

Sutton Forest Quarries Pty Ltd

ABN 66 158 999 994

Sutton Forest Quarry

Documentation Supporting an Application for Director- General's Requirements

December 2013



Prepared by
R.W. CORKERY & CO. PTY. LIMITED

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COMMONLY USED ACRONYMS

CCC	Community Consultative Committee
DGRs	Director-General's Requirements
DP&I	Department of Planning & Infrastructure (NSW)
DRE	Division of Resources and Energy (NSW)
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
EPL	Environment Protection Licence
LEP	Local Environmental Plan
LGA	Local Government Area
NOW	NSW Office of Water
OEH	Office of Environment and Heritage (NSW)
SEPP	State Environmental Planning Policy

COMMONLY USED SYMBOLS AND UNITS

ha	hectare
km	kilometre
kph	kilometres per hour
m	metres
ML	million litres (megalitres)
tpa	tonnes per annum

SUMMARY OF KEY FACTS AND STATISTICS PROPOSED SUTTON FOREST QUARRY PROPOSAL

Applicant: Sutton Forest Quarries Pty Ltd.

Application Area/ Site: Quarry Area (50.8ha) / Quarry Access Road (5.7ha).

- Area of Disturbance
- Extraction Area (39.1ha).
 - Quarry Access Road (5.7ha).
 - Processing and Product Stockpile Area (6.1ha).
 - Temporary Silt Storage Area (4.4ha).
 - Water Storage Dam (1.2ha).

- Proposal Overview
- Proposal Life = up to 30 years (including construction and rehabilitation)
 - In situ Resource = approximately 25 million tonnes
 - Annual Sales = 700 000tpa (average) 1 000 000tpa (maximum).
 - Total Products Produced = approximately 21 million tonnes.
 - Access via Hume Highway/Sutton Forest Interchange/private Quarry Access Road.
 - Estimated employment = Construction (20)/Operations (20)
 - All quarry products despatched by road
 - Hours of Operation – see Table below (to be confirmed).

Activity	Monday to Friday	Saturday	Sunday
Site Establishment	7:00am to 10:00pm	7:00am to 6:00pm	-
Extraction Operations	6:00am to 10:00pm	6:00am to 6:00pm	-
Processing Operations	4:00am Monday to Midnight Friday	Midnight Friday to Midnight Saturday	-
Product Despatch	24 hours / day	24 hours / day	24 hours / day
Maintenance	24 hours / day	24 hours / day	24 hours / day
1. Activities beyond 6:00pm, Monday to Friday and 1:00pm Saturdays would be restricted to those that are not audible at surrounding residences.			

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1. INTRODUCTION

1.1 SCOPE

Sutton Forest Quarries Pty Ltd (the Applicant) proposes to develop and operate a sand extraction and processing operation “the Proposal” at 13302 Hume Highway, Sutton Forest (the Site) (see **Figure 1.1**). The Site is located west of the Hume Highway, approximately 1.7km southwest of the Sutton Forest Interchange.

This document has been prepared by R.W. Corkery & Co. Pty Limited in support of the Applicant’s request for Director-General’s Requirements for the Proposal from the DP&I. For the purposes of this document, the Proposal would involve:

- the development and operation of the sand extraction operation;
- the operation of a sand processing plant and management of process residues;
- the despatch of sand products; and
- progressive rehabilitation of the disturbed areas.

This document introduces the Proposal and provides information on the key environmental issues to be addressed in the design and assessment of the Proposal. The information provided will ultimately be incorporated into a comprehensive *Environmental Impact Statement* (EIS) to be prepared in accordance with the provisions of Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979*. The design and operational safeguards the Applicant would adopt to avoid or reduce potential impacts within the Site and the surrounding environment will also be provided in the EIS together with a description of the residual impacts and proposed monitoring to assess the ongoing environmental performance of the Proposal.

This document has been prepared for circulation to the Department of Planning and Infrastructure, other relevant NSW government agencies, Wingecarribee Shire Council and the local community.

1.2 THE APPLICANT AND THE SITE

1.2.1 The Applicant

The Applicant for the proposed Sutton Forest Sand Quarry Proposal is Sutton Forest Quarries Pty Ltd (ABN 66 158 999 994).

Mr Kevin Maloney is the sole director of the Applicant, Sutton Forest Quarries Pty Ltd, and also is a director of Tulla Resources Group Pty Ltd, which is the sole shareholder of the applicant. The Tulla Group is a major investor in resources in Australia and overseas. Mr Maloney has a long history of involvement in the resources industry ranging from project financing, executive management and equity ownership. He has had direct management responsibility for sand and gravel quarries in both New South Wales and Queensland.



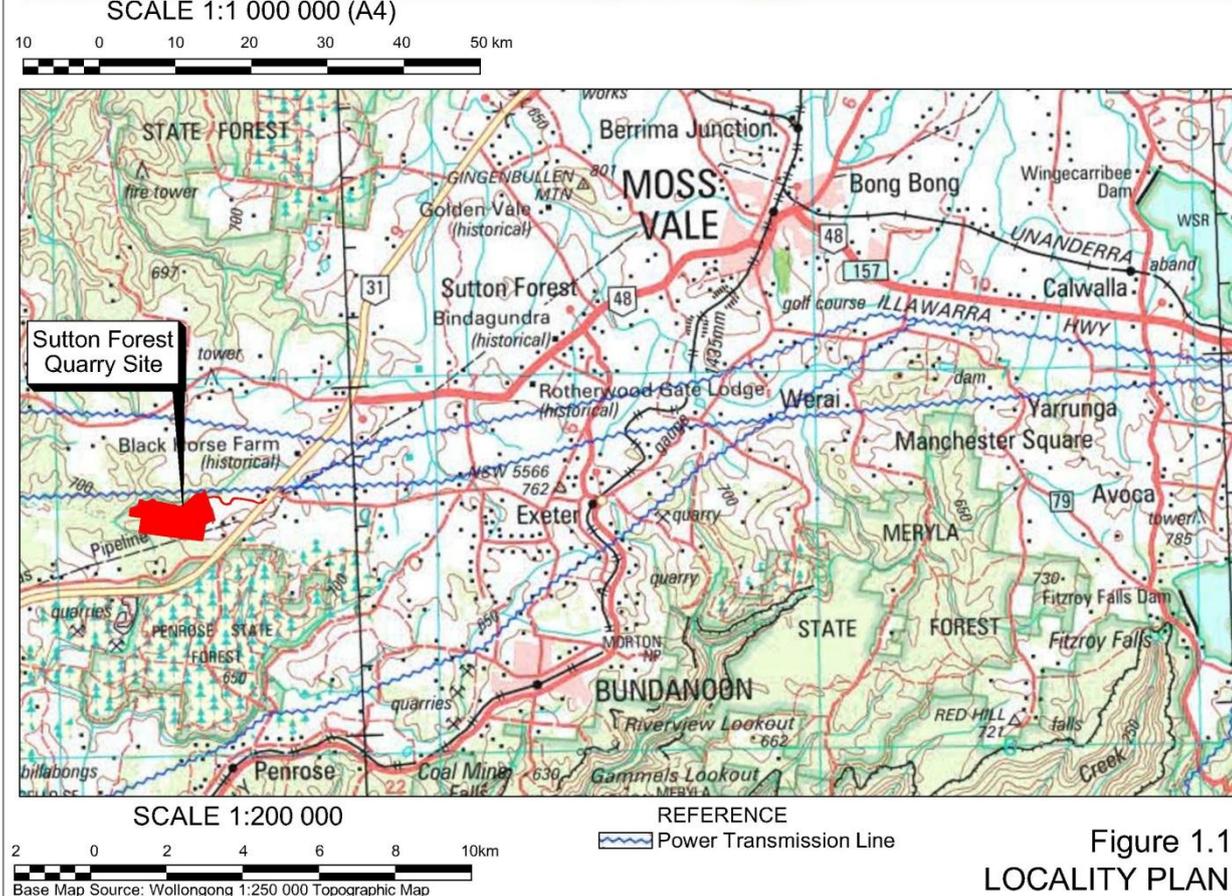
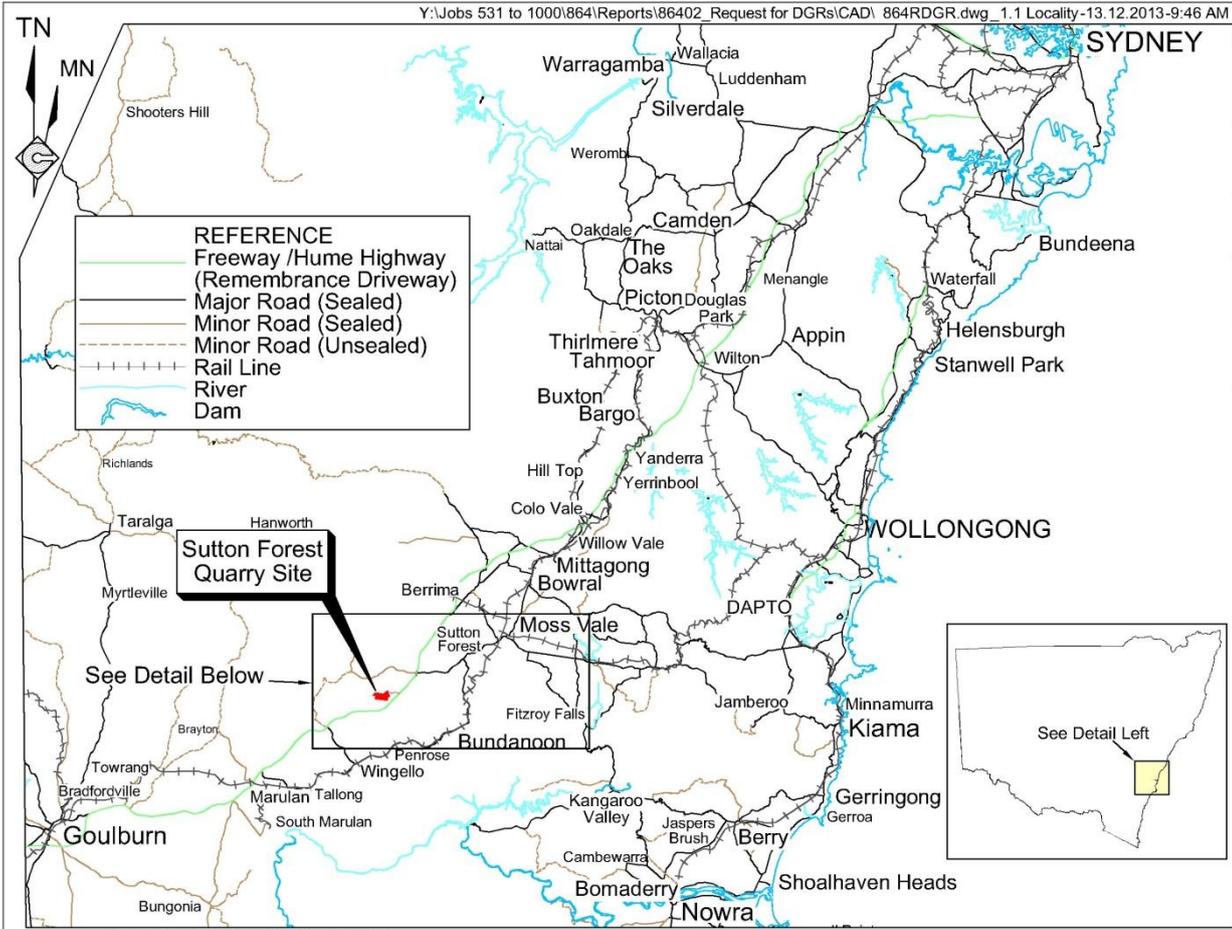


Figure 1.1
LOCALITY PLAN



The Applicant has entered into an agreement with the owner of Lot 4 DP253435 that enables it to lease a substantial proportion of the property, allowing for the extraction and processing of the defined sand resource on the property. Access to the Quarry Area would be via Lots 1, 2 and 3 Lot 253435, where leases are held by the Applicant across the subject lots.

1.2.2 The Site

The Site is located west of the Hume Highway, approximately 1.7km southwest of the Sutton Forest Interchange. For the purposes of the Proposal, the Site comprises the “Quarry Area” and “Quarry Access Road”. The Site is privately owned and comprises parts of Lots 1, 2, 3 and 4 DP 254435 i.e. the areas of the property required for access, extraction and processing, infrastructure and water management. **Figure 1.2** displays the boundary of the Site and component areas.

The Site was selected due to its proximity to the Hume Highway and the Sutton Forest Interchange, as well as the viable resource much of which occurs above the regional groundwater table. The exact area covered by the Site will be presented in the EIS following the completion of the design of the Proposal and assessment of environmental impacts.

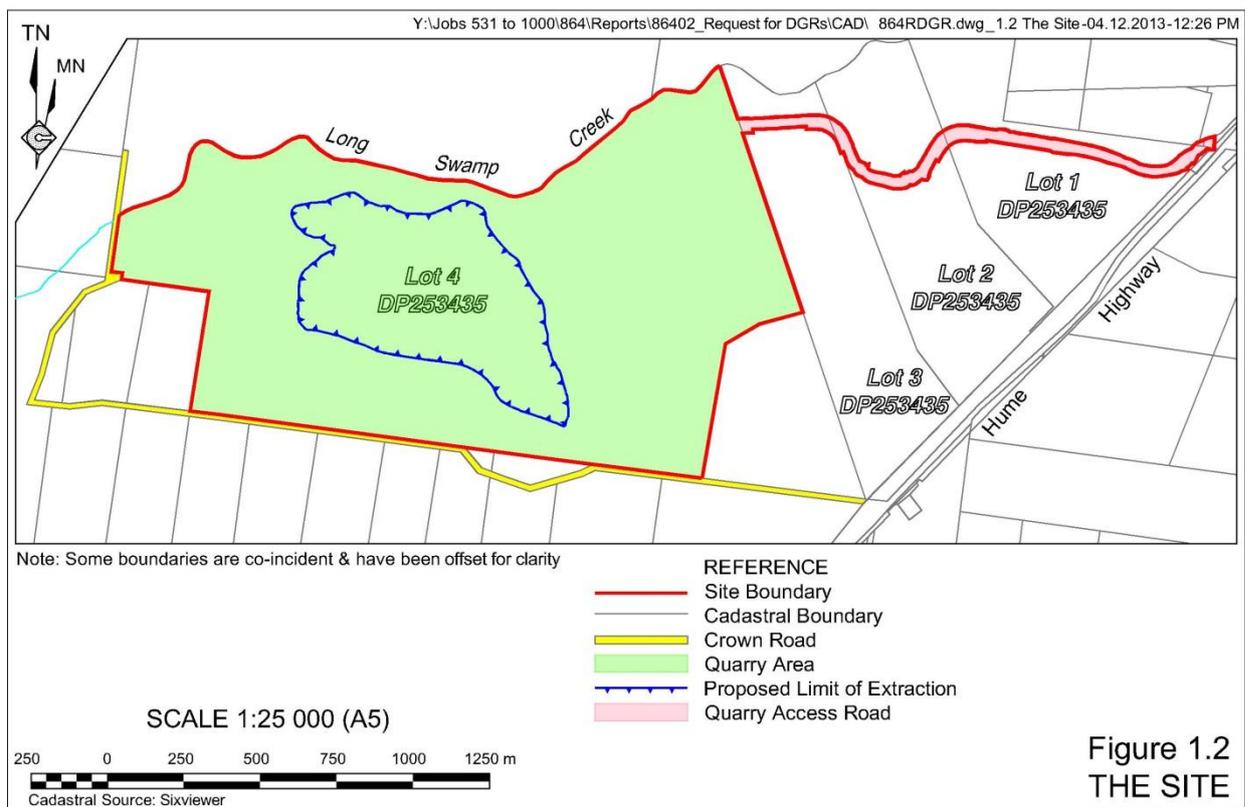


Figure 1.2
 THE SITE

1.3 PROPOSAL BACKGROUND

Sydney consumes an average of approximately 6 million tonnes of construction sand annually, approximately two-thirds of which is fine to medium-grained sand. The major uses of fine to medium-grained sand are for concrete manufacture, mortar for bricklaying, roof tile and fibre cement manufacture, plastering and production of concrete products e.g. blocks, culverts, pipes etc. The price and demand for particular types of sand are determined by use and distance from the source to the market.

Historically, the bulk of Sydney's fine sand has been supplied from Kurnell Peninsula (up to 1.5Mtpa) and Penrith Lakes (up to 0.6Mtpa). Of these, the production of fine sand from Penrith Lakes has ceased and it is noted that production of coarse sand from Penrith Lakes is likely to cease in about 2014. As the supply of coarse sand diminishes from Penrith Lakes, greater reliance is being placed by the concrete industry upon the use of "manufactured sands", i.e. fine materials <5mm in size produced from hard rock crushing operations. However, for technical as well as economic reasons, natural fine to medium-grained sand will still need to be blended with such products in the manufacture of concrete. The fine to medium-grained sand for the Sydney Market is currently supplied from sources at Maroota, the Sommersby Plateau and Newnes Plateau. The supply of fine-grained sand from Kurnell Peninsula is likely to cease before the end of the current decade.

1.4 CONSULTATION

The Applicant has commenced a program of consultation with local landowners, community (including Aboriginal) stakeholders and relevant government agencies. This process has included the distribution of information relating to the proposal to all adjoining landowners, and, where possible, meeting with these landowners to discuss the Proposal. The Applicant recognises that consultation is an ongoing process, and will continue to liaise with all relevant parties throughout the preparation of the EIS.

1.5 MANAGEMENT OF INVESTIGATIONS

The preparation of this document has involved a study team managed by Mr Rob Corkery, M.Appl.Sc., B.Sc (Hons), Principal of R.W. Corkery & Co Pty. Limited, assisted by Mr David Schumacher, B.Soc.Sc (Hons), Environmental Consultant with the same company. Mr Corkery, assisted by Mr Schumacher, will also manage the preparation of the EIS for the Proposal.

Strong emphasis has been, and will continue to be, placed upon a multi-disciplinary team approach to the design of the Proposal, the description of the existing environment, identification of key issues, development of appropriate mitigation measures and management controls and assessment of impacts.

The following specialist consultancies have been commissioned to undertake an initial assessment of the existing environment and potential constraints posed by the Proposal.

