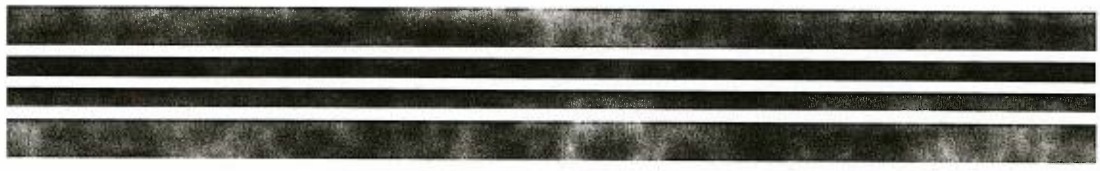

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Environmental impact statement Cattai sandstone quarry

Nepean Quarries Pty Ltd. Volume 1, Main report

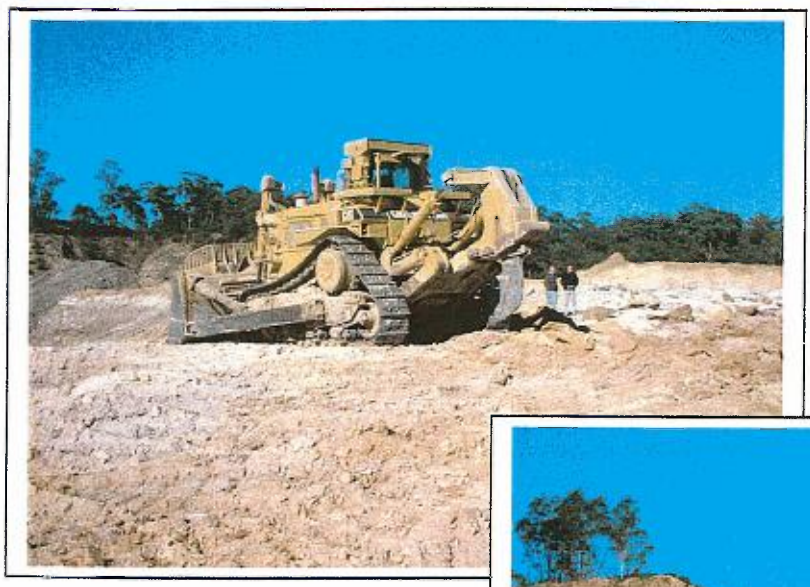
101/0453

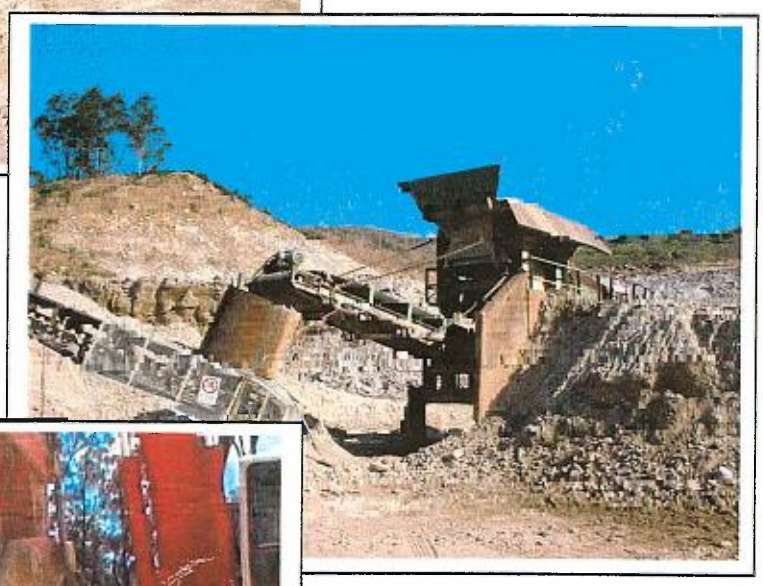
ENVIRONMENTAL IMPACT STATEMENT

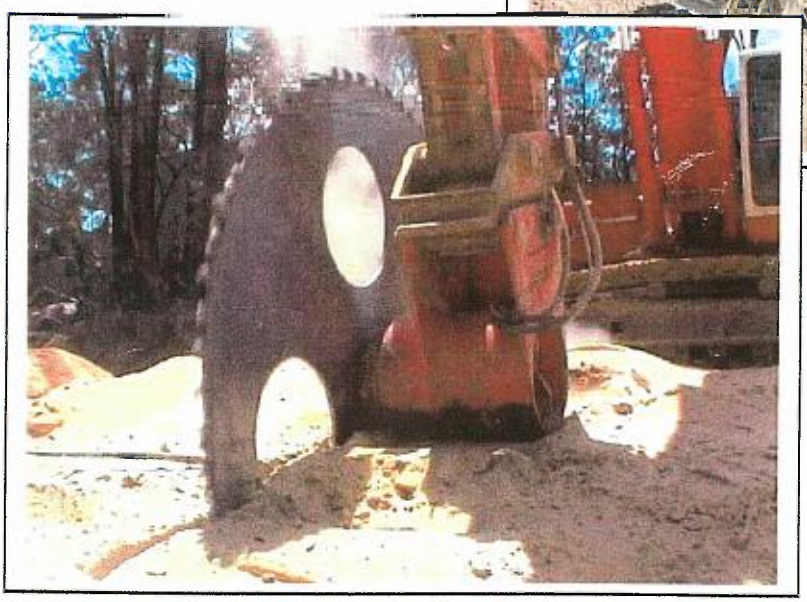
CATTAI SANDSTONE QUARRY

NEPEAN QUARRIES PTY LTD

VOLUME 1 MAIN REPORT







Harvest Scientific Services
July 2002

FORM 2

Submission of
Environmental Impact Statement (EIS)
Prepared under the Environmental Planning and Assessment Act, 1979

EIS prepared by:

Name:	Mart Rampe
Qualifications:	BSc (Applied Geology), CPEnv., CPESC
Address:	Unit 4a, 20 Somerset Avenue Narellan NSW 2567

In respect of:

Development Application:

Applicant name:	Harvest Scientific Services (A.C.N. 003 069 501)
Applicant address:	Unit 4a, 20 Somerset Avenue Narellan NSW 2567
Land to be developed: Lot No., DP/MPS, vol/fol etc	Lots 1,2,3,4&5 DP 240610 Wisemans Ferry Road, CATTAI
Proposed Development	Extraction and production of sandstone aggregate and dimension stone for sale.

Environmental Impact Statement: ☑ An Environmental impact Statement is attached

Certificate

I, Mart Rampe of Unit 4a, 20 Somerset Avenue Narellan , hereby certify that I have prepared the contents of this Statement and to the best of my knowledge:

- It is in accordance with clauses 54A and 55 of the Environmental Planning and Assessment Regulation, 1994; and
- It is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Signature: Mart Rampe

Name: Mart Rampe

Date: 22th July 2002

ENVIRONMENTAL IMPACT STATEMENT

CATTAI SANDSTONE QUARRY

NEPEAN QUARRIES PTY LTD

VOLUME 1

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ENVIRONMENTAL IMPACT STATEMENT

CATTAI SANDSTONE QUARRY

NEPEAN QUARRIES PTY LTD

EXECUTIVE SUMMARY

Overview:

Nepean Quarries Pty Ltd is proposing to commence a sandstone extraction project on Lots 1-5, DP 240610, Wisemans Ferry Road, Cattai. The proposal covers crushed sandstone as well as dimension stone.
The site was previously leased by Western Sand Mining Pty Ltd, who extracted sand and sandstone resources from the area between the Wisemans Ferry Road and the main catchment dam to the north. Prior to this, the existing property owners (the Curran Family) had extracted topsoil and sand resources. Approvals for their activities have since lapsed and this proposal will be subject to a fresh development application and assessment.
The proposed extraction area covers approximately 24 ha, and a resource of approximately 3.5 million tonnes of sandstone is indicated. In this case, the consent authority will be Baulkham Hills Shire Council.

Approvals Required:

The project is considered to be a Designated Development and as such will require an Environmental Impact Statement to be lodged with Baulkham Hills Shire Council. The proposal will be determined under the auspices of the Environmental Planning and Assessment Act 1979.

Description and Location of Proposed Quarry Extension:

The old quarry is located within Lots 2 and 3, DP 240610 and is situated between Wisemans Ferry Road and the Hawkesbury River at Cattai, immediately east of the Riverside Oaks International Golf Course. The site is located approximately 45 kilometres north-west of Sydney.
The proposal now under consideration is to recommence quarrying operations on the site of the old quarry and then to eventually expand it to encompass lots 1, 4 & 5 covering a distance of approximately 800m. The depth of extraction will be limited to 15 metres from the existing surface.

Land Ownership and Zoning:

The land subject to the proposed quarry development is wholly owned by interests associated with the Curran and Westland Families. The land is zoned Rural 1 (b) and extractive industries are permitted subject to approval by the appropriate consent authority.

Surrounding Land Uses:

A mixture of bush and developed land dominates the surroundings. The developed land mostly consists of recreation facilities, including several golf courses located to the east of the Project Area Other nearby land uses include public reserves, wetlands and recreation areas including the Cattai National Park, located approximately 5 kilometres to the south–west of the project area. Small-scale agricultural enterprises and rural residential properties are also located within close proximity to the site.

Quarry Products:

The sandstone resource upon which the proposal is based is part of the outcropping massive Hawkesbury Sandstone of Permian age. Previous testing and utilisation of the sandstone has demonstrated its suitability for use in the construction industry as road base material, high-quality fill and stabiliser. In addition, other products from the quarry will include dimension stone.

Production:

Nepean Quarries are aiming to produce an annual amount of sandstone products (including dimension stone) not exceeding 200,000 tonnes per year. The potential for dimension stone is unknown at this stage, but it is envisaged that annual production could be between 5000 and 20,000 tonnes.

Quarry Infrastructure:

Quarry infrastructure is to include an office, weighbridge, storage and workshop area together with a series of access roads. Working equipment will include a D11 bulldozer, Front End Loader (FEL), crusher and power screen.

Operational Description:

Sandstone will be extracted by bulldozer ripping. No blasting will be required. The ripped material is then crushed and screened to a variety of sizes and stockpiled. The product is then transported off-site by trucks, the volume of which depends on the demand for the final product. Dimension stone will be extracted using a rock cutting wheel in conjunction with a hydraulic excavator.

Environmental Assessment:

It is considered that the primary environmental issues relating to the project are;

- Traffic:
- Soil and Water Management – Preventing soil degradation, erosion and water pollution;
- Land Management and Conservation – Designing sites to have minimal impact on surrounding land usage and ecosystems;
- Noise Impacts and Air quality – Controlling the level of air and noise pollution generated by the project;
- Protection of waterways, and flora and fauna, and
- Visual Amenity.

Detailed Environmental Assessment has been conducted in the following areas:

- Landform & Geology;
- Water Resources;
- Noise Impact;
- Air Quality;
- Climate & Meteorology;
- Traffic;
- Flora & Fauna;
- Archaeology & Heritage;
- Landscape & Visual Amenity, and
- Landuse & Planning.

Proposed Mitigation Measures:

Mitigative measures to be employed will include but not be limited to:

- staged revegetation and rehabilitation measures;
- soil and water management devices (including a dust-suppression watering system); and
- acoustic barriers,

A number of other measures are to be implemented and whilst minor in detail, cumulatively, they will have a significant influence in providing for a more environmentally 'in-tune' operation.

Final Landuse:

It has been determined that the final landuse for the quarry area will be a woodland, sympathetic with the surrounding vegetation.

Community Consultation:

Nepean Quarries is committed to on-going community consultation and liaison. To this end, the company incurs a number of statutory and public reporting obligations, which will be supplemented by direct presentation of information to local government, property owners, neighbours and other relevant interest groups.

Statutory authorities approached include:

- Department of Urban Affairs and Planning;
- Baulkham Hills Shire Council;
- NSW Department of Land and Water Conservation;
- NSW Environment Protection Authority;
- NSW National Parks and Wildlife Service;
- NSW Department of Mineral Resources;
- NSW Department of Agriculture;
- Roads and Traffic Authority, and
- Integral Energy.

