-tested prior to further discharging.
WQ15	Monitor and inspect diversion swales to ensure they remain stable and are not contributing any sediment.
WQ16	Maintain a regular supply of flocculants on site and store in accordance with manufacturer's recommendations.
WQ17	Silts would periodically be removed from the sediment basin and reused in the production of quarry products.
Soil and landforms	
SL1	***Ideally, topsoil stripping will done when the soil is moist and Eurobodalla Quarry should consider wetting the soil prior to stripping. Topsoil will not be stripped during rain events.***
SL2	***Stockpile topsoil for reuse in accordance with Drawing SD4-1 from the Blue Book (Landcom 2004), including temporary erosion and sediment control measures such as earth banks and sediment fences. If long term stockpiling of topsoil is required (ie. greater than three montsh), stockpiles shall not be more than 2 metres high and have a batter slope of not more than 2:1 to preserve biological viability and reduce soil deterioration.***
SL3	***Stockpiles will be placed in areas so as to avoid impediment of natural localised drainage lines and minimise the likelihood of water ponding against the stockpile.***
SL4	Spill kits would be stored onsite and staff trained in their use.
SL5	If any signs of contaminated soils are discovered (e.g. smell, discolouration, suspect rubbish), the site would be marked and the soil replaced to cover the contamination. The soil would be analysed without delay to determine the type of contamination and an appropriate management plan would then be developed and followed.
SL6	A detailed Rehabilitation Plan would be developed by a qualified person, in accordance with the Rehabilitation Strategy provided in Appendix G of this EIS. Aims of rehabilitation will be to provide a stable landform that is resistant to erosion, to preserve downstream water quality through adequate management of site surface water runoff and minimising weed infestation.
SL7	The Rehabilitation Plan would include input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).
SL8	Respread topsoil immediately following the closure and regrading (if required) of each worked section of the quarry. The quarry floor and benches would then be revegetated and rehabilitated as soon as possible.
SL9	Monitor revegetated areas to ensure good strike rates with revegetated areas.
SL10	Monitor rehabilitated areas to ensure they remain stable and free from erosion.

SL11	Repair any erosion - regrading to ensure an even surface and diversion of surface runoff around disturbed areas and if required use jute or mulch and reseed locally.
Biodiversity	
B1	Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, parawebbing or similar.
B2	The existing riparian vegetation along Swamp Creek would be permanently fenced to prevent impacts to the River Flat Eucalypt Forest EEC. The fencing should exclude stock from the riparian vegetation and allow access for ongoing management, including impact monitoring and weed control.
B3	A 50 metre buffer strip should be maintained between the proposed works boundary and the top bank of Swamp Creek to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC.
B4	If stock grazing is to be carried out within the 50m buffer strip, grazing management practices (such as rotational grazing) should be implemented, to control grazing impacts and to ensure that naturally regenerating vegetation is not adversely affected.
B5	The following Biodiversity (fauna) Construction Management Protocol included must be implemented to mitigate impacts to native fauna: • Avoidance of clearing hollow-bearing trees during the breeding season for the main fauna types that may be present in the area. • For most species, this includes avoidance of clearing hollow bearing trees in summer period. • If the above timing restrictions are not feasible, then a targeted pre-clearance survey (including primarily Anabat, spotlighting and stagwatching survey techniques) are to be undertaken by an ecologist to confirm if the individual hollow-bearing trees are being used by threatened fauna. These surveys are to be undertaken (immediately) prior to the proposed clearing (i.e. less than 48 hours prior to clearing). Occupied trees are not be cleared until it can be demonstrated that no threatened fauna are occupying them. • ***Pre-clearance surveys of all trees (including non-hollow bearing trees) is also to be completed to ensure that no koalas are present within the development footprint.*** • The staged felling protocol provided in ***Section 3.3.2 of the Eurobodalla Quarry Environmental Management Plan*** will be implemented for the removal of all hollow-bearing trees. • An experienced fauna spotter should be engaged to be present on-site during the removal of hollow-bearing trees and ground habitat. • The fauna spotter should also be present during the removal of any burrows, specifically wombat burrows, and where possible, a pre-clearance survey should occur to confirm whether any (wombat) burrows to be removed are currently occupied. ***This would involve the use of a small flexible inspection camera capable of being inserted at least 5 m into the burrow.*** • ***If any wombat burrows are found to be occupied, then a process is to be implemented to ensure that the burrow is empty prior to removal. This is likely to involve monitoring of the burrow, and when confirmed empty (i.e. when the animal is seen leaving the burrow, and the inspection camera used to confirm it is empty of any other individuals), a wire net should be installed across the opening of the burrow to prevent any animals re-entering the burrow. The net is to remain in place until the burrow has been removed.*** • Any large sections of hollow-bearing trees (including either trunks or major branches/limbs) that have been felled and are still relatively intact, should be collected and stored for later translocation into adjacent habitats as an offset for the removal of the hollows in the first instance. • Collection/salvage and translocation of high value ground dwelling fauna habitat (such as larger fallen timber logs, hollow logs) into adjacent areas (outside of the development footprint).
B6	Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.
B7	Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera.* Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the

	site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection.
B8	During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation.
B9	Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil.
B10	Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas.
B11	No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.
B12	***Pre-clearance surveys of all trees (including non-hollow-bearing trees) is also to be completed to ensure that no koalas are present within the development footprint.***
With the implementation of the biodiversity management measures above, it is considered that impacts would be avoided where possible and effectively mitigated, where avoidance is not possible. All areas disturbed by the works would eventually be subject to a detailed Rehabilitation Plan. The Rehabilitation Strategy to guide development of the plan is provided at Appendix G of the EIS and requires that the pre-development habitat values be reinstated or improved at the site in the long term. A such, this ensures an overall 'maintain environmental values' objectives has been met and therefore further offsets are not proposed.	
Aboriginal Heritage	
AH1	If work on the quarry expansion is to proceed, the site Eurobodalla Quarry AS1 ***must*** be fenced to prevent inadvertent disturbance. A buffer of at least 10m should be included.
AH2	If any work was to extend beyond the proposal boundary in the vicinity of the site Eurobodalla Quarry AS1, an Aboriginal Heritage Impact Permit ***must*** be obtained. This would require undertaking an Aboriginal Cultural Heritage Assessment (ACHA) including Aboriginal consultation under the Guides and Codes of practice provided by OEH.
AH3	Staff ***must*** undertake an Aboriginal Heritage Induction prior to the commencement of the expansion works, particularly prior to any work in the proposed expansion north of Eurobodalla Quarry.
AH4	An Aboriginal Heritage Unexpected Finds Management Plan ***must*** be established for Eurobodalla Quarry.
AH5	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) may be required; and
AH6	Any activity proposed outside of the current assessment area ***must*** also be subject to an Aboriginal heritage assessment.
Historic Heritage	
HH1	Should an item of historic heritage be identified, works in the vicinity of the find would cease. The Heritage Division (NSW Office of Environment and Heritage) would be contacted prior to further work being carried out in the vicinity of the find.
Traffic and Transport	
TT1	Traffic management protocols would be developed and required for all Eurobodalla Quarry Drivers. The protocol would be made available to all regular suppliers. They would aim to further reduce risks encountered on the haulage

	network, specifically, between the quarry site and the Eurobodalla Road/ Princes Highway intersection. Protocols would include: o The speed limit of 40km/hr shall be adhered to for any unsealed section of the haul route. o Specifying any higher risk periods, such as the timing of the local bus connection. o Requirements to report hazardous conditions, such as pot holing, when they appear, to the road administrator.
T2	***A specialist would be engaged to complete SIDRA modelling of the Eurobodalla Road/ Princes Highway intersection if any increase to current Eurobodalla Quarry traffic volumes is proposed in this location.***
Noise	
N1	All equipment used on site would be in good condition and good working order.
N2	Vehicles would be kept properly serviced and fitted with appropriate mufflers.
N3	Where reasonable and feasible, activities that generate high noise levels would be substituted with alternative processes that generate less noise.
N4	Works will be restricted to: o 7am to 6pm Monday to Friday o 7am to 12pm on Saturdays o No work on Sundays or public holidays.
N5	A complaints register would be maintained and noise and vibration complaints would be responded to promptly.
Air quality	
AQ1	During dry, windy periods: o A water cart shall be made available and used to dampen unsealed sections of the haul routes, stockpiles and loading pads. o Visual monitoring of dust generation will be undertaken and quarrying activities will be limited if dust generation becomes unmanageable.
AQ2	A speed limit of 40km/h shall be adhered to for any unsealed section of the haulage route.
AQ3	All blast holes would be stemmed with aggregate to avoid creating excessive dust during blasting.
AQ4	Vehicles and motorised equipment would be maintained so that emissions are minimised.
AQ5	Vehicles and machinery will be switched off when not in use, rather than leaving them to idle.
AQ6	A complaints register would be maintained and air quality complaints would be responded to promptly.
Waste Management	
W1	Green waste from vegetation clearing would be mulched at the site for composting, or used in the management of soil and water.
W2	Topsoil stripped from the proposal area would be stockpiled for onsite landscaping and rehabilitation.
W3	A Waste Management Plan (WMP) would be prepared for the resource recovery, recycling and composting activities. The WMP would include, but not be limited to the following measures: o All incoming wastes would be subject to visual inspection prior to unloading, during unloading and after unloading, to determine waste acceptability. NCW is either: ▪ Not unloaded and the load is rejected prior to tipping; or ▪ Rejected following tipping, reloaded and the driver instructed to remove the load from the site.

	o Wastes would be delivered to designated locations at the hardstand area. o A waste rejection register would be maintained to detail the types and quantities of non-conforming wastes rejected from the site, including the reasons for the waste rejection.
Social and economic impacts	
SE1	Nearby residents will be notified of the proposal and feedback sought.
SE2	A complaints register would be maintained and complaints would be responded to promptly.
Hazards and risks	
H1	Operate the quarry in accordance with the Eurobodalla Quarry Mine Safety Management Plan.
H2	All staff would be trained in the safe operation of machinery on site.
H3	All staff would be trained in the use of fire-fighting equipment.
H4	No hot works would be undertaken onsite during total fire ban days.
H5	All equipment used on site would be maintained in good condition and good working order.
H6	The Eurobodalla Quarry Emergency Response Procedure will be updated to reflect the new extraction areas and new activities occurring onsite.
H7	A copy of the Emergency Response Procedure will be available at the site office at all times and would be implemented in the event of an emergency (eg. bushfire).
H8	Signage will be provided to clearly indicate the location of and directions to the waste receivals area.
H9	Composting will generally be carried out in accordance with the NSW Office of Environment and Heritage's *Environmental Guidelines for Composting and Related Organics Processing Facilities* (DEC, 2004).
H10	The composting process outlined in Section 3.5 of this EIS would be implemented.

COUNCIL ASSESSMENT REPORT ATTACHMENT 3 - Response letter dated 28 July 2017 to matters raised by OEH with updated biodiversity measures

Hi David,

I provide the following response to the three submissions to our development proposal, the RMS, Fisheries and OEH. Our consultants have addressed issues raised by Fisheries and OEH with further documentation attached.

As discussed with yourself and previous correspondence the issues raised with the RMS can be addressed by having a condition of consent. The current approved rate of 100,000 ton cannot be increased through the Eurobodalla road and princess hwy intersection until the studies are undertake and approval sort and gained as requested by the rms using SIDRA modelling.

NGH has provided a response to the issues raised by OEH, see attached document. Regarding the issue of the offset area being protected. I propose that we us the most current form of offsetting that is to be adopted by the new Biodiversity conservation act 2016. This is the most current state government legislation to deal with offset area for land clearing. It involved the listing off set land on a public register. This act came into force on 1st of July 2017 and therefor would be the most current and appropriate. We are willing to list the offset on this register.

Southeast engineering and environmental have responded to fisheries concerns, they have gone to great detail to explain the modelling used. Fisheries wanted justification and protection measures in place to have a buffer zone of 60m. In my previous response I have provided justification due to resource sterilization and operational issues. If the proposal is approved the area adjacent to swamp creek will be improved as we will fence of swamp creek adjacent to the proposed quarry. Currently it is agricultural land that is farmed. This included cultivation that at times allows for now ground cover. Under the proposal the area will be permanently vegetated improving water quality, hence fish habitat. Additionally, livestock will be fenced out, currently they graze this freehold land which can have effects on ground cover and land degradation adjacent and in swamp creek. The proposal will fence out livestock and hence improve water quality and fish habitat. The proposal will have a net improvement over the current agricultural management practices.

Thank you

Troy Hollis

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Tel. 02 44744 439 - Mbl. 0450 154 441

20 July 2017

Jillian Reynolds
Fisheries Manager
Aquatic Ecosystems, South

Re: Designated Development Application DA 366/17 - Quarry Expansion and Resources Recovery Facility, Lot 1 DP 1165095, Nerrigundah Mountain Road, Eurobodalla

Dear Jillian,

I refer to your letter dated 1 June 2017 regarding the MUSIC modelling analysis undertaken to date and the request for a Neutral or Beneficial Effect (NorBE) analysis.

The documentation we have already prepared, and that has been reviewed by yourself was based on detailed requests for additional information regarding proposed water quality management for the development. In particular; the EPA made specific requests for more information around how water quality was to be managed and a demonstration of how the NSW Water Quality Objectives and the associated relevant ANZECC water quality guidelines would be achieved by the development to ensure that environmental values of the sensitive receiving wasters are improved or maintained.

The Water Quality Objectives and ANZECC guidelines use, in general, pollutant concentrations, rather that load based estimations to assess impact, and measure the effectiveness of pollution control, hence our presentation of the model results of water management on the site in the context of pollutant concentrations and trigger values. This has allowed the EPA and Council to clearly assess the development.

We understand that a NorBE approach can be used as a proxy for assessment of environmental impact, however, this approach has no specific reference in the *Fisheries Management Act 1994* nor in the *Policy and guidelines for fish habitat conservation and management (Update 2013)* and increasing current loads could have a neutral effect as environmental values exist through a range of water quality concentrations (it would be possible to increase loads and have a neutral effect on the environment).

One way to gain meaning from the existing MUSIC modelling with respect to a NorBE assessment could be to compare concentrations and trigger values. The figures in Section 3.2 of the report show pollutant concentrations upstream and downstream of the quarry which could be read as a conservative proxy for pre-development conditions (upstream of discharge) and post development (downstream of discharge). Viewed this way, a NorBE is achieved (no real change in concentrations around ANZECC trigger value or below exceedance level).

To assist with your assessment we have also prepared an additional MUSIC model of the existing approved development to allow a comparison of estimates of the existing and future pollutant loads from the site. The existing configuration is shown in Figure 1 and results in Table 1. Model assumptions are attached.

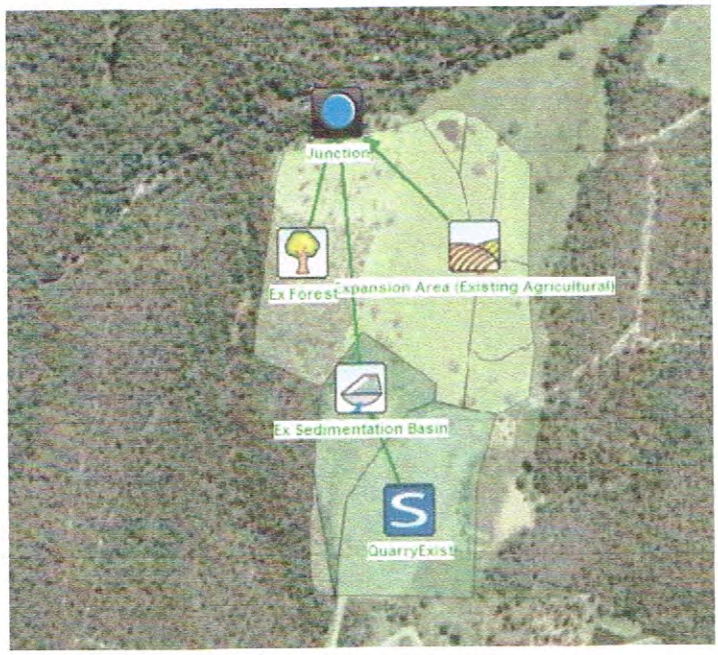

Figure 1 Existing model configuration

Table 1 Pre and most pollutant load results.

Pollutant	Existing Quarry + Pre-dev Expansion Area (current grazing and forest)		Existing Quarry + Post-dev Expansion Area (with proposed treatments)		Change in pollutant load pre to post
	Sources	*Residual Load after existing water quality management*	Sources	*Residual Load after water quality management*	
Total Suspended Solids (kg/yr)	41100	*9730*	101000	*8840*	-890
Total Phosphorus (kg/yr)	26.6	*14.5*	53	*14.2*	-0.3
Total Nitrogen (kg/yr)	138	*116*	233	*141*	25

The future scenario presents a slightly improved situation over the existing development for both sediment and phosphorus loads. The primary reason is that the water quality management infrastructure has been sized to manage runoff from a higher rainfall intensity event than is currently applied. In addition to this, a lower allowable discharge concentration for TSS has been proposed for this development than currently exists along with stricter discharge timing requirements.

There is an increase in nitrogen loads, however in the context of the receiving waters this represents an increase in nitrogen load of about 0.6% over current conditions (increase from 4086kg/y to 4111kg/y). Additionally, as the previous report shows, there is no real modelled change in concentrations below the 15% exceedance level or trigger value for nitrogen concentrations.

Overall, given the modelling shows a significant reduction in TSS, which is a significant threat to receiving waters, and the approximate maintenance of in-situ pollutant concentrations, then NorBE is achieved.

In addition the existing riparian vegetation along Swamp Creek would be permanently fenced to maintain and enhance the vegetation cover over the buffer between the proposed quarry footprint.

Notwithstanding that NorBE can be demonstrated we would suggest that using the legislated framework that references the NSW WQOs and ANZECC guidelines provides for a more robust assessment and control of the proposal at approval stage and during operation.

Please do not hesitate to contact me if you have any questions.

Yours sincerely

Lachlan Bain (BEng, MEnvMgt)

ngh environmental

28 July 2017

David Sheehan
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Dear David,

RE – Eurobodalla Quarry - additional information for OEH, (OEH letter dated 2 June 2017).

OEH have provided ESC with a series of recommended conditions of consent relating to Biodiversity and Aboriginal cultural heritage (2/06/2017).

This letter provides specific additional information in response to the OEH letter. Specifically:

- Two Assessments of Significance
- Clarification regarding biodiversity mitigation measures for ground dwelling fauna
- Clarification regarding security of the proposed offset area.

In summary:

Assessments of Significance

OEH is seeking Assessments of Significance to be undertaken in accordance with section 5A of the *Environmental Planning and Assessment Act 1997*, for two threatened species: the Spotted-tailed Quoll (*Dasyurus maculatus*) and the White Footed Dunnart (*Sminthopsis leucopus)*. The Assessments of Significance have been undertaken and they are included at Attachment 1 of this letter. A significant impact is not anticipated for either of these species.