- Landskape Natural and Cultural Heritage Pty Limited and formerly Artefact Heritage Pty Ltd – Aboriginal Heritage Assessment.
 - Dr Matt Cupper, PhD (Landskape).
 - Ms Sandra Wallace, PhD (Artefact).
- Kevin Mills & Associates in association with Lesryk Environmental Consultants – Flora and Fauna Assessment.
 - Dr Kevin Mills, PhD, B.Sc (Hons); and
 - Mr Deryk Engel, B.Env.Sc (Hons).
- Larry Cook Consulting – Hydrogeological Assessment.
 - Mr Larry Cook, M.App.Sc., M.Sc.
- Spectrum Acoustics – Noise Assessment.
 - Dr Neil Pennington, PhD, B.Sc. (Physics), B.Math (Hons)).
- SEEC Morse McVey – Surface Water and Soils Assessment.
 - Mr Mark Passfield, B.Sc. (Hons) – Engineering Geology and Geotechnic.
- Pacific Environments Pty Limited – Air Quality Assessment.
 - Ms Justine Firth B.Sc. (Hons) Grad.Dip. Env. Law.
- GHD Pty Ltd – Road Design.
 - Mr Michael Lyons, Civil Engineering Diploma.
- GHD Pty Limited – Traffic Assessment.
 - Mr Edward Baird, B.Eng. (Civil).

The results of the preliminary studies from each of the above consultancies have been incorporated into this document.

Mr Greg Todd of Southern Region Land Engineering Pty Limited has undertaken a preliminary design of the Quarry Access Road.

Once confirmation of the key issues to be assessed is established through receipt of Director-General's Requirements (DGRs) for the EIS, these consultancies will complete their respective assessments of impacts and provide recommendations for necessary design and operational safeguards for inclusion in the Proposal This would then enable the Applicant to finalise its Proposal for assessment.

2. OVERVIEW OF THE PROPOSAL

2.1 OBJECTIVES

The Applicant's principal objectives for the Proposal centre upon:

- i) securing access to sand resources that would provide a range of construction materials to the Sydney and Southern Highlands construction markets at a market-competitive price;
- ii) providing for a level of production from the Proposal that would supply up to 1 000 000 tonnes per annum (tpa) of sand products to meet the supply demands of these markets particularly as production is reduced or ceases at other sand sources;
- iii) maximising the recovery of the natural resource;
- iv) progressively rehabilitating disturbed areas to provide for future agricultural and nature conservation land uses at the completion of operations;
- v) increasing local employment levels; and
- vi) operating the quarry in a cost efficient and environmentally responsible manner.

The sand produced would contribute significantly towards meeting the predicted requirements for this important construction material for the building and construction industry in the southern and western sectors of the Sydney Metropolitan Area, the Illawarra, Southern Highlands and surrounding areas. These broad objectives would be achieved by:

- i) planning, extraction and processing the sand resource in a manner that maximises the quality and quantity of materials removed;
- ii) undertaking all activities in an environmentally responsible manner that enables compliance with all relevant statutory requirements;
- iii) planning and operating all activities in consultation with surrounding residents and the wider community; and
- iv) monitoring and reviewing the operational and environmental performance of all activities.

2.2 GEOLOGY AND RESOURCES

The sand resources beneath the Quarry Area are located within the Hawkesbury Sandstone, a unit deposited during the Triassic Period (195 to 225 million years ago). The Hawkesbury Sandstone is the predominant sandstone unit outcropping within and around Sydney. It is noted that the Site is located close to the southwestern extremity of the outcrop of the Hawkesbury Sandstone. The sandstone is sufficiently friable such that the sand grains are relatively easily disaggregated through a combination of extraction and processing operations.

Based on the results of a drilling program, the Hawkesbury Sandstone beneath the Quarry Area principally comprises friable, variously pale coloured sands with minor thin pale greyish coloured clay, with darker grey shale interbedded at the base of some of the drill holes.

The proposed extraction area, as shown on **Figure 2.1**, has been defined based upon the occurrence of friable sandstone within the area that is both practical and environmentally responsible to extract. An estimated 24 million tonnes of friable sandstone occurs within the proposed extraction area. There is virtually no overburden within the proposed extraction area as the friable sandstone lies directly beneath the skeletal soil where it is present.

In addition to extracting the sand resources defined within the extraction area, the Applicant proposes to recover additional friable sandstone within the footprint of the processing area / product stockpile area and the Quarry Access Road. Approximately 1.2 million tonnes of raw sand would be recovered from these areas. Collectively, the total quantity of in situ friable sandstone that would be recovered throughout the life of the Proposal is approximately 25 million tonnes.

2.3 QUARRY AREA LAYOUT

Figure 2.1 displays the layout of the main components within the Quarry Area, which includes the following components.

1. Extraction area (39.1ha).
2. Processing area (2.9ha).
3. Product stockpile area (3.2ha).
4. Water storage dam (1.2ha).
5. Temporary silt storage facility (4.4ha).
6. Quarry access road (5.7ha).

Overall, the combined indicative area of disturbance within the Quarry Area would cover approximately 56.5ha.

2.4 EXTRACTION OPERATIONS

Extraction would involve a rip, push, load and haul operation with the following activities undertaken.

- i) The vegetation in each defined extraction stage would be cleared progressively by bulldozer and/or excavator and pushed up into designated areas adjoining the extraction stage. Any millable timber, i.e. logs of diameter >300mm would be stockpiled separately and removed from site. Other large logs would be potentially used for fauna habitat or sold as firewood or other uses. Any unusable vegetation would be mulched.

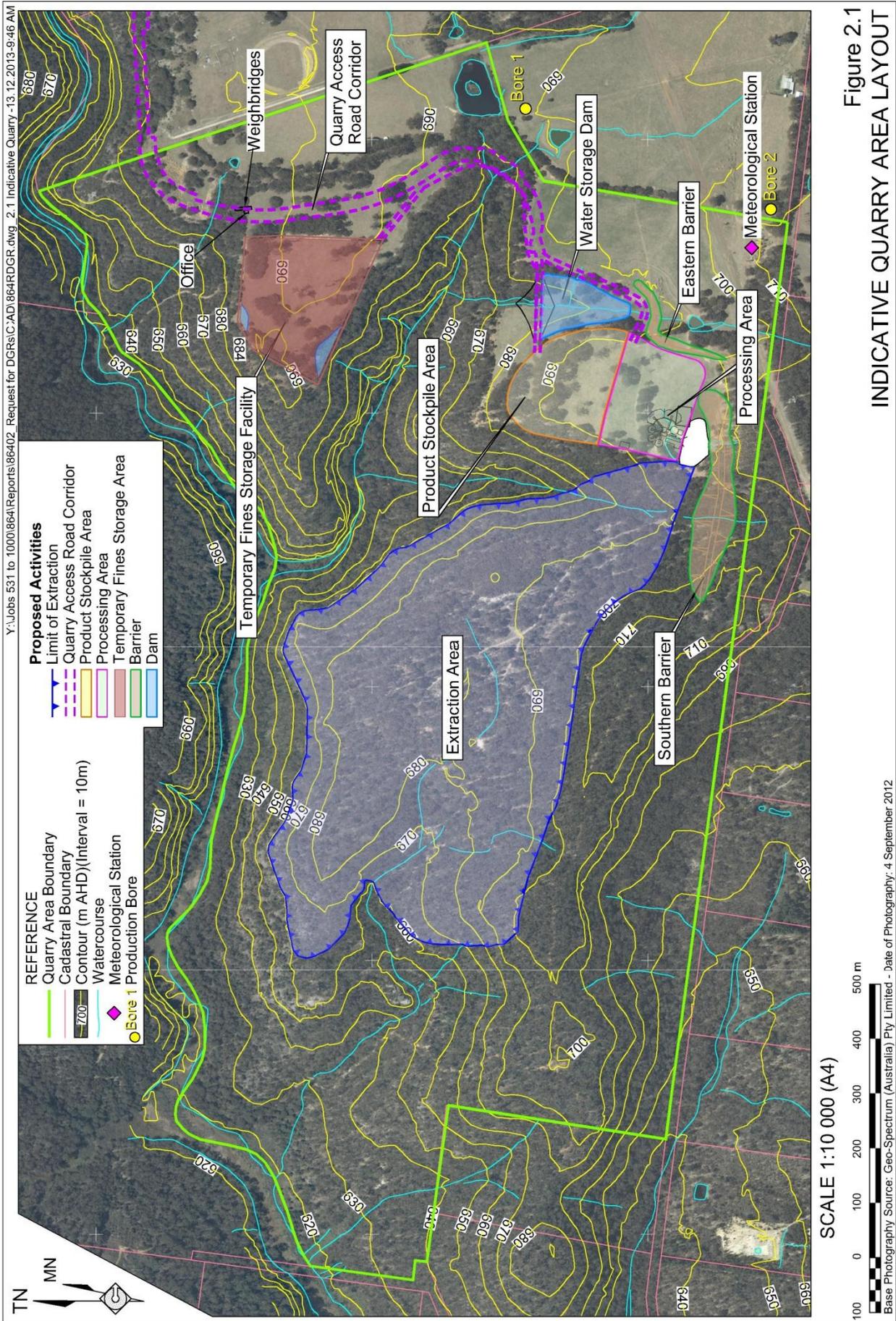


Figure 2.1
 INDICATIVE QUARRY AREA LAYOUT

- ii) Topsoil and subsoil, where present, would be stripped to depths determined by the soil structure and other physical and chemical characteristics and stockpiled for future use in rehabilitation activities within the extraction area. Soil stockpiling would occur largely in areas within the footprint of disturbance. As the extraction area is further developed, emphasis would be placed upon directly transferring the soils and vegetative material removed from one area of extraction to a completed section or final benches awaiting revegetation.
- iii) The exposed friable sandstone would be cross-ripped using the tynes of a bulldozer and pushed up into operational stockpiles.
- iv) The ripped and pushed-up friable sandstone would be loaded into haul trucks by an excavator or front-end loader and transported to the processing area.

Extraction would initially commence with the extraction and stockpiling of raw materials from the processing area. It is envisaged that up to approximately 110 000m³ of this material would be used to construct the southern and eastern barriers, with the remainder being stockpiled and processed. The exact quantity required for the barriers would reflect their final design.

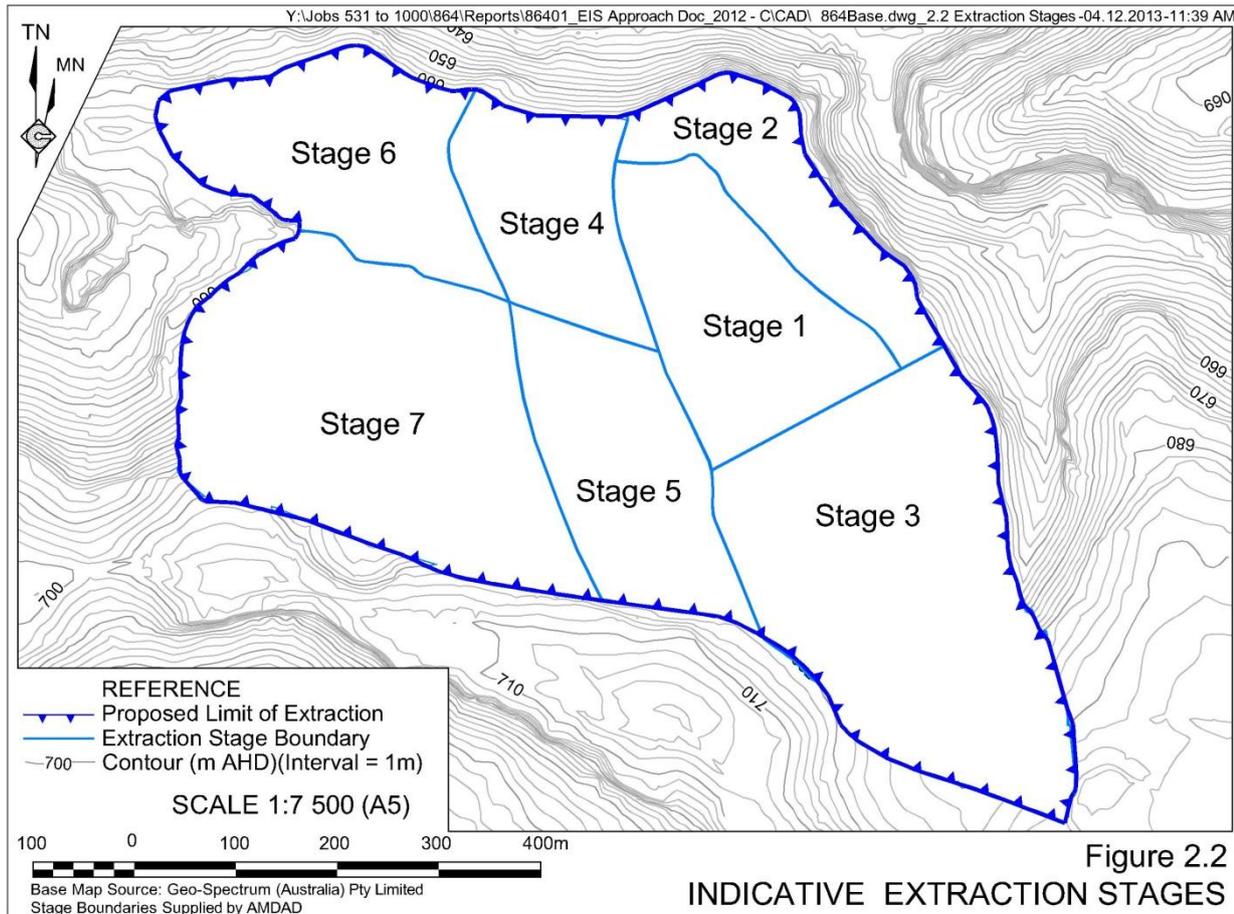
Figure 2.2 displays the boundaries of the seven stages of extraction within the extraction area. Extraction would commence in Stage 1 at an annual rate of approximately 230 000t¹ in the first year increasing to up to a maximum of 1 150 000tpa within 5 years. The maximum production level would be approached during periods of high demand from the construction and building industry. For planning purposes, the Applicant anticipates that the annual sales from the quarry would be approximately 700 000tpa. This would equate to an annual extraction rate of approximately 800 000tpa.

2.5 PRODUCTS, PROCESSING OPERATIONS AND STOCKPILES

A range of plant and equipment would be installed / constructed to process the extracted raw sand to produce quality sand products meeting nominated Australian standards and customers' individual specifications. The principal products produced would be various grades of washed sands and various mortar sand products (of different colours). Small quantities of oversize materials (i.e. >6.75mm) would be produced and sold for a range of uses.

It is currently proposed that the key processing equipment would be a concrete sand plant involving washing, screening, dewatering and product stockpiling beneath radial stackers. The plant would be designed to produce up to 300tph which in turn would be capable of producing up to 1 000 000tpa of various washed sand products. Dependent upon product specifications, the sand would be washed either once or twice. The concrete sand plant would be located at the southern end of the processing area shown on **Figure 2.1** with access directly from the extraction area.

¹ The quantity of raw sand extracted would be approximately 15% higher than the annual sales as 15% of the raw sand comprises silts that would be removed during processing and retained on Site. Hence, for example 230 000 tonnes of raw sand would yield approximately 200 000tpa of sand products.



The Applicant also proposes to produce a range of mortar sand products with a mobile processing plant located close to the active extraction area. At times, the mortar and sand plant would be operated within the processing area.

Sand products accumulating within the processing area would be relocated by front-end loader and/or haul truck to the dedicated product stockpile area north of the processing area (see Figure 2.1).

2.6 RESIDUAL FINES MANAGEMENT

The raw sand comprises approximately 15% of fines that need to be removed by washing to produce sand products suitable for concrete manufacture. The processing plant would incorporate a series of filter presses to maximise the amount of water able to be recycled. The filter presses would produce a filter cake consisting of the residual fines and approximately 10% water. The fines would be predominantly comprised of silt with a small proportion of clay.

The filter cake produced would initially be managed through storage in a temporary fines storage area north-northeast of the processing area (see **Figure 2.1**). Once extraction is sufficiently advanced, the filter cake would be placed directly within completed sections of the extraction area. The filter cake would be transported to the extraction area using haul trucks on their return trip for the processing plant (i.e. backloading). The filter cake would be used in the progressive rehabilitation of the extraction area. The filter cake from the temporary fines storage area would also be progressively transported to the completed sections of the extraction area.

2.7 PRODUCT TRANSPORTATION

The Site is well situated close to the Hume Highway and in close proximity to the Sutton Forest Interchange, which would be used by all quarry-related traffic to access the Site. **Figure 2.3** displays the alignment and two representative sections along the Quarry Access Road. The road would be constructed to carry trucks up to 19m in length at speeds up to 70kph. The Quarry Access Road alignment has been selected to either minimise impacts upon the occupants of Lots 1, 2 and 3 DP 254435 and/or to provide sufficient area for road-side barriers to limit noise impacts from trucks travelling to and from the Quarry Area.