It is the intention of the company to:

- Ensure the community is aware of the operations;
- Facilitate information exchange between the company and the community;
- Provide an opportunity for public comment;
- Assist and supply interested parties with information;
- Identify, analyse and address community concerns and suggestions;
- Identify potentially conflicting areas of interest, and
- Demonstrate that community concerns are being addressed and complaints recognised.

Environmental Management Plan:

An Environmental Management Plan ('EMP') will be prepared to specify in detail the manner in which the site should be managed and the extraction process controlled. The plan will be prepared for the benefit of the operating staff, contractors and regulators. The EMP will represent an amalgamation of all of the environmental safeguards contained in the Environmental Impact Assessment, together with conditions imposed by the relevant statutory authorities. The EMP will be regularly updated and a reporting procedure developed in consultation with relevant control authorities.

Conclusion:

Nepean Quarries believes that the proposed sandstone quarry:

- Can be operated in an environmentally responsible manner;
- Will have no long term adverse cumulative impacts;
- Will provide employment during the construction and operational stages of the project;
- Will benefit the local business community, and
- Will assist the State Government achieve its objective of developing the State's natural resources.

ENVIRONMENTAL IMPACT STATEMENT

CATTAI SANDSTONE QUARRY
NEPEAN QUARRIES PTY LTD

PART A: PROJECT OVERVIEW

SECTION 1 BACKGROUND

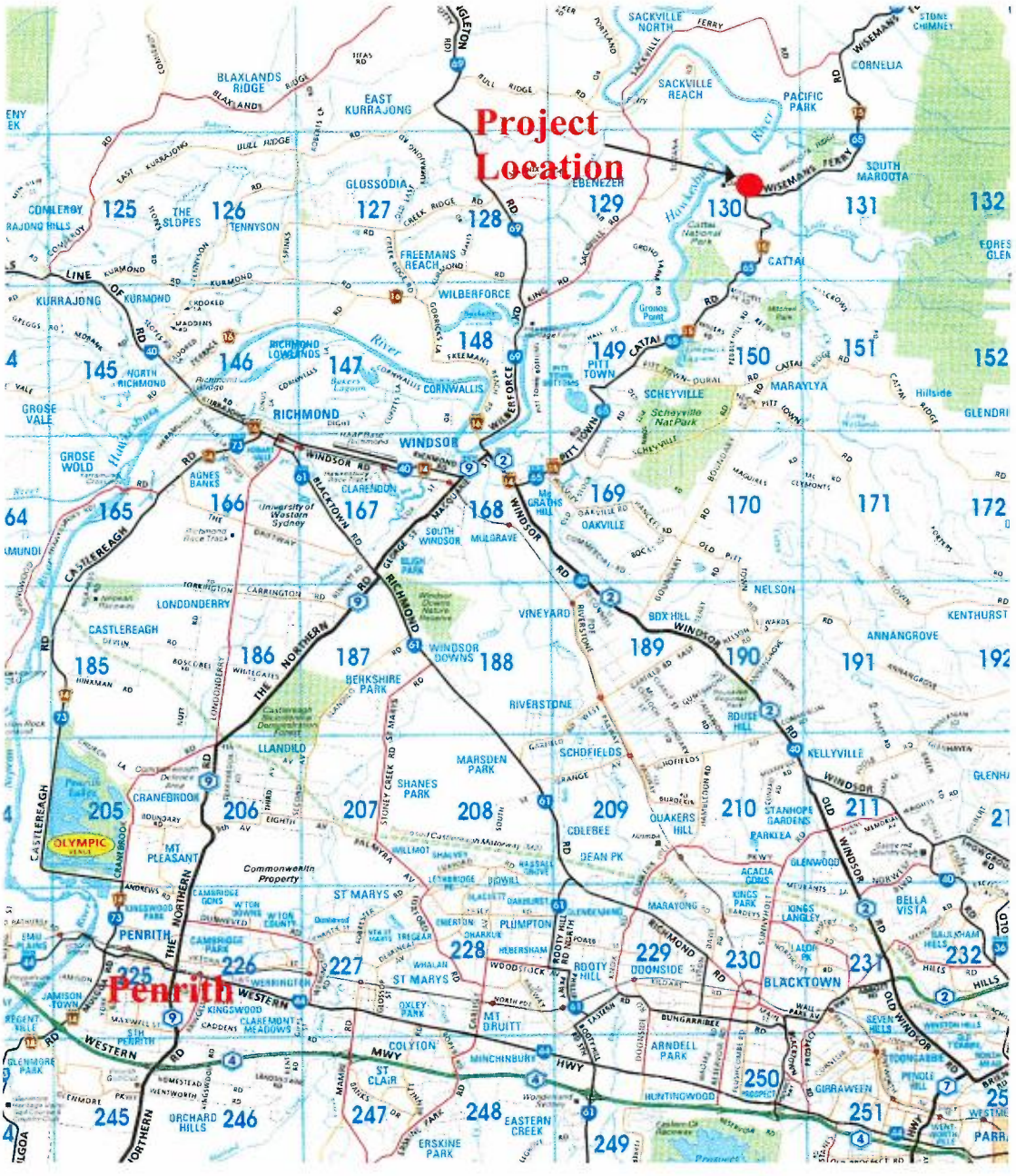
1.1 Introduction

Nepean Quarries Pty Ltd (the 'Company') is proposing to recommence a sandstone extraction project (the 'Project') on land located at Lots 1-5, DP 240610, Wisemans Ferry Road, Cattai (Figure 1). The proposal covers the production of both crushed and screened sandstone as well as the development of sandstone based dimension stone. Previous quarrying operations were located primarily within Lots 2 and 3.
The Project area is situated between Wisemans Ferry Road and the Hawkesbury River at Cattai, immediately east of the Riverside Oaks International Golf Course (Figure 2) and is located approximately 45kilometres north-west of Sydney.

The Company wishes to recommence quarrying operations in order to satisfy the increased demand for crushed sandstone products in the north-western part of Metropolitan Sydney and the local area. It is proposed to extend the area of the previous quarry workings to encompass lots 1-5, a distance of approximately 800m (Figure 3). The depth of extraction will be limited to 15 metres from the existing (natural) surface.
Sandstone will be extracted by bulldozer ripping. The ripped material is then crushed and screened to a variety of sizes and stockpiled. No blasting is involved in the extraction process. Dimension stone on the other hand, will be extracted by cutting saws which are able to cut out large blocks (measuring approximately 2.0 x 0.75 x 0.75 metres) of sandstone. These blocks are exported off the site for further product enhancement.
The sandstone resource, upon which the proposal is based, is part of the outcropping massive Hawkesbury Sandstone of Permian Age. Previous testing and utilisation has demonstrated the suitability of the sandstone for use in the construction industry, primarily as road base. The main features of the quarry site are illustrated in Plates 1 to 6.

1.2 Background to the Project

The land subject to the proposed quarry development is wholly owned by interests associated with the Curran and Westland Families. The land is zoned Rural 1 (b) and extractive industries are permitted subject to approval by the appropriate consent authority. In this case, the consent authority will be Baulkham Hills Shire Council.
The proposed extraction area covers approximately 24 ha, and a resource of approximately 3.5 million tonnes of sandstone is indicated.
The Company is aiming to produce up to but not exceeding 200,000 tonnes of crushed sandstone per year at an average rate of between 10,000 and 20,000 tonnes per month, markets permitting. The potential for dimension stone is unknown at this stage, but it is envisaged that annual production could be up to 20,000 tonnes. Given the potential for added value from dimension stone, production of dimension stone will be increased should suitable markets be found.



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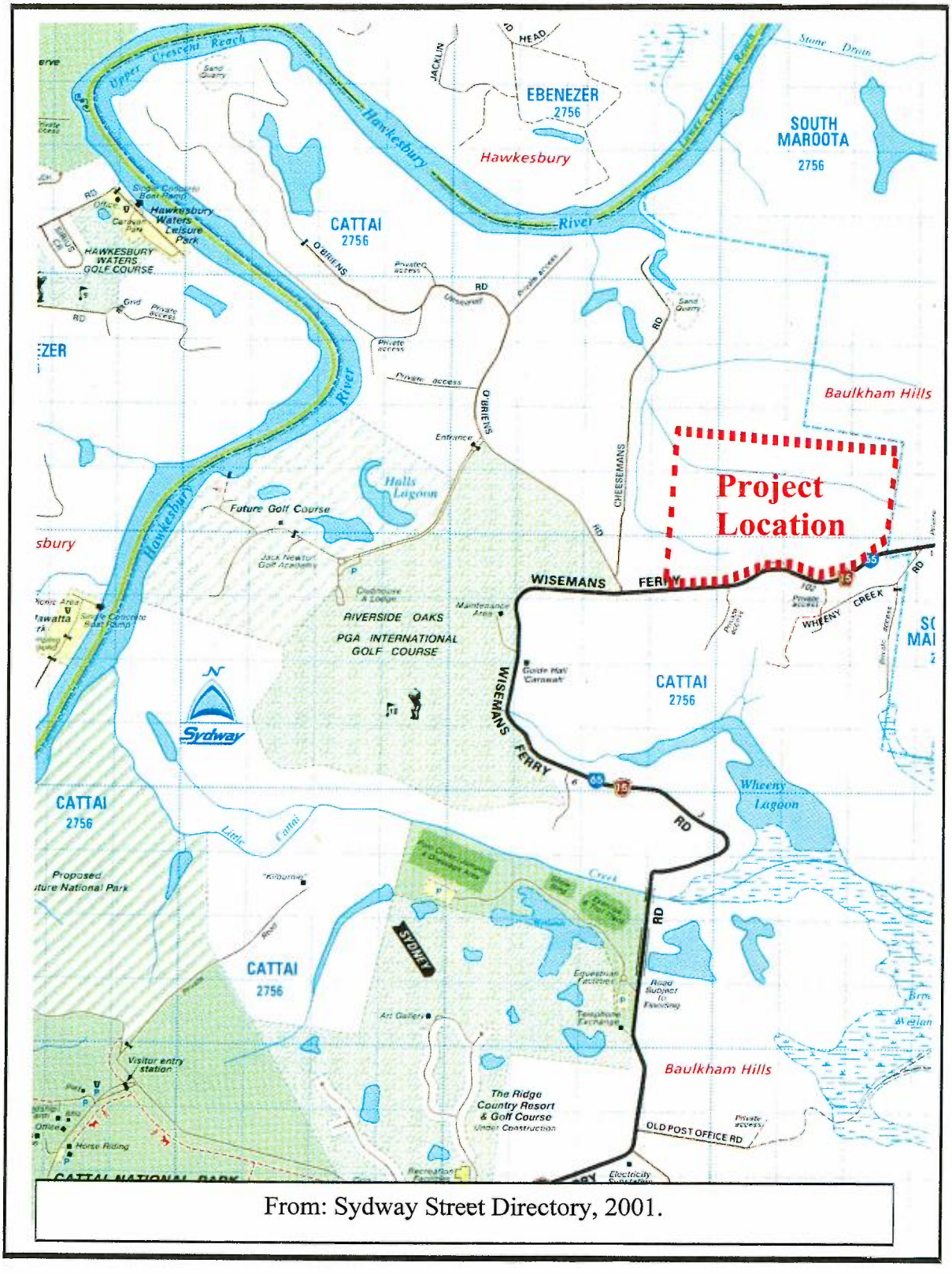
HARVEST SCIENTIFIC SERVICES

Figure 1

Cattai Sandstone Quarry

PROJECT LOCATION: REGIONAL CONTEXT

Nepean Quarries Pty Ltd



From: Sydway Street Directory, 2001.