Mitigation measures relating to ground dwelling fauna

OEH is seeking clarification regarding the mitigation measures that were included in the Biodiversity Addendum (NGH Environmental, 2017) to minimise the impacts of the development on ground dwelling fauna. NGH Environmental provides the following clarifications:

- A mitigation measure was included which requires an experienced fauna spotter to be engaged to be present on-site during the removal of ground habitat (i.e. including any habitat for ground dwelling fauna).
  As recommended by OEH in their letter dated 2 June 2017, the mitigation measure in the Environmental Management Plan (EMP) (Section A.5.1) would be amended to state that only qualified ecologists with experience in fauna handling are to conduct flora and fauna searches as part of the pre clearing process, and that a licenced wildlife carer or ecologist be used to carry out any fauna handling.

- Specific measures were included in Section A.5.1 to manage impacts to wombat burrows (which may provide habitat for native species other than wombats, such as the Spotted-tailed Quoll). This included a requirement for pre-clearance surveys of all burrows that are to be impacted, and requirements for ensuring that the burrow is empty, with no fauna occupying it, prior to the destruction of the burrow.
- Measures were also included in Section A.5.1 to salvage and relocate high value ground dwelling fauna habitat (eg. large timber logs, hollow logs) from the development area to a suitable adjacent area outside the development footprint.

These measures have been proposed to mitigate impacts of the development on ground dwelling fauna. An updated list of biodiversity mitigation measures that will be included in the EMP for the Eurobodalla Quarry are listed in Attachment 2 of this letter.

Biodiversity Offsets

OEH notes that adequate management and mitigation measures have been provided to protect the River Flat Eucalypt Forest on Coastal Floodplains EEC. OEH supports the onsite conservation of the area proposed, and points out that a mechanism must be employed to ensure that the area is protected in perpetuity. There are several ways that this can be achieved, including a conservation agreement, or a Section 88B instrument under the *Conveyancing Act 1919*. Management of the offset area can be achieved with a Vegetation Management Plan written into the s88B instrument, with Part 2 containing a provision that the easement may not be extinguished or altered without the written consent of Council.

A suitable mechanism would be employed by the proponent to protect the proposed offset area in perpetuity, and this is likely to be in the form of a Vegetation Management Plan, written into the s88B instrument.

Yours sincerely,

Alana Gordijn
Environmental Consultant

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NGH Environmental Pty Ltd
ABN: 31 124 444 622
ACN: 124 444 622

ATTACHMENT 1 – ASSESSMENTS OF SIGNIFICANCE

NSW threatened species and communities

Section 5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) specifies seven factors to be taken into account in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the *Threatened Species Conservation Act 1995*.

This *Seven-part Test* characterises the significance of likely impacts associated with the proposal on the following entities:

- White-footed Dunnart (*Sminthopsis leucopus*) – vulnerable
- Spotted-tailed Quoll (*Dasyurus maculatus*) – vulnerable

a) In the case of a threatened species, whether the action proposed 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.

White-footed Dunnart (*Sminthopsis leucopus*)

White-footed Dunnarts are relatively short-lived dasyurid predators, nesting in tree hollows and under logs and strips of bark and feeding on invertebrates up to 18 mm in length, and skinks up to 1.5 grams (Lunney 2008). In NSW, mating occurs in late July and August, with up to 10 young occupying the pouch for 8 weeks then left in a nest and suckled for a further month (Lunney 2008 in Burbidge and Woinarski 2016). Females appear to have only one short breeding season during their lifetime and males do not survive to breed in a second year (Menkhorst 1995 in Burbidge and Woinarski 2016).

Movement patterns in males appear to fall into two groups: resident males and explorer males actively seeking out new areas of suitable habitat (Lunney and Leary 1989). In forest near Bega (in the same broad region as the quarry and including similar habitat types), the largest recorded movement of an explorer male was 1,025 metres in 24 hours. Explorer males and juvenile females exhibit similar movement patterns, moving long distances along ridgelines (Lunney and Ashby 1987). The study near Bega found that females occupy small exclusive home ranges with a pooled range length of 79.5 metres, and resident males have larger overlapping home ranges with an average range length of 104.9 metres (Lunney and Leary 1989).

Presence and abundance of the White-footed Dunnart appear to be related to vegetation density and seral succession stage. In forest near Bega, it bred in disturbed habitat but did not persist when the vegetation regrew and became dense. Suitable disturbed forest habitat may occur naturally only as disjunct and temporary patches, hence the need to travel long distances to utilise suddenly abundant and transient resources (Lunney and Ashby 1987). However, in Victoria a preference for disturbed sites or regenerating vegetation is less clear (Menkhorst 1995 in Burbidge and Woinarski 2016). The choice of logged, burnt ridge habitats does not appear to be related to food (Lunney *et al.* 1986).

Ashby (2013) suggests that the wide range of recorded habitats can in part be explained by the long distances travelled, and the trapping of travelling individuals. Other *Sminthopsis* species display similarly high rates of mobility and transience, an extended seasonal pattern of reproduction, relatively rapid development of the young and the probable existence of polyoestry (Haythornthwaite and Dickman 2006, Friend et al. 1997 in Ashby 2013).

The proposal would result in the loss of some marginal dry forest habitat at the edge of cleared farmland, but would not isolate or fragment any populations, or impede the movement of this species. Given the abundance of similar habitat and food sources, the proposal would not adversely affect the life cycle of the species such that a viable local population of the species would be likely to be placed at risk of extinction.

Spotted-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tailed Quoll is known from a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. The species utilises hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.

The Spotted-tailed Quoll is mostly nocturnal, and spends most of the time on the ground, although it can hunt for possums and gliders in tree hollows and prey on roosting birds. It is normally a generalist predator with a preference for medium-sized (500g-5kg) mammals, but is known to consume a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. It also eats carrion and can take domestic fowl.

Spotted-tailed Quolls are known to use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.

The species has a relatively large home range, with females occupying home ranges up to about 750 hectares and males up to 3500 hectares. Animals are known to traverse their home ranges mainly along densely vegetated creeklines.

The species has been recorded previously at several locations in the Bodalla area, within most records occurring within Dampier State Forest and Deua National Park as well as Bodalla State Forest, although some records also exist along Tuross River, within 5 km of the site.

Habitat values for the species within the site are considered to be of only marginal quality, with limited denning opportunities, restricted to only a small number of wombat burrows, all of which showed either no signs of use by any fauna, or where currently being used by wombats (evidenced by faecal pellets at/near the entrances). No latrine sites were observed, and generally, there were no rocky outcrops or large flat rocks observed within the site that would be used for either denning or communal latrine purposes. Additionally, no important movement corridors for the species occur within the site, with movement corridors likely to be along Swamp Creek.

Given the lack of any obvious denning sites within the site and the large areas of suitable habitat located adjacent to the site within Dampier and Bodalla State Forests and Deua National Park, as well as the fact that movement opportunities for the species in the local area would not be affected by the proposal and combined with the highly mobile nature of the species, the development is not expected to result in any adverse effects 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.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

White-footed Dunnart (*Sminthopsis leucopus*)

There are no relevant listed Endangered Populations in the study area.

Spotted-tailed Quoll (*Dasyurus maculatus*)

There are no relevant listed Endangered Populations in the study area.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **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.**

N/A

d) In relation to the habitat of a threatened species, population or ecological community:

- **i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

White-footed Dunnart (*Sminthopsis leucopus*)

i. The White-footed Dunnart has been recorded in a range of different habitats across its distribution, possibly as a result of the trapping of travelling individuals (Ashby 2013). Vegetation types have included coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest.

Preferred habitat appears to be recently disturbed sites or low density vegetation communities (Strahan 1998). Surveys near Melbourne and on Twofold Bay south of Eden identified this species in coastal dune habitat (NGH

Environmental 2006). In Mumbulla State Forest it inhabits logged or burnt areas on ridge crests and sparsely vegetated mid-slopes with sparse ground cover of less than 51% and where tree cover was absent (Lunney et al. 1989). It disappeared from this site three years after logging or fire, suggesting that the regenerating understorey vegetation was not favourable for its presence. It was not recorded in gullies or where ferns were abundant at Mumbulla. The study suggested that it seeks initial seral stages of forest regenerating from gross disturbance. At Mumbulla, the species favours early- to mid-successional vegetation in post-fire and post-logging coastal forests (Lunney 2008). The research suggests that local source population locations are dynamic, reflecting patterns of disturbance and seral change across the landscape.

At Broulee, the species occurs in Bangalay – Old Man Banksia open forest with, a patchy native understorey of ferns, grasses, graminoids and regenerating shrubs, fallen timber and dense leaf litter (Ashby 2013). Habitat features likely to be important were identified as native vegetation, leaf litter, terrestrial shelter sites, open patchy ground cover and habitat connectivity (Ashby 2013).

The proposal would result in the loss of 1.98 ha of potential dry ridge forest habitat (DSFe32A Deua-Brogo Foothills Dry Shrub Forest) and 2.26 ha of more marginal gully and lower slope habitat (WSFe34 Southeast Coastal Gully Shrub Forest). Both of these communities are abundant in the locality, and have been subjected to low rates of clearing (Tozer *et al.* 2010). In terms of area of potential habitat, the proposal would not be likely to result in a significant impact to a local population of the species.

ii. Females occupy small exclusive home ranges, and males have larger overlapping home ranges (Lunney and Leary 1989). Explorer males and juvenile females moving long distances along ridgelines, seeking out suitable habitat (Lunney and Ashby 1987). Because of the transient nature of the preferred successional habitat, the ability to migrate and disperse is critical for the survival of the species. The proposal would result in the loss of some potential dry forest habitat at the margins of cleared farmland, but would not isolate or fragment any populations, or impede the movement of this species

iii. Potential habitat is present at the subject site, although the habitat has been assessed as marginal, and better quality habitat occurs state forests to the north of the site. Nesting habitat for the species at the site is limited with little suitable fallen timber/log piles or grass trees present within the development footprint. The habitat affected by the proposal is not likely to be important or limiting for the species, and the proposal is unlikely to affect its long-term survival in the locality.

Spotted-tailed Quoll (*Dasyurus maculatus*)

i. The Spotted-tailed Quoll has been recorded in a range of different habitats across its distribution, and vegetation types include rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Preferred habitat within the Eurobodalla area appears to be associated with more dense remnant forests, with the bulk of records occurring within National Park and State Forest land tenures.

The proposal would result in the loss of 1.98 ha of potential dry ridge forest habitat (DSFe32A Deua-Brogo Foothills Dry Shrub Forest) and 2.26 ha of more marginal gully and lower slope habitat (WSFe34 Southeast Coastal Gully Shrub Forest). Both of these communities are abundant in the locality, and have been subjected to low rates of clearing (Tozer *et al.* 2010). In terms of area of potential habitat, the proposal would not be likely to result in a significant impact to a local population of the species.

ii. The species is highly mobile and tends to use well-vegetated creeks, gullies and streams for movement corridors. As such, most movements of the species are likely to be along Swamp Creek which will not be affected by the proposal. Given this, and the occurrence of extensive areas of intact forest within the Dampier State Forest to the north and west, the proposal would not isolate or fragment any habitat or populations, or otherwise impede the movement of this species in the area.

iii. The habitat values for the species within the site is considered to be of only marginal quality, with limited denning opportunities, restricted to only a small number of wombat burrows, all of which showed either no signs of use by any fauna, or where currently being used by wombats (evidenced by faecal pellets at/near the entrances). No latrine sites were observed, and generally, there were no rocky outcrops or large flat rocks observed within the site that would be used for either denning or communal latrine purposes. Additionally, no important movement corridors for the species occur within the site, with movement corridors likely to be along Swamp Creek. As such, the proposal is not expected to result in the removal of any habitat that would be important to the long term survival of the species.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

White-footed Dunnart (*Sminthopsis leucopus*)

No areas of critical habitat have been declared for the study area.

Spotted-tailed Quoll (*Dasyurus maculatus*)

No areas of critical habitat have been declared for the study area.

f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.

White-footed Dunnart (*Sminthopsis leucopus*)

There is no approved recovery plan for this species.

The OEH Saving Our Species program lists the following recovery actions for the species (OEH 2017):

Protect and maintain areas of high quality habitat, including coastal dune vegetation, coastal forest, tussock grassland, sedgeland and heath with a relatively open diverse understorey. Where possible negotiate conservation agreements with landholders, agreements should preferably be funded and in perpetuity.

Undertake revegetation, using a diverse mix of locally appropriate native species, that will produce high quality habitat. Revegetation should seek to expand existing small patches of habitat or improve connectivity between remnant patches in which the species is known to occur through the creation or improvement of corridors of suitable habitat. Minimum corridor width should be 50m.

Prevent access, particularly vehicular access and camping in areas of known or potentially suitable dunnart habitat, especially coastal dune vegetation and coastal forest.

Control the establishment of high density re-growth over extensive areas of potentially suitable habitat. Where activities likely to result in such regrowth are being undertaken (for example burning or vegetation/timber removal) they should be confined to small patches (less than 10ha), with adjacent patches of suitable habitat retained. Connectivity between patches of suitable habitat should also be maintained.

Raise awareness amongst land managers of the importance of retaining fallen and standing dead timber, and preventing firewood collection in areas in which dunnarts are known to occur or there is potentially suitable habitat.

The proposal would not interfere with the operation of these recovery actions.

Spotted-tailed Quoll (*Dasyurus maculatus*)

The *National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus* (DELWP, 2016), lists 11 Specific Objectives for the species, including:

1. Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices.
2. Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery.
3. Reduce the rate of habitat loss and fragmentation on private land.
4. Evaluate and manage the risk posed by silvicultural practices.
5. Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.
6. Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.
7. Reduce deliberate killings of Spotted-tailed Quolls.
8. Reduce the frequency of Spotted-tailed Quoll road mortality.
9. Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.
10. Determine the likely impact of climate change on Spotted-tailed Quoll populations.
11. Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

Of the above, only Objective 3 has any relevance to the proposed development, with the other 10 Objectives either related to requirements for further research, or involve matters not applicable to the area (i.e. Cane Toads), or not

applicable to the nature of the development (i.e. the development would not involve a notable increase in traffic or increase in traffic speeds, therefore is unlikely to result in any changes to road mortality rates).

With regard to Objective 3, as stated in the responses above to items (a) and (d)(iii), the site is note regarded as containing important habitat for the species, and is also unlikely to result in any fragmentation of habitat for the species. Given this and the above, the proposal is not regarded as being inconsistent with any of the objectives of the National Recovery Plan for the species.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

White-footed Dunnart (*Sminthopsis leucopus*)

The SOS project report identifies loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease as key threats to the viability of landscape-managed species (OEH 2017).

Listed Key Threatening Processes relevant to this species include:

- Clearing of native vegetation
- Predation by feral cats
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
- Infection of native plants by *Phytophthora cinnamomi*.

While the proposal would involve the clearing of native vegetation, the communities affected are widespread and abundant in the locality. The loss of a small area of likely marginal potential habitat and other impacts of the proposal would not be likely to significantly exacerbate any Key Threatening Process affecting the White-footed Dunnart.

Spotted-tailed Quoll (*Dasyurus maculatus*)

The main threatening process to the species include:

- Loss, fragmentation and degradation of habitat.
- Competition with introduced predators such as cats and foxes.
- Deliberate poisoning, shooting and trapping, primarily in response to chicken predation.
- Roadkill.

While the proposal would involve the clearing of some native vegetation, the habitat values for the species within the site are considered to be marginal, with extensive habitat of similar or better quality available to within adjacent State Forests. The loss of a small area of marginal potential habitat would not be likely to significantly exacerbate any Key Threatening Process affecting the Spotted-tailed Quoll. Additionally, the proposal would not exacerbate impacts to the species associated with introduction of feral predators, poisoning, shooting or trapping, or, increasing the frequency of roadkill.

Conclusion

The proposal would not be likely to significantly impact the listed threatened species White-footed Dunnart (*Sminthopsis leucopus*) or the Spotted-tailed Quoll (*Dasyurus maculatus*).

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ATTACHMENT 2 – UPDATED BIODIVERSITY MEASURES

EMSP 03 – BIODIVERSITY MANAGEMENT	
Responsible person	• Quarry Operator • Quarry staff
Objectives	• Avoid impacts to biodiversity where possible, or effectively mitigate and minimise impacts where avoidance is not possible. • Rehabilitate the worked quarry site, such that pre-development habitat values are reinstated or improved in the long term.
Procedures/Requirements	<u>BIODIVERSITY (FAUNA) CONSTRUCTION MANAGEMENT PROTOCOL</u> • The following protocols will be implemented to mitigate impact to native fauna: ○ Preclearance surveys are to be carried out by a suitably qualified ecologist prior to the clearing of native vegetation at the site, regardless of the time of year. ○ Pre-clearance surveys (including primarily Anabat, spotlighting and stagwatching survey techniques) are to be undertaken by a suitably qualified ecologist to confirm if the individual hollow-bearing trees are being used by threatened fauna. These surveys are to be undertaken (immediately) prior to the proposed clearing (i.e. less than 48 hours prior to clearing). Occupied trees are not to be cleared until it can be demonstrated that no threatened fauna are occupying them. ○ Where possible, avoid clearing hollow-bearing trees during the breeding season for the main fauna types that may be present in the area. For most species, this is during the summer period. ○ Pre-clearance surveys of all trees (including non-hollow-bearing trees) is also to be completed to ensure that no koalas are present within the development footprint. ○ The staged felling protocol provided in Section 3.3.2 of Appendix H of the EIS (and included further below for reference) will be implemented for the removal of all hollow-bearing trees. ○ A suitably qualified ecologist with experience in fauna handling should be engaged to be present on-site during the removal of hollow-bearing trees and ground habitat. Only a licenced wildlife carer or ecologist are to carry out any fauna handling. ○ A licenced wildlife carer or ecologist must be present during the removal of any burrows, specifically wombat burrows, and where possible, a pre-clearance survey should occur to confirm whether any (wombat) burrows to be removed are currently occupied. This would involve the use of a small flexible inspection camera capable of being inserted at least 5 m into the burrow. ○ If any wombat burrows are found to be occupied, then a process is to be implemented to ensure that the burrow is empty prior to removal. This is likely to involve monitoring of the burrow, and when confirmed empty (i.e. when the animal is seen leaving the burrow, and the inspection camera used to confirm it is empty of any other individuals), a wire net should be installed across the opening of the burrow to prevent any animals re-entering the burrow. The net is to remain in place until the burrow has been removed. ○ Any large sections of hollow-bearing trees (including either trunks or major branches/limbs) that have been felled and are still relatively intact, should be collected and stored for later translocation into adjacent habitats as an offset for the removal of the hollows in the first instance. ○ Collection/salvage and translocation of high value ground dwelling fauna habitat (such as larger fallen timber logs, hollow logs) into adjacent areas (outside of the development footprint).