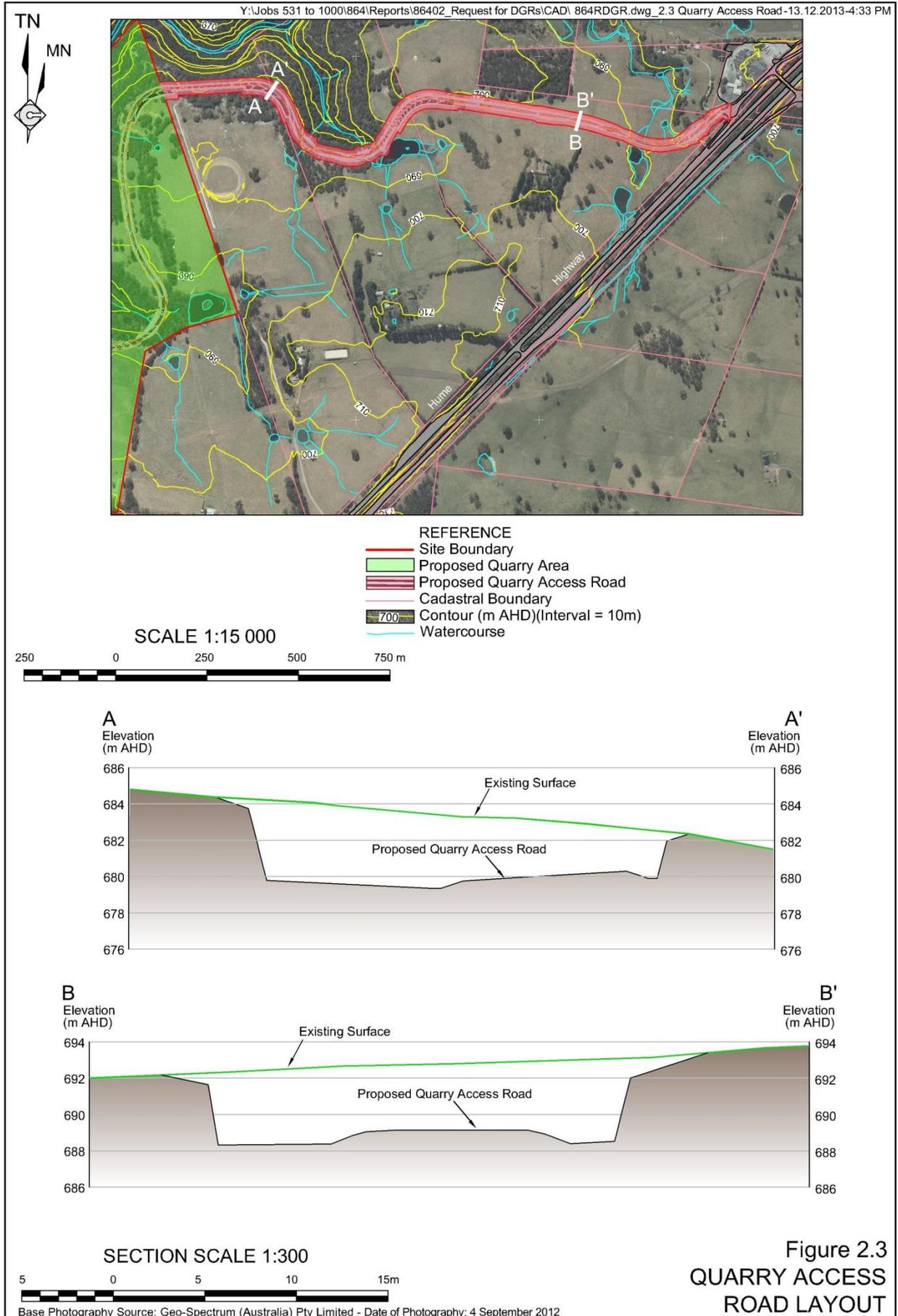
Product trucks entering and leaving the quarry would be typically rigid trucks with dog trailers or semi-trailers, usually of 25t to 33t capacity. Larger capacity B-double trucks may be used from time to time to transport products from the site. A small number of the small capacity trucks of 12t to 18t may also transport products from the quarry for local users. For the purposes of calculating annual, daily or hourly truck movements, an average load of 30t has been assumed.

The bulk of the traffic would travel to and from the Site between 4:00am and 4:00pm. On some occasions, customers may require deliveries before and after this core period. The average number of truck movements per day entering and exiting the Site would be approximately 156 (78 loads) (at 700 000tpa) and 224 movements (112 loads) (at 1 million tpa). Given the variability in sales, it is likely, however, the 85th percentile of daily truck movements on a busy day would be approximately 224 (112 loads) and 284 (142 loads) for the annualised rates of 700 000tpa and 1 million tpa respectively.

The majority of truck movements would occur during periods to avoid the Sydney peak periods and to meet the supply demands of customers in Sydney and the Southern Highlands. From an hourly perspective, it is envisaged the busiest period would be between 4:00am and 6:00am with up to 50 truck movements (25 loads) per hour. The number of truck movements outside the core hours may vary between 8 and 16 per hour, i.e. between 4 and 8 loads per hour.

2.8 INFRASTRUCTURE, UTILITIES AND SERVICES

Site operations would require a site office, car park, laboratory, lunchroom, two weighbridges, fuel storage workshop, and first-aid and ablutions facilities. During the site establishment phase, all electrical power on site would be generated by diesel-fuelled generators. The bulk of the Site would be progressively converted to the use of mains power.



Water required for sand processing and dust suppression would be drawn principally from surface water supplies. The Applicant would rely upon water stored in the dams on Lots 2 and 4 (totalling approximately 20ML) and the water storage dam immediately east of the product stockpile area shown in **Figure 2.1**. If necessary, water would be pumped from one or both of the existing groundwater bores within the Quarry Area to source water from aquifers within the Hawkesbury Sandstone during periods when reliance cannot be placed on the use of surface water.

All sewage effluent generated on site would be treated and disposed of on site. Disposal of treated effluent would rely on surface or near-surface methods where evapotranspirative processes are dominant rather than on subsurface absorption-style methods.

Diesel fuel would be stored on site in double-skin above-ground tanks located adjacent to the workshop. A small covered bunded area would be constructed at the rear of the workshop to store all hydrocarbon drums when not in use.

All chemicals used on site would be stored within the workshop area in designated storage areas and cupboards in accordance with relevant Australian Standards and manufacturers' specifications. Material safety data sheets would be maintained for all chemicals used / stored on site.

2.9 HOURS OF OPERATION AND PROPOSAL LIFE

Table 2.1 lists the proposed hours of operation. These hours represent the full band width that the proposed activities would operate within. In reality, extraction and processing operations would occur within the core hours of 6:00am to 6:00pm and 4:00am to 4:00pm for product despatch. It is recognised that the exact hours of operation would be established following the noise assessment of the proposed activities.

Table 2.1
Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday
Site Establishment	7:00am to 10:00pm	7:00am to 6:00pm	-
Extraction Operations	6:00am to 10:00pm	6:00am to 6:00pm	-
Processing Operations	4:00am Monday to Midnight Friday	Midnight Friday to Midnight Saturday	-
Product Despatch	24 hours / day	24 hours / day	24 hours / day
Maintenance	24 hours / day	24 hours / day	24 hours / day
2. Activities beyond 6:00pm, Monday to Friday and 1:00pm Saturdays would be restricted to those that are not audible at surrounding residences.			

At the proposed rate of extraction and processing, the overall operational life of the Sutton Forest Quarry would be approximately 30 years.

2.10 REHABILITATION

2.10.1 Rehabilitation Objectives

The Applicant's objectives for rehabilitation are centred upon the progressive shaping and revegetation of areas of disturbance through the creation of a final landform, soil substrate and vegetative cover suitable for grazing activities and passive nature conservation in selected areas. The specific objectives for the long term rehabilitation program are to:

- blend the created landforms and vegetation established on the post-extraction landform with that of the surrounding topography; and
- provide a low maintenance, geotechnically stable and safe landform with minimal erosion, particularly within the extraction area.

The Applicant would also implement a program of interim rehabilitation of disturbed/constructed areas in order to:

- reduce the visibility of extraction and overburden placement activities from surrounding properties and the local road network;
- where possible, conserve all topsoil and if not immediately used in rehabilitation, stockpile in an appropriate manner and location;
- minimise the areas of exposed surfaces that would otherwise be potential sources of windblown dust; and
- ensure interim slopes are stable.

2.10.2 Extraction Area

The rehabilitation of the extraction benches would involve the profiling of each bench to ensure drainage flows toward the western corner batters of the extraction area where a long-term water storage dam would be constructed. Up to 0.5m of overburden and/or oversize material, possibly with previously cleared vegetation, would be used to cover the final benches and reprofiled landform within the floor of the extraction area and provide the ideal microclimate for hydro-seeding or hand seeding with either grass or native species, dependent on the final land use.

2.10.3 Processing Area, Quarry Infrastructure and Services

All infrastructure associated with the processing plant would be removed at the end of quarry life. It is proposed that the hardstand surface be ripped and returned for use for agricultural purposes.

2.11 BIODIVERSITY OFFSET

The Applicant will commission a suitably qualified ecologist to assess the requirements for a biodiversity offset.

Details of the proposed biodiversity offset will be presented in the EIS.

2.12 ALTERNATIVES CONSIDERED

The Applicant has examined a range of alternatives before deciding upon the Proposal as presented within this document.

Method of Extraction

Given the nature and location of the sand resource at or near the surface, open cut methods were determined to be the only feasible means of extracting the identified resource.

Limit of Extraction

The Applicant originally considered a larger extraction area, particularly to the east of the area proposed. The eastern area was retained for use as a product stockpile area.

Transport Options

Access to the Site via a new interchange with the Hume Highway has been considered by the Applicant. However, given the proximity to the existing Sutton Forest Interchange and the prohibitive costs associated with the construction of a new interchange, transport via the Sutton Forest Interchange is considered to be the only feasible option, albeit with the incorporation of a few minor modifications to the interchange.

Extraction Area

The Applicant inspected a range of potential sand quarry sites in the Wingello-Penrose area, as documented by Mason (1995) which identified large resources of friable sandstone in the area, however, so sites on the southeastern side of the Hume Highway were considered suitable given the need to construct a new interchange with the Hume Highway to obtain access to the Highway.

3. PLANNING ISSUES AND PERMISSIBILITY

3.1 COMMONWEALTH PLANNING ISSUES

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are collectively referred to as Matters of National Environmental Significance (NES).

Under the EPBC Act, if a proposal has the potential to have a significant impact on a Matter of NES, it is required to be referred to the Commonwealth Department of the Environment for assessment as to whether it represents a 'controlled action' and therefore requires approval from the Minister for the Environment.

It is considered unlikely that the Proposal would impact on any threatened species of flora and fauna listed under the EPBC Act, and referral to the Minister for the Environment would not be required.

3.2 STATE PLANNING ISSUES

As an extractive industry, the Proposal is identified as State Significant Development under Schedule 1 (7(a)) of *State Environmental Planning Policy (State and Regional Development) 2011* by virtue of having an annual rate of extraction exceeding 500 000tpa and a resource in excess of 5 million tonnes.

In addition to this, the following SEPPs have been considered as potentially applying to the Proposal or over the Site.

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

This SEPP was gazetted in recognition of the importance to New South Wales of mining, petroleum production and extractive industries. The SEPP specifies matters requiring consideration in the assessment of any mining, petroleum production and extractive industry development, as defined in NSW legislation. A summary of the matters that the consent authority needs to consider when assessing a new or modified proposal is as follows.

- Clause 12: Compatibility of proposed development with other land uses.
- Clause 13: Compatibility of proposed development with mining, petroleum production or extractive industry.
- Clause 14: Natural resource management and environmental management.
- Clause 15: Resource recovery.
- Clause 16: Transportation.
- Clause 17: Rehabilitation.

An assessment of how each of these clauses is addressed with respect to the Applicant's Proposal will be provided within the EIS.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33)

Hazardous and offensive industries, and potentially hazardous and offensive industries, relate to industries that, without the implementation of appropriate impact minimisation measures, would, or potentially would, pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment. A risk screening of the Proposal will be performed in accordance with the document entitled *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (DP&I, 2011). However, as the only hazardous substances and dangerous goods to be used or stored on the Site would be restricted to well managed diesel fuel and other hydrocarbon products, the Proposal is unlikely to be classified as a hazardous or potentially hazardous industry.

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44)

Wingecarribee Local Government Area is identified in Schedule 1 of this policy as an area that could provide habitat for Koalas. An investigation was carried out to determine if the Site represents core or potential Koala habitat. This investigation established that there is no potential Koala habitat within the Site.

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)

SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. In particular, this policy requires consideration of whether a development requires a consent for remediation works or not and, where warranted, requires that remediation works meet certain standards and notification requirements.

As the areas proposed for disturbance within the Site have previously been used only for grazing cattle, it is highly unlikely any contamination is present that requires remediation work prior to undertaking the proposed extraction operations.

3.3 LOCAL PLANNING ISSUES

The Site is located on land zoned Environmental Management (E3) under the Wingecarribee Local Environmental Plan 2010 (LEP). The objectives of the zone are listed as follows.

- *To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.*
- *To provide for a limited range of development that does not have an adverse effect on those values.*
- *To encourage the retention of the remaining evidence of significant historic and social values expressed in existing landscape and land use patterns.*
- *To minimise the proliferation of buildings and other structures in these sensitive landscape areas.*

- *To provide for a restricted range of development and land use activities that provide for rural settlement, sustainable agriculture, other types of economic and employment development, recreation and community amenity in identified drinking water catchment areas.*
- *To protect significant agricultural resources (soil, water and vegetation) in recognition of their value to Wingecarribee's longer term economic sustainability.*

Under the LEP 2010, extractive industries within the E3 Zone are prohibited, however, it is noted that the proposed extractive industry is a permissible use in accordance with the provisions of Clause 7(3)(a) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* which states that:

“(3) Development for any of the following purposes may be carried out with development consent:

(a) extractive industry on land on which development for the purposes of agriculture or industry may be carried out (with or without development consent)”

Given that agricultural activities are permitted without consent in the E3 Zone, the Proposal is considered to be able to be carried out with development consent issued under Part 4 (Division 4.1) of the EPA Act.

4. ENVIRONMENTAL FEATURES AND PRELIMINARY ASSESSMENT

4.1 IDENTIFICATION OF KEY ISSUES (PRELIMINARY RISK ASSESSMENT)

Risk is the chance of something happening that will have an impact upon the objectives or the task, which in this case is the construction and operation of the Sutton Forest Quarry without unacceptable environmental impact. Risk is measured in terms of consequence (severity) and likelihood (probability) of the event happening.

As part of a preliminary environmental risk assessment, and in accordance with Australian and International Standards HB 203:2012, HB 89:2012 and IEC/ISO 310101 2009, environmental parameters that could be affected by the Proposal were identified. Risk sources, potentially affected receptors or environments, potential consequences and specific potential impacts were then identified. A review of the proposed operations, the local environment and other factors was undertaken to identify the likely consequence and likelihood of each potential environmental impact.

The determination of consequence was based on the definitions contained in **Table 4.1**. It is noted that the assigned consequence rating represents the highest level applicable, i.e. if a potential impact is assigned a level of 4 - Major based on cost of remediation and 2 - Minor based on area of impact, the consequence level assigned would be 4 - Major. The likelihood or probability of each impact occurring was then rated according to the definitions contained in **Table 4.2**.

The risk associated with each environmental impact was assessed **without** the inclusion of any specific operational controls or systems, mitigation measures or other safeguards in place (other than standard environmental management practices). Based on the assessment of consequence and likelihood, an overall risk ranking of Negligible, Minor, Moderate, Major or Severe was assigned to each potential impact based on the matrix of **Table 4.3**.

The four levels of risk that have been identified for this Proposal are defined as follows.

- Low (L): can be managed by routine procedures and unlikely to require specific application of resources.
- Medium (M): can be managed to minimise the potential for environmental harm by the implementation of specific monitoring programs and response procedures. Responsibility for the implementation of monitoring and management activities must be specified.
- High (H): requires the development of specific management or action plans identifying specific monitoring, trigger levels for contingency management and specification as to the roles and responsibilities of personnel to implement contingency management. Senior executive management attention is required to ensure appropriate resources are available to manage this risk.

- Very High (VH): presents a risk which may not be able to be satisfactorily managed by the development and implementation of management plans. Board attention needed to identify alternative methods of operation to reduce the risk to a level where it can be satisfactorily managed.

Table 4.1
Qualitative Consequence Rating

Level	Severity Level	Consequence Types						
		Financial	Health and Safety	Natural Environment	Social /Cultural Heritage	Government Regulation	Public / Community Relations	Legal
1	Negligible	<\$10 000	No injury or review required	Minor impact on biological or physical environment	Minor social issues, repairable damage	Minor incident (Non-reportable) (passes the 'no material harm' assessment)	Minor adverse local public or media attention or complaints	
2	Minor	\$20 000 - \$100 000	First aid treatment required but no lost time or restricted duties	Short-term impact not affecting ecosystem functions	Minor medium-term social impacts on local population. Mostly repairable	Reportable incident (administrative or with minimal material harm) (minimal threat of action by regulator)	Attention from media and/or heightened concern by local community	Isolated complaint / incident with a threat of legal action
3	Moderate	\$100 000 - \$1M	Medical treatment leading to lost time or restricted duties	Short term impairment of ecosystem affecting function	On-going social issues, damage to items of cultural significance	Reportable incident (notable material harm or repeat of previous incident) (real threat of action by regulator)	Adverse media / public / NGO attention	Significant level of complaints / incidents with a high threat of legal action
4	Major	\$1M-\$5M	Hospitalisation required leading to permanent injury	Medium term impairment of an ecosystem	Significant social issues, significant damage to structures / items of cultural significance	Reportable incident (major material harm) (action by regulator almost certain)	Major public embarrassment /adverse media coverage	Serious breach of regulation leading to litigation
5	Severe	>\$5.0M	Fatality	Long-term impairment of ecosystem	On-going serious social issues, major permanent impact to cultural and heritage sites	Reportable incident (extensive material harm) (severe action by regulator almost certain)	Serious public or media outcry (national coverage) /major reputation impact	Significant prosecution and fines, litigation including class action

Source: Rating modified after HB 89:2012 and HB 203:2012

Table 4.2
Qualitative Likelihood Rating

Level	Descriptor	Description
A	Certain	Is an ongoing occurrence or will occur under all conditions
B	Almost Certain	Is expected to occur in most circumstances
C	Likely	Will probably occur in most circumstances
D	Possible	Will probably occur under favorable circumstances
E	Unlikely	May occur, but only under favorable circumstances
F	Rare	Not expected to occur, unless subject to exceptional circumstances
G	Very Rare	Theoretically possible but not expected to occur

Source: Rating modified after HB 89:2012 – Figure B7

Table 4.3
Risk Ranking

Likelihood	Consequences				
	1 Negligible	2 Minor	3 Moderate	4 Major	5 Severe
A Certain	M	H	H	VH	VH
B Almost Certain	M	M	H	VH	VH
C Likely	M	M	H	H	VH
D Possible	L	M	M	H	H
E Unlikely	L	L	M	M	H
F Rare	L	L	L	M	M
G Very Rare	L	L	L	L	M

Source: Modified after HB 89:2012 - Figure B8

Following the identification of environmental risk sources for those parameters which could be affected by the Proposal (e.g. water resources, ecology, heritage, etc.), the likely receptor(s), potential environmental outcome and the likelihood and consequence of specific impacts of these outcomes (if not mitigated) have been reviewed and the **unmitigated** risk for each assessed based on the classifications and definitions provided in **Tables 4.1 to 4.3**.

Throughout Section 4, the results of the preliminary risk assessment as relevant to each environmental parameter are presented. The type of impact and rating of the risk has been used to prioritise the assessment of specific issues in the EIS.