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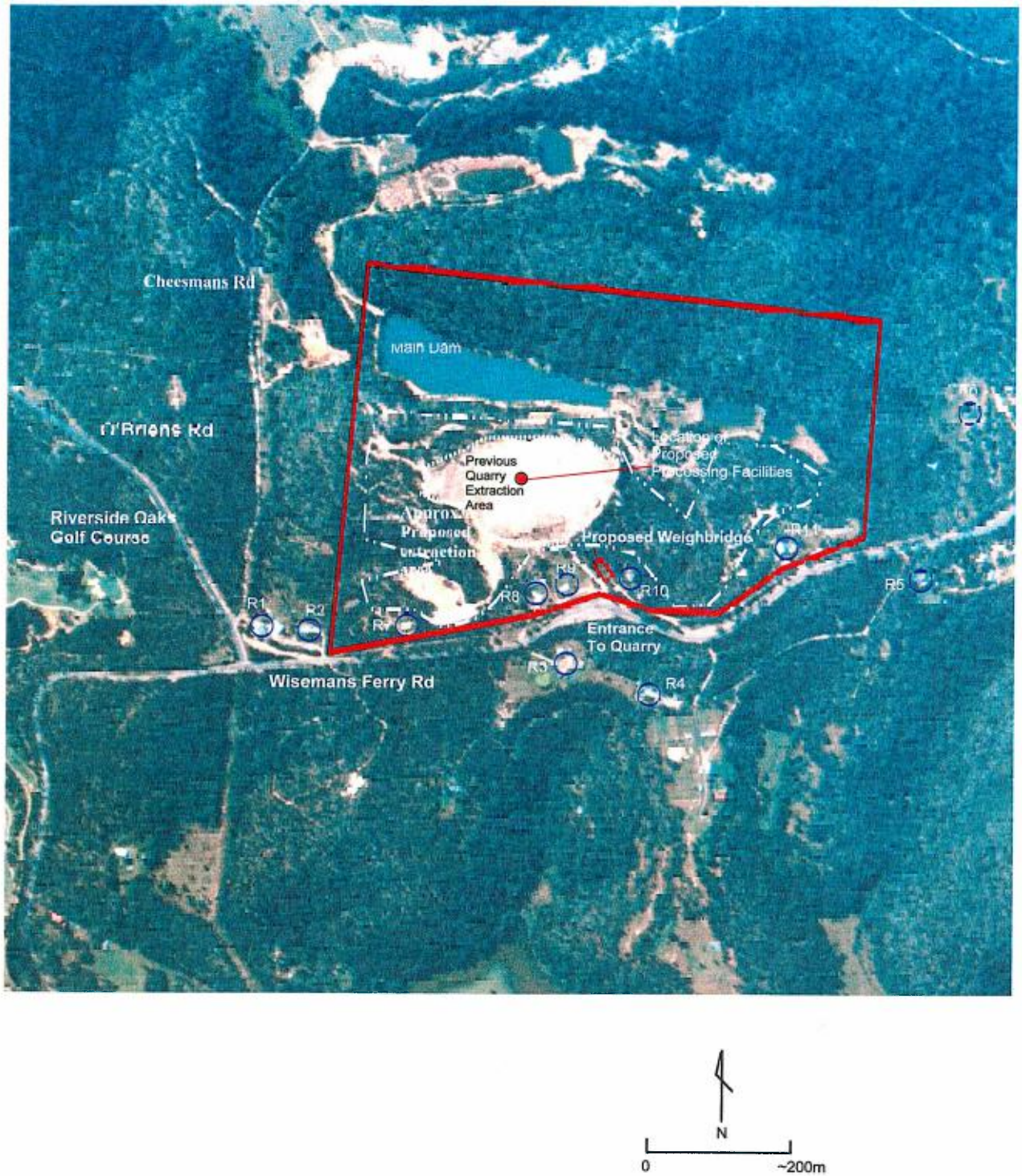
HARVEST SCIENTIFIC SERVICES

Figure 2

Cattai Sandstone Quarry

PROJECT LOCATION - LOCAL SETTING

Nepean Quarries Pty Ltd



From: NSW Department of Information Technology and Management.

R3 ○ Nearby residences

HARVEST SCIENTIFIC SERVICES

Figure 3

Cattai Sandstone Quarry

AERIAL VIEW

Nepean Quarries Pty Ltd

Plate 1 Panoramic view of previous extraction area looking north-west.

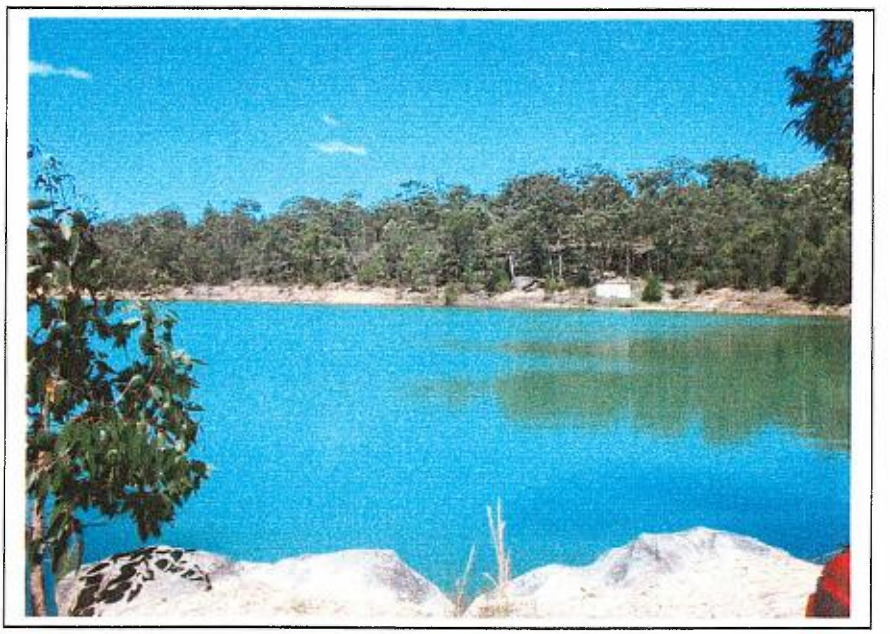


Plate 2

View of the main dam (Dam 1) looking south-east. Main quarry area behind the line of trees.

Plate 3

View from the access track to Dam 1 showing existing soil and water management controls including this sediment basin.

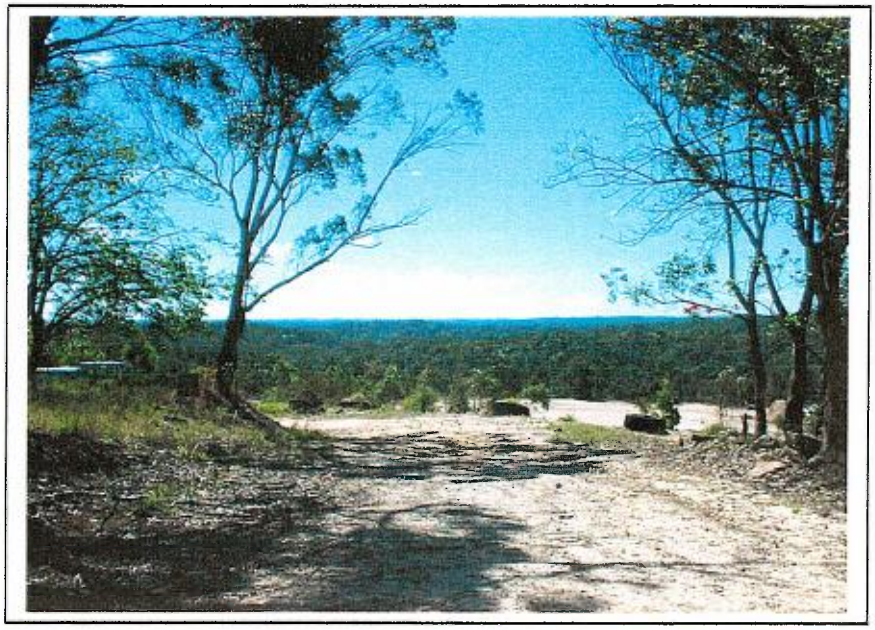


Plate 4

View looking north from the entrance road.

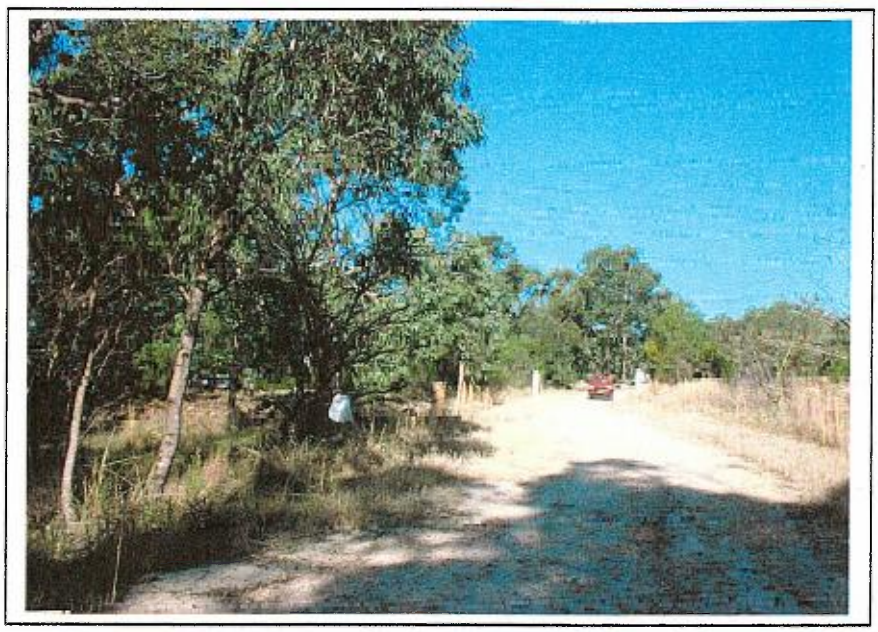


Plate 5

View of the exit from within the quarry. Weighbridge and office are to be located on the LHS of the track.

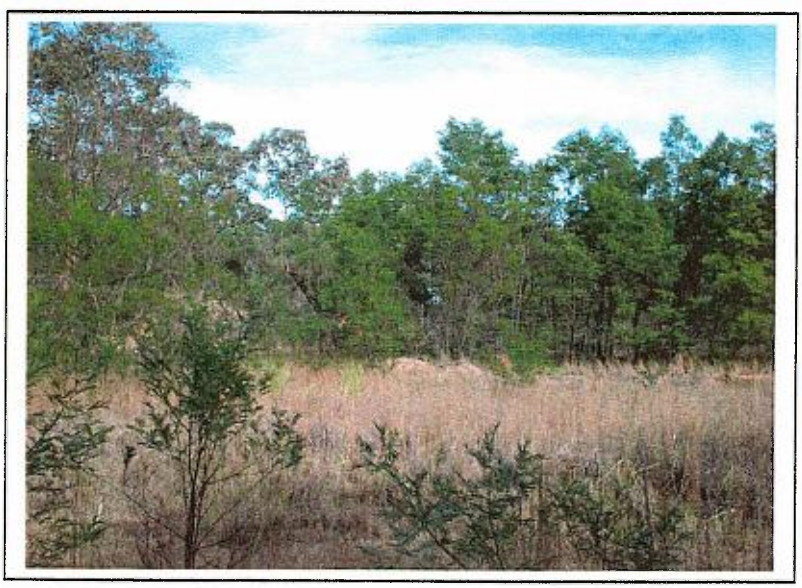


Plate 6

Former treatment area. The main sedimentation retention pond is to be constructed in this area.

1.3 Format of the Statement

This Environmental Impact Statement (EIS) consists of two Volumes, Volume 1 contains the main text and appendices, whereas Volume 2 contains reports which have been undertaken by a number of specialist consultants. The main text has been written in nine sections with a set of appendices. Preparation of this report is based on Development Control Plan No 500 (Baulkham Hills Shire Council, 1997) and the EIS Guidelines for Extractive Industry (Department of Urban Affairs & Planning, 1996).
The format is as follows:

Part A: Project Overview. Introduces the proposal and the Company and outlines the background to the project. In addition, an outline of the management of this statement is given as well as details on the statutory requirements.

Part B: Project Operation. Outlines the Company's objectives and proposed plans for the quarrying operation. A brief proposal for site rehabilitation is also examined.

Part C: Environmental Setting, Safeguards and Impacts. Describes the existing natural environment in and around the project site. Potential environmental constraints are identified and measures to ameliorate potential environmental impacts are detailed.

Part D: Cultural and Economic Environment. Describes the built environment in and around the project site. Potential environmental constraints are identified and measures to ameliorate potential environmental impacts are detailed.

Part E: Planning Requirements. Statutory planning controls, polices and legislation is discussed and evaluated.