VEGETATION & WATER QUALITY MANAGEMENT

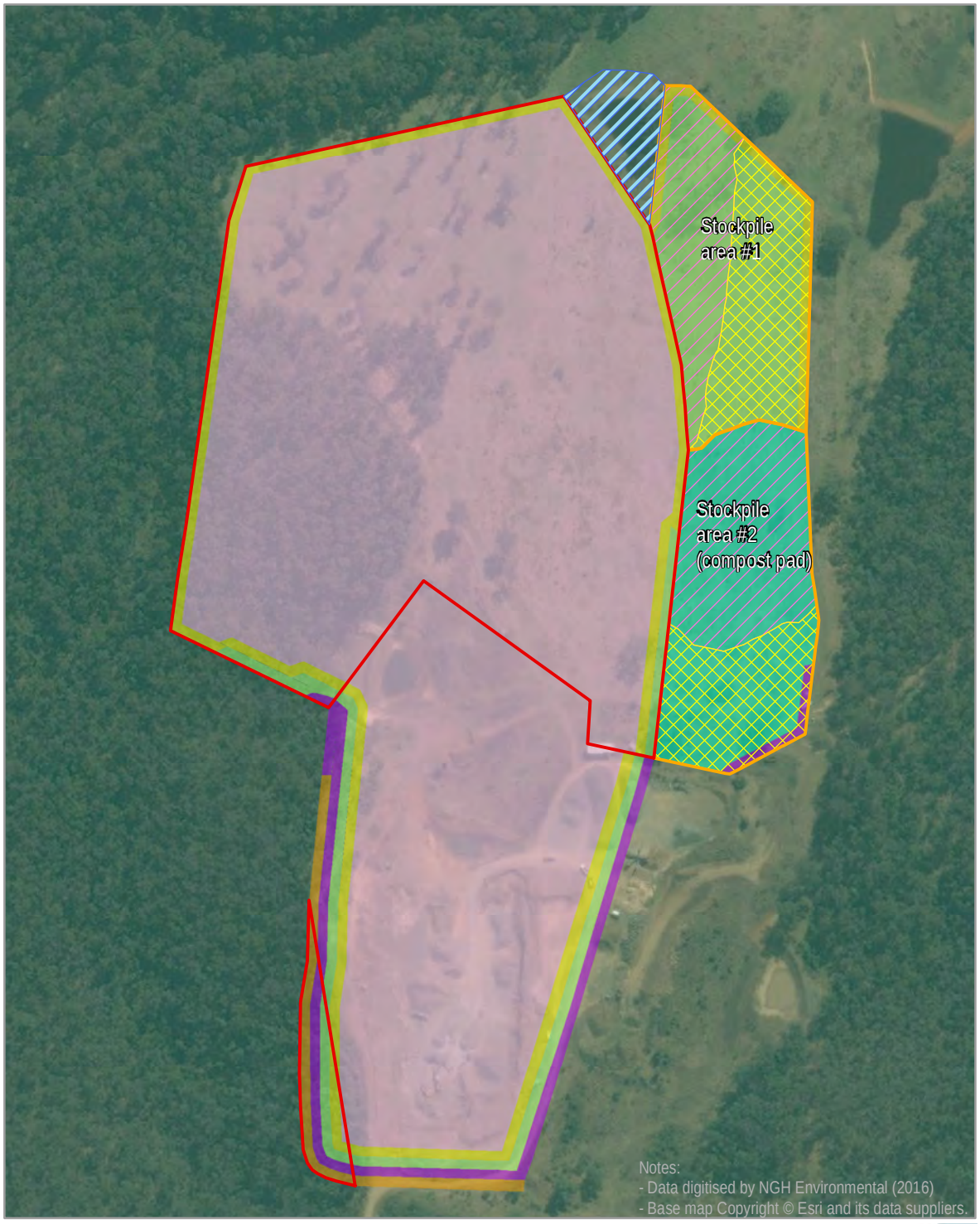
- Prior to the commencement of vegetation clearing, a physical clearing boundary at the approved clearing limit should be established to restrict impacts to that required for the works. The boundary may be demarcated using temporary fencing, flagging tape, para-webbing or similar.
- A 60 metre buffer strip between the proposed works boundary and the top bank of Swamp Creek should be established and maintained to protect water quality, streambank stability and the River Flat Eucalypt Forest EEC. Stockpiling, dumping, access tracks and stormwater control and treatment structures such as earth bunds and sediment dams should not be located within the buffer strip.
- The buffer strip should be permanently fenced at the boundary with the works site to exclude works vehicles and machinery and stock. The fencing should allow gate access for ongoing management, including revegetation, impact monitoring and weed control.
- Forest vegetation within the buffer strip should be allowed to regenerate naturally or actively restored using planting of indigenous tree, shrub and groundlayer species. Any planting undertaken should include the regionally uncommon herb *Desmodium rhytidophyllum* in drier parts of the site.
- The diversion bunds should be surfaced with topsoil and stabilised with a suitable non-invasive grass species as soon as possible. Sediment fencing should be installed between the bunds and the buffer strip until the bund walls have been stabilised with vegetation cover.
- Discharges from the sediment dams should not be released into the River-flat Eucalypt Forest EEC. Releases should be a dispersed, energy-dissipated flow through at least 20 metres of dense grassland before entering the community or the creek. The release site should be monitored for soil stability and flow concentration.
- No excavated material or cleared vegetation should be deposited in natural forest adjacent to the site. Vehicles, machinery and stockpiles should not be placed within the dripline of large trees.
- Noxious and serious environmental weeds, particularly Blackberry and Tree of Heaven, should be controlled within the riparian buffer area according to guidelines in DPI (2014). Where registered and suitable, the low toxicity surfactant formulation Roundup Biactive should be used in this area to protect riparian and aquatic ecosystems.

SOIL MANAGEMENT

- Any soil overburden that is intended for export from the site must first be tested for the presence of *Phytophthera*. Only overburden soils that have been tested and confirmed to be free of *Phytophthera* may be exported from the site. Any soils that are tested positive for *Phytophthera* must be securely stored on site and must not be removed from the site to prevent the possible export of *Phytophthora* infection.
- During the quarry establishment phase when soil that may be contaminated with *Phytophthora* is being excavated and moved, vehicles and equipment should be washed down using a suitable disinfectant (such as Phytoclean or sodium hypochlorite) before leaving the site. Minimal water volume and high pressure water delivery should be used in the cleaning operation.
- Excavated topsoil should be stored separately in low surface area to volume ratio piles for later use in rehabilitation. Soil from cleared pasture areas should be stabilized by sowing with a perennial grass cover. Soil from natural forest areas should be lightly mulched, sown with a sterile cereal cover crop and native herbaceous species allowed to regenerate from propagules in the soil.
- Stockpiles of soil, gravel or other materials should be protected from runoff and contained using sediment fencing as required to prevent sedimentation in adjacent native vegetation and habitat areas.

	REHABILITATION • The Rehabilitation Strategy provided at Appendix G of the EIS should be used to guide the preparation of a detailed Rehabilitation Plan. The strategy requires that the pre-development habitat values be reinstated or improved at the site in the long term.
Information/References	• Environmental Impact Statement, Eurobodalla Quarry expansion and resource recovery activities (NGH Environmental, 2016).

COUNCIL ASSESSMENT REPORT ATTACHMENT 4 - Replacement quarry plan



Bench height (RL)

- 10m
- 20m
- 35m
- 40m
- 50m
- 65m

Proposal

- Extraction areas
- Sediment basin
- Stockpile sites
- Cut
- Fill

0 25 50 100 Metres

Ref: 6122 141117
Author: JB

www.nghenvironmental.com.au

COUNCIL ASSESSMENT REPORT ATTACHMENT 5 - Existing Deed of Agreement (Road Maintenance)

Deed of Amendment

between

Eurobodalla Shire Council (the Council)

and

Troy and Shellee Hollis (Hollis)

Dated: 24th day of January 2014

Table of Contents

1. Details of Parties

This Deed is made the 24th day of January 2014

between

(Name)	**Eurobodalla Shire Council**
(Short form name)	the Council
(Notice details)	of Campbell Street, Moruya in New South Wales, 2537

and

(Name)	**Troy and Shellee Hollis**
(Short form name)	Hollis
(Notice details)	of Elizabeth Farm, Comerang Road, Bodalla in New South Wales, 2545

2. Background

2.1. The Council and Maureen Hollis entered into a Deed of Agreement dated 10 April 2003 (**the Principal Agreement**) a copy of which is set out in Annexure A.

2.2. The operation of the Hard Rock Quarry (**the first development**) which is described in the Principal Agreement has been taken over by Hollis. In connection with their operation of the first development, Hollis is bound by the terms set out in the Principal Agreement.

2.3. The Council has granted consent to Hollis for designated development 451/07 (**the second development**) for a concrete works and batching plant on the land described in that development application.

2.4. Condition 4 of the Council's consent to the second development requires amendment of the Principal Agreement as set out in this Deed of Amendment.

3. Defined Terms and Interpretation

Except as otherwise provided, the terms defined in the Principal Agreement have the same meaning, construction and interpretation when used in this Deed of Amendment.

4. Operation of Amendments

4.1 This Deed of Amendment shall have effect from and including the date hereof, and is supplementary to and shall be read in conjunction with the Principal Agreement.

4.2 The parties agree that the monetary rate per tonne stated in the amendment at Clause 5 below was the amount applicable at the date of consent for the second development (16 April 2007) and the amount will be indexed for the time elapsed since that date when the Council next revises its fees and charges.

5. Amendment to Clause 3

The Principal Agreement shall be amended by adding the following clause after sub-clause 3.1(a)(iii):

"(iv) Pre-mixed concrete $0.45 per tonne"

6. Legal Costs and Disbursements

Each party will pay its own legal costs in the preparation and completion of this Deed of Amendment and all stamp duty payable on this Deed.

7. Confirmation of the Principal Agreement

Subject only to the amendments set out in this Deed, the parties hereto confirm the terms and conditions of the Principal Agreement in all other respects.

Executed by the parties unconditionally as a Deed.

Signed by Troy Hollis in the presence of Shellee Hollis

Name of witness (print)

Troy Hollis (signature)

Witness (signature)

Signed by Shellee Hollis in the presence of Troy Hollis

Name of witness (print)

Shellee Hollis (signature)

Witness (signature)

Executed on behalf of Eurobodalla Shire Council by its General Manager,

Dr Catherine Dale, in the presence of KAREN SYDENHAM

Name of witness (print)

Dr Catherine Dale (signature)

Witness (signature)

for ACTING GENERAL MANAGER

Annexure A

The Principal Agreement

Deed of Agreement

Details

Date

10 April 2003

Parties

Name	**Eurobodalla Shire Council**
Short form name	the Council
Notice details	of Campbell Street, Moruya in New South Wales, 2537

Name	**Maureen Hollis**
Short form name	Hollis
Notice details	of 3 Hay Avenue, Shoalhaven Heads in New South Wales, 2535

Background

A. The Council has granted deferred commencement consent to Hollis for designated development application No. 848/02 ('the Development Consent') for a Hard Rock Quarry ('the Development') on the land described in the development application.

B. The Development Consent is the subject of a Class 1 application in the New South Wales Land and Environment Court No. 10775 of 2002 ('the Proceedings').

C. The Council has agreed to amend condition 1 of its proposed Conditions of Consent for the Development Consent on the terms set out in this Deed.

Agreed terms

1. Defined terms & interpretation

1.1 Defined terms

In this document:

Agreed Sum means the sum of $17,000

Contribution means the contribution per tonne of material extracted over the life of the Development as specified in clause 3.1

Court means the Land and Environment Court of New South Wales

Land means those parts of lot 31 DP 854280 and 106 DP 752156 Nerrigundah Mountain Road, Bodalla described in the development application as the land on which the development will be carried out

1.2 Interpretation

In this Deed, unless otherwise indicated by the context:

(a) words importing the singular include the plural and vice versa;

(b) headings are for convenience only and do not affect interpretation of this Deed;

(c) reference to a clause, paragraph or schedule is a reference to a clause, paragraph or schedule of this Deed;

(d) where any word or phrase is given a definite meaning by this Deed, any part of speech or grammatical form of that word or phrase has a corresponding meaning;

(e) an expression importing a natural person includes a body corporate, partnership, joint venture or association;

(f) reference to a statute or regulation includes all amendments, consolidations or replacements thereof;

(g) a reference to a party to a document includes that party's successors and permitted assigns;

(h) no rule of construction applies to the disadvantage of a party because that party was responsible for the preparation of this deed;

(i) a reference to a body, whether statutory or not:

  (i) which ceases to exist; or

  (ii) whose powers or functions are transferred to another body is a reference to the body which replaces it or which substantially succeeds to its powers or functions;

(j) a reference to Hollis shall include her executors, administrators and assigns;

(k) a reference to the Council shall include its successors and assigns.

2. Agreement to pay the Agreed Sum

2.1 Payment of the Agreed Sum

Hollis agrees to pay to the Council the Agreed Sum within 14 days from the grant of development consent by the Court.

2.2 Refund by the Council

If the development consent lapses, the Council will refund any unexpended portion of the Agreed Sum within 14 days of the Council receiving a request by or on behalf of Hollis for a refund.

3. Agreement to Pay Contribution

3.1 Payment of Contribution

Hollis agrees to:

(a) pay to the Council a contribution per tonne at the following rates:

(i)	Non-specified road base	$0.20 per tonne;
(ii)	Specified road base	$0.35 per tonne; and
(iii)	Aggregates	$0.35 per tonne

for material extracted over the life of the Development ('the Contribution').

(b) lodge a return with the Council detailing the volume of all material extracted, including specifying the volume for each of Non-Specified road base, Specified road base and Aggregates, ('the Return') within 14 days of the end of each quarter.

(c) pay the Contribution quarterly within 14 days of lodging the Return to Council.

(d) upon request, to answer questions and to provide information to the Council about material extracted from the Development.

(e) allow the Council to undertake inspection of all records it holds in relation to the volume of material extracted from the Development, including records relating to each of Non-Specified road base, Specified road base and Aggregates on 3 days written notice by the Council to Hollis.

3.2 Commencement of Returns

The obligation to lodge returns and to pay Contributions under clause 3.1 shall commence at the end of the first quarter in which extraction commences from the Development.

4. Contribution review

The Contribution must be reviewed on the first day of July of each year that the Development continues. The Council may increase (measured as a percentage) the Contribution in accordance with the increase (measured as a percentage) of the national CPI in the previous 12 months.

5. Council's obligations

In consideration of the Agreed Sum and the Contribution paid to the Council by Hollis, the Council will amend Condition 1 of the Council's without prejudice Conditions of Consent in the Proceedings to provide:

'1. The applicant must satisfy the council that the following upgrades have been completed:

(a) The removal/relocation of the existing power pole on the south-western corner of the Eurobodalla Road and Princes highway;

(b) The placement of Give Way signs at Tyrone Bridge;

(c) The removal of a large eucalypt tree on the Eurobodalla Road, below Sutcliffe Street;

(d) The trimming of vegetation to improve sight distance at the intersection of Eurobodalla Road and Nerrigundah Mountain Road;

(e) The junction of Nerrigundah Mountain Road with Eurobodalla Road is provided with suitable warning signage to address the deficient sight distance;

(f) The pavement on the north-eastern corner of the Eurobodalla and Nerrigundah Mountain Road intersection be widened to allow a truck turning left toward Bodalla to clear a truck waiting on Nerrigundah Road to cross Tyrone Bridge;

(g) The rectification of the vertical alignment of the Tyrone Bridge prior to commercial quarrying activities commencing on the site; and

(h) The removal of some parts of the embankment within the road reserve of Eurobodalla Road north of the intersection with Nerrigundah Mountain Road to improve sight distances to the reasonable satisfaction of the Council's Technical Services and Property Manager.

6. Use of the Agreed Sum and Contribution

(a) The Agreed Sum and the Contribution will be used by Council to undertake the works specified in condition 1 of the consent as outlined in clause 5 above.

(b) The Contribution will be used by Council to address the impact of the Development on those sections of Eurobodalla and Nerrigundah Mountain Roads used as part of the haul route.

7. Rights and obligations of each Party

7.1 Operation of Rights and Obligations

The rights and obligations of Hollis and the Council under this deed will only arise if the Court grants consent to the development application ('Development Consent').

7.2 Credit allocation

If the Development Consent granted by the Court contains conditions requiring Hollis to carry out road works and maintenance in excess of the works required by condition 1 of the development consent set out in clause 5 of this deed, the cost of those works will be treated as a credit against the contributions which would otherwise be payable by Hollis under clause 3.1 of this deed.

8. Agreement to register public positive covenant

The parties agree that the obligations imposed on Hollis, her successors and assigns by this deed shall be incorporated into a public positive covenant to be registered on the title to the land pursuant to section 88E of the *Conveyancing Act 1919* (NSW).

9. Legal Costs and Disbursements

Each party will pay its own legal costs in the preparation and completion of this deed and all stamp duty payable on this deed.

10. Governing Law and Jurisdiction

This deed is governed by the laws of New South Wales and each party irrevocably submits to the non-exclusive jurisdiction of the Courts of New South Wales.

11. Assignment

11.1 Assignment requires Council's consent

Hollis may assign her rights and obligations this Deed but only with the prior written consent of the Council. The Council must not unreasonably withold its consent.

11.2 Need to obtain further like Deed

Subject always to Clause 11.1, if Hollis:

(a) sells the Land; or

(b) grants to another person the right to carry out the Development

then, as a term of any such sale or the grant of any such right, she must require the purchaser or grantee (as the case may be) to enter into another Deed with the Council in like terms to this Deed.

12. Further Assurance

Each party will from time to time do all things (including executing all documents) necessary or desirable to give full effect to this deed.

13. Goods and Services Tax

Amounts expressed to be payable under this Deed do not include Goods and Services Tax within the meaning of the A New Tax System (Goods and Services Tax) Act 1999.

Signing page

EXECUTED as a Deed on the date set out on the commencement of this Deed.

Signed sealed and **delivered** by **Maureen Hollis** in the presence of

Signature of witness ← Maureen Hollis ←

ANITA O'HART
Name of witness (print)

Executed on behalf of Eurobodalla Shire Council by James Levy (as General Manager) in the presence of)

Signature of ~~Councillor~~ Witness

James Levy

General Manager

Name of ~~Councillor~~ Witness (print)

Signing page

EXECUTED as a Deed on the date set out on the commencement of this Deed.

Signed sealed and **delivered** by **Maureen Hollis** in the presence of

Signature of witness

Maureen Hollis

Name of witness (print)

Executed on behalf of **Eurobodalla Shire Council** by its General Manager, James Levy, in the presence of:

Signature of Witness

James Levy

General Manager

Andrew Partinson

Name of Witness (print)

COUNCIL ASSESSMENT REPORT ATTACHMENT 6 - Water Quality Management Strategy

Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations.

November 2017 – Revision C

southeast
engineering+environmental

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Document Verification

Document title: Water Quality Management Strategy for proposed Eurobodalla Quarry Expansion and Resource Recovery Operations

Project number: 361

Prepared by: Lachlan Bain and Brogan Addison

Issue and date: C 14/11/2017

Issue to: Alana Gordijn and Brooke Marshal

Document history: Issue C 14/11/2017, Issue B 08/05/2017, Issue A – 05/04/2017

Table of Contents

1.0 INTRODUCTION

Southeast Engineering and Environmental have been engaged to review and enhance the Water Quality Management Strategy for the proposed Eurobodalla Quarry Expansion and Resource Recovery Activities.