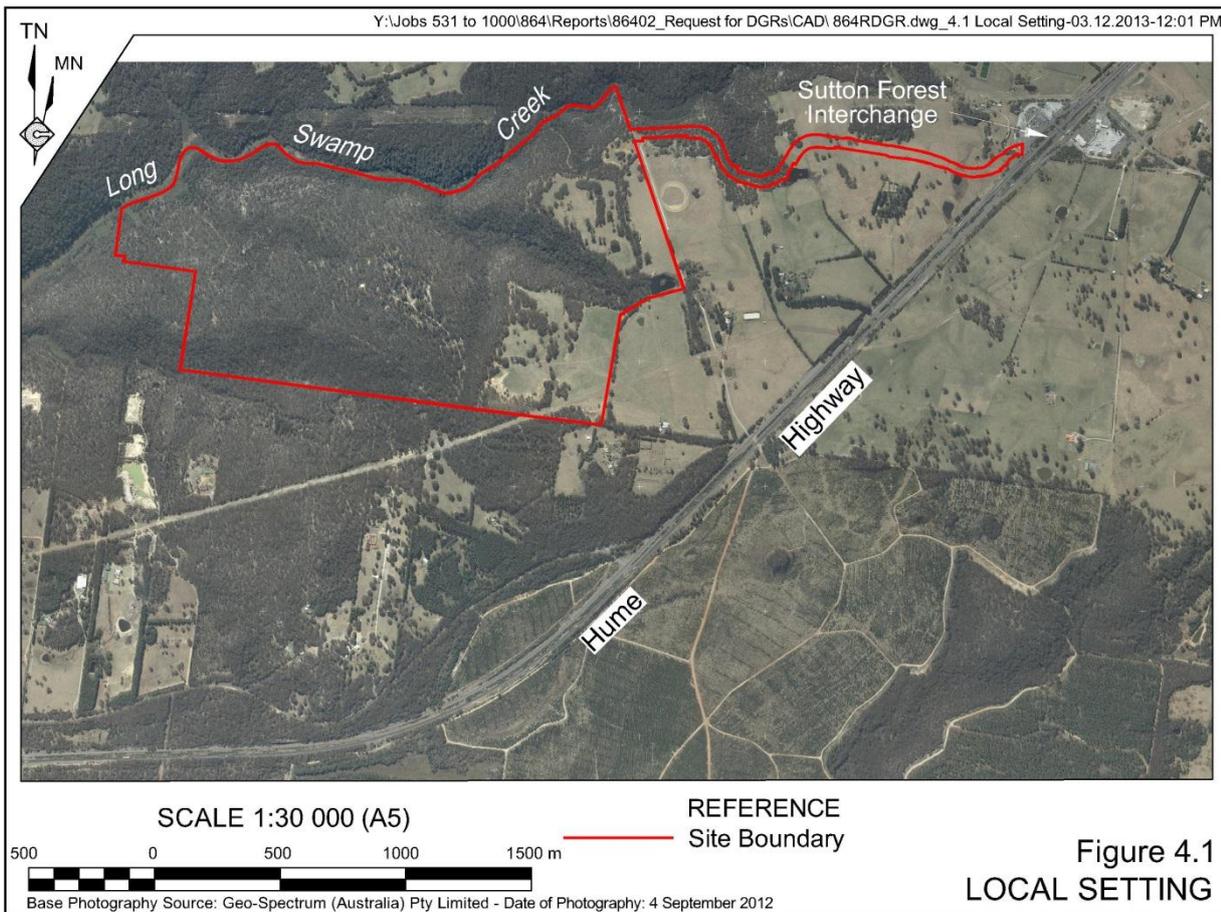
4.2 ENVIRONMENTAL SETTING

Figure 4.1 presents an aerial photograph (dated 4 September 2012) displaying the local setting of the Site and its surrounds.

4.2.1 Topography

The Site is located in an area of elevated terrain within the Southern Highlands. Elevations range from approximately 650m AHD to 710m AHD at the highest point within the Site (see **Figure 2.1**).

The Site covers a variety of landforms, from gently-inclined (<5% slope) crests and ridges to moderately inclined (up to 30%) short hill slopes. Small cliff lines with drops of up to 5m to 10m are present within the Site but beyond the proposed extraction area. The proposed extraction area occupies a series of gentle crests and ridges, lying mostly at or near the top of the local catchments. A substantial ridge is located on the southern side of the extraction area which would provide substantive topographic protection to the properties south of the Site.



4.2.2 Surrounding Land Ownership and Land Uses

Land Ownership and Surrounding Residences

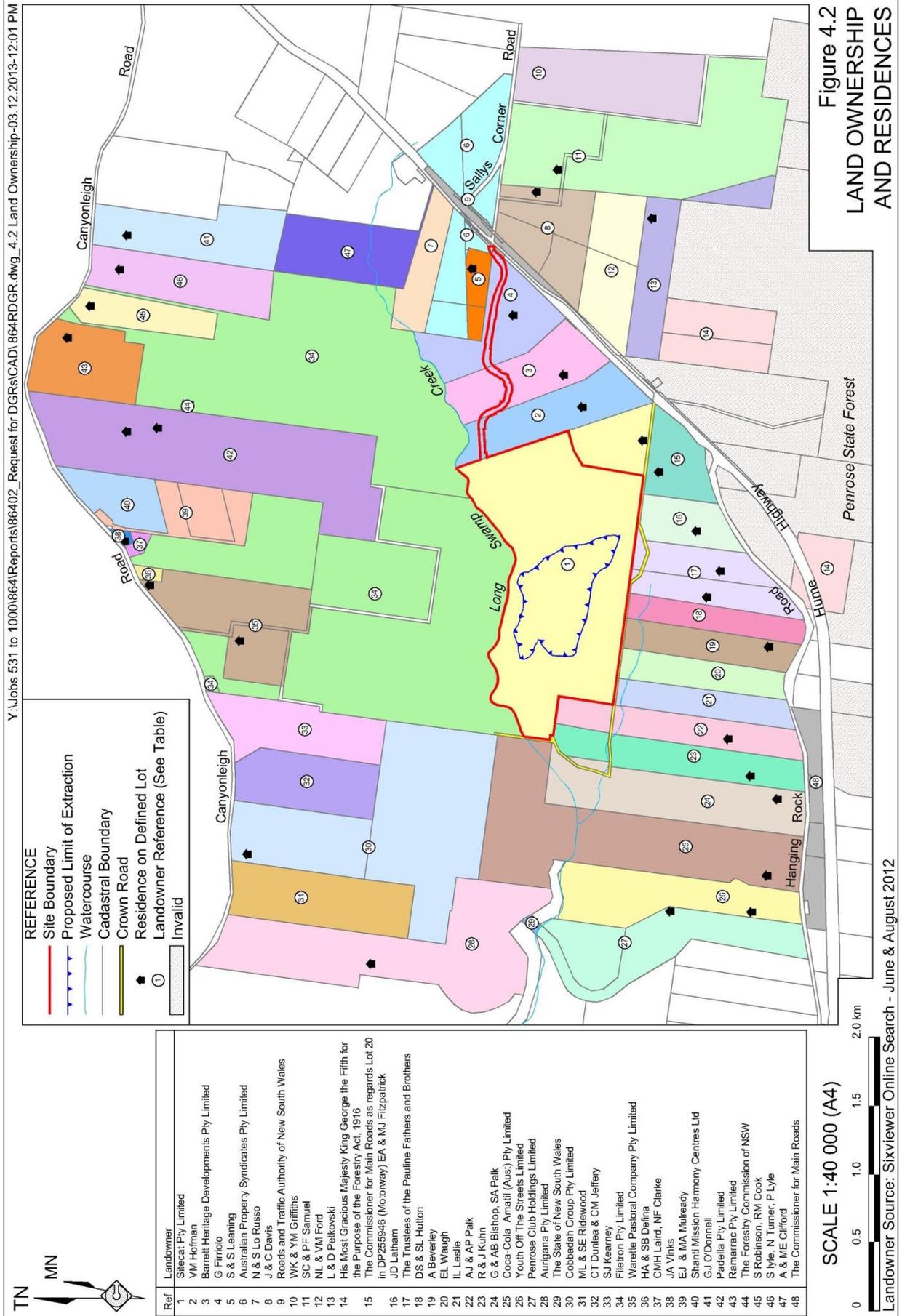
The existing land ownership within and surrounding the Site is shown on **Figure 4.2**. Residences on properties surrounding the Site are also shown in **Figure 4.2**. A total of five residences are located within 1km of the proposed extraction area whilst a further five residences are located between 1km and 2km from the proposed extraction area.

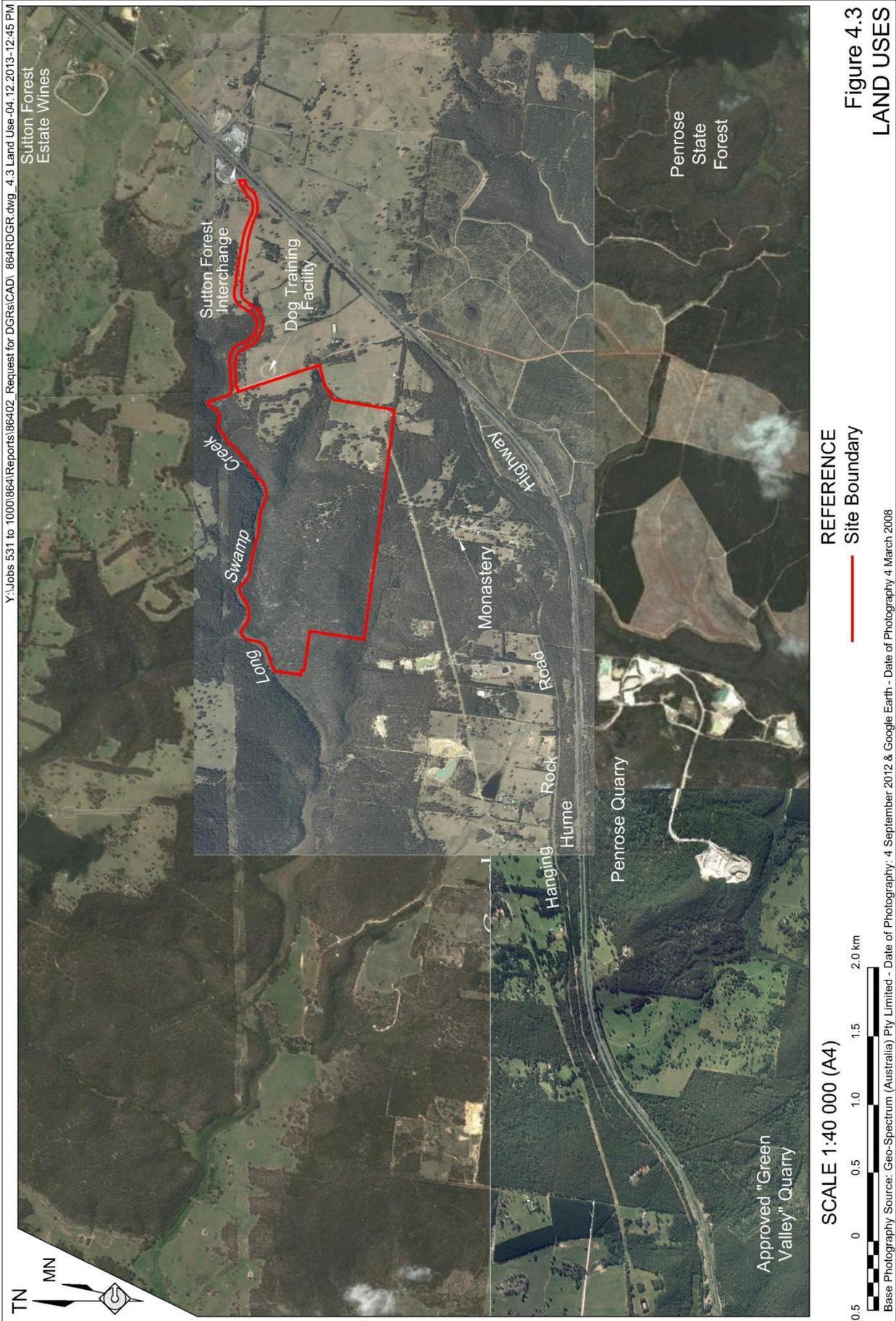
On-site Land Uses

The southeastern part of the Site is currently used by the landowner for the grazing of up to 50 dry stock cattle, with the remainder of the Site retained in native vegetation. The majority of the native vegetation within the extraction area is regrowth.

Surrounding Land Uses

Figure 4.3 displays the land uses surrounding the Site. Land uses to the east of the Site comprise grazing as well as the Sutton Forest Interchange and an established small viticulture venture (Sutton Forest Estate Wines).





Land to the north and west generally comprises large to medium landholdings, much of which is vegetated although some grazing is undertaken on these landholdings. Lot 3 DP 254435, immediately to the east of the Quarry Area, also contains facilities for the training of greyhounds. Land to the south comprises medium sized lifestyle blocks (typically 15ha to 60ha) with a mixture of native vegetation, forestry, areas previously extracted for sand and agricultural land uses. A property comprising two lots located southwest of the proposed processing area (Property 17) is occupied by a monastery and is frequently used for both indoor and outdoor religious services. The monastery site contains a church, accommodation facilities and a large number of smaller shrines and chapels located around the northern end of the property.

The Penrose Quarry (owned by Hy-Tec Industries Pty Limited) is located to the south of the Site on the southern side of the Hume Highway. Whilst this quarry is currently closed, it is approved to operate between 7:00am and 7:00pm Monday to Saturday. Products are able to be despatched 24 hours per day except on and immediately before and after public holidays. A new quarry has recently been approved to the southwest of the Penrose Quarry, i.e. the Green Valley Sand Quarry to be operated by Rocla.

A 132kV power transmission line and easement runs in an east-west direction immediately north of the Site, while a natural gas pipeline and easement runs in an east-northeast/west-southwest direction immediately south of, and bisecting the southeastern corner of the Site.

It is noted that each of the above land uses are either sufficiently distant from the proposed activities or there would be appropriate topographic or vegetated barriers between the on-site activities and the adjoining land uses to avoid adverse impacts upon the adjoining land uses.

4.2.3 Climate

Table 4.4 provides a brief statistical summary of climate data sourced from the weather monitoring station at Moss Vale (BOM Station 068239), identified as the closest station to the Site. Data from this station and other relevant BOM stations (and the on-site meteorological station) will be incorporated into the EIS and used/referenced in the various environmental assessments, where appropriate.

Temperature

The highest temperatures are recorded from December through to February with January having the highest mean monthly temperature of 26.2°C. The lowest temperatures are recorded through June to August with the lowest mean monthly temperature in July of 2.3°C.

Rainfall

Mean annual rainfall is 722.6mm, with mean rainfall highest from November to March with highest recorded monthly mean rainfall of 113.2mm in February.

Table 4.4
Monthly Meteorological Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C) Moss Vale AWS (Station # 068239) 2001 to 2013												
Mean maximum temperature	26.2	24.5	21.8	19.0	15.3	12.6	11.6	13.5	16.7	19.2	22.0	23.5
Mean minimum temperature	14.0	14.2	11.6	8.3	4.5	3.4	2.3	2.8	5.3	7.6	10.6	11.9
Rainfall (mm) Moss Vale AWS (Station # 068239) 2001 to 2013												
Mean monthly rainfall	60.3	113.2	70.9	46.4	45.9	78.2	48.4	30.9	39.2	50.0	76.3	57.5
Highest monthly rainfall	136.8	254.4	204.4	100.4	110.4	270.6	104.6	102.6	107.0	98.6	176.2	106.6
Lowest monthly rainfall	12.4	4.0	24.8	5.4	4.8	10.4	15.2	8.4	16.6	1.6	11.0	11.6
Highest daily rainfall	66.0	78.4	71.2	63.0	50.6	62.4	61.6	46.0	28.2	56.0	41.8	51.8
Source: Bureau of Meteorology Moss Vale (BOM Station 068239) – Accessed 5 November 2013												

Wind Speed and Direction

The wind distribution patterns at Moss Vale across all years are characterised by winds predominantly from the west-southwestern and northern quadrants. The prevailing winds during summer are dominated by those originating from the north and north-northeast as well as the south-southeast. During winter, there is a clear dominance of winds from the western quadrant, occurring approximately 30% of the time during these months. The prevailing winds during autumn and spring are a transition between winter and summer.

4.3 TRANSPORTATION

4.3.1 Introduction

The proximity of the Site to the Hume Highway and the Sutton Forest Interchange provides both opportunities and constraints for the Proposal. The close proximity of the highway would allow product trucks to travel to the major markets without travelling on local roads – a feature recognised to be of considerable importance. The road configuration at and adjoining the interchange would, however, require some minor re-design to accommodate the proposed truck movements.

4.3.2 Existing Environment

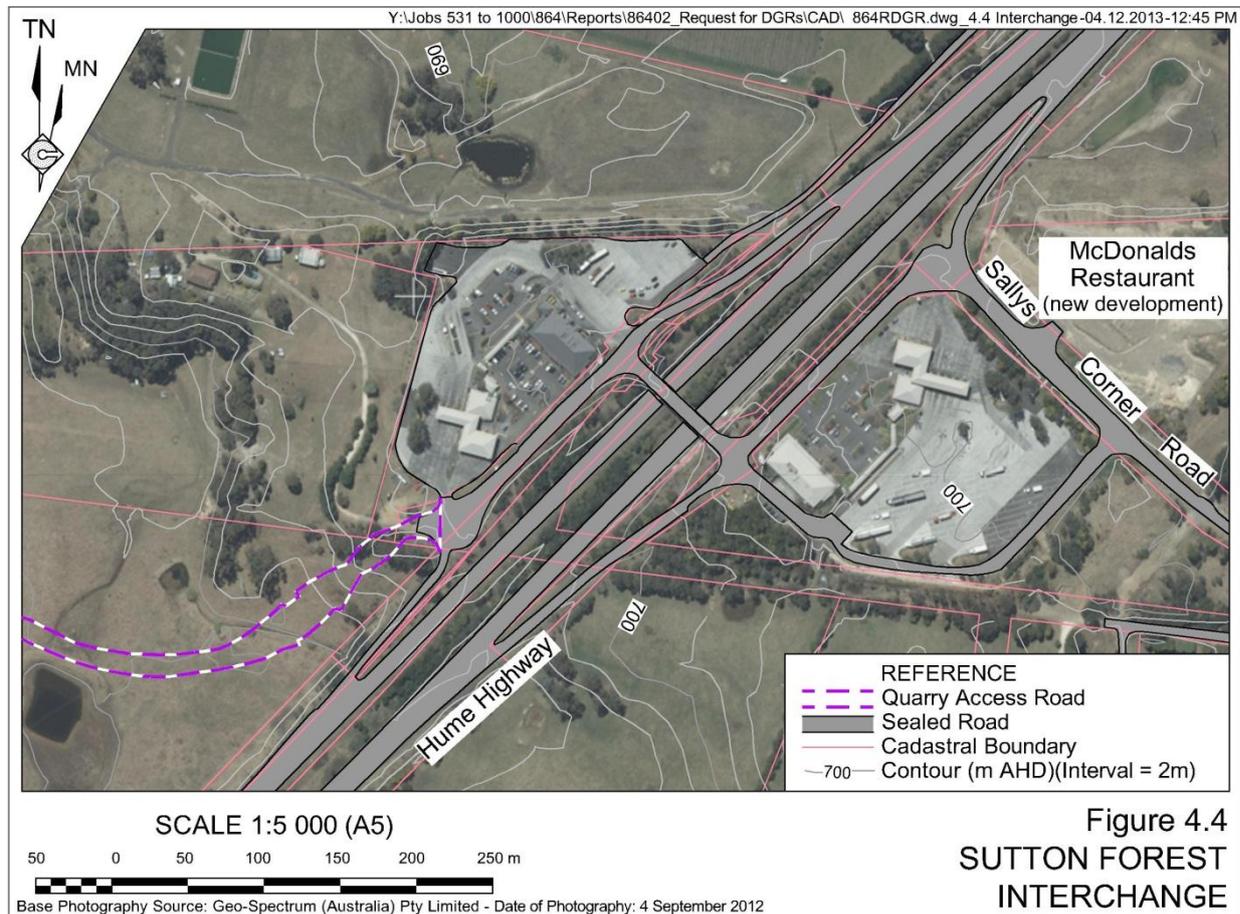
The Hume Highway adjacent to the Site comprises two by two lane carriageways approximately 20m apart. A cross-over between the two carriageways approximately 1.7km south of the Sutton Forest Interchange is currently used by light vehicles entering and departing Lots 1 to 4 DP 253435.