Part F: Other Environmental Matters. Describes current ecological issues, provides an Energy Statement and provides details on Risk and Safety

Part G: Community Consultation. Describes the proponents approach to involving the community

Part H: Environmental Management Plan. This section includes a detailed description of how the operation is managed on a day to day basis with respect to all environmental aspects.

Part I: Evaluation of the Proposal. This section outlines the need and justification for the project as well as considering alternatives.

1.4 The Proponent

The Company is the operator of several other quarries located in the Sydney Metropolitan area. It is a part of the Nepean Group which is a diverse group of companies with interests in engineering, quarrying, agriculture, property development and mining throughout NSW. Today the company operates a number of quarry sites including the following:

- Elderslie - Sand
- Brownlow Hill – Sandstone and shale
- Mt Hunter - Sandstone

- Glenfield - Sandstone
- Kurrajong - Sandstone

The Company has an extensive client list, which it has built up and serviced over many years. These include major earthmoving & civil contractors, various semi-government authorities and local government bodies. The Company has established itself as a reliable and efficient supplier of raw materials. The Cattai quarry will support approximately 3-5 staff and 8 indirectly.

1.5 The EIS Assessment Process

The Environmental Planning and Assessment Act, 1979 (EP & A Act), as amended, provides regulations for environmental planning and assessment of quarrying activities in New South Wales. The Director General's requirements in this matter are attached as Appendix 1. It is a requirement of this act that an assessment of the environmental impact of a proposal must be undertaken prior to consent for the project being granted. This EIS has been prepared in accordance with Part 4 of the EP & A Act, the Environmental Planning and Assessment Regulation, 1994, and Guidelines for Extractive Industries – Quarries (Department of Urban Affairs & Planning, 1996).
Schedule 3 of the Act introduces thresholds based on the volume of material obtained, the area disturbed and the sensitivity of the affected environment. Due to the size and position of the proposed quarry, the project is classified as a designated development and subject to approval by Baulkham Hills Shire Council. The requirements of Clause's 54, 54A and 55 of the Environmental Planning and Assessment Regulation, 1994 and the Director's letter (Appendix 1-Schedule 2) have been incorporated into the most appropriate sections of the Statement.

1.6 Approvals required

This EIS is to be submitted as part of a Development Application (DA) to Baulkham Hills Shire Council. As the project will require licencing from the NSW Environment Protection Authority (EPA) and Department of Land and Water Conservation (DLWC), the project is also considered to be an Intergrated Development.

1.7 Scope of the EIS

The Environmental Impact Assessment involves detailed assessments of numerous issues and topics relating to the proposal, including landform, geology, soils, flora, fauna, visual amenity, noise, surfacewater and groundwater, air quality, meteorology, traffic, archaeology and heritage, land use and planning, safety and risk, ecological issues, environmental management, community consultation and energy issues.
The scope of the study is based on the requirements of all applicable government legislation and statutory authorities. Advice was sought from the following and their responses are attached as Appendix 2:

Department of Urban Affairs and Planning	Department of Land and Water Conservation
NSW Department of Mineral Resources	NSW Environment Protection Authority
Integral Energy	NSW Department of Agriculture
Roads and Traffic Authority	Baulkham Hills Shire Council

A checklist indicating compliance with the requirements of the above authorities together with Development Control Plan 500 (DCP 500) issued by Baulkham Hills Shire Council is given in Appendix 3.

1.8 Management of Investigations

The bulk of the investigations and report writing has been undertaken by Mr Mart Rampe B.Sc (Applied Geology) (Principal of Harvest Scientific Services), Mr Mark Griffiths B.App.Sc. (Project Environmental Scientist at Harvest Scientific Services), and Mr Geoffrey Muers B.Sc.(Hons.) (Project Geoscientist at Harvest Scientific Services). Considerable assistance has been provided in the preparation of the Statement by a range of individuals and organisations. These include:

- Anderson Ecological Surveys for matters relating to the Flora and Fauna of the Project Site;
- Julie Dibden (archaeologist) for matters relating to archaeology;
- Representatives from the Deerubin Local Aboriginal Land Council, the Darug Custodial Aboriginal Corporation and the Darug Tribal Aboriginal Corporation; and
- Dick Benbow & Associates Pty Ltd for matters relating to noise and dust.

Furthermore, a continuing dialogue was maintained with the Company's personnel regarding operational matters and their assistance is also gratefully acknowledged. This report has been prepared in accordance with Local and State Government planning legislation, and reflects the requirements of Baulkham Hills Shire Council.

SECTION 2 OPERATIONAL SUMMARY

2.1 Production Process

The operation will consist of a number of elements including:

- **Establishment of quarry infrastructure:** This includes roads, weighbridge, office, car parking space, soil and water management devices and water reticulation system;

- **Overburden removal and placement:** Where the operation enters undisturbed areas, overburden placement and removal is required. This operation occurs infrequently and is carried out to expose fresh sandstone. It is conducted on a campaign basis lasting several days and is carried out by a D11 bulldozer and scraper. During the first stages of the operation (designated as Stages 1A and 1B), there will be no requirement for overburden stripping as the targeted extraction areas coincde with the previously extracted area which is completely denuded of all soil and overburden;

- **Production of Sandstone:** Sandstone is won by either ripping or cutting:-

  - **Sandstone Ripping:** A D11 bulldozer is used to rip the sandstone and push the released material onto the floor of the quarry.
  - **Dimension Stone:** Dimension stone will be extracted in campaigns using a rock-cutting wheel ('Paodovan Wheel') in conjunction with a hydraulic excavator;

- **Product Development:** Ripped sandstone is picked up and either screened for armour rocks and/or taken to the crusher where the sandstone is crushed and screened to a number of product sizes. Each product is stockpiled separately;

- **Trucking:** Trucks are loaded from the product stockpiles by a Front End Loader (FEL), then proceed to the weighbridge station; and

- **Recording of Data:** Each load is weighed and electronically recorded for billing and royalty purposes at the weighbridge.

2.2 Previous Approvals

The site was previously leased by Western Sand Mining Pty Ltd, who extracted sand and sandstone resources from the area between the Wisemans Ferry Road and the main catchment dam to the north, during the 1980's and 1990's (See Figurc 3). Prior to this, the existing property owners had extracted topsoil and sand resources. Approvals for all previous activities at the site have since lapsed and this proposal will be subject to a fresh development application and assessment.

2.3 Existing & Required Infrastructure

The design and layout of the quarry site is well suited to accommodate the infrastructure required for the operation of the quarry, as it has previously been the site of a well established operation. Elements of the existing infrastructure include the following:

- A well maintained road links the mouth of the quarry to Wisemans Ferry Road;
- Sediment control devices are already in place at the quarry, including rock check structures and sediment retention basins;
- A network of access tracks linking the different parts of the quarry;

Items of infrastructure that will be required for the operations include:

- A portable weighbridge with an attached office to be located near the entrance to the quarry. The office will be powered by mains electricity and have a standard telephone link;
- A covered work area will be made available for minor repairs and maintenance; and.
- A concrete bunded fuel tank area (with roof) with a capacity of 12000-15000 litres of diesel will be installed. This will be located behind the weighbridge.

SECTION 3 OBJECTIVES

3.1 Overview

The Company, in submitting this application has a limited but important number of objectives. These entail the following basic principles:

- Extractive industries such as sandstone quarrying form the core activity of the Company. It is therefore keen to maintain its business by operating quarries such as the Cattai Quarry as their other operations reach the end of their economic life;

- The opportunity for developing new quarries within easy reach of the Metropolitan market is becoming increasingly difficult because of the pressure from urban development and therefore potential land-use conflict. To open up a 'greenfields' site for any type of quarrying operation would face extreme difficulty. Therefore existing operating or semi operating sites are considered extremely valuable as an on-going source of supply, from both an environmental and economic perspective; and

- The quarry will provide income and employment to both quarry operators and their employees. The extension to the quarry will guarantee their long-term prospects. In addition, the owners of the site will benefit from the resumption of economic activity.

3.2 State and Regional Initiatives

It is the intention of the Company to demonstrate that sandstone extraction can be carried out successfully and in an environmentally acceptable manner.
These outcomes are in line with State objectives of realising the potential of natural resources and have been recognised in the past by the provisions of Regional Environmental Plan 9 (2) – Extractive Industries. This Plan recognises that many of the State's resources should be given priority when questions of land development and potential conflict are being considered. Though the quarry site is outside of the REP-9 area of Maroota, the same principles are nevertheless applicable.

3.3 Project Benefits

Re-commencement of quarrying operations in the region would realise a number of significant benefits to the local and wider communities, including:

- Assisting the State Government achieve its objective of developing the State's natural resources;
- Providing a long term solution to predicted shortages of quality aggregates in the Greater Sydney Metropolitan Region;
- Generation of employment during the construction and operational stages of the project;
- Benefit to local businesses in the surrounding areas including Cattai, Windsor and Richmond; and;
- Avoidance of the development of a 'greenfields' site further away from the Metropolitan area which could potentially increase the pollution load on the community.

SECTION 4 SANDSTONE RESOURCES

4.1 General Description

The resource underlying the Cattai Quarry is massive sandstone known as Hawkesbury Sandstone. It is estimated that approximately 1.5 Million tonnes of sandstone have been previously extracted from the site.

4.2 Resources Determination

The estimated size of the sandstone resource outlined in this proposal is approximately 3.5 million tonnes. This is based on:

- A recently completed survey of the entire property by a registered surveyor (contours to 1metre);
- The known extent of sandstone within or adjacent to the proposed quarry outline obtained from past drilling, previous excavations and surface mapping traverses;
- The maximum depth to the future quarry floor from the surface being approximately 15 metres, and;
- Specific density of sandstone, which is approximately 2.5 tonnes/cubic metre.

4.3 Rock Quality

The Hawkesbury Sandstone conforms to standard specifications, with low Plasticity Index (PI) and Linear Shrinkage (LS).
Products from the quarry have for a considerable period of time been a NSW Department of Housing approved product. Rock quality and specification compliance information is also attached as Appendix 4.

4.4 Products and Overburden

4.4.1 Crushed or Ripped Sandstone

The bulk of the crushed sandstone product produced by the quarry will be utilised as Prepared Road Base (PRB) material for large commercial developments such as road constructions and subdivision infrastructure. Its main uses include:

- Road base material
- High-quality fill
- Stabiliser

These products are illustrated in Plates 7-9.

Modern communities require large quantities of sand, gravel, crushed rock and structural clay for their building and construction needs. New South Wales annually needs about 50 million tonnes of these materials, representing almost 9 tonnes for every person in the State. The total raw production value of these construction materials is currently about 500 million dollars.

Plate 7

Typical 40mm crushed Sandstone product to be produced from the quarry.

Plate 8

A selection of various sandstone products including armour rock will be produced from the quarry.

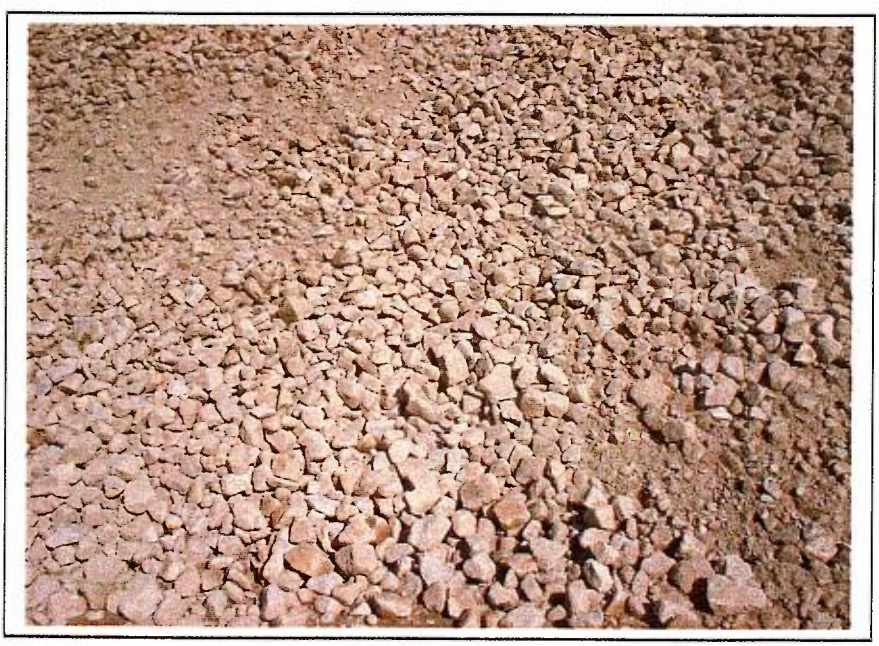


Plate 9

The most popular product is this 75mm crushed sandstone which is used as a road base.