The purpose of this document is to add to the information provided in the Environmental Impact Statement (EIS) prepared by NGH Environmental in the following ways:

- Outline the relevant water quality objectives applicable for the development proposal and receiving waters
- Provide additional information and assessment regarding the potential water quality risks associated with the development proposal
- Develop appropriate water management measures for the development proposal in accordance with relevant environmental guidelines
- Provide an assessment of the potential water quality impacts of the development proposal in the context of the recommended water management measures and the water quality objectives for the site and receiving waters

1.1. The Proposal

A detailed description of the proposed Eurobodalla Quarry expansion can be found in Section 3 of the EIS prepared by NGH Environmental.

1.2. Feedback from Council and Agencies

The EIS was submitted to Eurobodalla Shire Council (the determining authority) in early January 2017, which was then forwarded to various state departments for comment including NSW EPA and DPI Fisheries, the feedback around site water management and water quality impacts was that the EIS did not sufficiently demonstrate how water quality impacts would be managed for the Proposal. There were specific concerns about the proposed water quality measures including the capacity of the proposed sediment basins and compost leachate pond. There was also request for demonstration as to how stormwater will be managed on site to ensure that discharges from the Proposal will meet the NSW Water Quality Objectives (WQOs). This management plan addresses these items.

1.3. Policy context and legislative framework

A brief summary of the strategic policy and guidelines that have been considered as part of the development for the Water Quality Management Strategy is provided below.

Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000)

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000), (referred to as the ANZECC water quality guidelines) form part of the National Water Quality Management Strategy and list a range of environmental values for water bodies.

Different water quality criteria are set for the water bodies based on environmental values assigned to that water body. These values include consideration as to whether the water is to be used for drinking, recreation or according to ecological values. The ANZECC water quality guidelines provide water quality criteria (scientifically-based benchmarks) for a wide range of parameters with the aim to maintain these values. The ANZECC guidelines state that "The Guidelines should not be used as mandatory standards because there is significant uncertainty associated with the derivation and application of water quality guidelines" (ANZECC, 2000, Chapter 1 Introduction). However the guidelines provide a useful measure of risks to aquatic ecosystem health.

The EPA submission to the preparation of the EIS requests that the basin size and discharge criteria; '*must be developed in consideration of the NSW WQO and ANZECC Guideline*'.

The guidelines have been used to undertake the sizing of water quality measures at the site, including basin sizing, through the use of water quality modelling. The water quality model includes the receiving waters' catchments along with the development site to assess how the in-situ water quality of the receiving waters may change, and compare with the ambient water quality guidelines. The ambient water quality concentration targets do not directly apply to discharge concentrations at the site.

There are guidelines specifically derived for the management of stormwater runoff for specific activities including the *Environmental Guidelines Solid Waste Landfills – second edition 2016 NSW EPA,* and *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills (NSW DECC, 2008),* as discussed below.

ANZECC guidelines are ambient water quality guidelines, appropriate for the monitoring of baseflows or water bodies and have been used in assessments such as the Eurobodalla Shire Council's Estuary Health Monitoring program (BMT WBM, 2011) as an indicator of existing water quality.

NSW Water Quality Objectives

The NSW Water Quality Objectives (WQOs) are consistent with the agreed national framework and are primarily aimed at maintaining and improving water quality, thereby supporting aquatic ecosystems, recreation and where applicable water supply and the production of aquatic foods suitable for consumption and aquaculture activities (DECCW, 2006).

NSW WQOs have been developed for most river catchments in the state. The receiving waters for the quarry, Swamp Creek, is a tributary of Tuross Lake, defined by the EPA as a sensitive environment, which in turn is part of the Batemans Marine Park which is also defined by the EPA as a high conservation value ecosystem. Based on the ultimate receiving waters the WQOs of relevance for potential pollutants from the Proposal are listed in Table 1.1.

In addition to these WQO trigger levels, exceedance levels assist in determining aquatic heath. Through Eurobodalla Shire Council's Estuary Health Monitoring program (BMT WBM, 2011), Council and the Office for Environment and Heritage (OEH) developed water quality condition descriptors based on the level of exceedance of trigger values. These have been adopted in this case to assist in assessing potential water quality impacts (Table 1.2).

Table 1.1 Default Water Quality Objectives for Swamp Creek

Parameter	**Measure**
Total phosphorus	25 µg/L
Total nitrogen	350 µg/L
Turbidity	6–50 NTU, although for a coastal river likely to be towards the lower end
pH	6.5–8.5

Table 1.2 Exceedance for Tuross estuary for Water Quality parameters

Percentage exceedance of trigger values	**Water quality condition rating**
0-15%	Very Good
15-30%	Good
30-50%	Fair
50-75%	Poor
75-100%	Very poor

Other Guidelines

NSW State Government agencies have developed a range of water quality management guidelines available that provide design parameters for developments such as these to provide protection for sensitive receiving waters.

Table 1.3 contains a range of recommended design events assumed for the design of water quality management measures based on relevant environmental guidelines assuming a lifespan of greater than three years and receiving environment of high conservation value.

In addition to the design criteria outlined, the water quality modelling software Model for Urban Stormwater Improvement Conceptualisation (MUSIC) has been used to provide a hypothetical (un-calibrated) comparison of the water quality in receiving waters upstream and downstream of the quarry. This provides an indication of the water quality impacts from the site through a comparison with the WQOs adopted for the receiving waters and guidance for discharge controls for the sediment basins.

Table 1.3 Minimum design criteria for water management measures for sensitive (high conservation) receiving waters.

Water management system	**Event**
Temporary drainage controls [1,2]	20y / 5% AEP
Temporary sediment controls [1,2]	20y / 5% AEP
Type F or D sediment basin [1,2]	5 day 95th %ile rainfall
Sediment basin spillway structure [1,2]	100y / 1% AEP
Leachate pond volume [3]	10y 24h duration storm

[1] Managing Urban Stormwater - Soils and Construction Volume 2E, Mines and Quarries (DECC, 2008)

[2] Managing Urban Stormwater - Soils and Construction Volume 2B, Waste Landfills (DECC, 2008)

[3] Environmental Guidelines for composting and related organics processing facilities (DECC, 2003)

2.0 SURFACE WATER MANAGEMENT

2.1. Topography and Soils

Refer to section 6 of the EIS document for descriptions of site soils and geology.

2.2. Hydrology

The existing quarry and the Proposal will discharge surface runoff via controlled sediment basins and other water quality management systems indirectly to Swamp Creek. The discharge points are located at their closest approximately 60m from the creek bank.

Upstream of the quarry, the catchment of Swamp Creek consists almost entirely of a forested catchment of about 3400ha that is managed by NSW State Forests and undergoes logging operations periodically. The landscape over this catchment is generally too steep and of poor soil type to support agricultural activities.

Downstream of the quarry, the catchment land use of Swamp Creek becomes more diverse including grazing and cropping over the alluvial areas before connection with the Tuross River approximately 4 kilometers downstream (Figure 2.1).

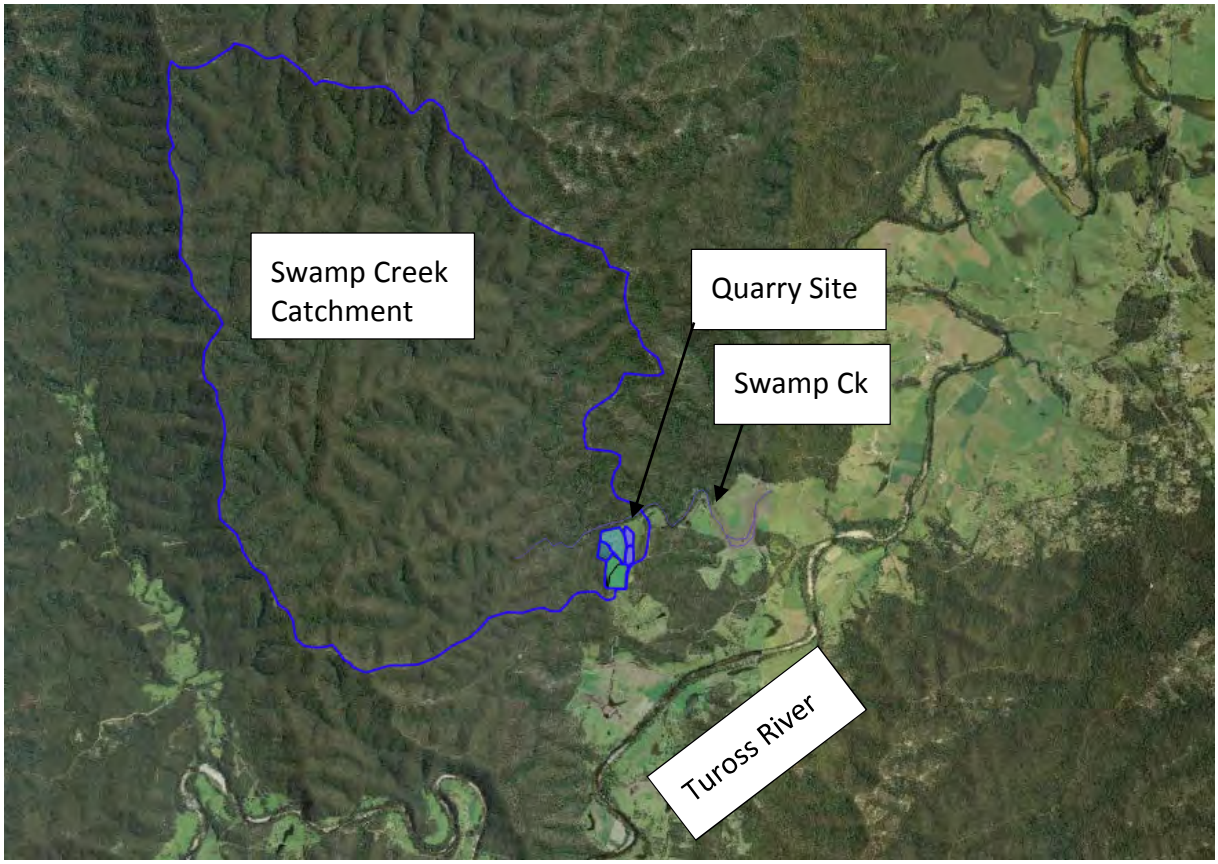


Figure 2.1 Catchment locality

2.3. Watercourse buffers and water quality

It is noted that DPI Fisheries recommended in their submission that a 100 metre buffer be provided between the quarry and the top bank of Swamp Creek. The proponent has determined that the maximum achievable buffer from the quarry boundary to Swamp Creek is 60 metres. The retention of this landscape between the quarry operations and Swamp Creek provides for flora and fauna habitat, a fauna corridor as well as informal water quality treatment that would occur between the site and Swamp Creek. Informal water quality treatment within the buffer would generally be of the form of sedimentation through slowing of flows through vegetation, and other biological and physical processes that would occur in the small flow paths between the site discharge and Swamp Creek.

Water quality modelling used in this assessment excludes the treatment processes outlined above to present a conservative approach to water quality management system sizing. Although buffers can perform useful water quality improvement functions, caution is recommended in relying on these for treatment as they are uncontrolled, and more suited to management of diffuse pollutant sources, such as grazing and cropping.

2.4. Potential Water Quality Impacts and Management Measures

The EIS has considered the broad risks to water quality and receiving waters associated with the Proposal. Comments from stakeholders such as Council, NSW EPA and NSW Fisheries reinforce this view. In order to manage this risk, operational aspects and consequences of the proposal in the context of water quality need to be considered. Key water quality risks for both the quarry operations and resource recovery operations are outlined below along with proposed mitigation measures.

2.4.1. Quarry Operations

Table 2.1 Water quality risks associated with proposed quarry

Activity	Pollutants generated	Potential receiving ecosystem impacts	Mitigation
Removal of vegetation and topsoil, stripping and removal of overburden to access new areas	Suspended solids and attached phosphorous export	Smothering of organisms, limiting light penetration in water column, nutrient contribution may increase algal concentrations. Potential to lower pH	Erosion and sediment controls, including appropriately sized sediment basins. Testing and treatment of stored water prior to discharge, selecting appropriate discharge points. Protection and maintenance of a vegetated riparian buffer zone of at least 60 metres width between the quarry site and top bank of Swamp Creek. Water quality monitoring and reporting.
Day to day quarry operations - removing and processing weathered basalt and clay materials	Suspended solids, attached phosphorous and other minerals, potential pH changes	Smothering of organisms, limiting light penetration in water column, nutrient contribution may increase algae concentrations. Potential to lower pH	Erosion and sediment controls, including appropriately sized sediment basins. Water quality monitoring and reporting.

2.4.2. Resource Recovery Operations

The site will not be operated as a landfill, that is, no waste material will be buried on site. Material will either be accepted onto the site as approved material and be processed to then be sold and removed from the site, or material will be refused and will be removed from the site. The composting site will generate leachate from water percolating through, or interacting with the windrows, and other composting material stockpiles. Depending on the compost material characteristics the leachate will contain nutrients, soluble chemicals and dissolved organic matter. Available research on the typical characteristics of compost leachate suggest that nitrates and ammonia, along with COD and BOD would be the primary water quality management issues.

Table 2.2 Water quality risks associated with resource recovery operation

Activity	**Pollutants generated**	**Potential receiving water impacts**	**Mitigation**
Construction of stockpiling and compost processing area	Suspended solids and attached phosphorous export	Smothering of organisms, limiting light penetration in water column	Erosion and sediment controls, including appropriately sized sediment basins
Stockpiling and processing of general solid waste accepted onto the site. (concrete waste, asphalt waste, brick waste, clean fill)	Low to moderate risk of suspended solids depending on stockpiled material.	Smothering of organisms, limiting light penetration in water column	Site runoff management and sediment basins
Compost stockpiling and processing of category 1 compostable materials	Leachate from compost processing windrows and stockpiles including turbidity, nutrients (particularly nitrogen) and dissolved organic matter	Addition of nutrients and organic matter, potential to reduce dissolved oxygen levels and potential to increase algae concentrations	Runoff and water management to limit interaction with compost stockpiles and windrows Collection of leachate in leachate management pond sized according to guidelines (Storage of the storm volume from 10 year 24hour event). Stockpile area and leachate pond to have a leachate barrier system with a minimum permeability of 1x10-9 meters per second. Leachate treatment and water reuse on site

3.0 WATER QUALITY IMPACT ASSESSMENT

3.1. Objective

As per the NSW DPI Fisheries response letter (Ref C17/36) the proposed water quality measures should support a Neutral or Beneficial Effect (NorBE) principal for the discharge of water from the development.

It is also important to understand concentrations within receiving waters both upstream and downstream of the quarry site in relation to ANZECC guideline trigger values to estimate the potential impact of the Proposal.

3.2. Methodology

The conceptual water quality modelling software Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.2 has been used to quantify pollutant loads for both the pre-development scenario (existing quarry and rural land) and the proposed development scenario (proposed quarry expansions and associated works). Modelling pre and post development allows a comparison to be made with regards to NorBE.

The model also includes a single node representing the existing upstream forested catchment that drains to Swamp Creek that is used to determine likely background concentrations both upstream and downstream of the quarry site.

The pre-development model includes the existing quarry and sediment basin and also the current land uses covering the proposed expansion areas (currently a combination of forested and agricultural land use). Refer Figure 3.1.

The post-development model represents the proposed quarry expansion assuming the fully approved site is completely open and includes the water quality management approaches (the final two sediment basins and leachate pond) designed as outlined in Section 4.6. Refer Figure 3.2.

Water reuse assumptions from the leachate pond of approximately 5.8ML/y has been assumed for the composting area as per Section 4.4. Water reuse for the main sediment basins have conservatively been assumed at 5.0ML/y (i.e. truck wash down and dust suppression)

The model runs at a 6-minute time step including rainfall over a period from 1999 to 2010 using rainfall data from the Bureau of Meteorology station at Moruya Airport. Model input assumptions, including pollutant generation rates and output is contained in Appendix A.

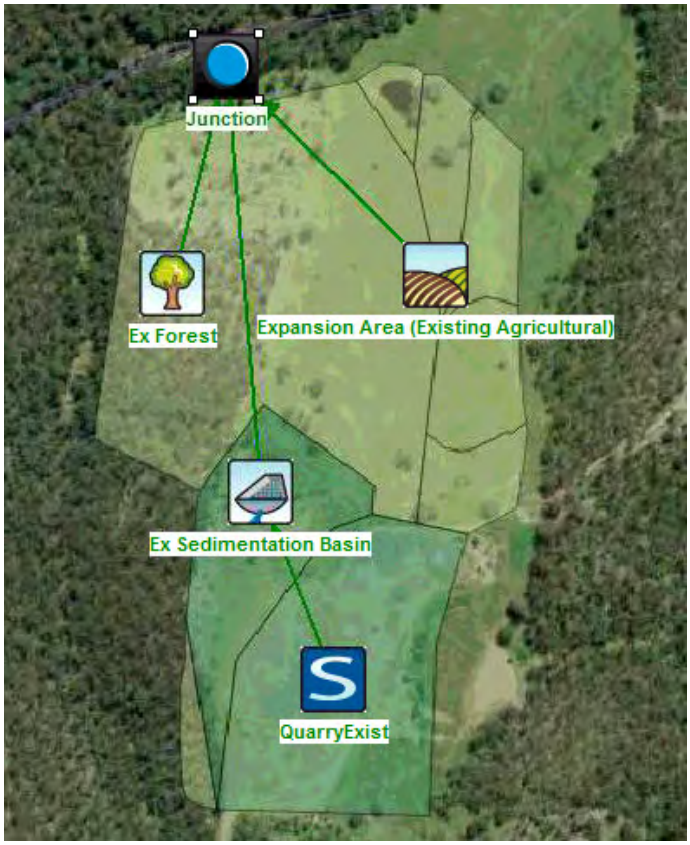


Figure 3.1 Pre-Development MUSIC configuration

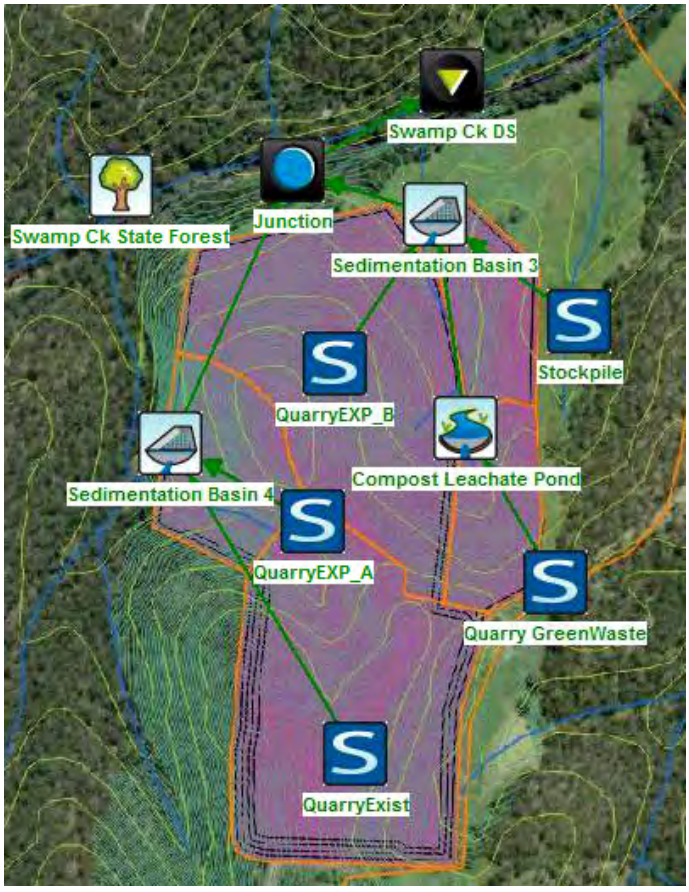


Figure 3.2 Post-Development MUSIC configuration

□5

3.3. MUSIC Output – Pollutant Loads

Using the above design parameters, the resultant mean annual loads for TSS, TP and TN were generated by MUSIC for the pre and post-development models as outlined in Table 3.1and Table 3.2.