Traffic levels on the Hume Highway typically average approximately 20 000 vehicles per day with approximately 30% being heavy vehicles. The hourly distribution of total traffic and heavy vehicles on the Hume Highway shows considerable heavy vehicle traffic between 8:00pm and 6:00am.

The closest intersection to the Site on the Hume Highway is the Sutton Forest Interchange, a graded intersection with Sallys Corner Road, a local road between Exeter and the Hume Highway. The interchange has single lane on and off ramps from both the north and south with a two lane bridge across the Hume Highway providing access between the eastern and western sides of the highway. **Figure 4.4** displays an aerial photograph of the intersection and the adjoining fuel and fast-food outlets adjacent to the intersection. It is noted that a new McDonalds store was constructed on the eastern side of the Hume Highway in 2013 which has reduced the amount of traffic using the bridge across the highway.

Traffic counts for the Sutton Forest Interchange undertaken by GHD show that average weekday traffic using the south-bound off ramp from the Hume Highway onto the interchange is in the order of 2 800 vehicles per day (85% cars/motorcycles, 15% heavy vehicles), and 2 200 vehicles per day (88% cars/motorcycles, 12% heavy vehicles) from the north-bound off ramp. The peak traffic volumes occur at these off ramps between 6:00am and 7:00pm.

Crash data for the period 2008 to 2012, provided by RMS, for the interchange ramps and intersections, indicates that there were nine non-casualty crashes and seven injury crashes over this period in the vicinity of the interchange. There were no fatal crashes reported, while only one crash involved a heavy vehicle.



4.3.3 Potential Transportation Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific traffic and transportation related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require specific assessment, are as follows.

- Increased traffic levels on the existing road network resulting in:
 - inconvenience to motorists (moderate);
 - inconvenience to local businesses (high);
 - increased risk of accidents occurring (high);
 - accelerated road, bridge and pavement deterioration (moderate); and
- Possible loss of native fauna species due to animals being killed on the Quarry Access Road (moderate).

4.3.4 Key Transportation Management Issues and Preliminary Assessment

Traffic travelling to and from the Site would utilise the existing Sutton Forest Interchange using the roundabout at the southwestern corner of the interchange as shown in **Figure 4.4**. It is envisaged that some minor amendments to the interchange would be required to accommodate the trucks accessing the Site.

The impact of the increased volumes of traffic on the existing road network and other motorists will be considered in greater detail as part of the EIS for the Proposal. This assessment will be undertaken in accordance with the Guide to Traffic Generating Development, Road Design Guide (Roads and Traffic Authority), relevant Austroads standards and other relevant guidelines.

The Proposal would result in increased levels of traffic on the Sutton Forest Interchange and the Hume Highway, however, considering that the proposed increase will not significantly impact total capacity or level of service, the likely impacts upon the road pavements, traffic congestion and road safety would be acceptable. Ongoing discussions are to be held with the existing fuel and food outlets to minimise impacts upon those businesses. Opportunities could arise for the Proposal to increase spending at these businesses.

4.4 GROUNDWATER

4.4.1 Existing Environment

The Site is located near the southwestern edge of the Sydney Basin and is underlain by less than approximately 100m of relatively flat-lying Triassic Hawkesbury Sandstone which overlies Permian sedimentary rocks.

Aquifers are commonly developed within the Hawkesbury Sandstone throughout the Sydney Basin at different elevations. Aquifers are found in:

- sub-horizontal relatively porous and stacked layers (beds) of sheeted sandstone with increased primary permeability which provides the main aquifer storage; and/or
- pervasive sub-vertical, semi-continuous to continuous, rock defects such as fractures and joints with secondary ‘enhanced’ permeabilities. These aquifers constitute a major component of the aquifers transmissivity but only a minor component of the aquifers storage.

Aquifer recharge is primarily by way of excess rainfall infiltrating the sandstone through the soil profile. A proportion of this recharge provides baseflow to the watercourses north and west of the Site that drain into the Long Swamp Creek system to the north of the Site. The existence of elevated springs in the local area may indicate that some of this recharge infiltrates down to very shallow sandstone zones, possibly down to the base of the weathered zone or localised shale lenses where ‘perching’ of shallow groundwater may occur.

Discharge from the aquifer is in the form of springs (shallow groundwater) which is often collectively referred to as ‘water features’ commonly developed in the Southern Highlands.

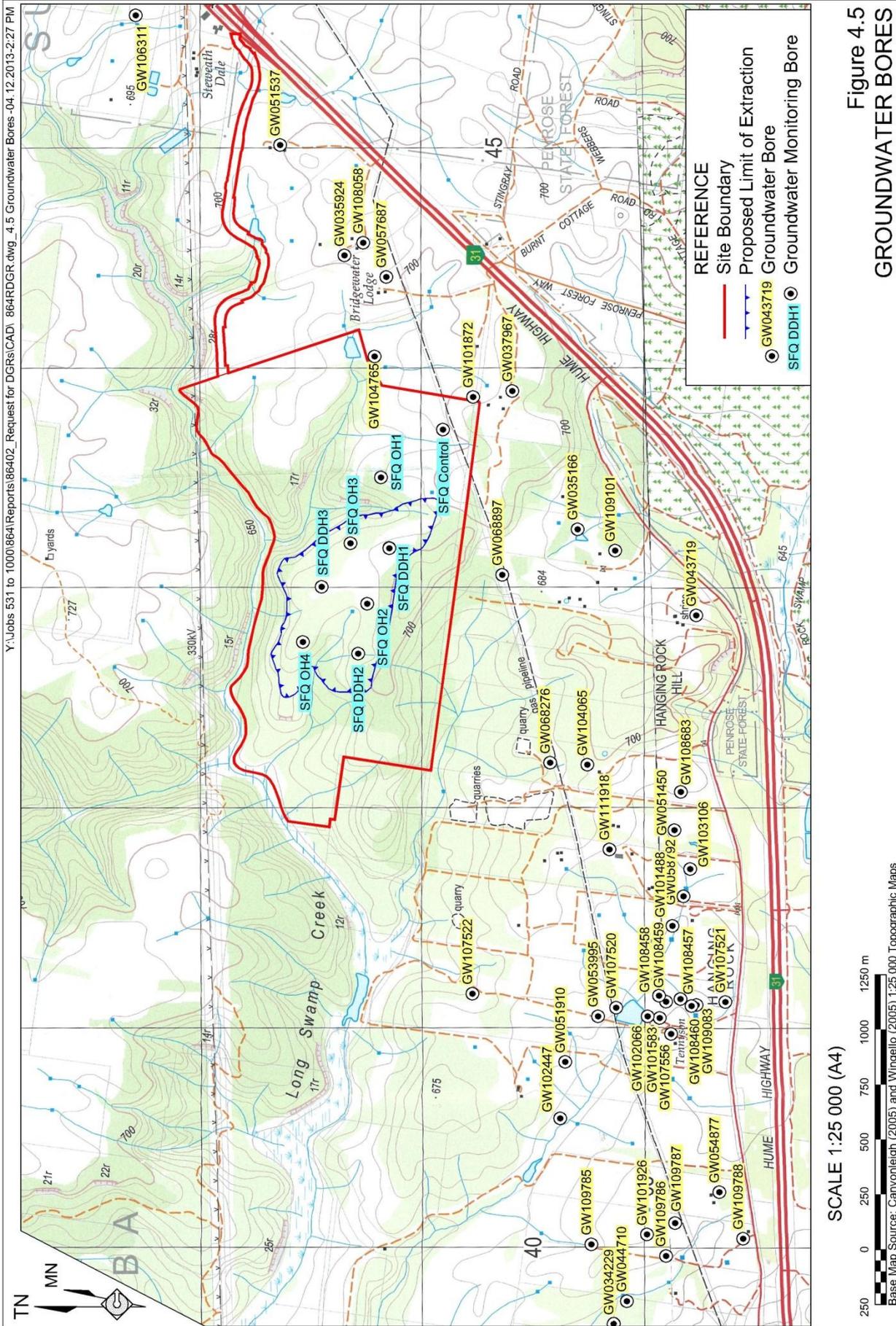
These areas commonly support Groundwater Dependent Ecosystems (GDEs). Two high priority GDEs have been identified by Kevin Mills and Associates, namely Long Swamp (see **Figure 4.5**) and Stingray Swamp. These GDEs include wetlands, heath scrub and woodland areas.

Baseline measurements of water level were collected between October 2012 and October 2013 in the network of eight on-site monitoring bores. Progressive manual water level measurements will continue to be collected in the future in order to increase the dataset of the groundwater activity within the Quarry Area.

The measurements of the initial water levels recorded in the eight monitoring bores are listed in **Table 4.5**, the locations of which are shown in **Figure 4.5**.

Table 4.5
Baseline Groundwater Level Monitoring Results

Monitoring Site*	Collar Elevation (m AHD)	Standing Water Level (m AHD)
SFQ DDH 1	692.7	649.7
SFQ DDH 2	682.0	655.9
SFQ DDH 3	688.0	650.5
SFQ OH 1	690.0	658.6
SFQ OH 2	685.2	656.1
SFQ OH 3	684.5	Dry
SFQ OH 4	686.0	646.3
SFQ Control	687.0	647.4
Source: Larry Cook Consulting		* See Figure 4.5 .



A total of 42 registered groundwater bores are located within 2.5km of the proposed extraction area (see **Figure 4.5**). These bores vary in depth from 30m to 204m and are used for stock and domestic irrigation and commercial water supplies.

4.4.2 Potential Groundwater Impacts

Potential impacts upon the groundwater resources beneath and surrounding the Quarry Area would occur under one of two circumstances, namely:

- i) when the extraction operations are undertaken beneath either the perched or regional groundwater table causing inflows to the active extraction area and depression of the groundwater table; and/or
- ii) as a result of pumping from one of the two groundwater supply bores within the Quarry Area, i.e. at times when surface water supplies cannot produce sufficient water for the on-site requirements.

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific groundwater-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Dewatering of an aquifer resulting in:
 - reduced availability to local users (high);
 - degradation of groundwater dependent ecosystems (high); and/or
 - reduction in base flows leading to:
 - degradation of riparian or aquatic vegetation / ecosystems (moderate); and/or
 - reduced availability of water to downstream users (moderate).
- Groundwater contaminated with chemicals and fuels used on site resulting in:
 - reduced groundwater quality and availability to local users (moderate);
 - degradation of groundwater dependent ecosystems (moderate);
 - contamination of local surface water bodies and as a result:
 - reduced availability of water to downstream users (high); and/or
 - degradation of riparian or aquatic vegetation / ecosystems become contaminated (high).

4.4.3 Key Groundwater Management Issues and Preliminary Assessment

An understanding of the interaction between the groundwater within the Quarry Area and the surrounding area is necessary to ensure that there are no adverse changes in either groundwater availability or quality for either the surrounding environment, particularly GDEs or licenced groundwater bores.

A Groundwater Management Plan will be prepared which will incorporate the development of a water level and water quality monitoring program and the establishment of a set of trigger levels and mitigation measures if adverse impacts occur on the environment and/or neighbouring water users.

Recognition of the important and dynamic link between surface water and groundwater systems would require that an integrated approach to water management for the proposed Proposal is required especially given the presence and documented importance of Groundwater Dependent Ecosystems in the Long Gully Creek catchment.

The groundwater assessment and its associated modelling will assist to better understand the extent to which both the perched and regional groundwater tables would be influenced by the extraction and pumping activities within the Quarry Area.

4.5 NOISE

4.5.1 Introduction

Spectrum Acoustics has been commissioned to undertake the noise impact assessment of the Proposal. The following provides a compilation of the recorded background noise monitoring data, consideration of the potential impacts on the local setting attributable to noise generated by the Proposal and an outline of the proposed method of assessment to be applied.

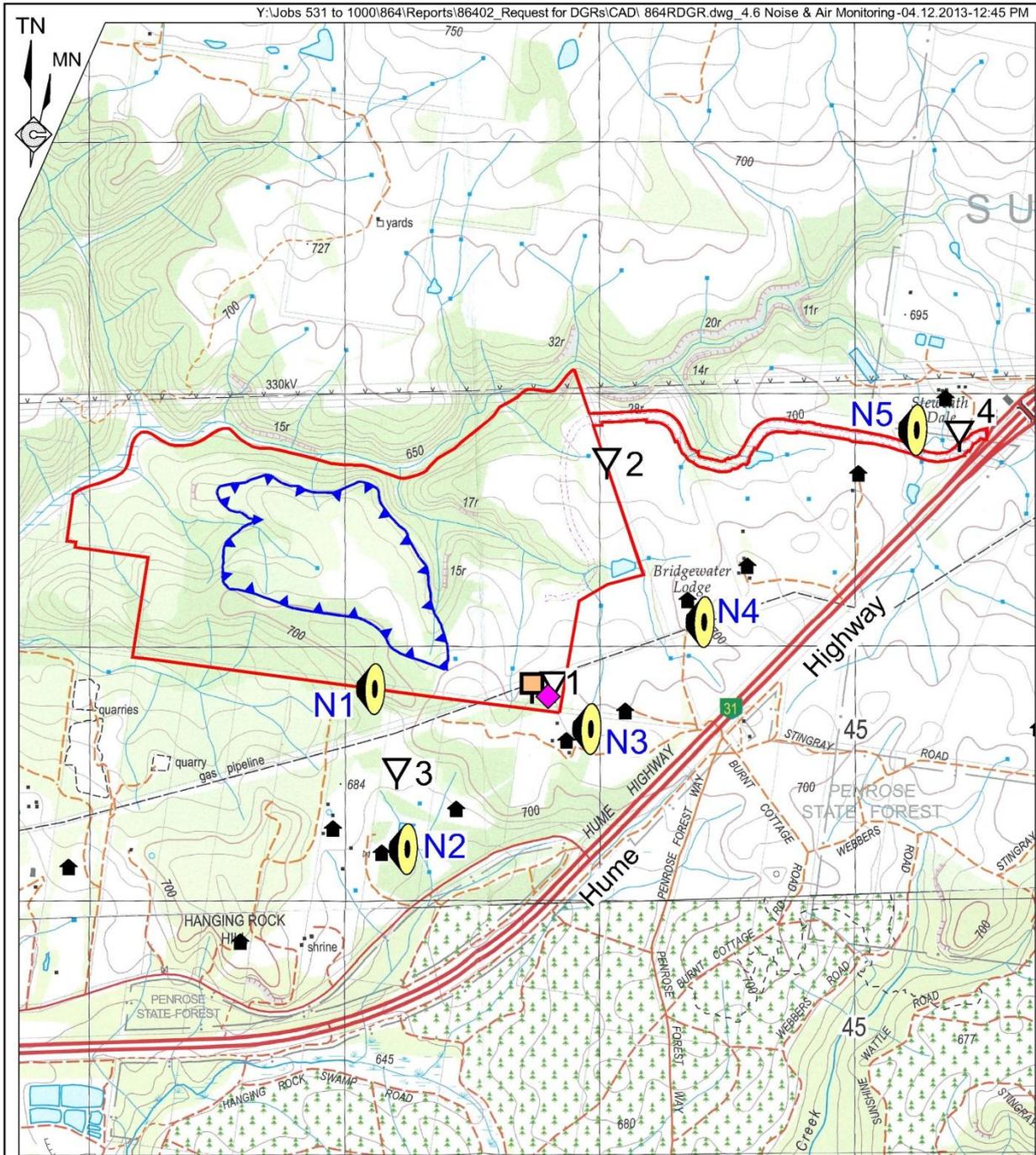
A comprehensive noise assessment will be undertaken by Spectrum Acoustics as part of the EIS for the Proposal, in accordance with the *NSW Industrial Noise Policy* and *NSW Road Noise Policy*.

4.5.2 Existing Noise Climate

The principal source of noise that contributes to background noise levels in the vicinity of the Site is traffic on the Hume Highway. Other sources include agricultural equipment (occasional), domestic animals, birds, wind in trees etc.

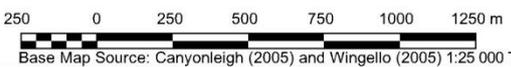
Ambient noise levels were measured by Spectrum Acoustics at five locations on properties near the Site between 24 September and 3 October 2013, see **Figure 4.6. Table 4.6** sets out the background L_{A90} and L_{Aeq} noise levels during the daytime, evening and night-time that were established during the background noise monitoring.

It is noted that the background noise level at locations N2, N3 and N4 are all comparable given that similar distance from the Hume Highway. The L_{A90} level at location N5 reflects its closer proximity to the Hume Highway and the service centre on the western side of the Hume Highway.