In a recent study, supply and demand relationships were examined for sands, gravel, crushed rock, and structural clay (Pienmunne, 2000). Demand for coarse aggregate has increased from around 8.8 million tonnes per annum in the 1970's to 10.8 million tonnes per annum in the 1990's, with the shortfall of supply from the Sydney region increased from 1.2 Mt to 2.5 Mt.

This situation is due to change after 2010 when the Penrith Lakes and Prospect Hill quarries cease operations. This is expected to place increased demand on existing river gravel and hardrock deposits in the region.

Production data and demand analysis provides some indication of future needs. It is often assumed that demand will grow in line with an increasing population and resultant infrastructure needs. However construction material production is affected by broad economic trends and the cyclical nature of the construction industry. As a result, demand often fluctuates, a reason why very few quarries maintain large stockpiles. Estimating approximate future demand can be determined by correlating population growth with coarse aggregate production. Coarse aggregate demand forecasts based on population statistics and predicted production rates predict a shortfall of about 21 million tonnes for the period 2000 – 2010 (see Figure 4).

The availability and supply of coarse aggregate from the currently identified and potential sources is influenced by a number of factors, such as cost of transport, competing land uses, and the environmental impacts of extraction and transport.

Analysis of production statistics for sandstone shows a linear increase in yearly production to about 1987/88, after which there is a short sharp peak in 1989/90. This is followed by a sharp decline and an irregular but nearly flat section from 1993/94 onwards illustrating demand for crushed sandstone has levelled off since the early 1990s.
Annual production, although variable, seems to have been in the order of 1.7 - 1.9 million tonnes per annum over the past decade with little if any growth. Part of the reason for this may be due to competition from recycled materials. The amount of recycled materials has increased rapidly over the past few years, with 300,000 tonnes estimated to be recycled in 1995/96 increasing to 1.2 million tonnes in 1998/99.

Although potential resources occur in most of the state, some regions lack sufficient supplies of suitable construction materials. Adequate resources of construction materials need to be identified and protected to meet future building and construction needs while ensuring that the community is not adversely affected by quarrying operations.

4.4.2 Dimension Stone

Dimension sandstone is to be quarried at the site and exported as blocks measuring up to 1.5 metres x 0.75 metres x 0.75 metres. These blocks will then be cut into specific sizes and shapes at a processing facility located off-site. Uses range from paving and landscaping, to residential buildings and panelling for high rise buildings. Sandstone from the Cattai quarry had been used for dimension stone purposes previously, with the stone assessed as being of good quality, with high strength and a good range of patterns and colours.
The majority of dimension sandstone available in the Sydney market is sourced from quarries near Gosford, with most of this sandstone of a uniform white and yellow colour.

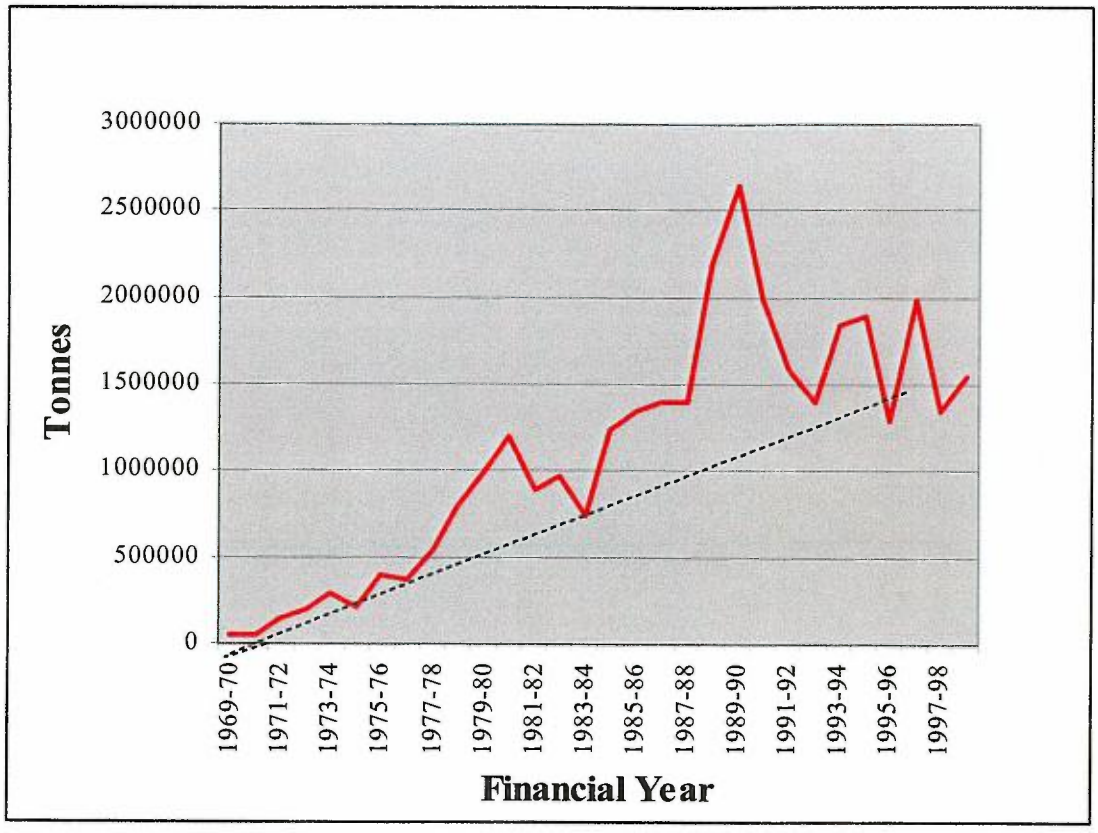


Figure 4: Sedimentary Aggregate Production in the Sydney Region 1969-1999

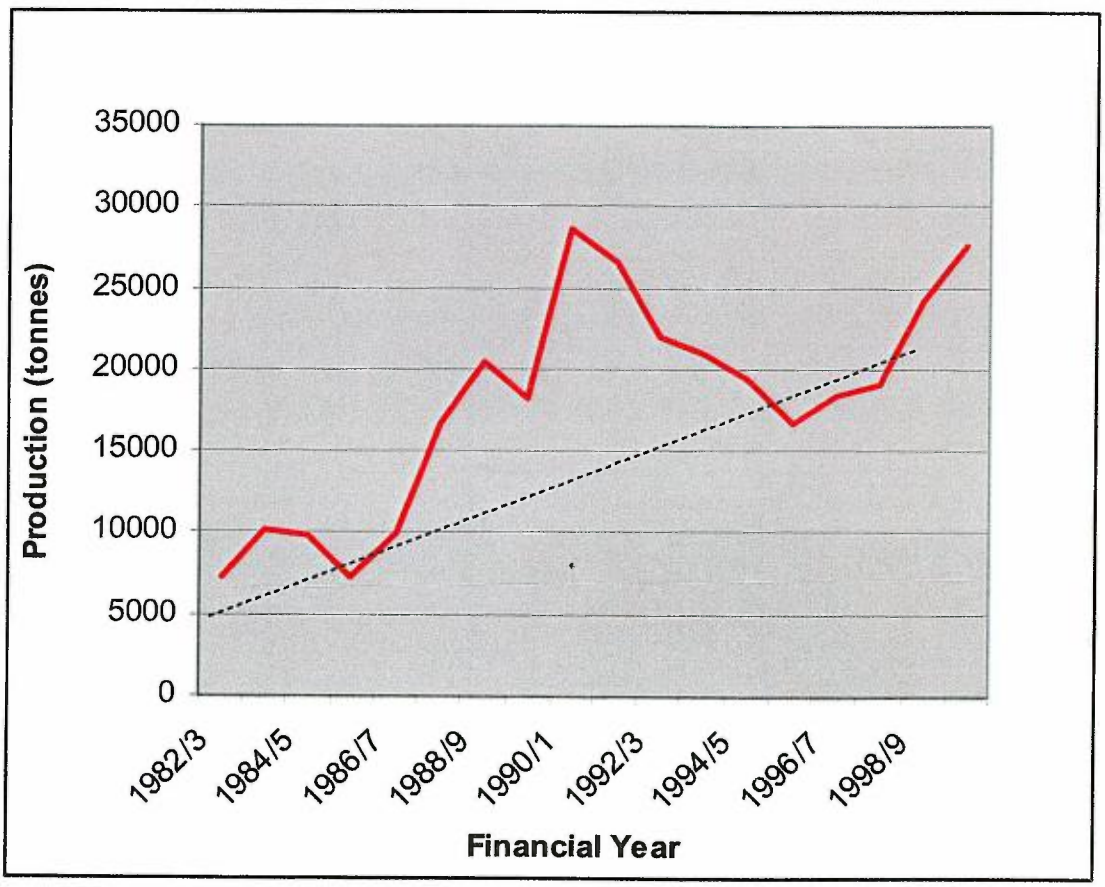


Figure 5: Production of Dimension Sandstone Products in NSW 1982-1999

It has been estimated (Ray, 1993) that the Australian Market was worth approximately $120 million in 1992, $100million of which represented imports. A limited amount of dimension stone (namely sandstone) is now exported. Recent production statistics of NSW dimension sandstone production indicate an increase in production of approximately 14% per annum since 1996 (see Figure 5). A significant amount of this growth has been in the export market, due to the lack of quality sandstone in many parts of the world, particularly South East Asia and Japan.

The primary problem faced by the local dimension stone industry, is the effect of cheap imports of processed stone from countries where labour and other processing costs are considerably less. This does not apply to the same degree to sandstone due to the lack of available quality resources, and the lower processing costs than the harder stones.

The marketability of dimension stone is the most important factor in assessing the potential value of resources. In general, the most marketable dimension stone is that which demonstrates unusual colours and/or textures. This is particularly applicable to granite, where local producers require a niche product along with economies of scale to compete with cheap imports.

The main constraint on the introduction of new materials or supply is the distribution channel, consisting primarily of re-sellers. In addition to this, there are a limited number of specialised contractors who install dimension stone products.

In assessing a sandstone resource, the quality of the stone needs to be thoroughly investigated to ascertain parameters important for extraction and end utilisation. These include:

- adequate joint spacing to allow extraction, with close spacing of vertical or horizontal jointing to be avoided;
- petrographic analysis to determine the mineral composition (ie. Identification of deleterious minerals such as feldspar and mica); and
- Physical properties such as tensile and compressive strength.

Product from the Cattai Quarry has been assessed in the past and is considered suitable for production. However, given the uncertain market conditions, initial production is estimated to be rather limited.

4.4.3 Overburden

A large proportion of the proposed extraction area consists of outcrops of sandstone, and for this reason there is a limited amount of overburden to be removed. However, where overburden does exist, it is restricted to clay, and minor amounts of shallow sandy soils. In addition, highly weathered and soft sandstone is often considered to be part of the overburden. All of this material can be removed and utilised in the construction of bunds and form the base for rehabilitation areas.

SECTION 5 PROJECT AREA AND ALTERNATIVES

5.1 Regional and Local Context

The Cattai Quarry is located within the north-western part of the Sydney Metropolitan area and is situated within the Nepean River Catchment, approximately 13kms north-east of Windsor township. The quarry and surrounding townships of Cattai and Pitt Town are serviced by a major road - Wisemans Ferry Road, which links Windsor to Pitt town, Cattai and Wisemans Ferry. The location of the quarry in the context of like operations within the Shire boundaries is illustrated in Figure 6.
Pitt Town is the nearest residential 'village', located approximately 8 kilometres to the south, though numerous rural-residential holdings are located throughout the Cattai area. Landuse in the northern area of the Shire is primarily rural with around 5% residential (Baulkham Hills Shire Council, 1999). The landscape in the area is dominated by agricultural enterprises (such as turf farms), recreation facilities (golf courses) and reserves surrounding the many wetlands in the area.