Comparing the annual loads of the pre-development model with the subsequent annual loads of the post-development model demonstrates that the proposed water quality measures are able to meet the NorBE principal (refer Table 3.3).

Table 3.1 Pollutant load generated and removed – Existing

Existing Quarry + Pre-dev Expansion Area (i.e. Agricultural and Forest)			
	Sources	Residual Load	% reduction
Total Suspended Solids (kg/yr)	41700	9880	76.3
Total Phosphorus (kg/yr)	26.7	14.4	46
Total Nitrogen (kg/yr)	140	118	15.6

Table 3.2 Pollutant load generated and removed – Proposed

Existing Quarry + Post-dev Expansion Area (with proposed treatments)			
	Sources	Residual Load	% reduction
Total Suspended Solids (kg/yr)	98700	4570	95.4
Total Phosphorus (kg/yr)	50.8	10.8	78.6
Total Nitrogen (kg/yr)	223	113	49.3

Table 3.3 Comparison of existing and proposed pollutant loads to a determine NorBE

Pre and Post Changes		
	Residual Load Comparison	NorBE
Total Suspended Solids (kg/yr)	-5310	beneficial
Total Phosphorus (kg/yr)	-3.6	beneficial
Total Nitrogen (kg/yr)	-5	beneficial

3.4. MUSIC Output – Pollutant Concentrations

The MUSIC is also able to provide water quality reporting at each model time step, including periods without rainfall. Figure 3.3, Figure 3.4 and Figure 3.5 show the modelled pollutant concentrations within Swamp Creek upstream and downstream of the quarry discharge point for the period 1999 – 2010 as cumulative frequencies. The 15% exceedance line is shown on the figures representing the proportion of water quality samples which may exceed a trigger with the condition of the waterway still considered as 'very good' based on the Eurobodalla Shire Council and OEH classification (BMT WBM, 2011).

It is not possible to provide reporting against the NTU trigger value as a relationship between TSS and NTU has not been developed for the catchment or the site. For TP and TN modelling results are presented against the trigger values and a % exceedance of the trigger values of 15%.

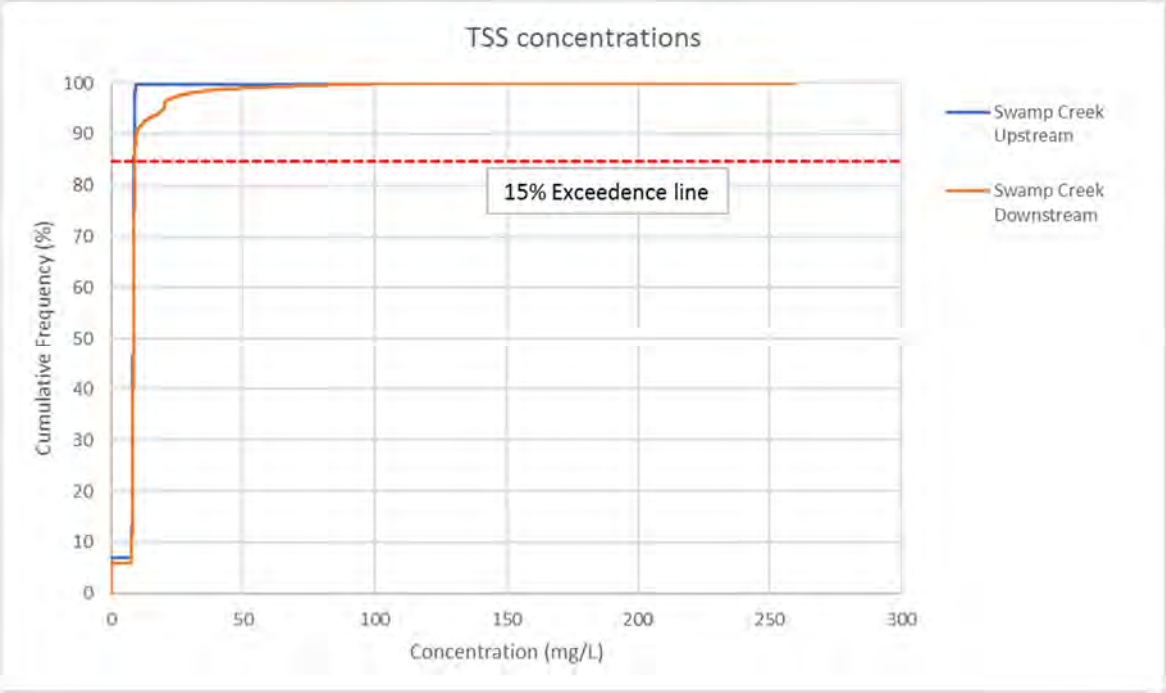


Figure 3.3 Modelled TSS concentrations upstream and downstream of quarry 1999-2010

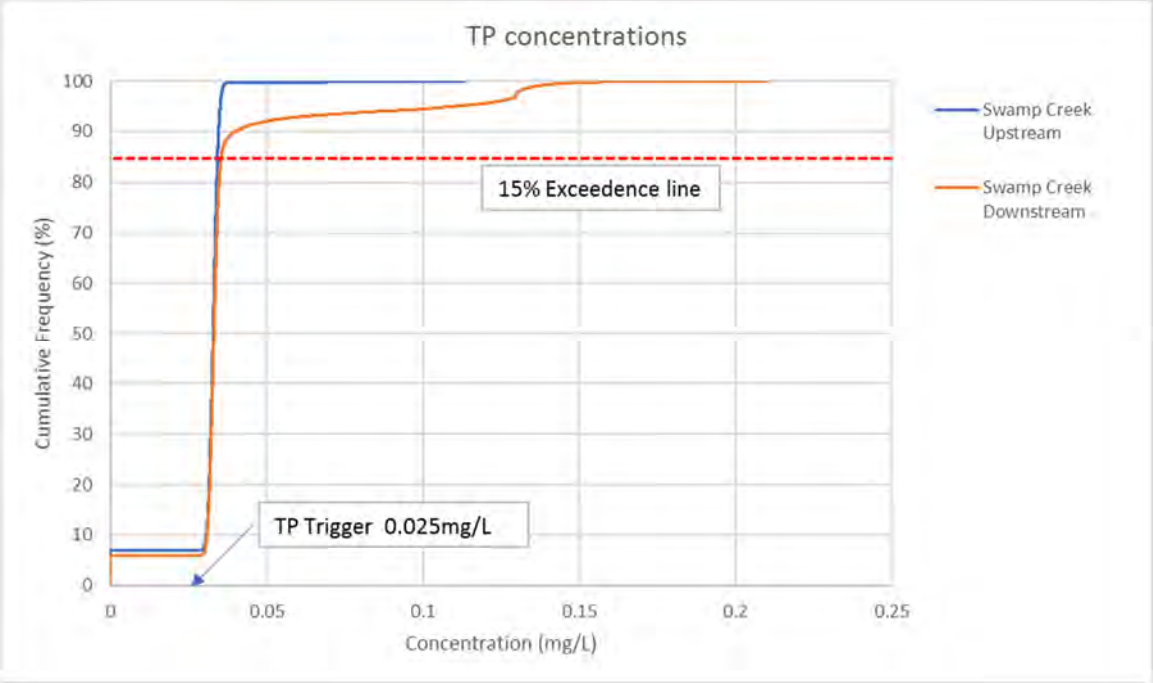


Figure 3.4 Modelled TP concentrations upstream and downstream of quarry 1999-2010

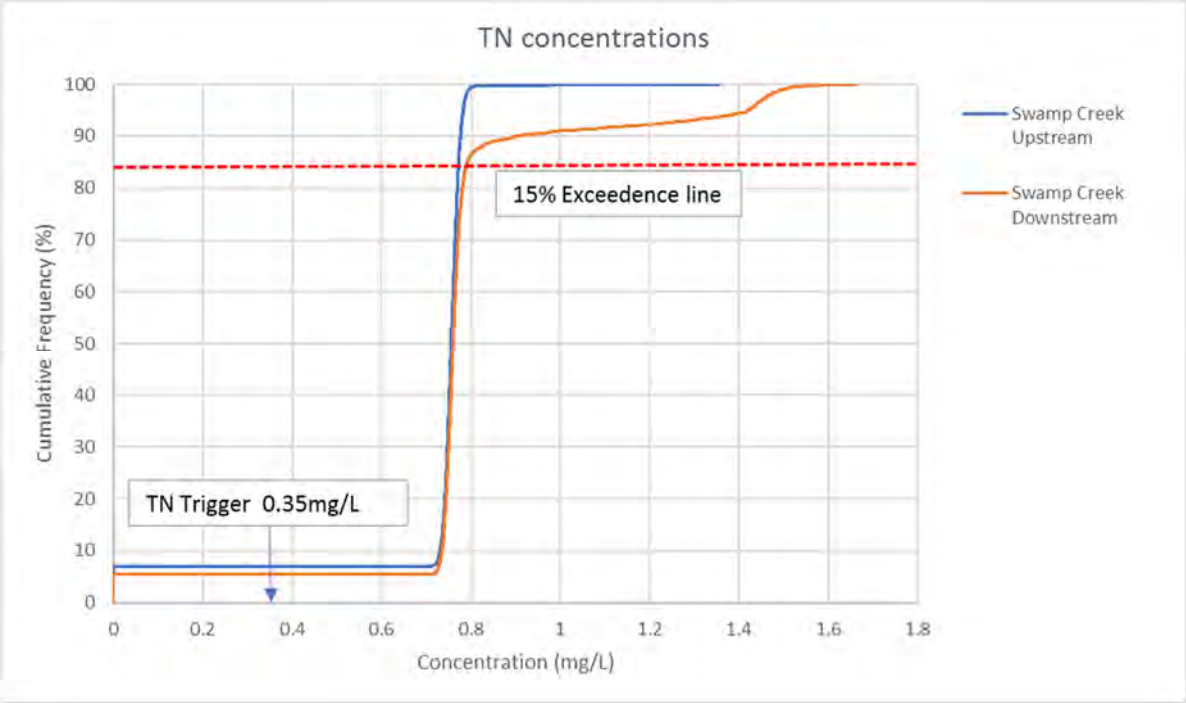


Figure 3.5 Modelled TN concentrations upstream and downstream of quarry 1999-2010

For all three pollutants, concentrations upstream and downstream begin to vary at around the 15% exceedance point, or in other words, 85% of the time pollutant concentrations upstream and downstream of the quarry are approximately the same. If upstream pollutant concentrations were considered the benchmark, using the ESC and OEH ranking outlined in section 1, the downstream water quality would be considered 'very good' based on these model results.

The proposed water quality management measures, designed based on relevant guidelines for this type of operation discharging to sensitive and high conservation value receiving waters, are shown to be very effective. Pollutant load removals assume only the modelled processes, and excluding small scale erosion and sediment controls such as sediment fences and armoured drainage as well as the effects of the buffer between the site and receiving waters.

As mentioned, the model presents a worst case scenario by assuming the quarry at full operational capacity and ignores many water quality management measures such as:

- Collection and retention of runoff within the quarry pit
- Sediment and erosion controls other than sediment basins
- Full reuse of all leachate and potentially negligible overflow volumes
- Timing of sediment basin discharge during dry events
- Discharge of sediment basins onto grassed areas (buffer) providing further treatment

4.0 WATER MANAGEMENT – DETAILED MEASURES

4.1. Quarry operations and expansion sequencing

A large part of the existing quarry operation drains to the existing sediment basins to the north of the quarry pit. The proposal includes significant expansion to the north. A ridge bisects the expansion area splitting the expansion into two distinct drainage zones, one to the west, which currently drains the existing quarry operations, and one to the north, which will only become significant once excavation extends beyond the ridge.

As the expansion proceeds, the existing basins to the north of the current operational area will continue to be used. These basins should be upgraded to accommodate the volume required for the expanded works area around the existing quarry zone (Basin 1).

Prior to the excavation footprint extending beyond the existing basins construction of the lower basin should commence (Basin 4).

As the quarry operations extend further north beyond the ridge, opening up towards the northern-most catchment and/or the construction of the waste recovery area and stockpile area commences then the northernmost basin (Basin 3) will need to be constructed.

4.2. Clearing

All proposed erosion and sediment control measures will be implemented in advance of clearing and stripping operations, including the installation of sediment fencing downslope of any areas that do not drain toward water treatment areas. Sediment fencing will be installed in accordance with Managing Urban Stormwater: Soils and Construction; sediment fence SD 6-8 (Landcom, 2004).

Prior to clearing, the limits of disturbance will be marked by pegs placed at intervals on each side of the disturbed area. All operations will be planned to ensure that there is no damage to any trees outside the area being cleared. Land disturbance will be minimised by clearing the smallest practical area of land ahead of proposed excavation, or as required to install sediment basins. It is recommended that clearing of vegetation and stripping of topsoil only extend over areas that will be quarried in the near future – 3 to 4 months.

4.3. Topsoil stripping

Topsoil stripping within the proposed expansion area will, as far as practicable, be undertaken when the soil is in a slightly moist condition thus reducing damage to soil structure. The soil materials will not be stripped in wet conditions. If feasible, topsoil will be spread over quarry areas that are no longer in operation as part of quarry rehabilitation.

If longer-term stockpiling (i.e. greater than three months) is required, a maximum stockpile height of two metres and a batter slope of 2:1 will be maintained to preserve biological viability and reduce soil deterioration. Stockpiles will be placed in areas so as to avoid impediment of natural localised drainage lines and minimise the likelihood of water ponding against the stockpile. Stockpiles will be managed in accordance with vol. 1: stockpiles SD 4-1, including temporary erosion and sediment control measures such as earth banks and sediment fences.

4.4. Quarry Drainage

Parts of the quarry will contain runoff within the quarry works area, depending on excavation operations, other parts will drain directly to sediment basins. As much as possible, drainage within the quarry works area should be configured to limit the erosion of soils and other materials within the works area. This will require the following:

- Clear delineation of haul roads;
- Provide drainage for haul roads as required, particularly around the outer edge of the quarry works area and ensure that erosion and sediment controls such as sediment fencing, armoured drainage and outlets are installed;
- Diversion of runoff away from stockpiles, particularly stockpile of finer materials;
- For concentrated flow paths use appropriate erosion and sediment controls to limit erosion where possible refer to section 5.4.3 of Managing Urban Stormwater: Soils and Construction; sediment fence SD 6-8 (Landcom, 2004) and drawings SD 5.4, SD 5.5, SD 5.6 and SD 5.7.
- Use sediment controls such as sediment fences, filter systems and armouring where feasible within the quarry works area to prevent erosion and collect sediment; and
- Limit cut floor grades to as low as possible to limit erosion and allow for sediment collection
- Pump collected runoff from internal ponding to sediment basins as required.

4.5. Runoff management for stockpiles and composting windrows

Site runoff over the compost processing area must be managed to limit interaction with leachate producing areas (windrows and organic material stockpiles) to keep potential pollutant streams separate.

4.6. Sediment basins

It is important to note that as excavation proceeds within the quarry, it is often the case that low points are created within the quarry where water will pond (Figure 4.1), allowing an alternate sedimentation system to be established. In these cases collected water is then pumped to the sediment basins for storage, prior to discharge. The use of the void within the quarry area is an acceptable approach to sediment management for a quarry (DECC, 2008). It is recommended that during the quarry operation, and expansion, that, as much as possible the quarry void be used as a primary settling/sedimentation area, and that collected water is pumped to the constructed sediment basins as required. This provides a level of control over the sediment basins to ensure their performance. Sediment basins shall still be constructed in accordance with the sizing and parameters outlined in this management plan.

Figure 4.1 Example of water storage within the quarry working area

Basins were initially designed as wet detention basins for dispersive soils (Type D) in accordance with Landcom (2008) SD 6.4 - based on the 5 day 95th percentile rainfall depth equating to a rainfall depth of approximately 85mm (1-2 overflow events per year, (Evans and Peck, 2007)), and in accordance with Soils and Construction, Volume 2E, Mines and quarries. Following discussions with the EPA it was requested that the design rainfall depth be increased to 140mm (approximately a 2 year 24 hour storm event or a 50 year 2 hour event). A depth of 140mm when compared with the Blue Book standards equates to approximately 90% of all 20 day rainfall depths.

Refer to Appendix B for sediment basin calculations and assumptions.

The basin sizing assumes a worst case scenario of full exposure of the proposed quarry area, no use of the quarry void itself for sedimentation purposes and no rehabilitation during the operational phase. To allow for these possibilities, and to reduce end of line sediment basin volume where possible, it is recommended that the quarry operator apply a storage volume rate to the area exposed and create that volume, either through the use of voids within the quarry and/or combined with dedicated sediment basins.

The volume rates shall be a minimum of 1050m^3 sediment storage per ha disturbed area.

4.7. Sediment basin discharge control and monitoring

The MUSIC model estimates that on average 4570kg/year of suspended solids leave the site based on the sediment basins sizing outlined above, and an average annual outflow volume of 72.5ML/year. This equates to an approximate average discharge concentration of 60mg/L whilst still achieving a neutral or beneficial effect in terms of sediment load.

References such as the Blue Book and other best management guidelines suggest a TSS discharge concentration of 50mg/L for sediment basin discharge.

The basins have been sized based on a much higher rainfall depth than Managing Urban Stormwater, Soils and Construction, Volume 2E, Mines and Quarries suggests for quarries discharging to sensitive receiving waters (95%ile 5 day, 85mm). As such, a significant factor of safety has been added to the design.

Controlled discharge from the sediment basin shall have concentrations of 50mg/L or lower. The addition of flocculant may be necessary to achieve this concentration.

To allow for a simple comparison between TSS and turbidity, a relationship between site sediment characteristics in terms of TSS (mg/L) and NTU should be developed through sampling from existing basins. Once a relationship is established for the site either a simple NTU meter measurement can made or a simple visual assessment against reference NTU bottles can be undertaken to estimate TSS concentration prior to discharge.

Basin discharge shall be undertaken either by pumping out of the basin, or through a gravity siphon or other gravity drainage. Draining of the basin shall be undertaken in such a way as to not disturb accumulated sediment. Basin drainage should either be used as on site dust suppression, or if discharged to the environment, should be over a grassed area with limited direct hydraulic connection to Saltwater Creek to maximise additional treatment in the vegetated buffer between the Quarry and Creek.