- REFERENCE
- Site Boundary
 - Proposed Limit of Extraction
 - Residence
 - Deposited Dust Gauge (and reference)
 - High Volume Air Sampler
 - Meteorological Station
 - Noise Monitoring Location (and reference)

SCALE 1:25 000 (A4)



Base Map Source: Canyonleigh (2005) and Wingello (2005) 1:25 000 Topographic Maps

Figure 4.6
 NOISE AND AIR QUALITY
 MONITORING LOCATIONS

Table 4.6
Unattended Background Noise Monitoring Results

Location*	Day		Evening		Night	
	L _{A90}	L _{Aeq}	L _{A90}	L _{Aeq}	L _{A90}	L _{Aeq}
N1	39	69	41	49	36	47
N2	36	58	38	50	32	45
N3	38	52	43	49	36	45
N4	38	53	39	47	34	45
N5	47	58	48	58	41	57

Day = 7:00am-6:00pm / Evening = 6:00pm-10:00pm / Night = 10:00pm-7:00am.
* See Figure 4.6.
Source: Spectrum Acoustics

4.5.3 Potential Noise and Vibration Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific noise and vibration-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require specific assessment, are as follows.

- Noise from fixed and mobile plant and equipment on site, unladen trucks on site and laden trucks transporting quarry products off site resulting in:
 - local annoyance and/or distractions (high);
 - adverse effects on physical and mental health (moderate); and/or
 - loss, relocation or reduction in native fauna species (low).
- Vibration from extraction activities resulting in:
 - reduced local amenity (moderate); and/or
 - structural damage to buildings or structures (low).

4.5.4 Key Noise Issues and Preliminary Assessment

The proposed sand extraction operations should be sufficiently distant from surrounding residences to ensure that noise generated lies well within noise criteria. Internal haul routes will be designed to provide maximum shielding for haul trucks travelling between the active extraction area and the processing plant(s), as well as product transport trucks accessing the Site.

The principal noise sources would be haul trucks travelling to and from the active extraction area and the product truck arrivals and departures and loading operations during the night-time period, particularly the period between 4:00am and 6:00am. Particular emphasis will be placed upon ensuring appropriate noise controls and procedures are developed and implemented to ensure both the night-time L_{Aeq} criteria and sleep arousal criteria are satisfied.

It is assessed at this preliminary stage that the mitigation measures envisaged would be sufficient to ensure that the relevant noise criteria at the surrounding residences would be satisfied. Particular attention would be placed upon satisfying the criteria at the monastery southwest of the processing area.

4.6 ECOLOGY

4.6.1 Introduction

A preliminary ecological assessment of the Site and its surrounds has been undertaken by Kevin Mills & Associates (flora) and by Lesryk Environmental Consultants (fauna). The assessment involved a database search, review of previous studies and multiple site inspections. The aim of the ecological assessment was to assess the existing environment and identify any potential constraints to the Proposal with regards to flora, fauna and ecological communities.

4.6.2 Existing Environment

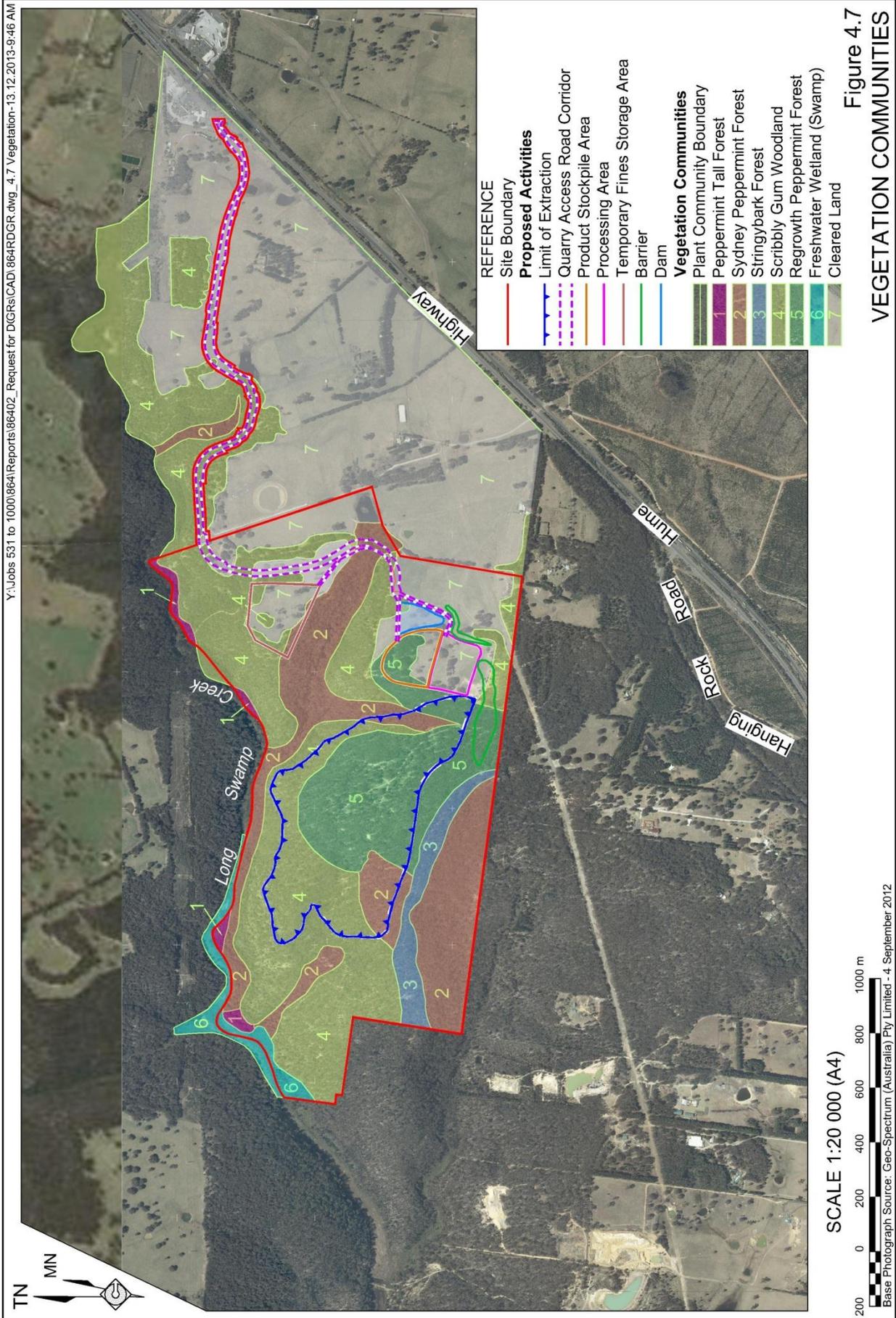
Site Flora

The Site is located near the southwestern edge of the Sydney Basin geological and biological regions and the eastern edge of the Southern Tablelands. The flora of the Site is therefore influenced by both provinces.

Figure 4.7 shows the distribution of vegetation communities across the Site. Seven vegetation communities were recorded on the Site during the surveys.

1. Peppermint Tall Forest.
2. Sydney Peppermint Forest.
3. Stringybark Forest.
4. Scribbly Gum Woodland.
5. Regrowth Peppermint Forest.
6. Freshwater wetland.
7. Cleared Land.

Forest and woodland are the dominant vegetation types across the Site. The main forest is dominated by Blue-leafed Stringybark *Eucalyptus agglomerata*, Silvertop Ash *E. sieberi*, Sydney Peppermint *Eucalyptus piperita*. The woodland is dominated by Scribbly Gum *E. sclerophylla*, with Brittle Gum *E. mannifera* and *E. dives* becoming common below the sandstone on the Berry Siltstone. The valleys contain a moister forest dominated mainly by Sydney Peppermint *E. piperita*, while the deepest valley of Long Swamp Creek supports a band of tall forest with *E. viminalis*, Narrow-leaved Peppermint *E. radiata*, River Peppermint *E. elata* and Brown Barrel *E. fustigata*. Exposed sandstone clifftops support a dry woodland, often with the mallee Narrow-leaved Mallee Ash *E. apiculata*. Approximately 54% of the proposed extraction area has previously been cleared and is now dominated by regrowth vegetation.



A total of 195 native flora species and 26 exotic species were recorded throughout the Site. Two threatened flora species were recorded within the Site, namely, Paddys River Swamp Gum, *Eucalyptus aquatic* and Dwarf Phyllota, *Phyllota humisfusa*. However, these two threatened species are not present within the proposed area of disturbance.

One endangered ecological community listed under the TSC Act was identified on the Site beyond the boundary of the proposed areas of disturbance. The swamp in the Long Swamp Creek catchment to the north of the Site, is listed under the TSC Act as 'Montane Peatlands and Swamps', and under the *EPBC Act* as 'Temperate Highland Peat Swamps on Sandstone'.

Site Fauna

Nine species listed as threatened under the TSC Act were recorded within the Site, namely the Powerful Owl, Gang-gang Cockatoo, Glossy Black Cockatoo, Scarlet Robin, Varied Sittella, Squirrel Glider, Eastern Bentwing-Bat, Greater Broad-nosed Bat and Large-eared Pied Bat.

No Koala activity has been recorded on the Site as part of the surveys and the site contains less than 15% of the feed trees required for Koalas. Therefore the Site does not contain "potential Koala habitat".

There is no "important habitat" in the area for migratory species and the habitats in the vicinity of the Site are not likely to support an ecologically important proportion of a population of migratory species.

No endangered populations listed under the *TSC Act* have been declared on or near the Site and there are no provisions under the *EPBC Act* for the listing of endangered populations.

4.6.3 Potential Ecological Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific biodiversity impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Removal of flora and fauna species identified within the Site through clearing activities resulting in:
 - local or regional reduction in distribution of threatened species, populations and endangered ecological communities (high); and/or
 - loss of biodiversity and alteration to existing habitat (high).
 - Reduction in vegetation within wildlife corridors within the local area (moderate).
- Detrimental effects of indirect Proposal impacts, e.g. noise, dust, lighting resulting in:
 - reduced biodiversity value of the Site (moderate); and/or

- reduced local distribution of threatened species, populations and endangered ecological communities (moderate).
- Possible loss of native fauna species due to animals being killed on the Quarry Access Road (moderate).

4.6.4 Key Ecological Issues and Preliminary Assessment

Considering the existing ecological setting and the design of the Proposal, the key ecological issues to be addressed in the EIS and a preliminary assessment of the possible impact(s) are set out as follows.

Native Vegetation Clearing

Clearing of native vegetation is a key threatening process as defined by the TSC Act for endangered and critically endangered species, populations and ecological communities and a number of the threatened species. The preliminary environmental survey and assessment did not record any endangered and critically endangered species, populations and ecological communities or threatened species that would be impacted by the Proposal. Approximately 47.8ha of native vegetation (of which 24.3ha is regrowth) would be progressively cleared as part of the proposed sand extraction operation.

Hydrological Changes due to the Proposal and Impacts on Hanging Swamps

Nearby downstream Hanging Swamps (groundwater-dependent ecosystems) may be at risk due to potential hydrological changes resulting from the potential extraction activities. Following the completion of a hydrogeological assessment of the Proposal, a more informed assessment of the potential impact on these vegetation types would be made.

Impacts on Threatened Species

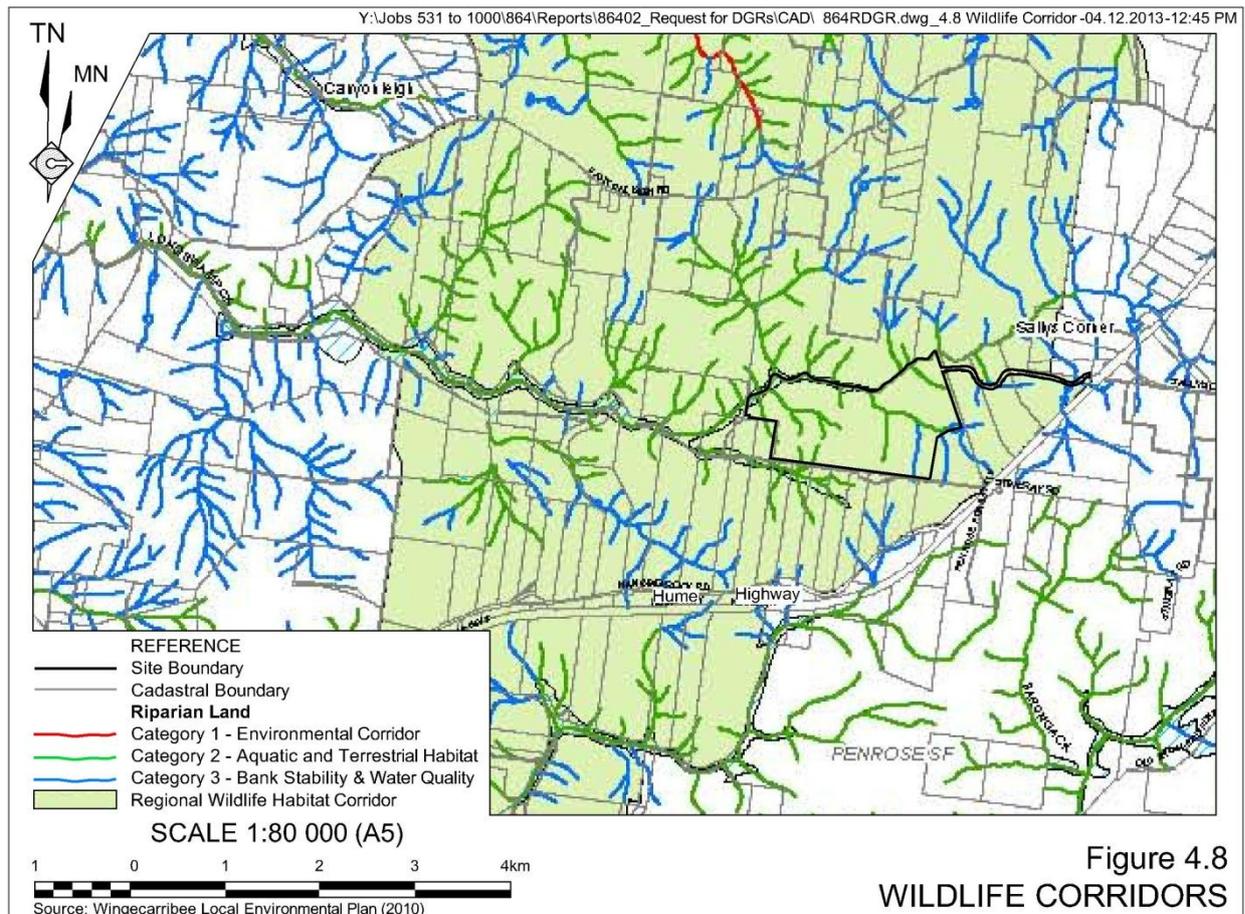
The preliminary assessment identified the following flora and fauna species are present within the locality and/or known or considered likely to occur within the area that is proposed to be disturbed during the life of the Proposal. All species are listed as “vulnerable” under the TSC Act.

- | | | |
|--------------------------|----------------------|---------------------------|
| • Paddys River Swamp Gum | • Powerful Owl | • Eastern Bentwing-Bat |
| • Dwarf Phyllota | • Gang-gang Cockatoo | • Greater Broad-nosed Bat |
| | • Squirrel Glider | • Large-eared Pied Bat |

The assessment undertaken by Kevin Mills & Associates and by Lesryk Environmental Consultants considered that there was not a high risk of impact on these species as a consequence of the Proposal. It was also noted that significant areas of habitat exist for all these species in the locality and thus the Proposal would not likely place them at risk of extinction).

Wildlife Corridors

The Site is located within land that is designated Regional wildlife corridor under the *Illawarra Regional Environmental Plan No 1* and under the *Wingecarribee LEP – Rural Land (Wildlife Corridors)* (see **Figure 4.8**). The purpose of the designated Regional wildlife corridor in the Penrose area is to facilitate the interaction of fauna species through the upper Wollondilly River catchment to the north, including the extensive natural areas in the Warragamba Water Catchment Area, and Morton National Park to the south of Bundanoon and Wingello. The mitigation and offsetting proposals would be designed in such a way that the Proposal will not significantly interrupt this corridor in the long term.

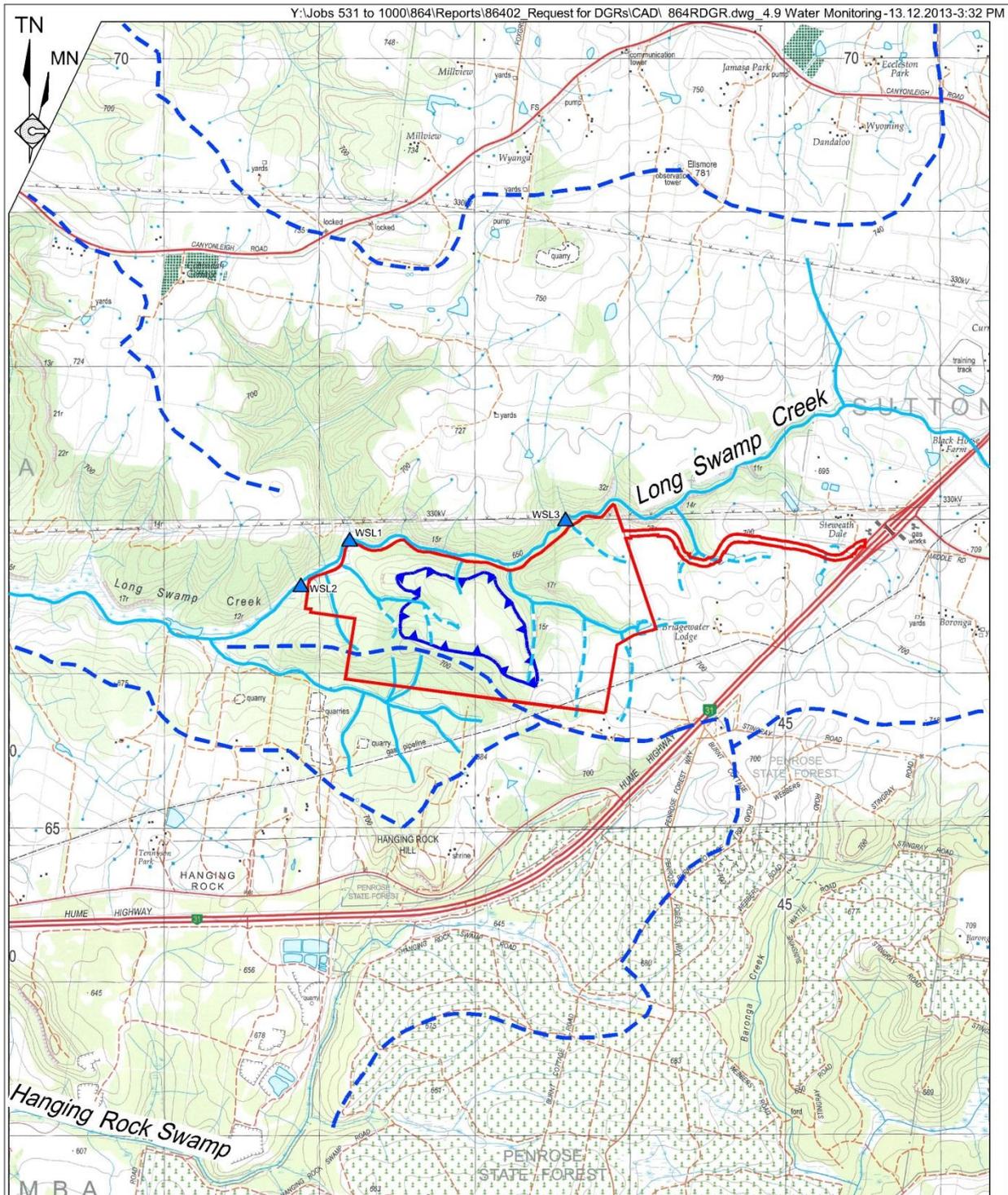


4.7 SURFACE WATER

4.7.1 The Existing Environment

SEEC Pty Limited has undertaken a preliminary surface water assessment for the Proposal. Field surveys were conducted during August 2013 to investigate the existing hydrology within and surrounding the Site.