5.2 Site Location and History

Regional

The Baulkham Hills Region is one of the fastest growing areas in NSW, with the area evolving from predominantly a rural landform with minor fringe urban areas, to a part of the Sydney Metropolitan Area over the last 30 years. As a result, the demand for quarry products has steadily increased over the years.
Properties in the area are varied in their land use and history, with the majority being part of large freehold properties, owned by various organisations and individuals, and used either as residential properties, agriculture enterprises or recreation facilities. The pressure of urbanisation has yet to reach this part of the Shire.

Local

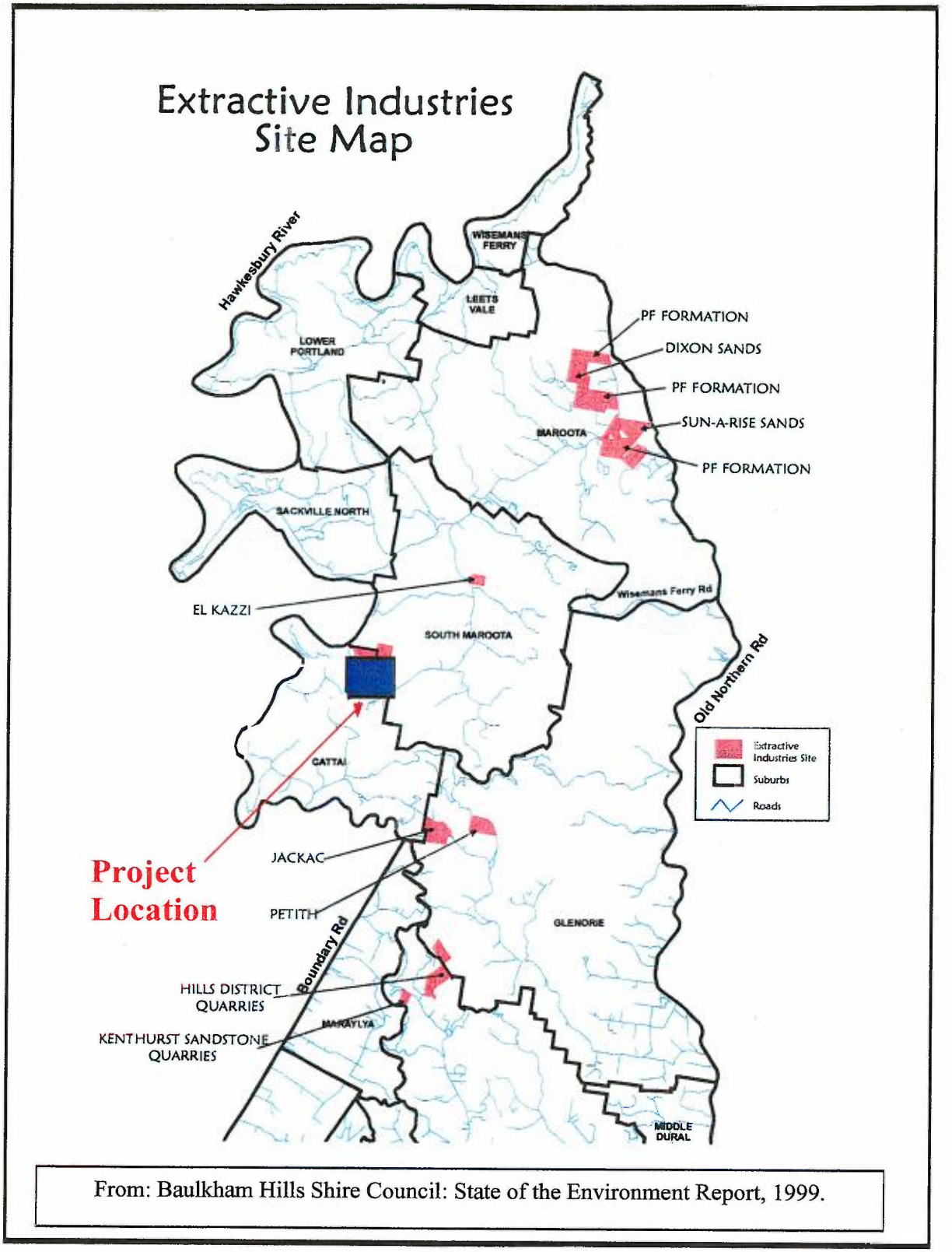
The site has been investigated to ascertain relevant environmental and physical data. The purpose of this work was to ensure that suitable plans could be drawn up to accommodate any environmental or other constraints. The outline of the existing physical environment and its relation to the proposed development is best illustrated in Figure 3.

Site History

The quarry site has been operational since the mid -1980's for sandstone extraction purposes and coincides with the ownership of the land by the Curran Family. Prior to quarrying activities, the site consisted mainly of undisturbed bushland.

5.3 Location Alternatives

Whilst other alternative sites could be found for quarrying operations, there is no doubt that such operations would now have to be located in remote locations to avoid potential land conflict issues. Given the costs of transport and start-up, such operations would be unviable – particularly given the presence of other similar quarries in the district owned by competitor organisations.



From: Baulkham Hills Shire Council: State of the Environment Report, 1999.

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0 5km

HARVEST SCIENTIFIC SERVICES

Figure 6

Cattai Sandstone quarry

EXTRACTIVE OPERATIONS WITHIN BAULKHAM HILLS SHIRE

Nepean Quarries Pty Ltd

Selection of the subject site took into consideration:

- Minimising disturbance of flora and fauna in the area
- Potential for disturbance of visual and acoustic amenity
- Potential for sediment and erosion hazards
- Environmentally sensitive areas
- The permissibility of the land use
- The presence of the existing quarry

Furthermore, the suitability of the site was assessed using the following criteria:

- Operational requirements
- Present and future land usage
- Technical criteria
- Geology and soils
- Topography and landform
- Acoustic environment
- Archaeology and heritage
- Transport issues
- Access onto site
- Flora and Fauna
- Archaeology and heritage

Part C of the EIS presents the findings of these assessments.

PART B: PROJECT OPERATION

SECTION 6 PROJECT DESCRIPTION AND ACTIVITIES

6.1 Introduction

The Proposal involves the re-commencement of quarrying operations at the Cattai Quarry and will involve the generation of coarse aggregate and dimension stone. The production of coarse aggregate will be generated by ripping, crushing and screening before being stockpiled for transport. Blasting will not be used as an extraction technique. Dimension stone will be produced by cutting exposed sandstone benches with a large industrial saw to produce large blocks of sandstone which are then wedged out and exported off-site. Approval for the annual extraction of an amount up to but not exceeding 200,000 tonnes (including dimension stone) is being sought.
The Company plans to extract sandstone at a rate of between 10,000 and 20,000 tonnes per month, the level of extraction being dependent on the overall demand for the products in a number of recipient industries.
A limited amount of dimension stone will also be extracted. At this stage, it is difficult to predict the likely output for dimension stone – however, approval for at least 20,000 tonnes per year is being sought.

6.2 Key Elements

The Key elements of the project are:

- Approvals process;
- The nature of the extraction activities;
- Supporting infrastructure;
- Short and long term environmental issues; and
- Rehabilitation and landscaping.

6.3 Approvals Required

This EIS together with a Development Application is to be lodged with Baulkham Hills Shire Council for Development Consent. It is anticipated that should consent be granted, a number of requirements will need to be fulfilled by the Company, namely:

- Complete and submit an Environmental Management Plan (EMP) and lodge with Baulkham Hills Shire Council;
- Apply for an EPA license (issued under the auspices of the Protection Of the Environment Operations Act, 1997. Licensing covers environmental issues such as noise, dust and water discharges with set operating parameters against which the operator must comply: and
- Apply for a Part 3A Permit from the Department of Land and Water Conservation (DLWC)

6.4 Major Environmental Issues

The primary environmental issues relating to the project are listed below in order of priority;

- Traffic Impacts - concerns about the impact of heavy trucks on Wisemans Ferry Road have been raised. A large number of trucks already utilise the road, and it is believed by some that the current road is not adequate to handle significant truck numbers safely;

- Visual amenity – the issue of visual exposure of the quarry to residences in the area has been raised both within the immediate vicinity of the quarry along Wisemans Ferry Road and adjacent side roads. Potential exposure to residents at Ebenezer, which is located on the north-western side of the Nepean River has also been raised as a concern;

- Noise Impacts – noise levels generated by any quarrying operation can be a significant issue. Noise will be generated by the internal quarrying operations (ripping, sawing, screening etc) as well as from trucks entering and leaving the site;

- Air quality – this issue relates primarily to the potential for dust generation as a result of the quarrying operations;

- Flora and Fauna – the need to conserve the ecological integrity of the site is an issue that will require close scrutiny;

- Landscaping and Rehabilitation - proposals for the rehabilitation of the quarry and its surrounds, as well as the intended final land use of the site must satisfy future environmental standards;

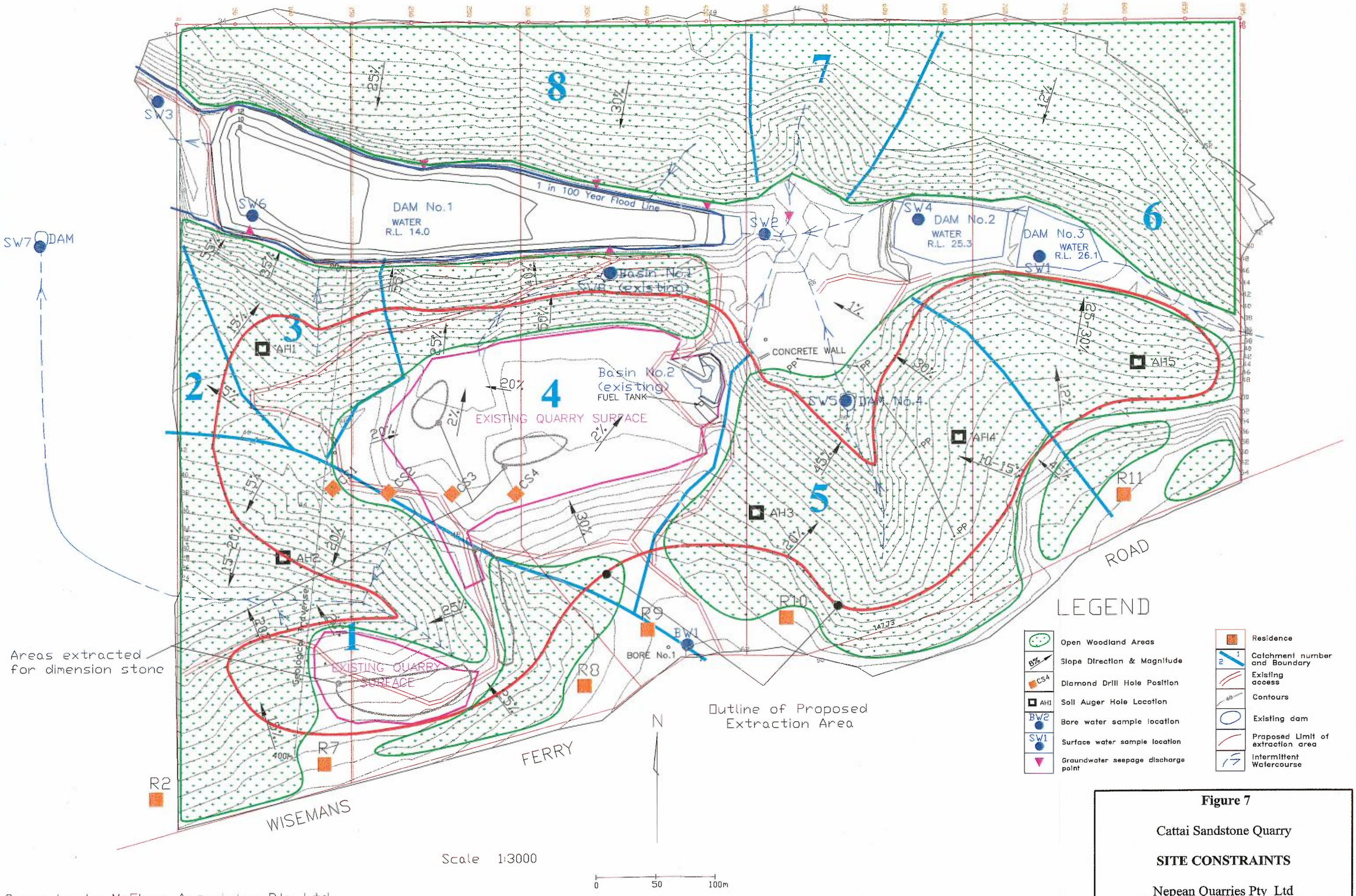
- Potential for Pollution – the potential of quarry operations to pollute the immediate surrounding and downstream environments is to be assessed. This includes issues such as surface and groundwater pollution, waste disposal, noise, dust and vehicle exhaust emissions.