Summary:

Controlled discharge concentration from basin of 50mg/L

Create Turbidity (NTU) references for TSS concentration at the site

Discharge to be to a stable grassed area to maximise treatment from proposed buffer

The following site records should be kept:

- *Daily rainfall*
- *Date of controlled discharge, approximate volume of discharge and estimate of TSS concentration*
- *Date of any uncontrolled overflow from the basins and approximate volume*

4.8. Leachate management

4.8.1. Leachate Barrier

In order to limit interaction between leachate and ground or surface waters, a leachate barrier is proposed for both the composting working areas and the storage area. The compost pad would be a hardstand area constructed of a clay base (at least 600mm) topped with rolled and compressed road base and/or aggregate. The hardstand areas would be graded to direct any runoff into a leachate pond. The proposed leachate pond would be appropriately lined with clay or similar to meet a permeability standard of $1x10^{-9}$ meters per second, as required by the NSW Environmental Guidelines for Composting and Related Organics Processing Facilities (DEC 2004).

Importantly, Hydromap (2007) concluded that the quarry site is non-vulnerable with respect to the regional groundwater system.

4.8.2. Leachate storage

Leachate management is required for any liquid draining from the composting processing and stockpile areas. As discussed above, as much as possible, site surface runoff is to be diverted away from compost processing and stockpile zones. For the purpose of this management plan an area of 0.6 ha has been allowed for as an area producing leachate. This assumes 8 windrows of 100m Length and 6m width each, as well as $1200m^2$ of compost material stockpile.

A leachate collection pond is required. The pond must have the capacity at a minimum to collect the runoff volume from a 10 year ARI, 24 hour storm (approx. 208mm rainfall depth), in accordance with the Environmental Guidelines for Composting and related organics processing facilities (DEC, 2003). Assuming an active composting area (composting windrows and stockpiles) of 0.6 ha a leachate collection and storage facility must have an available storage volume of $900m^3$ to account for the 10 year ARI 24 hour storm event. Any modification to the leachate generation area can assume a proportional relationship between area and storage volume.

The leachate collection volume shall be a minimum $1560m^3$ per hectare of leachate production area.

The leachate storage needs to be managed so that the storage volume is available when rain is forecast.

4.8.3. Leachate disposal

Leachate shall be contained within the site and disposed of through recycling on site for dust suppression and to maintain moisture content in compost, windrows and stockpiles. Using the MUSIC and 10 years of rainfall data and composting area assumptions outlined above, 3.86ML of leachate is estimated to be generated per year. Evaporation losses over the composting area are about 5.8ML per year. Water is required to offset these losses to maintain the compost windrows and stockpiles at approximately 65% moisture content. Although evaporation losses, and therefore moisture demands of the composting area exceed the volume generated, modelling shows that there is still an excess of leachate of about 370kL per year as the timing of runoff and irrigation demands (evaporation) do not always occur in similar periods. However, the remaining 370kL could easily be disposed of over the quarry site of more than 10ha over the year, or used on the windrows through careful leachate pond management and by using other storage opportunities in the quarry.

Should leachate disposal be required, an agreement with the EPA to licence any discharge is likely to be necessary, depending on leachate quality. A constructed wetland, or other passive biofiltration treatment system prior to any discharge may be a possibility, however this would need to be designed based on analysis of leachate characteristics. A rule of thumb area of 2% of the leachate generation zone has been identified as a potential treatment area to be used should a leachate discharge agreement be required.

REFERENCES

BMT WBM (2011) Eurobodalla Estuary Health Monitoring Program Review, OEH.

Department of Environment and Climate Change (DECC) (2008) Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries.

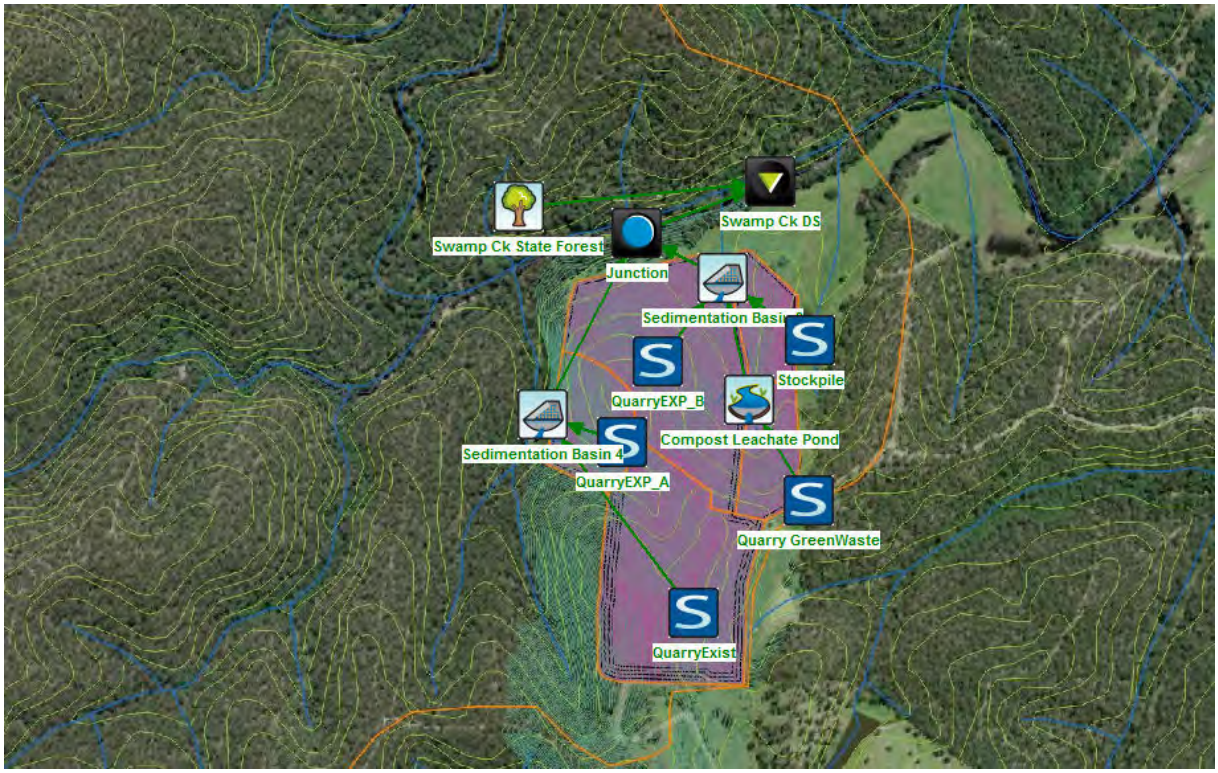
Department of Environment and Climate Change (DECC) (2008) Managing Urban Stormwater, Soils and Construction, Volume 2B Waste Landfills.

Department of Environment and Climate Change (DECC) (2003) Environmental Guidelines for composting and related organics processing facilities

Evans and Peck (2007) Sediment basin performance, final report to NSW Roads and Traffic Authority, Sydney.

Landcom (2004) The Blue Book - Managing Urban Stormwater (MUS): Soils and Construction, 4th edition.

APPENDIX A – MUSIC MODEL INPUTS



Source nodes				
Location	QuarryExist	Expansion Area (Existing Agricultural)	Ex Forest	
ID	1	4	5	
Node Type	UserDefinedSourceNode	AgriculturalSourceNode	ForestSourceNode	
Zoning Surface Type				
Total Area (ha)	10.24	13.65	3.8	
Area Impervious (ha)	5.12	0	0	
Area Pervious (ha)	5.12	13.65	3.8	
Field Capacity (mm)	70	80	80	
Pervious Area Infiltration Capacity coefficient - a	135	200	200	
Pervious Area Infiltration Capacity exponent - b	4	1	1	
Impervious Area Rainfall Threshold (mm/day)	1.5	1	1	
Pervious Area Soil Storage Capacity (mm)	90	120	120	
Pervious Area Soil Initial Storage (% of Capacity)	0	25	25	
Groundwater Initial Depth (mm)	10	10	10	
Groundwater Daily Recharge Rate (%)	10	25	25	
Groundwater Daily Baseflow Rate (%)	10	5	5	
Groundwater Daily Deep Seepage Rate (%)	0	0	0	
Stormflow Total Suspended Solids Mean (log mg/L)	3	2.3	1.9	
Stormflow Total Suspended Solids Standard Deviation (log mg/L)	0.32	0.31	0.2	
Stormflow Total Suspended Solids Estimation Method	Mean	Stochastic	Stochastic	
Stormflow Total Suspended Solids Serial Correlation	0	0	0	
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	-0.27	-1.1	
Stormflow Total Phosphorus Standard Deviation (log mg/L)	0.25	0.3	0.22	
Stormflow Total Phosphorus Estimation Method	Mean	Stochastic	Stochastic	
Stormflow Total Phosphorus Serial Correlation	0	0	0	
Stormflow Total Nitrogen Mean (log mg/L)	0.34	0.59	-0.075	
Stormflow Total Nitrogen Standard Deviation (log mg/L)	0.19	0.26	0.24	
Stormflow Total Nitrogen Estimation Method	Mean	Stochastic	Stochastic	
Stormflow Total Nitrogen Serial Correlation	0	0	0	
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.4	0.9	
Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.17	0.13	0.13	
Baseflow Total Suspended Solids Estimation Method	Mean	Stochastic	Stochastic	
Baseflow Total Suspended Solids Serial Correlation	0	0	0	
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.88	-1.5	
Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.19	0.13	0.13	
Baseflow Total Phosphorus Estimation Method	Mean	Stochastic	Stochastic	
Baseflow Total Phosphorus Serial Correlation	0	0	0	
Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.074	-0.14	
Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.12	0.13	0.13	
Baseflow Total Nitrogen Estimation Method	Mean	Stochastic	Stochastic	
Baseflow Total Nitrogen Serial Correlation	0	0	0	
Flow based constituent generation - enabled	Off	Off	Off	
Flow based constituent generation - flow file				
Flow based constituent generation - base flow column				
Flow based constituent generation - pervious flow column				
Flow based constituent generation - impervious flow column				
Flow based constituent generation - unit				
OUT - Mean Annual Flow (ML/yr)	39.5	18.8	5.24	
OUT - TSS Mean Annual Load (kg/yr)	3.92E+04	2.20E+03	210	

OUT - TP Mean Annual Load (kg/yr)	19.7	6.67	0.295	
OUT - TN Mean Annual Load (kg/yr)	86.2	49.5	4.39	
OUT - Gross Pollutant Mean Annual Load (kg/yr)	1.17E+03	0	0	
Rain In (ML/yr)	73.3467	97.7714	27.2184	
ET Loss (ML/yr)	33.91	79.4054	22.1056	
Deep Seepage Loss (ML/yr)	0	0	0	
Baseflow Out (ML/yr)	0.289087	11.1601	3.10684	
Imp. Stormflow Out (ML/yr)	30.9351	0	0	
Perv. Stormflow Out (ML/yr)	8.30557	7.6523	2.13031	
Total Stormflow Out (ML/yr)	39.2407	7.6523	2.13031	
Total Outflow (ML/yr)	39.5298	18.8124	5.23715	
Change in Soil Storage (ML/yr)	-0.0932708	-0.44645	-0.124287	
TSS Baseflow Out (kg/yr)	4.58172	293.026	25.813	
TSS Total Stormflow Out (kg/yr)	39240.7	1908.23	184.281	
TSS Total Outflow (kg/yr)	39245.3	2201.26	210.094	
TP Baseflow Out (kg/yr)	0.0408346	1.53868	0.102774	
TP Total Stormflow Out (kg/yr)	19.6669	5.13611	0.192689	
TP Total Outflow (kg/yr)	19.7078	6.67479	0.295463	
TN Baseflow Out (kg/yr)	0.372416	13.8179	2.35485	
TN Total Stormflow Out (kg/yr)	85.8493	35.6459	2.03865	
TN Total Outflow (kg/yr)	86.2217	49.4637	4.3935	
GP Total Outflow (kg/yr)	1171.33	0	0	
No Imported Data Source nodes				
USTM treatment nodes				
Location	Ex Sedimentation Basin			
ID	2			
Node Type	SedimentationBasinNode			
Lo-flow bypass rate (cum/sec)	0			
Hi-flow bypass rate (cum/sec)	100			
Inlet pond volume	0			
Area (sqm)	1000			
Initial Volume (m^3)	500			
Extended detention depth (m)	1			
Number of Rainwater tanks				
Permanent Pool Volume (cubic metres)	500			
Proportion vegetated	0			
Equivalent Pipe Diameter (mm)	100			
Overflow weir width (m)	10			
Notional Detention Time (hrs)	11.9			
Orifice Discharge Coefficient	0.6			
Weir Coefficient	1.7			
Number of CSTR Cells	1			
Total Suspended Solids - k (m/yr)	8000			
Total Suspended Solids - C* (mg/L)	20			
Total Suspended Solids - C** (mg/L)	20			
Total Phosphorus - k (m/yr)	6000			
Total Phosphorus - C* (mg/L)	0.13			
Total Phosphorus - C** (mg/L)	0.13			

Total Nitrogen - k (m/yr)	500			
Total Nitrogen - C* (mg/L)	1.4			
Total Nitrogen - C** (mg/L)	1.4			
Threshold Hydraulic Loading for C** (m/yr)	3500			
Horizontal Flow Coefficient				
Reuse Enabled	On			
Max drawdown height (m)	0.499571429			
Annual Demand Enabled	On			
Annual Demand Value (ML/year)	5			
Annual Demand Distribution	PET			
Annual Demand Monthly Distribution: Jan				
Annual Demand Monthly Distribution: Feb				
Annual Demand Monthly Distribution: Mar				
Annual Demand Monthly Distribution: Apr				
Annual Demand Monthly Distribution: May				
Annual Demand Monthly Distribution: Jun				
Annual Demand Monthly Distribution: Jul				
Annual Demand Monthly Distribution: Aug				
Annual Demand Monthly Distribution: Sep				
Annual Demand Monthly Distribution: Oct				
Annual Demand Monthly Distribution: Nov				
Annual Demand Monthly Distribution: Dec				
Daily Demand Enabled	Off			
Daily Demand Value (ML/day)				
Custom Demand Enabled	Off			
Custom Demand Time Series File				
Custom Demand Time Series Units				
Filter area (sqm)				
Filter perimeter (m)				
Filter depth (m)				
Filter Median Particle Diameter (mm)				
Saturated Hydraulic Conductivity (mm/hr)				
Infiltration Media Porosity				
Length (m)				
Bed slope				
Base Width (m)				
Top width (m)				
Vegetation height (m)				
Vegetation Type				
Total Nitrogen Content in Filter (mg/kg)				
Orthophosphate Content in Filter (mg/kg)				
Is Base Lined?				
Is Underdrain Present?				
Is Submerged Zone Present?				
Submerged Zone Depth (m)				
B for Media Soil Texture	-9999			
Proportion of upstream impervious area treated				
Exfiltration Rate (mm/hr)	0			
Evaporative Loss as % of PET	100			
Depth in metres below the drain pipe				

TSS A Coefficient				
TSS B Coefficient				
TP A Coefficient				
TP B Coefficient				
TN A Coefficient				
TN B Coefficient				
Sfc				
S*				
Sw				
Sh				
Emax (m/day)				
Ew (m/day)				
IN - Mean Annual Flow (ML/yr)	39.5			
IN - TSS Mean Annual Load (kg/yr)	3.92E+04			
IN - TP Mean Annual Load (kg/yr)	19.7			
IN - TN Mean Annual Load (kg/yr)	86.2			
IN - Gross Pollutant Mean Annual Load (kg/yr)	1.17E+03			
OUT - Mean Annual Flow (ML/yr)	34.2			
OUT - TSS Mean Annual Load (kg/yr)	7.47E+03			
OUT - TP Mean Annual Load (kg/yr)	7.44			
OUT - TN Mean Annual Load (kg/yr)	64.4			
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0			
Flow In (ML/yr)	39.5193			
ET Loss (ML/yr)	0.994887			
Infiltration Loss (ML/yr)	0			
Low Flow Bypass Out (ML/yr)	0			
High Flow Bypass Out (ML/yr)	0			
Orifice / Filter Out (ML/yr)	21.6393			
Weir Out (ML/yr)	12.521			
Transfer Function Out (ML/yr)	0			
Reuse Supplied (ML/yr)	4.39986			
Reuse Requested (ML/yr)	4.99759			
% Reuse Demand Met	88.0397			
% Load Reduction	13.5605			
TSS Flow In (kg/yr)	39245.4			
TSS ET Loss (kg/yr)	0			
TSS Infiltration Loss (kg/yr)	0			
TSS Low Flow Bypass Out (kg/yr)	0			
TSS High Flow Bypass Out (kg/yr)	0			
TSS Orifice / Filter Out (kg/yr)	2033.65			
TSS Weir Out (kg/yr)	5439.97			
TSS Transfer Function Out (kg/yr)	0			
TSS Reuse Supplied (kg/yr)	106.23			
TSS Reuse Requested (kg/yr)	0			
TSS % Reuse Demand Met	0			
TSS % Load Reduction	80.9567			
TP Flow In (kg/yr)	19.7078			
TP ET Loss (kg/yr)	0			
TP Infiltration Loss (kg/yr)	0			
TP Low Flow Bypass Out (kg/yr)	0			

TP High Flow Bypass Out (kg/yr)	0			
TP Orifice / Filter Out (kg/yr)	3.59554			
TP Weir Out (kg/yr)	3.84204			
TP Transfer Function Out (kg/yr)	0			
TP Reuse Supplied (kg/yr)	0.5816			
TP Reuse Requested (kg/yr)	0			
TP % Reuse Demand Met	0			
TP % Load Reduction	62.2607			
TN Flow In (kg/yr)	86.2219			
TN ET Loss (kg/yr)	0			
TN Infiltration Loss (kg/yr)	0			
TN Low Flow Bypass Out (kg/yr)	0			
TN High Flow Bypass Out (kg/yr)	0			
TN Orifice / Filter Out (kg/yr)	38.5134			
TN Weir Out (kg/yr)	25.8642			
TN Transfer Function Out (kg/yr)	0			
TN Reuse Supplied (kg/yr)	6.32372			
TN Reuse Requested (kg/yr)	0			
TN % Reuse Demand Met	0			
TN % Load Reduction	25.335			
GP Flow In (kg/yr)	1170.63			
GP ET Loss (kg/yr)	0			
GP Infiltration Loss (kg/yr)	0			
GP Low Flow Bypass Out (kg/yr)	0			
GP High Flow Bypass Out (kg/yr)	0			
GP Orifice / Filter Out (kg/yr)	0			
GP Weir Out (kg/yr)	0			
GP Transfer Function Out (kg/yr)	0			
GP Reuse Supplied (kg/yr)	0			
GP Reuse Requested (kg/yr)	0			
GP % Reuse Demand Met	0			
GP % Load Reduction	100			
PET Scaling Factor				
No Generic treatment nodes				
Other nodes				
Location	Junction			
ID	3			
Node Type	JunctionNode			
IN - Mean Annual Flow (ML/yr)	58.2			
IN - TSS Mean Annual Load (kg/yr)	9.88E+03			
IN - TP Mean Annual Load (kg/yr)	14.4			
IN - TN Mean Annual Load (kg/yr)	118			
IN - Gross Pollutant Mean Annual Load (kg/yr)	0			
OUT - Mean Annual Flow (ML/yr)	58.2			
OUT - TSS Mean Annual Load (kg/yr)	9.88E+03			
OUT - TP Mean Annual Load (kg/yr)	14.4			
OUT - TN Mean Annual Load (kg/yr)	118			
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0			