The Site is located within the wider Warragamba Dam Catchment. Runoff from the Site flows into Long Swamp Creek, a tributary of the Paddys River. Paddys River in turn flows into the Wollondilly River approximately 2km downstream from its intersection with Long Swamp Creek. The Wollondilly River flows into the Warragamba Dam, the key water supply dam for Sydney’s drinking water.



- REFERENCE**
- Site Boundary
 - ▲— Proposed Limit of Extraction
 - - - Catchment Boundary
 - Class 1 Watercourse
 - - - Class 2 Watercourse
 - WSL1 ▲ Surface Water Quality Monitoring Location

SCALE 1:40 000 (A4)



Base Map Source: Canyonleigh (2005) and Wingello (2005) 1:25 000 Topographic Maps

Figure 4.9
SURFACE WATER CATCHMENTS AND
MONITORING LOCATIONS



The proposed extraction area lies immediately to the north of a prominent ridge which lies between two watercourses, namely Long Swamp Creek to the north of the Site and an unnamed watercourse to the south of the Site which in turn drains into Long Swamp Creek to the west of the Site.

The proposed extraction area lies within an elevated area (with respect to the surrounding watercourses) and as such contains mainly first order and two second order watercourses (see **Figure 4.9**). The proposed Quarry Access Road east of the Quarry Area crosses three first order watercourses. The proposed water storage dam is located on a first order watercourse.

All watercourses are identified as intermittent, however, Long Swamp Creek has a significant catchment and it is also fed by groundwater. Therefore, it is anticipated that Long Swamp Creek would flow for the majority of the time.

Existing dams are located on Lots 2 and 4 DP 253435 which collect water from runoff from catchments within these lots and nearby. Water required for dust suppression and processing operations would be drawn preferentially from these two dams as well as from the main storage dam (see **Figure 2.2**) to provide for processing operations and dust suppression.

4.7.2 Potential Surface Water Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific surface water-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Reduction in environmental flows through on-site capture of water resulting in:
 - reduced flows to Long Swamp Creek (high);
 - reduced availability of water to downstream users (moderate);
 - stress to, and possible reduction in viability of native vegetation (moderate); and/or
 - degradation of aquatic habitats (moderate).
- Discharge of sediment-laden water resulting in:
 - pollution of downstream waters within the Warragamba Dam catchment (high);
 - detrimental effects to flora and fauna (moderate);
 - contamination of soil resources and indirect impacts on future land use (low);
 - health-related impacts (people) due to consumption of contaminated water (moderate); and/or
 - health-related impacts (stock) due to consumption of contaminated water (moderate).

- Erosive actions of water resulting in:
 - soil erosion and loss of agriculturally productive capacity (moderate); and/or
 - decreased availability of soil for rehabilitation (moderate).

It is noteworthy that the friable nature of the sandstone and the sandy soils across the Site provide the opportunity for considerable infiltration of rainfall and reduced surface runoff.

4.7.3 Key Surface Water Management Issues and Preliminary Assessment

Erosion and Sediment Control

The extraction area would be developed in a manner that would maximise internal drainage. Consequently, the extraction area would be a no-discharge area in the extraction area. Runoff accumulating would either be used for dust suppression on internal unsealed roads or allowed to percolate to groundwater.

The processing and product stockpile areas would drain to the proposed water storage dam. The proposed water storage dam would have a volume of approximately 6ML which is significantly higher than the required 1.3 ML for a Type C Basin to control sediment-laden runoff from its catchment. Water from this dam would be used for dust suppression purposes for dust suppression internal unsealed roads within the extraction area and for re-use in processing.

The proposed Quarry Access Road would be constructed largely in cut to minimise the opportunity for the erosion of constructed embankments along the alignment of the road and to minimise the noise impact at the residences on Lots 1, 2 and 3. During construction, appropriately-sized dry-type (Type-C) sediment basins² would be installed at regular intervals to capture and settle sediment-laden runoff. However, where the road traverses the Moss Vale or the Kangaloon Soil Landscapes (see Section 4.11.1), the sediment basins would be wet-type (Type-F) basins designed to capture the 5-day 80th percentile rainfall depth (25.2mm³) for flocculation before release. All sediment basins (dry and wet) would have a spillway designed for the 100-year ARI storm event.

Runoff from the Quarry Access Road would be directed by stabilised table drains to sediment basins before release to receiving waters. The sediment basins would be those remaining after road construction but they would all be lined to provide a permanent pool volume and have an extended detention depth and trickle outlet designed to restrict peak flows to pre-existing rates.

Surface Water – Ground Water Interaction

As discussed in Section 4.4.1, the regional groundwater table and the perched groundwater above the shale unit beneath the proposed extraction area provide a source of water for the watercourses in the vicinity of the Site. The progressive removal of vegetation from within the extraction area would mean that evapotranspiration would progressively cease in those areas that are actively disturbed or not yet re-vegetated. As evapotranspiration accounts for most (approximately 80%) of the natural water balance, this would represent a significant change to the hydrology of the Quarry Area.

² There would be approximately 6,000 m³ of basins with a total surface area of about 10,000 m².

³ Site-specific value

Water that would otherwise have evapotranspired would now be either evaporated (if it were to remain at the surface long enough) or would infiltrate to groundwater. Given the highly permeable nature of the friable sandstones, the latter would represent the majority.

Surface Water Quality

A surface water quality monitoring program has been initiated to achieve the following objectives.

- Establish baseline (i.e. existing) water quality in local drainage lines.
- Monitor water quality in local drainage lines during and after quarry operations.
- Protect aquatic ecosystems downstream of the Site.
- Monitor and control the quality of water released from the Site.

Figure 4.8 illustrates the three water quality testing locations established within Long Swamp Creek, namely:

- WSL1 – Downstream of the northern section of the Quarry Area but upstream from the main watercourse draining the Quarry Area;
- WSL2 – Downstream of the quarry and downstream of the junction with an unnamed stream that lies immediately to the south of the Quarry Area; and
- WSL3 – Upstream of the Quarry Area.

The quality of the water in the water storage dam would be monitored following its construction and throughout the life of the quarry.

4.8 INDIGENOUS HERITAGE

4.8.1 Introduction

The Applicant has commissioned Landskape Natural and Cultural Heritage Pty Limited to undertake an Aboriginal Cultural Heritage Assessment of the Proposal. This section reviews the identified Aboriginal heritage sites within the Site, the potential impacts on Aboriginal heritage sites and provides an outline of the proposed method of assessment to be applied.

The specific objectives of the cultural heritage assessment are to:

- consult the local Aboriginal community to identify any concerns they may have;
- conduct a desktop assessment to delineate areas of known and predicted cultural heritage within the Site;
- undertake a stratified archaeological survey of known and predicted cultural heritage identified in the desktop assessment with representatives of the local Aboriginal community;
- record any cultural heritage sites within the Site and assess their significance;

- identify the nature and extent of potential impacts of the Proposal on cultural heritage; and
- identify options in consultation with the community to avoid or mitigate potential impacts of the Proposal on cultural heritage places and items.

4.8.2 Stakeholder Consultation

Relevant stakeholders from the Aboriginal community were identified using a process consistent with the “Aboriginal Cultural Heritage Community Consultation Requirements for Proponents” (DECCW 2010a). Following the completion of Steps 4.1.2 and 4.1.3 of these *Consultation Requirements*, six Aboriginal stakeholders registered as groups that may hold cultural knowledge relevant to determining the Aboriginal cultural values of the Site. The six registered Aboriginal stakeholders were:

- Bellambi Indigenous Corporation;
- Cubbitch Barta Native Title Claimants Aboriginal Corporation;
- Illawarra Local Aboriginal Land Council;
- Gundungurra Aboriginal Heritage Association Inc.;
- Gundungurra Tribal Council Aboriginal Corporation; and
- Peter Falk Consulting.

The registered Aboriginal parties were provided with information about the Proposal and the proposed cultural heritage assessment process in the form of a proposed methodology. The purpose of the proposed methodology was to explain the Proposal and consultation process in detail, define the roles of the registered Aboriginal parties and the Applicant, identify any protocols for obtaining and using sensitive cultural information and to give the registered Aboriginal parties an opportunity to comment on the proposed assessment method and provide any relevant information on the cultural significance of the Site.

4.8.3 Existing Environment

Previously Recorded Aboriginal Cultural Heritage Sites

There are no previously recorded Aboriginal cultural heritage sites recorded on the Site on the NSW OEH Aboriginal Heritage Information Management System (AHIMS) database (AHIMS searches 76370 on 2 August 2012 and 118676 on 4 December 2013). Searches were conducted over a 20km x 20km area centred on the extraction area, sufficient to allow adequate landscape interpretation and also provided a large number of registered Aboriginal sites to assist in an understanding of the distribution of Aboriginal cultural heritage across the landscape.

The distribution of sites in the AHIMS database is a reflection of where site surveys have been previously completed. Other sites may be present, but in areas that have not been previously examined. A total of 80 sites have been previously recorded within the 400km² search area for the Proposal, with stone artefact scatters being the most common site type. Grinding grooves were the second-most prevalent site type.

NSW State Heritage Inventory and Australian Heritage Database searches completed on 4 December 2013 yielded no Statutory Listed Heritage Items within the Site.

Field Survey

Archaeological field surveys of the Site were conducted based on the sampling strategy developed in accordance with the Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011) and Requirement 5a of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010b).

An assessment of the Site was made based on the level of disturbance from previous land uses, survey variables (ground visibility and archaeological visibility) and the potential archaeological sensitivity of the area.

The methodology for the field surveys involved:

- the identification of landforms and areas of potential archaeological sensitivity;
- a focus on areas that had a high probability of containing Aboriginal objects, including sandstone outcrops, creek banks, and eroded areas; and
- representative coverage of all survey units, including those with a lower probability of containing Aboriginal cultural heritage.

The surveys were conducted on 20 and 21 November 2012 and 8 November 2013. The participants of the field survey were archaeologists Mr Josh Symons and Mr Jack Hinde of Artefact Heritage (20 and 21 November 2012) and Dr Matt Cupper of Landskape on 8 November 2013. Representatives from the Aboriginal community groups were engaged on a roster such that each team comprised one or two archaeologists with one to three Aboriginal community representatives.

Nine Aboriginal cultural heritage sites were identified during the cultural heritage surveys of the Site as set out in **Table 4.7** and shown on **Figure 4.10**. These comprise eight stone artefact scatters and one rock shelter with art and stone artefacts.

Table 4.7
Aboriginal cultural heritage places at the Site

AHIMS Site Number	Field Code	Feature	Location GDA94 56 mE	Location GDA94 56 mN
52-4-0315	SFQ AS1	Stone artefact scatter	243165	6166200
52-4-0316	SFQ AS2	Stone artefact scatter	243037	6166253
52-4-0317	SFQ AS3	Stone artefact scatter	243344	6166261
52-4-0318	SFQ AS4	Stone artefact scatter	243940	6166179
52-4-0319	SFQ AS5	Stone artefact scatter	244032	6166246
52-4-0320	SFQ AS6	Stone artefact scatter	244052	6166352
52-4-0321	SFQ AS7	Stone artefact scatter	244047	6166869
52-4-0322	SFQ AS8	Stone artefact scatter	244294	6166779
52-4-0323	SFQ SH1	Rock shelter	242443	6166498

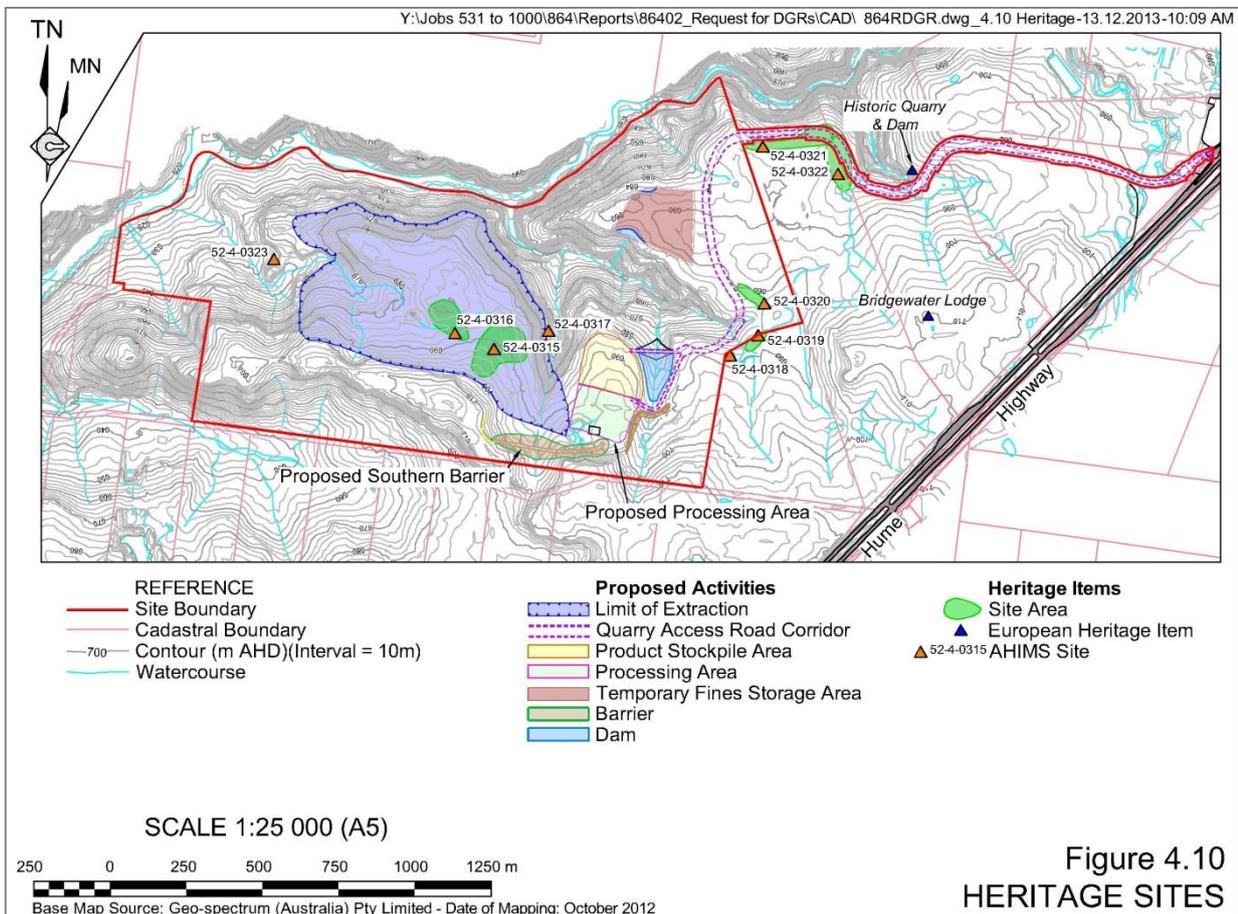


Figure 4.10
HERITAGE SITES

4.8.4 Potential Indigenous Heritage Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific Aboriginal heritage-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Loss of information which could otherwise be gained by conducting research today (high);
- Loss of the archaeological resource for future research using methods and addressing questions not available today (high); and
- Permanent loss of the physical record (high).

4.8.5 Preliminary Assessment

The impact of the Proposal on the nine Aboriginal cultural heritage sites is determined by the degree of harm the Proposal would cause. The type of harm will either be direct or partial and therefore the consequence of harm is a total or a partial loss in value (see **Figure 4.10**). A total loss in value would occur when the entire site is impacted by the Proposal. A partial loss of value would occur when only part of a site (such as in the case of an artefact scatter) is impacted by the Proposal.

The Proposal would result in a total loss of value for two known sites (being Sites 52-4-0315 and 52-4-0316) and a partial loss of value for a further two known sites (being Sites 52-4-0322 and 52-4-0321). Five known sites would not be directly impacted by the Proposal. Importantly, the rock shelter site would not be directly impacted (i.e. subject to surface disturbance) by the Proposal. As part of the vibration assessment for the Proposal, the potential vibration levels at the rock shelter site attributable to bulldozer ripping will be determined. A buffer will be established around the rock shelter site such that no vibration-induced damage would occur at the site.

4.9 NON-INDIGENOUS HERITAGE

4.9.1 Introduction

Artefact Heritage Pty Limited, archaeological consultants, was commissioned to prepare an assessment of potential impacts on Non-Indigenous heritage. This section reviews the identified Non-Indigenous heritage sites within the Site, the potential impacts on Non-Indigenous heritage sites and provides an outline of the proposed method of assessment to be applied.

4.9.2 Existing Environment

Listed Sites

A search of statutory heritage database and listings was completed on 3 June 2013. The following databases were included.

- NSW State Heritage Register
- NSW State Heritage Inventory
- Australian Heritage Database
- Local Environmental Plan for the Wingecarribee Shire Council – Heritage Schedule

There are currently no listed Non-Indigenous heritage items within or near the Site.