The above issues are covered in Part C where a detailed assessment of the above (and other) issues are outlined together with the proposed measures that are required to ameliorate any adverse impacts.

6.5 Existing Site Characteristics and Constraints

The land subject to this proposal and the existing site constraints is illustrated in Figure 7. This figure should be considered in conjunction with Plates 1-6. In broad terms, the property subject to the proposal consists of several well defined elements. These include:

- A broad east-west trending valley, with drainage flowing out of the site in a westerly direction;
- A large water storage dam located on the drainage and occupying the western half of the property – it is estimated that the depth of water in the dam at its deepest is approximately 5 metres;
- Two smaller water storage dams are located on the same drainage line and in the eastern portion of the property – these two dams are densely vegetated with reeds;
- A zone of disturbance near to the main drainage and approximately 1 hectare in size is located within Lot 4 and represents the location of tailings and fill derived from the previous quarrying operations. Remnants of constructed infrastructure are also located in this area;



Surveying by McElwee Associates Pty Ltd

Figure 7

Cattai Sandstone Quarry

SITE CONSTRAINTS

Nepean Quarries Pty Ltd

- Land bare of vegetation and soil which represents previous quarrying operations are restricted primarily to Lots 2 and 3, with minor incursions into Lot 1. This amounts to approximately 5 hectares of disturbed land.
- A residence is located on each lot with close access to Wisemans Ferry Road;
- The valley sides are generally well timbered where none of the above disturbances have occurred,
- Slopes on either side of the valley vary from 10% to 45%. Minor drainages drain to the large water storage dam and are isolated by relatively well defined catchment boundaries;
- Access roads occur throughout the property.

6.6 Proposed Extraction Activities

6.6.1Sequence of Extraction and Rehabilitation

Sandstone extraction will be subject to a staged approach. This staging is illustrated in Figure 8 and discussed below.

Stage 1A: Consists of deepening the previously mined areas and some peripheral zones within catchment Number 4. Quarrying is to be undertaken according to a 'cell by cell' approach and the following sequence of activities is planned, viz:

- Extraction will commence within Cell 1, with the ripping of the sandstone floor. Much of the sandstone will be pushed onto Cell 3, with some being used as acoustic screening around Cell 1;
- Sandstone is then pushed out of Cell 1 until the final approved level is reached and there is enough floor space to establish the crusher and screening facilities;
- Sandstone pushed onto Cell 3 will then be processed;
- The height of the bunding around Cell 1 is approximately 3 metres which has been determined by noise studies;
- Upon the completion of Cell 1 extraction, the extraction face is advanced into Cell 2;
- Once extraction in Cell 2 nears completion, rehabilitation on this cell will also commence;
- Upon the completion of extraction in Cell 2, extraction will commence within Cell 3 - and so on.

Stage 1B: The area designated for dimension stone extraction will commence on approval and continue on in parallel with the main extraction activities of Stage 1A for the life of the project;

Stage 2: This will be an extension of Stage 1 activities and quarrying will conform with the cell by cell extraction methodology discussed above; and

Stage 3: This is merely the eastern extension of the whole Project area. Quarrying will conform with the "cell by cell" approach. It is intended that the details of the "cell by cell" approach for this stage will be detailed in future annual environmental and operational reviews. Consideration of Stage 3 extraction however is unlikely to occur for at least 10 years, which is reflected in Table 1.

It should be noted that the potential for dimension stone will be assessed at the commencement of each stage and/or cell. In the event that the quality of sandstone is adequate and suitable markets exist for the product, extraction may focus entirely on dimension stone. Hence, it may be feasible that dimension stone is the only form of product to be extracted. Should this be the case, extraction will still follow the cell by cell methodology as described above. It is important that the approval process recognise the importance of the need for internal quarry flexibility, thus giving the quarry operators the ability to meet industry demand for its products.

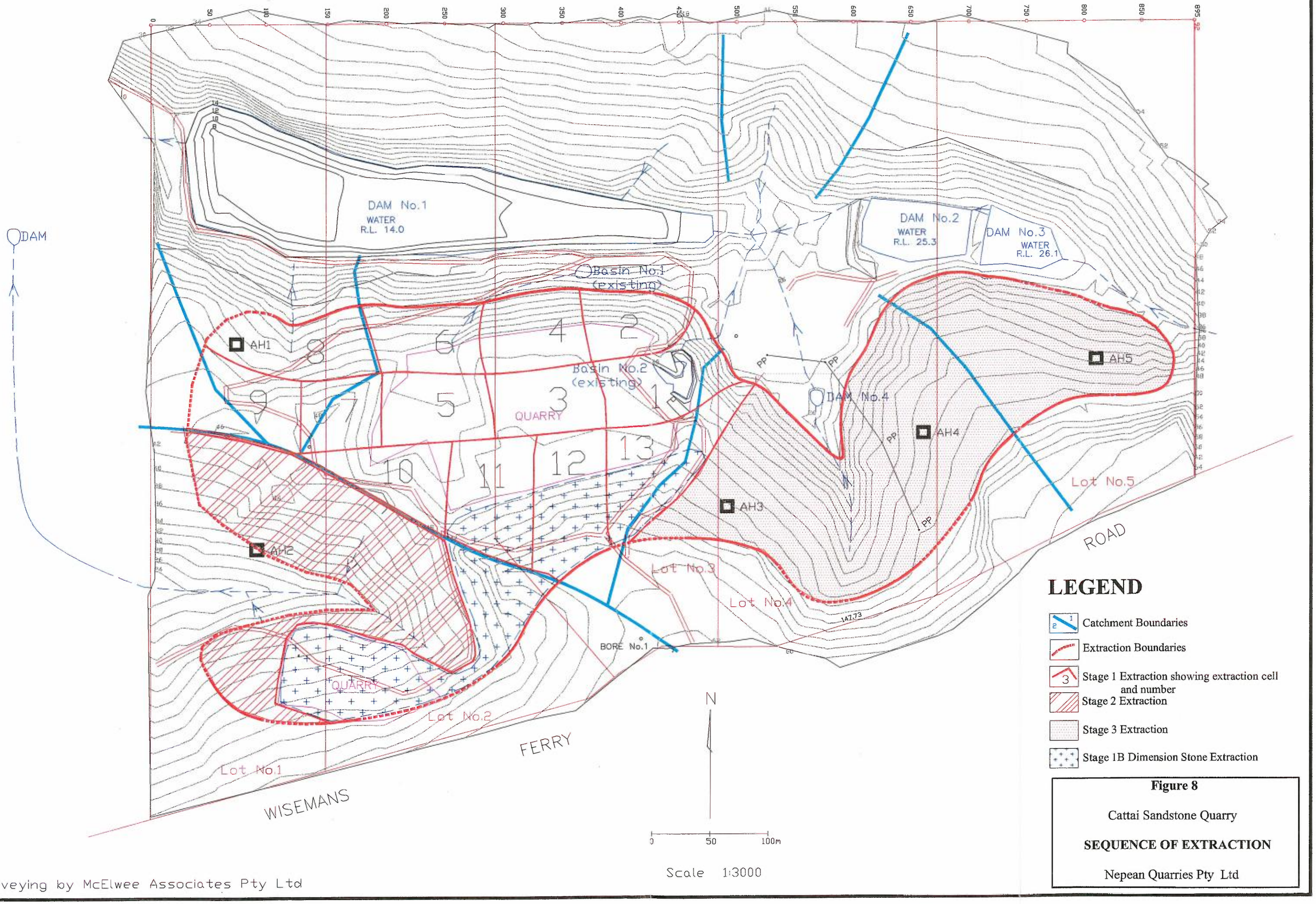


Figure 8

Cattai Sandstone Quarry

SEQUENCE OF EXTRACTION

Nepean Quarries Pty Ltd

Surveying by McElwee Associates Pty Ltd

A conceptual extraction sequence is outlined in Table 1. This is based on the quarry being focused on crushed aggregate. However, in the event that dimension stone was to become a more significant aspect of the extraction process, this timetable may become less relevant as the rate of extraction would be potentially much less. On the other hand, the value of production would be significantly higher.

TABLE 1: PROPOSED EXTRACTION SEQUENCE

Revegetation Management Category	Location*	Years 1-2	Years 3-5	Years 6-10	Years 11-15	Years 16-20
Stage 1A	Cell 1	→				
	Cell 2	→				
	Cell 3	→				
	Cell 4	→				
	Cell 5	→				
	Cell 6	→				
	Cell 8	→				
	Cell 9	→				
	Cell 10	→				
	Cell 11	→				
	Cell 12	→				
Stage 1B		→	→	→	→	→
Stage 2				→	→	
Stage 3					→	→

6.6.2 Proposed Extent of Quarrying

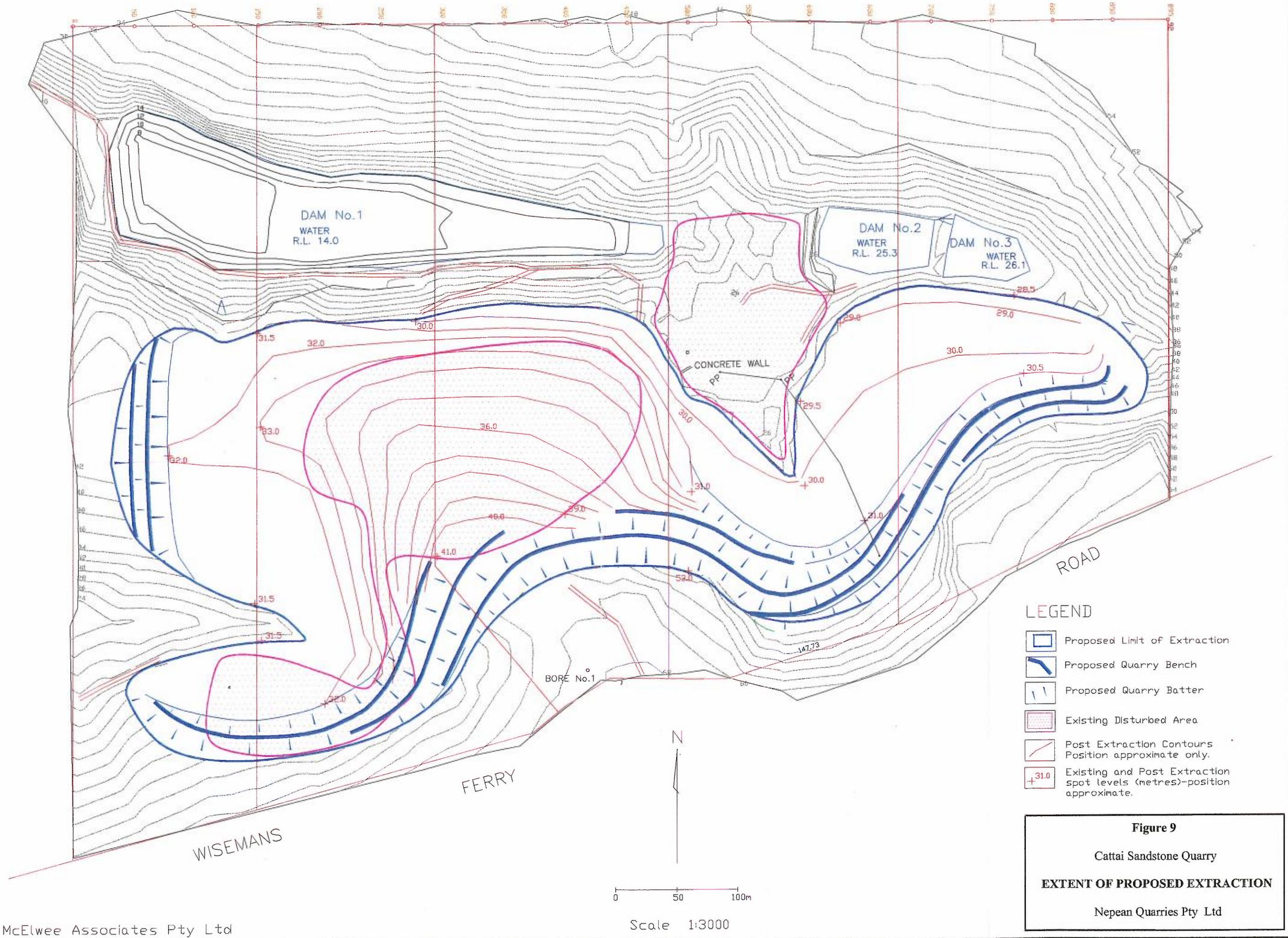
The extent of the existing disturbed area and proposed quarrying operations is indicated in Figures 8 and 9. Upon completion, the extent of quarrying operations will have encompassed approximately 24 hectares. This includes both the winning of crushed aggregates as well as dimension stone.
The maximum depth to the quarry floor will be approximately 15 metres from the natural surface. In the case of the already disturbed area within lots 2 and 3, the maximum amount to be removed is approximately 7 to 8 metres.
The extent of the extraction in a vertical sense is depicted in Figure 10. Several cross-sections through the quarry have been selected to indicate the existing surface and the proposed depth of extraction.