% Load Reduction	8.45			
TSS % Load Reduction	76.3			
TN % Load Reduction	15.6			
TP % Load Reduction	46			
GP % Load Reduction	100			
Links				
Location	Drainage Link	Drainage Link	Drainage Link	Drainage Link
Source node ID	1	2	4	5
Target node ID	2	3	3	3
Muskingum-Cunge Routing	Not Routed	Not Routed	Not Routed	Not Routed
Muskingum K				
Muskingum theta				
IN - Mean Annual Flow (ML/yr)	39.5	34.2	18.8	5.24
IN - TSS Mean Annual Load (kg/yr)	3.92E+04	7.47E+03	2.20E+03	210
IN - TP Mean Annual Load (kg/yr)	19.7	7.44	6.67	0.295
IN - TN Mean Annual Load (kg/yr)	86.2	64.4	49.5	4.39
IN - Gross Pollutant Mean Annual Load (kg/yr)	1.17E+03	0	0	0
OUT - Mean Annual Flow (ML/yr)	39.5	34.2	18.8	5.24
OUT - TSS Mean Annual Load (kg/yr)	3.92E+04	7.47E+03	2.20E+03	210
OUT - TP Mean Annual Load (kg/yr)	19.7	7.44	6.67	0.295
OUT - TN Mean Annual Load (kg/yr)	86.2	64.4	49.5	4.39
OUT - Gross Pollutant Mean Annual Load (kg/yr)	1.17E+03	0	0	0
Catchment Details				
Catchment Name	Quarry MUSIC_Pre & Post			
Timestep	6 Minutes			
Start Date	7/12/1999			
End Date	30/04/2010 23:54			
Rainfall Station	69148 MORUYA			
ET Station	User-defined monthly PET			
Mean Annual Rainfall (mm)	717			
Mean Annual ET (mm)	1128			

Source nodes									
Location	Swamp Ck State Forest	QuarryEXP_B	Quarry GreenWaste	Stockpile	QuarryEXP_A	QuarryExist			
ID	2	3	4	8	9	10			
Node Type	ForestSourceNode	UserDefinedSourceNode	UserDefinedSourceNode	UserDefinedSourceNode	UserDefinedSourceNode	UserDefinedSourceNode			
Zoning Surface Type									
Total Area (ha)	3410.6	8.68	0.6	4.118	2.62	10.24			
Area Impervious (ha)	0	4.34	0.297738806	2.059	1.31	5.12			
Area Pervious (ha)	3410.6	4.34	0.302261194	2.059	1.31	5.12			
Field Capacity (mm)	80	70	70	70	70	70			
Pervious Area Infiltration Capacity coefficient - a	200	135	135	135	135	135			
Pervious Area Infiltration Capacity exponent - b	1	4	4	4	4	4			
Impervious Area Rainfall Threshold (mm/day)	1	1.5	1.5	1.5	1.5	1.5			
Pervious Area Soil Storage Capacity (mm)	120	90	90	90	90	90			
Pervious Area Soil Initial Storage (% of Capacity)	25	0	0	0	0	0			
Groundwater Initial Depth (mm)	10	10	0	10	10	10			
Groundwater Daily Recharge Rate (%)	25	10	10	10	10	10			
Groundwater Daily Baseflow Rate (%)	5	10	10	10	10	10			
Groundwater Daily Deep Seepage Rate (%)	0	0	0	0	0	0			
Stormflow Total Suspended Solids Mean (log mg/L)	1.9	3	2.15	3	3	3			
Stormflow Total Suspended Solids Standard Deviation (log mg/L)	0.2	0.32	0.31	0.32	0.32	0.32			
Stormflow Total Suspended Solids Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean			
Stormflow Total Suspended Solids Serial Correlation	0	0	0	0	0	0			
Stormflow Total Phosphorus Mean (log mg/L)	-1.1	-0.3	-0.22	-0.3	-0.3	-0.3			
Stormflow Total Phosphorus Standard Deviation (log mg/L)	0.22	0.25	0.3	0.25	0.25	0.25			
Stormflow Total Phosphorus Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean			
Stormflow Total Phosphorus Serial Correlation	0	0	0	0	0	0			
Stormflow Total Nitrogen Mean (log mg/L)	-0.075	0.34	0.48	0.34	0.34	0.34			
Stormflow Total Nitrogen Standard Deviation (log mg/L)	0.24	0.19	0.26	0.19	0.19	0.19			
Stormflow Total Nitrogen Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean			
Stormflow Total Nitrogen Serial Correlation	0	0	0	0	0	0			
Baseflow Total Suspended Solids Mean (log mg/L)	0.9	1.2	1.3	1.2	1.2	1.2			
Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.13	0.17	0.13	0.17	0.17	0.17			
Baseflow Total Suspended Solids Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean			
Baseflow Total Suspended Solids Serial Correlation	0	0	0	0	0	0			
Baseflow Total Phosphorus Mean (log mg/L)	-1.5	-0.85	-1.05	-0.85	-0.85	-0.85			
Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.13	0.19	0.13	0.19	0.19	0.19			
Baseflow Total Phosphorus Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean			
Baseflow Total Phosphorus Serial Correlation	0	0	0	0	0	0			
Baseflow Total Nitrogen Mean (log mg/L)	-0.14	0.11	0.04	0.11	0.11	0.11			
Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.13	0.12	0.13	0.12	0.12	0.12			
Baseflow Total Nitrogen Estimation Method	Stochastic	Mean	Mean	Mean	Mean	Mean			
Baseflow Total Nitrogen Serial Correlation	0	0	0	0	0	0			
Flow based constituent generation - enabled	Off	Off	Off	Off	Off	Off			
Flow based constituent generation - flow file									
Flow based constituent generation - base flow column									
Flow based constituent generation - pervious flow column									
Flow based constituent generation - impervious flow column									
Flow based constituent generation - unit									

OUT - Mean Annual Flow (ML/yr)	4.70E+03	33.5	2.32	15.9	10.1	39.5			
OUT - TSS Mean Annual Load (kg/yr)	1.94E+05	3.33E+04	325	1.58E+04	1.00E+04	3.92E+04			
OUT - TP Mean Annual Load (kg/yr)	260	16.7	1.39	7.93	5.04	19.7			
OUT - TN Mean Annual Load (kg/yr)	3.96E+03	73.1	6.96	34.7	22.1	86.2			
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	992	68.6	471	300	1.17E+03			
Rain In (ML/yr)	24429.3	62.1726	4.29766	29.4962	18.7664	73.3467			
ET Loss (ML/yr)	19840.3	28.7442	1.98691	13.6368	8.67624	33.91			
Deep Seepage Loss (ML/yr)	0	0	0	0	0	0			
Baseflow Out (ML/yr)	2788.47	0.245046	0.0169387	0.116256	0.0739656	0.289087			
Imp. Stormflow Out (ML/yr)	0	26.2224	1.81261	12.4405	7.91505	30.9351			
Perv. Stormflow Out (ML/yr)	1912.01	7.04027	0.486654	3.34007	2.12506	8.30557			
Total Stormflow Out (ML/yr)	1912.01	33.2626	2.29926	15.7806	10.0401	39.2407			
Total Outflow (ML/yr)	4700.48	33.5077	2.3162	15.8968	10.1141	39.5298			
Change in Soil Storage (ML/yr)	-111.55	-0.0790616	-0.00546509	-0.0375087	-0.0238642	-0.0932708			
TSS Baseflow Out (kg/yr)	23172.4	3.88373	0.337971	1.84253	1.17228	4.58172			
TSS Total Stormflow Out (kg/yr)	170357	33262.6	324.779	15780.6	10040.1	39240.7			
TSS Total Outflow (kg/yr)	193529	33266.5	325.117	15782.4	10041.3	39245.3			
TP Baseflow Out (kg/yr)	92.1546	0.0346137	0.00150963	0.0164215	0.0104479	0.0408346			
TP Total Stormflow Out (kg/yr)	167.406	16.6708	1.38544	7.90902	5.03197	19.6669			
TP Total Outflow (kg/yr)	259.56	16.7054	1.38695	7.92544	5.04242	19.7078			
TN Baseflow Out (kg/yr)	2115.23	0.315681	0.0185729	0.149767	0.0952862	0.372416			
TN Total Stormflow Out (kg/yr)	1845.83	72.7707	6.94364	34.5242	21.9653	85.8493			
TN Total Outflow (kg/yr)	3961.06	73.0864	6.96222	34.6739	22.0606	86.2217			
GP Total Outflow (kg/yr)	0	992.887	68.6328	471.049	299.696	1171.33			
No Imported Data Source nodes									
USTM treatment nodes									
Location	Sedimentation Basin 3	Compost Leachate Pond	Sedimentation Basin 4						
ID	5	7	11						
Node Type	imentationBasinN	PondNode	imentationBasinNode						
Lo-flow bypass rate (cum/sec)	0	0	0						
Hi-flow bypass rate (cum/sec)	100	2	100						
Inlet pond volume	0	0	0						
Area (sqm)	7350	940	6930						
Initial Volume (m^3)	4900	0	4620						
Extended detention depth (m)	0.67	0.33	0.67						
Number of Rainwater tanks									
Permanent Pool Volume (cubic metres)	9800	627	9240						
Proportion vegetated	0	0.1	0						
Equivalent Pipe Diameter (mm)	100	100	100						
Overflow weir width (m)	10	2	10						
Notional Detention Time (hrs)	71.7	6.44	67.6						
Orifice Discharge Coefficient	0.6	0.6	0.6						
Weir Coefficient	1.7	1.7	1.7						
Number of CSTR Cells	1	2	1						
Total Suspended Solids - k (m/yr)	8000	400	8000						
Total Suspended Solids - C* (mg/L)	20	12	20						
Total Suspended Solids - C** (mg/L)	20	12	20						

Total Phosphorus - k (m/yr)	6000	300	6000						
Total Phosphorus - C* (mg/L)	0.13	0.09	0.13						
Total Phosphorus - C** (mg/L)	0.13	0.09	0.13						
Total Nitrogen - k (m/yr)	500	40	500						
Total Nitrogen - C* (mg/L)	1.4	1	1.4						
Total Nitrogen - C** (mg/L)	1.4	1	1.4						
Threshold Hydraulic Loading for C** (m/yr)	3500	3500	3500						
Horizontal Flow Coefficient									
Reuse Enabled	On	On	On						
Max drawdown height (m)	1.333	0.667021277	1.333						
Annual Demand Enabled	On	On	On						
Annual Demand Value (ML/year)	5	5.8	5						
Annual Demand Distribution	PET	PET	PET						
Annual Demand Monthly Distribution: Jan									
Annual Demand Monthly Distribution: Feb									
Annual Demand Monthly Distribution: Mar									
Annual Demand Monthly Distribution: Apr									
Annual Demand Monthly Distribution: May									
Annual Demand Monthly Distribution: Jun									
Annual Demand Monthly Distribution: Jul									
Annual Demand Monthly Distribution: Aug									
Annual Demand Monthly Distribution: Sep									
Annual Demand Monthly Distribution: Oct									
Annual Demand Monthly Distribution: Nov									
Annual Demand Monthly Distribution: Dec									
Daily Demand Enabled	Off	Off	Off						
Daily Demand Value (ML/day)									
Custom Demand Enabled	Off	Off	Off						
Custom Demand Time Series File									
Custom Demand Time Series Units									
Filter area (sqm)									
Filter perimeter (m)									
Filter depth (m)									
Filter Median Particle Diameter (mm)									
Saturated Hydraulic Conductivity (mm/hr)									
Infiltration Media Porosity									
Length (m)									
Bed slope									
Base Width (m)									
Top width (m)									
Vegetation height (m)									
Vegetation Type									
Total Nitrogen Content in Filter (mg/kg)									
Orthophosphate Content in Filter (mg/kg)									
Is Base Lined?									
Is Underdrain Present?									
Is Submerged Zone Present?									
Submerged Zone Depth (m)									
B for Media Soil Texture	-9999	-9999	-9999						
Proportion of upstream impervious area treated									

Exfiltration Rate (mm/hr)	0	0	0						
Evaporative Loss as % of PET	100	100	100						
Depth in metres below the drain pipe									
TSS A Coefficient									
TSS B Coefficient									
TP A Coefficient									
TP B Coefficient									
TN A Coefficient									
TN B Coefficient									
Sfc									
S*									
Sw									
Sh									
Emax (m/day)									
Ew (m/day)									
IN - Mean Annual Flow (ML/yr)	49.7	2.32	49.6						
IN - TSS Mean Annual Load (kg/yr)	4.91E+04	325	4.93E+04						
IN - TP Mean Annual Load (kg/yr)	24.7	1.39	24.8						
IN - TN Mean Annual Load (kg/yr)	108	6.96	108						
IN - Gross Pollutant Mean Annual Load (kg/yr)	1.46E+03	68.6	1.47E+03						
OUT - Mean Annual Flow (ML/yr)	36	0.276	36.5						
OUT - TSS Mean Annual Load (kg/yr)	2.22E+03	12.4	2.35E+03						
OUT - TP Mean Annual Load (kg/yr)	5.37	6.63E-02	5.48						
OUT - TN Mean Annual Load (kg/yr)	56	0.608	57						
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	0	0						
Flow In (ML/yr)	49.661	2.31527	49.6186						
ET Loss (ML/yr)	8.30007	0.31682	7.82634						
Infiltration Loss (ML/yr)	0	0	0						
Low Flow Bypass Out (ML/yr)	0	0	0						
High Flow Bypass Out (ML/yr)	0	0	0						
Orifice / Filter Out (ML/yr)	27.3716	0.246363	27.4007						
Weir Out (ML/yr)	8.63157	0.0293962	9.06396						
Transfer Function Out (ML/yr)	0	0	0						
Reuse Supplied (ML/yr)	4.99759	1.72272	4.99759						
Reuse Requested (ML/yr)	4.99759	5.79957	4.99759						
% Reuse Demand Met	100	29.7043	100						
% Load Reduction	27.502	88.0896	26.5101						
TSS Flow In (kg/yr)	49061.5	325.117	49286.7						
TSS ET Loss (kg/yr)	0	0	0						
TSS Infiltration Loss (kg/yr)	0	0	0						
TSS Low Flow Bypass Out (kg/yr)	0	0	0						
TSS High Flow Bypass Out (kg/yr)	0	0	0						
TSS Orifice / Filter Out (kg/yr)	769.53	10.2557	789.387						
TSS Weir Out (kg/yr)	1446.57	2.1176	1562						
TSS Transfer Function Out (kg/yr)	0	0	0						
TSS Reuse Supplied (kg/yr)	104.007	22.8585	104.252						
TSS Reuse Requested (kg/yr)	0	0	0						
TSS % Reuse Demand Met	0	0	0						
TSS % Load Reduction	95.483	96.1942	95.2292						
TP Flow In (kg/yr)	24.6973	1.38695	24.7503						

TP ET Loss (kg/yr)	0	0	0						
TP Infiltration Loss (kg/yr)	0	0	0						
TP Low Flow Bypass Out (kg/yr)	0	0	0						
TP High Flow Bypass Out (kg/yr)	0	0	0						
TP Orifice / Filter Out (kg/yr)	3.67221	0.056058	3.68537						
TP Weir Out (kg/yr)	1.69444	0.0102452	1.79445						
TP Transfer Function Out (kg/yr)	0	0	0						
TP Reuse Supplied (kg/yr)	0.652646	0.168727	0.652766						
TP Reuse Requested (kg/yr)	0	0	0						
TP % Reuse Demand Met	0	0	0						
TP % Load Reduction	78.2703	95.2195	77.8595						
TN Flow In (kg/yr)	108.368	6.96223	108.282						
TN ET Loss (kg/yr)	0	0	0						
TN Infiltration Loss (kg/yr)	0	0	0						
TN Low Flow Bypass Out (kg/yr)	0	0	0						
TN High Flow Bypass Out (kg/yr)	0	0	0						
TN Orifice / Filter Out (kg/yr)	40.8098	0.533387	40.9782						
TN Weir Out (kg/yr)	15.2184	0.0744205	16.0106						
TN Transfer Function Out (kg/yr)	0	0	0						
TN Reuse Supplied (kg/yr)	7.07042	2.24535	7.07266						
TN Reuse Requested (kg/yr)	0	0	0						
TN % Reuse Demand Met	0	0	0						
TN % Load Reduction	48.2982	91.2699	47.3702						
GP Flow In (kg/yr)	1463.05	68.5911	1470.14						
GP ET Loss (kg/yr)	0	0	0						
GP Infiltration Loss (kg/yr)	0	0	0						
GP Low Flow Bypass Out (kg/yr)	0	0	0						
GP High Flow Bypass Out (kg/yr)	0	0	0						
GP Orifice / Filter Out (kg/yr)	0	0	0						
GP Weir Out (kg/yr)	0	0	0						
GP Transfer Function Out (kg/yr)	0	0	0						
GP Reuse Supplied (kg/yr)	0	0	0						
GP Reuse Requested (kg/yr)	0	0	0						
GP % Reuse Demand Met	0	0	0						
GP % Load Reduction	100	100	100						
PET Scaling Factor									
No Generic treatment nodes									
Other nodes									
Location	Swamp Ck DS	Junction							
ID	1	6							
Node Type	ReceivingNode	JunctionNode							
IN - Mean Annual Flow (ML/yr)	72.5	72.5							
IN - TSS Mean Annual Load (kg/yr)	4.57E+03	4.57E+03							
IN - TP Mean Annual Load (kg/yr)	10.8	10.8							
IN - TN Mean Annual Load (kg/yr)	113	113							
IN - Gross Pollutant Mean Annual Load (kg/yr)	0	0							
OUT - Mean Annual Flow (ML/yr)	72.5	72.5							
OUT - TSS Mean Annual Load (kg/yr)	4.57E+03	4.57E+03							