Site Survey

A survey of the study area was undertaken on 20 and 21 November 2012. A small sandstone quarry and small sandstone lined dam were identified during the site survey, these are identified on **Figure 4.6** are not assessed to be of heritage significance.

One potential heritage item, Bridgewater Lodge house (c. late 19th century), is located on Lot 2 DP 253435. This building is not listed on any heritage registers but may be of some heritage value as an early surviving residence of the area. The house is built of sandstone and surrounded by gardens. This property is owned by a company associated with the Applicant.

4.9.3 Potential Non-Indigenous Heritage Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific Non-Indigenous heritage-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Removal or destruction of sites of historic (European) heritage significance due to disturbance associated with the Proposal (low).

4.9.4 Preliminary Assessment

It is not anticipated that there would be any impacts to Bridgewater Lodge, which is the only item of potential heritage significance in the vicinity of the Site. The Quarry Access Road would pass approximately 300m to the northwest of the house and garden and would not have any direct impacts to the item. Because of its distance from the house, its location at the base of a slope, and the presence of screening vegetation within the garden of Bridgewater Lodge, it is not expected that the Quarry Access Road would have any substantial impacts on the item's views or setting.

4.10 AIR QUALITY

4.10.1 Introduction

The Applicant has commissioned Pacific Environment Limited to undertake an air quality assessment for dust and particulate matter generation, to be undertaken in accordance with *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (Department of Environment and Climate Change)* and to recommend appropriate design and operational safeguards to minimise any potential impacts on the surrounding environment.

4.10.2 Existing Environment

As no baseline air quality monitoring is currently available for the Proposal, and there are no EPA monitoring sites located close to the Site, representative data from the closest available source has been utilised to establish indicative baseline air quality conditions.

The air quality monitoring dataset relied upon for this document has been referenced from Holcim's Lynwood Quarry located approximately 22km southwest of the Site and includes the measurement of dust deposition and dust concentration (as PM₁₀) spanning July 2011 through June 2012 (source: Lynwood Quarry Annual Environmental Review 2013). The data from Lynwood Quarry are considered to provide a conservative estimate in characterising the local air quality environment.

Dust Deposition

Sources of particulate matter on and around the Site are generated from a number of sources that include traffic on unsealed roads, local building and construction activities, animal grazing activities and, to a lesser extent, traffic from the Hume Highway.

Eight dust deposition gauges located around the Lynwood Quarry site were used to establish background dust deposition levels. The dust deposition data collected indicate that all dust gauges comply with the EPA annual average criterion of 4g/m²/month. Monthly results typically range from 0.9 to 3.8g/m²/month. Several individual months returned levels above 4g/m²/month on individual months, often coinciding with contamination within the gauge.

From the above data, it is assumed that the average dust deposition rate in the vicinity of the Site would be 2.1g/m²/month.

PM₁₀ Concentrations

Measurements of PM₁₀ concentrations are available for the July 2011 – July 2012 period around the Lynwood Quarry Site for two high volume air samplers (HVAS), namely PM1 or PM2 each recording a 24 hour average sample, every six days.

A summary of the data collected from high volume air samplers installed for the Lynwood Quarry are shown in **Table 4.8**.

Table 4.8
Summary of PM₁₀ Background Levels for Lynwood Quarry Site

	Measured PM ₁₀ 24 hour concentration (µg/m ³)	
	PM1	PM2
Highest	20.5	11.8
Mean	8.0	4.1

To establish the existing air quality for the Site and the surrounding area, a value of 8.0µg/m³ was selected to be the annual average PM₁₀ background level. Assuming that PM₁₀ constitutes 40% of the TSP, an annual average background TSP level would be 20.0µg/m³.

4.10.3 Potential Air Quality Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific air quality-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require specific assessment, are as follows.

- Dust generation resulting from vehicle movements on unsealed roads, hard stand surfaces, fixed plant, including crushing operations and wind action on disturbed areas, silt storage and stockpiles resulting in:
 - nuisance/amenity impacts from dust deposited on window sills, cars, surfaces (moderate);
 - adverse health impacts (if PM₁₀ levels are excessive) (moderate); and/or
 - reduction in local water quality (moderate).
- Increased contribution to greenhouse effect (moderate).

4.10.4 Key Air Quality Issues and Preliminary Assessment

The air quality assessment to be completed as part of the EIS will incorporate further details of the design and operational safeguards that the Applicant would implement so that compliance with the site specific criteria would be achieved. Key safeguards to be adopted would include the sealing of the Quarry Access Road and regular road watering. The wet processing of most of the extracted raw sand would limit opportunities for dust generation during processing.

Dust and Particulate Matter

The assessment will involve consideration of several representative operational scenarios. The scenarios selected would involve the proposed extraction, processing, silt management, rehabilitation and related activities with the nominated static equipment positioned at their nominated locations and elevations and the mobile equipment considered along their movement paths.

The dust emission levels attributable to each of the proposed activities on site, i.e. after the adoption of the design and operational safeguards, will be entered into a dispersion model and predictions made to each of the non-project-related residences surrounding the proposed activities. The meteorological inputs to the model will be drawn from the on-site meteorological station and any available relevant longer term data (e.g. the Moss Vale AWS). The air quality modelling will predict future air quality surrounding the Site relating to both the amenity and health effects of dust and particulate matter and will be assessed against the relevant criteria.

The assessment of potential air quality impacts for inclusion in the EIS will also incorporate details of the proposed air quality monitoring program.

Greenhouse Gas Emissions

Emissions of carbon dioxide (CO₂) would be the most significant greenhouse gas (GHG) emitted as a result of the Proposal. Detailed inventories of greenhouse gas emissions will be presented in the EIS for the three ‘scopes’ of emissions (Scope 1, Scope 2 and Scope 3). Sources that will be considered for the Site include:

- fuel consumption (diesel and gas) during operations – Scope 1;
- indirect emissions resulting from the consumption of purchased electricity – Scope 2;
- indirect emissions associated with the production and transport of fuels – Scope 3; and
- indirect emissions associated with transmission and distribution losses from electricity supply – Scope 3.

GHG emissions attributable to the Proposal will be presented in the EIS in the context of Australian baseline and NSW total emissions and global climate change. A qualitative assessment of the potential impacts of these emissions on the environment will be presented in the EIS, including consideration of all reasonable and feasible measures to minimise emissions.

It is assessed at this preliminary stage that with the proposed methods of operation, the proposed operational safeguards and distances to surrounding receptors the relevant criteria would be satisfied.

4.11 SOIL RESOURCES AND LAND CAPABILITY

4.11.1 Existing Environment

Regional Setting

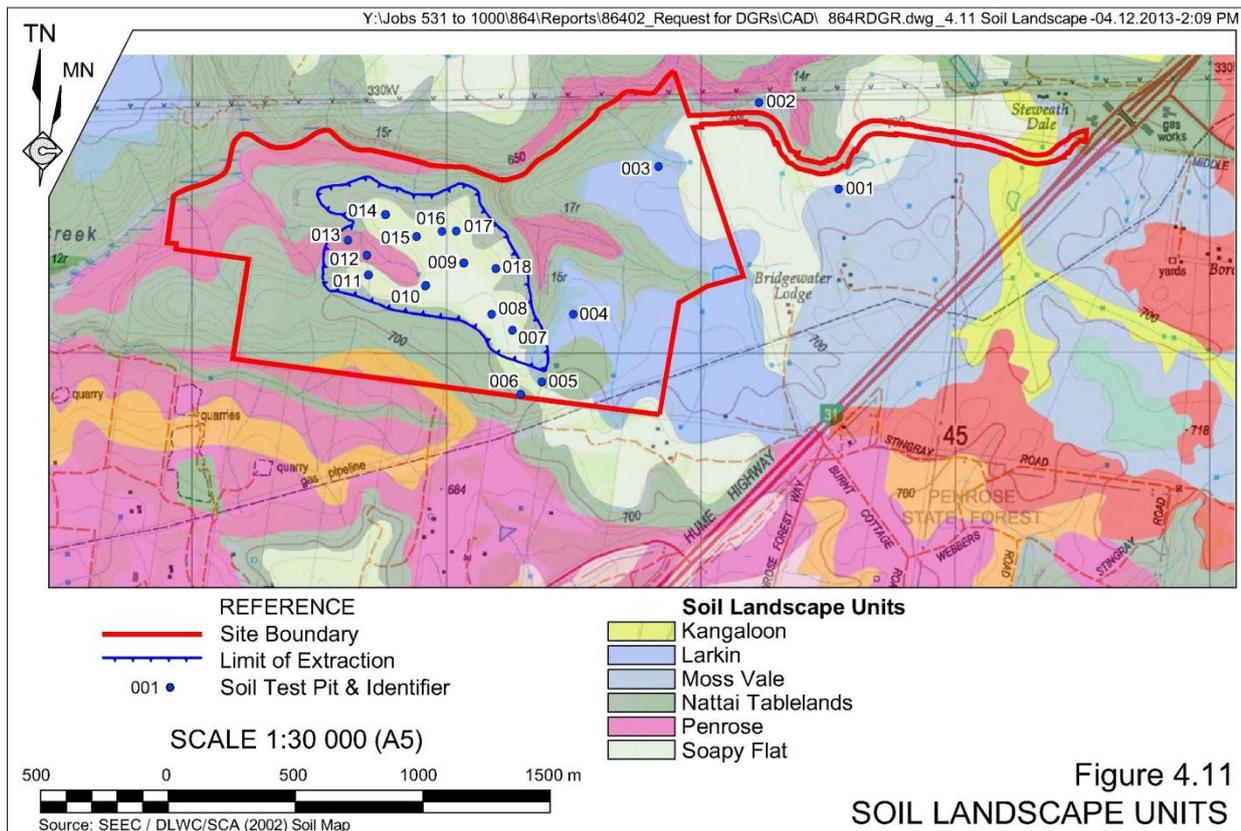
The available regional soil landscape mapping shows that the disturbance area incorporates six soil landscapes, namely:

- Penrose Soil Landscape;
- Nattai Tablelands Soil Landscape;
- Moss Vale Soil Landscape;



- Kangaloon Soil Landscape;
- Soapy Flat Soil Landscape; and
- Larkin Soil Landscape.

Figure 4.11 displays the boundaries of the above soil landscapes and the proposed components within the Site.



Existing Soils

Site investigations by SEEC established that the soils in the extraction area, processing area and most of the Quarry Access Road are:

- moderately erodible;
- Type C (coarse) for the purpose of sediment basin design;
- infertile;
- not dispersive;
- non-sodic;
- strongly acidic;
- very low in their cation exchange capacity;
- not saturated with cations;

- highly permeable; and
- prone to acidification and so the land and soil capability class is Class 5 (severe limitations to agricultural production).

The soils are comparatively thin and skeletal in places. Details of recoverable topsoil and subsoil thicknesses would be recorded in the EIS.

The eastern end of the proposed Quarry Access Road would cross land within the mapped Moss Vale and Kangaloon Soil Landscapes. These are derived on shale bedrock and consequently have finer soils (clay loam and clay).

4.11.2 Potential Soil Resources and Land Capability Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific soil and associated land use-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Removal and loss or degradation of the soil resources on site due to extraction operations and surface water runoff resulting in:
 - reduced soil resources to undertake appropriate rehabilitation program and therefore rehabilitation outcomes not meeting objectives (moderate);
 - compromised soil quality leads to poor vegetation regrowth on site and therefore reduced productivity on final landform (moderate); and/or
 - sedimentation of on-site and local surface water bodies resulting in poor water quality (moderate).

4.11.3 Key Soils Issues and Preliminary Assessment

The proposed areas of disturbance would involve the removal and transfer/storage of all topsoil and selected subsoil in operational areas. Progressive and final rehabilitation would also be undertaken using the previously stripped topsoil and subsoil. Although the bulk of the proposed disturbance area is not located over land currently used for agriculture, further studies will be undertaken in accordance with the NSW Strategic Regional Land Use Policy to confirm the Proposal would have minimal, impact on local agriculture. The soils and land capability assessment will identify the required design and operational safeguards with respect to soil stripping, stockpiling, erosion control and rehabilitation methods.

It is assessed at this preliminary stage that the proposed soil management procedures would be sufficient to ensure there are no long term adverse impacts on soil resources.

4.12 VISIBILITY

4.12.1 Potential Impacts on Visual Amenity

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific visual amenity-related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Changes in visual characteristics of the locality resulting in reduced visual amenity of local residents and visitors (low).

4.12.2 Visibility Issues and Preliminary Assessment

The proposed sand extraction and processing areas would be well shielded from the adjoining Hume Highway such that no motorists travelling along the highway near the quarry would be able to observe any extraction or processing activities.

Views of the proposed sand extraction area, processing areas and Quarry Access Road would also be substantially shielded from surrounding properties by the incorporation of amenity barriers. Particular emphasis would be placed upon either locating the Quarry Access Road in the most shielded location or construct visual barriers to visually shield sections of the road. A detailed visual assessment is to be conducted for inclusion in the EIS.

4.13 SOCIO-ECONOMIC SETTING

4.13.1 Local Setting

The Site is located in a rural area in the southwestern corner of Wingecarribee Local Government Area (LGA) where the population is comparatively low. A substantial number of the properties around the Site (as displayed on **Figure 4.2**) are either lifestyle blocks or “week-enders”. It is recognised that a number of the properties are also used for home industries / businesses including commercial water bottling enterprises.

Whilst there is a degree of community liaison amongst neighbours (to varying degrees), there is a low level of social capital with few community groups centred around the Site. Many of those who live permanently in the area participate mainly with community groups in the main centres in the Wingecarribee Shire, namely Moss Vale, Bowral and Mittagong.

4.13.2 Existing Environment

An overview of the statistical data for Wingecarribee LGA is provided to place the local area in perspective.

Population

The 2011 Census recorded that the Wingecarribee LGA had a population of 43 947 with a relatively even proportion of males to females (48% male and 52% female). This represents a population growth of 5.0% from the 2006 Census data. The Census data (2006 and 2011) also identifies a trend towards an aging of the population with the percentage of the population over the age of 65 trending upwards.

Employment, Labour Force and Industry Employment Profile

Unemployment figures remained stationary in 2006 and 2011 at 4.3%. Overall, 95.7% of the labour force was employed (54.1% of the population aged over 15), and 4.3% unemployed (2.4% of the population aged over 15), compared with 94.1.0% and 5.9% respectively for NSW.

An analysis of the jobs held by the resident population in the LGA (in 2011) shows the three dominant industry sectors as:

- manufacturing (15.0%);
- construction(14.1%); and
- retail trade (8.8%).

Income

Analysis of household income levels in the Wingecarribee LGA in 2011 compared to the NSW average shows a smaller proportion of persons earning high income (those earning \$1,000 per week or more) and a corresponding higher proportion of persons earning a low income (those earning less than \$400 per week). Overall, 23.5% of the population earned a high income, and 36.0% earned a low income, compared with 25.8% and 36.7% respectively for NSW.

Housing

The total number of households at the time of the 2011 census was 16 694. Of these households, 41.6% owned their dwelling; 33.9% were purchasing, and 21.3% were renting, compared with 33.2%, 33.4% and 30.1% respectively for NSW. This indicates a higher percentage of the local population that have or are purchasing their household compared to the whole of NSW average.

4.13.3 Potential Socio-economic Impacts

Based on the preliminary risk assessment undertaken for the Proposal (see Section 4.1), the specific social and economic related impacts (and assessed risk rating) that may result as a consequence of the Proposal (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment, are as follows.

- Increase in local employment for quarry operations (moderate).
- Perceived minor loss of local amenity at local and neighbouring properties and tourist or accommodation locations causing:
 - changes to local social activities (moderate);

- potential impacts to ongoing existing business viability (moderate);
- decreasing land values of neighbouring properties (moderate) and/or
- impacts to community feelings of well-being derived from perceived inability to influence changes to their residence or local surroundings (moderate).

4.13.4 Approach to Socio-economic Assessment

The approach to the socio-economic assessment will involve an analysis of the available socio-economic data and the results and issues raised through community consultation to capture potential issues and opportunities within the community. The assessment will include the following.

- A more detailed analysis of the socio-economic data for the local area, the Wingecaribee LGA and NSW.
- Use of Australian Bureau of Statistics and Council data to profile the local and regional communities including information relating to education, housing, industry and employment, community services and facilities.
- A review of surrounding land uses and relevant community infrastructure/services surrounding the Site and identification of the potential social contribution/impact on those land uses and community infrastructure/services, if any.
- An assessment of the potential impact on the local area and Wingecaribee LGA community including the following.
 - Social impact with respect to potential noise, air quality and transport impacts.
 - Impacts upon services and social infrastructure.
 - Economic impacts on the local community (e.g. employment local businesses and land values) and broader area of influence (i.e. contribution to the regional and NSW economies).
 - Community perceptions (based on the results of the community consultation program).
- Consideration of community contributions appropriate for the types and scale of development proposed.

4.13.5 Preliminary Assessment of Socio-economic Impacts

Contribution to the wider Regional and State Economy

The Proposal would contribute to the regional economy through spending on employment, local purchases, local contractors and suppliers and local transporter operators. In addition, the Proposal would provide a further strategically important resource for the Sydney construction industry.

Employment Impacts and Population Growth

The quarry would employ approximately 20 full time staff which over a period of 30 years would provide regular income (and indirect spending) throughout the Wingecaribee LGA given it is anticipated that the majority of the workforce would be drawn from within the Wingecaribee LGA.

Environmental Impacts

The social consequences of the environmental impacts would be addressed in the EIS for issues relating to:

- vegetation clearing (loss of local habitat and rehabilitation plans);
- processing and dust emissions (and perceived health impacts);
- water management and impacts;
- traffic impacts; and
- noise impacts.

4.14 CUMULATIVE IMPACTS

The main potential for cumulative impacts is attributable to the increase in heavy vehicle traffic on the Hume Highway. The Hume Highway is the main route between Sydney and Melbourne and accommodates high volumes of light and heavy vehicles as outlined in Section 4.3.2. Cumulative impacts of other traffic utilising the Sutton Forest Interchange are also relevant as this traffic would access the Hume Highway using the same access points as traffic associated with the Proposal.

Cumulative impacts would also arise from the proximity of the nearby Penrose Quarry, operated by Hy-Tec, and the recently approved Green Valley Quarry, owned by Rocla. These quarries are approved to produce a combined 1.8 million tpa of sand products with the associated transportation of these products using the Hume Highway as a main transport route.

5. REFERENCES

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