OUT - TP Mean Annual Load (kg/yr)	10.8	10.8							
OUT - TN Mean Annual Load (kg/yr)	113	113							
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	0							
% Load Reduction	28.5	28.5							
TSS % Load Reduction	95.4	95.4							
TN % Load Reduction	49.3	49.3							
TP % Load Reduction	78.6	78.6							
GP % Load Reduction	100	100							
Links									
Location	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link
Source node ID	3	6	4	7	8	10	9	11	5
Target node ID	5	1	7	5	5	11	11	6	6
Muskingum-Cunge Routing	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed	Not Routed
Muskingum K									
Muskingum theta									
IN - Mean Annual Flow (ML/yr)	33.5	72.5	2.32	0.276	15.9	39.5	10.1	36.5	36
IN - TSS Mean Annual Load (kg/yr)	3.33E+04	4.57E+03	325	12.4	1.58E+04	3.92E+04	1.00E+04	2.35E+03	2.22E+03
IN - TP Mean Annual Load (kg/yr)	16.7	10.8	1.39	6.63E-02	7.93	19.7	5.04	5.48	5.37
IN - TN Mean Annual Load (kg/yr)	73.1	113	6.96	0.608	34.7	86.2	22.1	57	56
IN - Gross Pollutant Mean Annual Load (kg/yr)	992	0	68.6	0	471	1.17E+03	300	0	0
OUT - Mean Annual Flow (ML/yr)	33.5	72.5	2.32	0.276	15.9	39.5	10.1	36.5	36
OUT - TSS Mean Annual Load (kg/yr)	3.33E+04	4.57E+03	325	12.4	1.58E+04	3.92E+04	1.00E+04	2.35E+03	2.22E+03
OUT - TP Mean Annual Load (kg/yr)	16.7	10.8	1.39	6.63E-02	7.93	19.7	5.04	5.48	5.37
OUT - TN Mean Annual Load (kg/yr)	73.1	113	6.96	0.608	34.7	86.2	22.1	57	56
OUT - Gross Pollutant Mean Annual Load (kg/yr)	992	0	68.6	0	471	1.17E+03	300	0	0
Catchment Details									
Catchment Name	Quarry MUSIC Post (140mm rainfall depth basins)								
Timestep	6 Minutes								
Start Date	7/12/1999								
End Date	30/04/2010								
Rainfall Station	69148 MORUYA								
ET Station	User-defined monthly PET								
Mean Annual Rainfall (mm)	717								
Mean Annual ET (mm)	1128								

APPENDIX B – SOIL AND WATER MANAGEMENT PLAN

Site name: Eurobodalla Quarry

Site location: Nerrigundah Road, Eurobodalla

Precinct:

Description of site: Quarry

Site area	Site						Remarks
	1	4	3	Compost			
Total catchment area (ha)	10	13.2	14	0.6			
Disturbed catchment area (ha)	10	13.2	9.6	0.6			

Soil analysis

Soil landscape							DIPNR mapping (if relevant)
Soil Texture Group	D	D	D	D			Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	20	20	20	20			See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	90	90	90	90			See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	140	140	140	208.32			See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	12.6	12.6	12.6	12.6			See IFD chart for the site
Rainfall erosivity (R-factor)	3430	3430	3430	3430			Automatic calculation from above data

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day} \ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

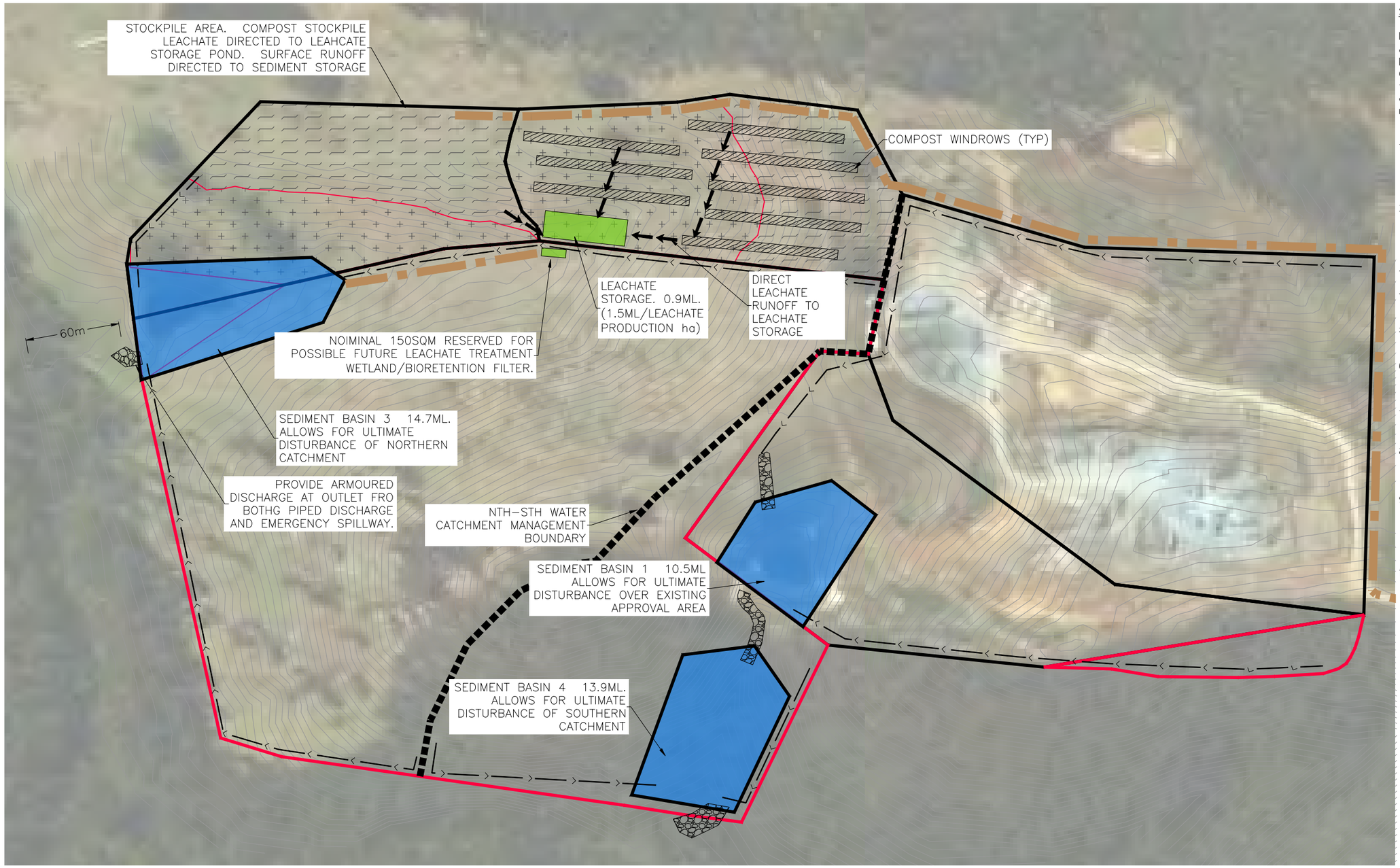
A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.50	140	10	7000	3500	10500
4	0.50	140	13.2	9240	4620	13860
3	0.50	140	14	9800	4900	14700
Compost	0.50	208.32	0.6	624.96	312	937.44



SEIDMENT BASIN AREA. CONSTRUCT ACCORDING TO SD 6.4. REFER SHEET 2.

APPROXIMATE CUT AND FILL OVER RESOURCE RECOVERY AREA

RESOURCE RECOVERY AREA

WATER DIVERSION, INDICATIVE, REFER SHEET 2.

APPROVED OPERATION AREA BOUNDARY

PROPOSED EXPANSION BOUNDARY

INDICATIVE LEACHATE DIVERSION TO LEACHATE STORAGE

FUTURE SITE ACCESS

ROCK ARMOURED FLOW TRANSFER/DISCHARGE. REFER SHEET 2.

Soil and Water Management

Refer to Managing Urban Stormwater, Sokls and Construction, Volume 1 (Blue Book), Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries, for erosion and sediment guideines, system design details and construction and maintenance procedures.

1. This plan is to be read in conjunction with the approved Water Management Plan prepared for the site
   Divert cleanwater run–on around disturbed areas.
2. Limit vegetation clearing to the minimum required.
   Remove and stockpile topsoil in accordance with guidelines and the Water Management Plan.
3. Any quarry operation area must drain to some form of sediment storage.
4. Construct sediment basin storage areas prior to commencement of quarring operations in new areas.
5. Sediment basins and collection areas to be in accordance with SD 6.4, refer to sheet 2.
6. Sediment basin sizes shown on this plan are the ultimate volumes required for disturbance of full quarry operations area, as such these sizes may not be necessary.
7. Sediment storage volume must be a minimum 1050m3 per ha of disturbed quarry area.
8. Sediment storage volume may be achieved through use of quarry void or through constructed basins or a combination of both.
9. For concentrated flow paths use appropriate erosion and sediment controls to limit erosion where possible refer to sheet 2 and section 5.4.3 of Landcom and drawings SD 5.4, SD 5.5, SD 5.6 and SD 5.7.
10. Refer to Water Management Plan, and water quality monitoring plan for sediment storage effluent discharge guidelines. Undertake necessary addition of flocculant and testing prior to discharge.

Leachate Management

Refer to Environmental Guidelines for composting and related organics processing facilities (DECC, 2003) fo leachate system design and operational procedures.

1. This plan is to be read in conjunction with the approved Water Management Plan prepared for the site.
2. Construct leachate barrier over the compost processing area and within the leachate storage basin, in accordance with the Environmental Guidelines for composting and related organics.
3. Ensure that work site runoff and leachate from composting windrows and compost stockpiles are kept separate.
4. Leachate storage shall be emptied as soon as possible after rainfall through reuse of leachate for moisture addition to stockpiles, or used for dust suppression.
5. When necessary, particularly after consecutive rainfall events in colder months provide for additional temporary storage of leachate around the site.
6. Any leachate discharge must comply with EPA requirements or licencing arrangements.

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PROJECT: Eurobodalla Quarry Expansion and Resource Recovery

CLIENT: Eurobodalla Quarry

DRAWING TITLE: Water Management Plan

DRAWING NUMBER: 361-01

SCALE: NTS @ A1

SHEET: 01 /02

DESIGNED: LB

CHECKED: LB

PURPOSE: EIS

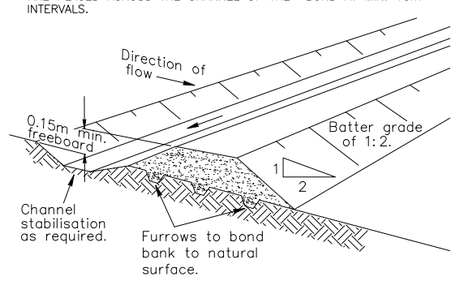
DATE OF ISSUE: 08/05/2017

REV	DESCRIPTION	BY	DATE	REV	DESCRIPTION	BY	DATE
A	BASINS ADJUSTED	BA	14/11/2017				

FLOW TRANSFER – (EROSION MANAGEMENT)

DIVERSION BANK

BUND WILL DIVERT SURFACE WATER AWAY FROM CONSTRUCTION AREAS. THE GRADE OF THE BUND MAY VARY. ROCK CHECK DAMS ARE PLACED ACROSS THE CHANNEL OF THE BUND AT MIN. 10m INTERVALS.



EARTH DIVERSION BANK DETAIL

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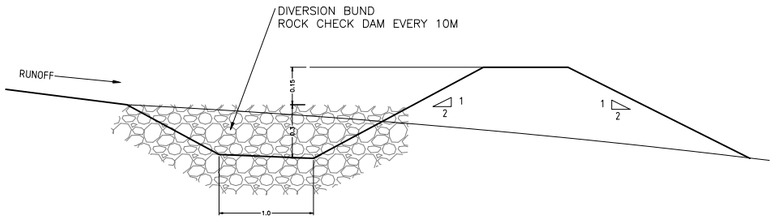
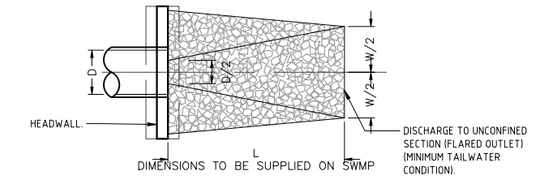


EARTH DIVERSION BANK CROSS SECTION

EARTH DIVERSION BANK CONSTRUCTION NOTES

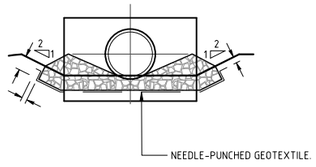
1. CONSTRUCT AT A GRADIENT BETWEEN 1 AND 5%
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE – WORK AROUND THEM
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V–SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. INSTALL ROCK DAMS MIN 10m OR AS REQUIRED
7. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITH 10 DAYS OF CONSTRUCTION.
8. WHERE DISCHARGING TO ERODIBLE LANDS, ENSURE THEY OUTLET THROUGH A PROPERLY CONSTRUCTED LEVEL SPREADER.
9. CONSTRUCT LEVEL SPREADER AT A GRADIENT OF LESS THAN 1%
10. WHERE POSSIBLE, ENSURE THEY DISCHARGE WATERS ONTO STABILISED AREA

ENERGY DISSIPATER FOR PIPE DISCHARGE



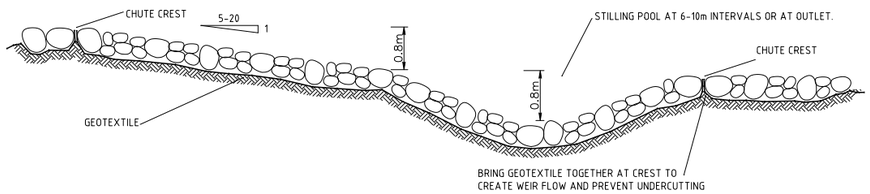
CONSTRUCTION NOTES

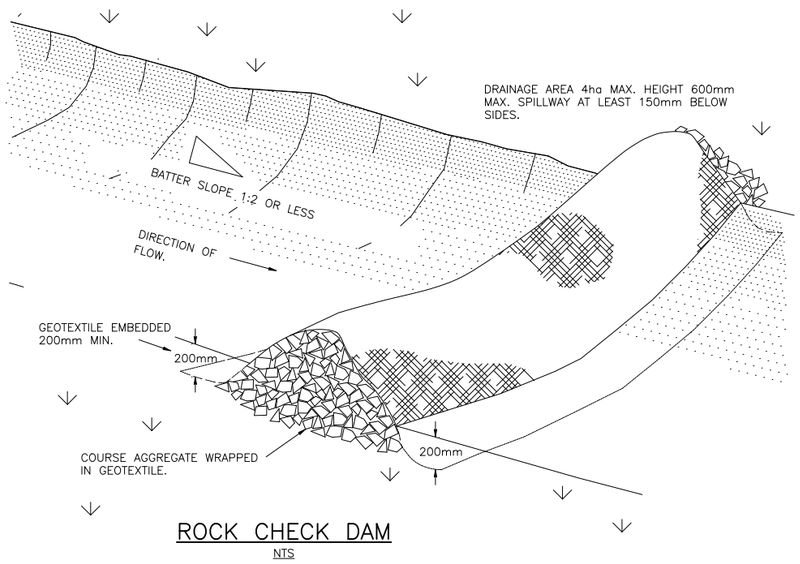
1. COMPACT THE SUBGRADE FILL TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL.
2. PREPARE A SMOOTH, EVEN FOUNDATION FOR THE STRUCTURE THAT WILL ENSURE THAT THE NEEDLE–PUNCHED GEOTEXTILE DOES NOT SUSTAIN SERIOUS DAMAGE WHEN COVERED WITH ROCK.
3. SHOULD ANY MINOR DAMAGE TO THE GEOTEXTILE OCCUR, REPAIR IT BEFORE SPREADING ANY AGGREGATE. FOR REPAIRS, PATCH ONE PIECE OF FABRIC OVER THE DAMAGE, MAKING SURE THAT ALL JOINTS AND PATCHES OVERLAP MORE THAN 300mm.
4. LAY ROCK FOLLOWING THE DRAWING, ACCORDING TO TABLE 5.2 OF LANDCOM (2004) AND WITH A MINIMUM DIAMETER OF 150mm.
5. ENSURE THAT ANY CONCRETE OR RIPRAP USED FOR THE ENERGY DISSIPATER OR THE OUTLET PROTECTION CONFORMS TO THE GRADING LIMITS SPECIFIED ON THE SWMP.



ROCK ARMOURING FLOW TRANSFER / DISCHARGE

WHERE FLOW TRANSFER GRADES EXCEED 5%, SURFACE ARMOURING (GENERALLY ROCK) IS RECOMMENDED.
ROCK ARMOURING SHOULD MATCH THE FOLLOWING SPECIFICATIONS:
1. SURFACE SHOULD BE GENERALLY SPOOTH AND FREE OF OBSTRUCTIONS
2. USE A NON WOVEN GEOTEXTILE, A64 BIDIM OR EQUIVALEN
3. USE A 150mm GRAVEL FOUNDATION BASE
4. PLACE APPROPRIATELY SIZED ROCK SUCH THAT ROCK INTERCONNECTS WELL TO CREATE A SECURE SURFACE.
5. ROCK SIZING SOULD RANGE FROM d50 ø250 FOR SLOPES OF 5% TO d50 ø800 FOR SLOPES UP TO 20%
6. ROCK DISTRIBUTION SHALL BE 0.5Xød50 FOR d15 ROCK TO 1.2Xd50 FOR D85 ROCK
7. ROCK LAYER THICKNESS IS 1.7 X d50.





ROCK CHECK DAM

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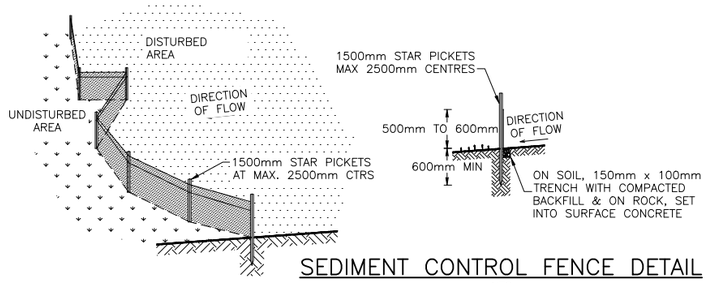
SEDIMENT COLLECTION AND RETENTION



SEDIMENT CONTROL FENCE DETAIL

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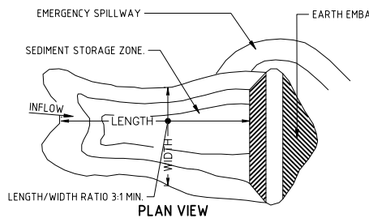
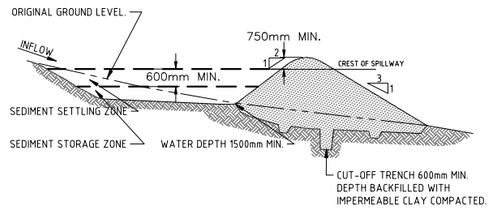
SEDIMENT FENCE CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10YR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1500mm LONG STAR PICKETS INTO THE GROUND AT 2500mm INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF–SUPPORTING GOETEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

EARTH SEDIMENT BASIN – WET (SD 6–4)





CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT–OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

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CLIENT: Eurobodalla Quarry	DRAWING NUMBER: 361-02	SCALE: NTS@20	SHEET: 02 /02	DESIGNED: LB	CHECKED: LB	DATE OF ISSUE: 08/05/2017	

REV	DESCRIPTION	BY	DATE	REV	DESCRIPTION	BY	DATE
A	BASINS ADJUSTED	BA	14/11/2017				