6.6.3 Method of Quarrying – Crushed Aggregate

6.6.3.1 Breaking Out

The "cell by cell" style of the quarrying technique to be adopted is depicted in Figure 11. There are several features of the quarrying method which should be noted, viz:

- A 'cell' approach as described above is to be adopted which facilitates a rapid rehabilitation strategy;
- Each cell may have an aerial extent of 100 metres x 50 metres. In most cases, the shallow depth of quarrying will not necessitate benching;



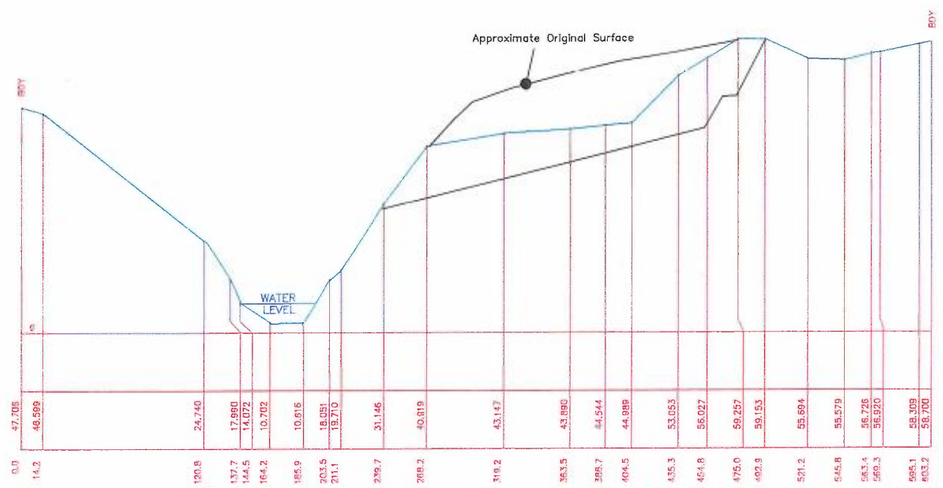
Surveying by McElwee Associates Pty Ltd

Figure 9

Cattai Sandstone Quarry

EXTENT OF PROPOSED EXTRACTION

Nepean Quarries Pty Ltd



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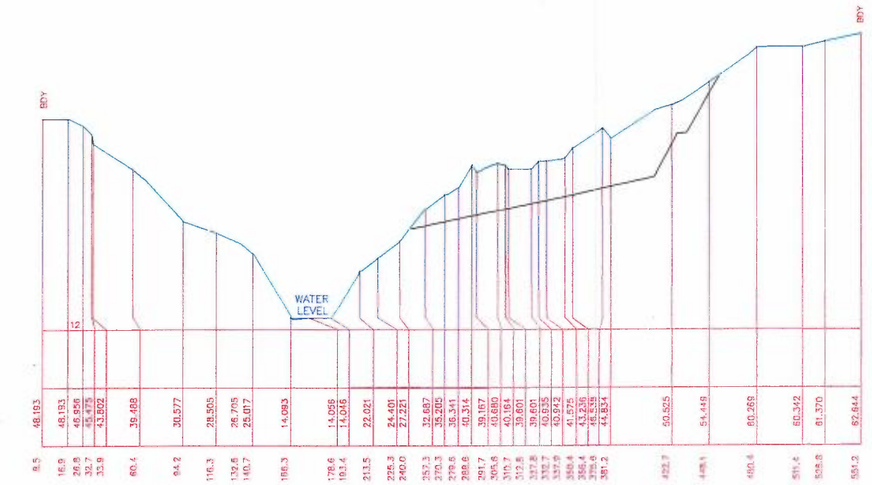

450

300

400

Views Looking North

All survey work by:

McELWEE Associates Pty Ltd
CONSULTING SURVEYORS
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Ph. 02 49295555 Fax. 02 49295554
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RATIO (A3)
HORIZ 1:2000 50 0 50 100 150 200
VERT 1:1500 10 0 10 20 30 40 50

Extraction Limits and Projected Surface as of 30/06/2002

Figure 10

Cattai Sandstone Quarry

CROSS SECTIONS THROUGH QUARRY

Nepean Quarries Pty Ltd

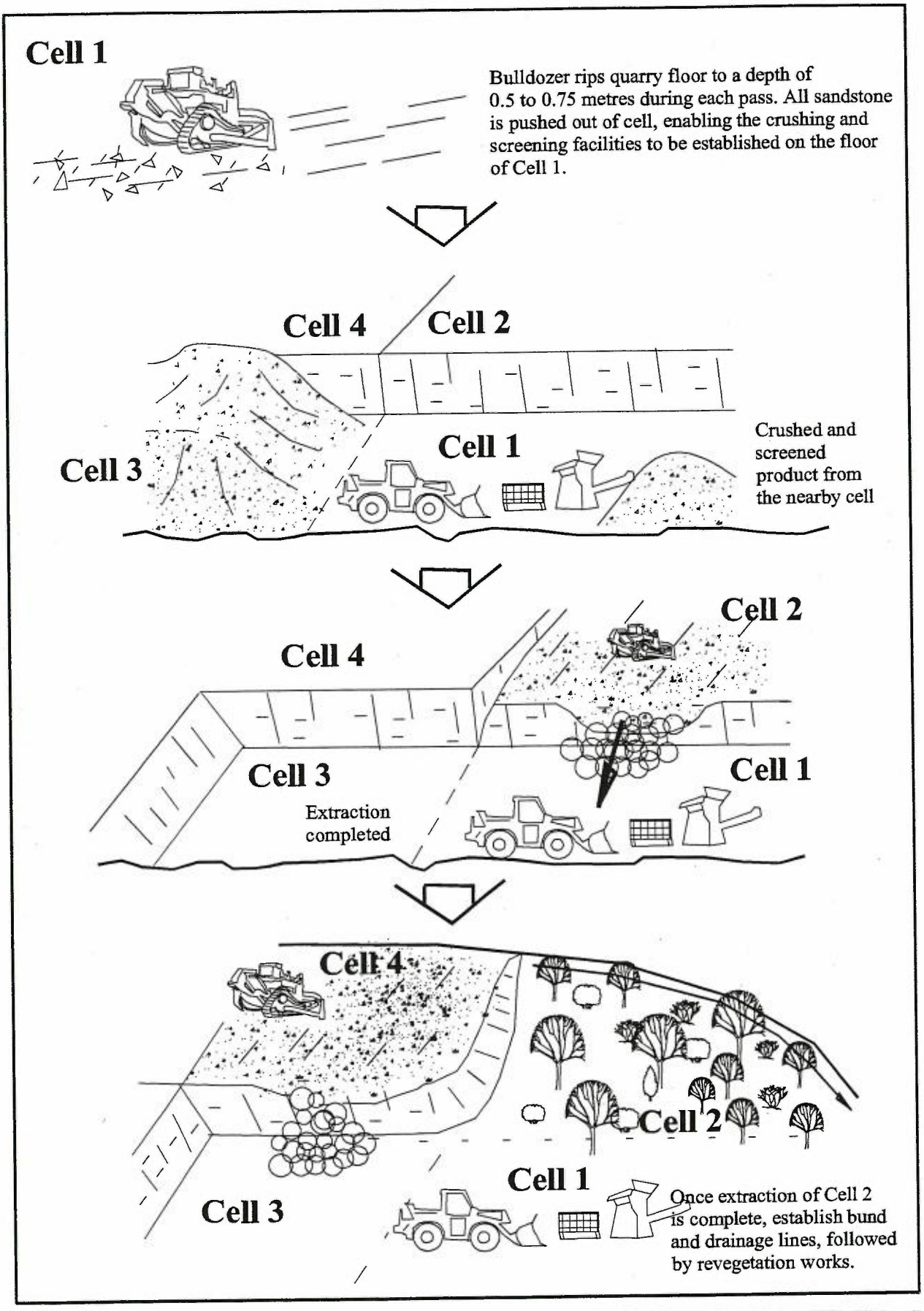


Figure 11

Cattai Sandstone Quarry

TYPICAL CELL EXTRACTION METHOD

Nepean Quarries Pty Ltd

- Surface clearing is carried out with a D11 bulldozer. Much of the surface consists of loose rock rubble and minor sand/clay. This material will be used in the construction of any necessary bunds;
- A bulldozer then 'works' the stripped area by ripping at the sandstone with rear mounted 'rippers'. Each pass of the bulldozer results in a depth of approximately 1.0 metre of sandstone being broken up into large boulders and fragments of varied size.
- Ripping will be carried out by a D11 utilising a single prong ripper
- The depth of each ripping sequence is approximately 1.5 metres, after which the dozer then pushes the ripped material to an area near the crusher;
- The slope of the batter within a cell will be approximately between 1:1 and 2:1 on average;
- The final level of the Cell floor will be approximately 1-2% and have an overall northerly fall;
- Drainage to the main sediment detention area will be maintained at all times to ensure that operating equipment is never inundated

6.6.3.2 Processing and Export

A number of activities are carried out to generate the sandstone products after ripping. This involves the following steps:

- The loose sandstone is transferred by a Front End Loader (FEL) to a coarse screen ("grizzly") where large pieces of sandstone are isolated from the finer material. The coarse screen is set at 500 mm;
- The undersize material (from the coarse screen) is picked up and taken to a crusher which is centrally located. The sandstone that is passed through the crusher is reduced to a nominal 150mm and is then picked up by a conveyor belt which forwards the material to the powerscreen for sizing;
- The powerscreen can generate up to 3 different sizes, which generally comply with standard industry requirements. The product size stockpiles are 40mm, 75mm and 110-200mm; and
- Trucks of roughly 28 tonne capacity enter the quarry via the weighbridge, where their empty weight is recorded (unless already known and on the database). The truck then enters the stockpiled area and awaits while the FEL loads up and dumps the relative product into the back of the truck. The loaded truck then advances to the weighbridge where the amount of sandstone is recorded. The turnaround time for this part of the operation is approximately 15 minutes.

The above operations - including ripping, coarse screening, crushing, power-screening and truck loading can occur simultaneously or in tandem, depending upon the level of demand on any particular day. However, it is usual to complete the ripping, crushing and screening operations on a campaign basis. Elements of the above activities are illustrated in Plates10 to 15.

6.6.4 Method of Quarrying - Dimension Stone

Dimension stone has been extracted at the site for many years with the areas previously worked shown on Figure 7. It is proposed to continue extracting dimension stone blocks at these localities on obtaining development approval.
Extraction of dimension stone is by a stone sawing process whereby a large circular blade mounted on an excavator is cut into the exposed sandstone faces. The blocks are then separated by either airbags, wedges or chemical means, lifted clear and transported off site for further processing.
Once an area is exhausted of suitable dimension stone, the area will be ripped and processed as described within Section 6.6.3. Aspects of dimension stone extraction are illustrated in Plates 16-18.

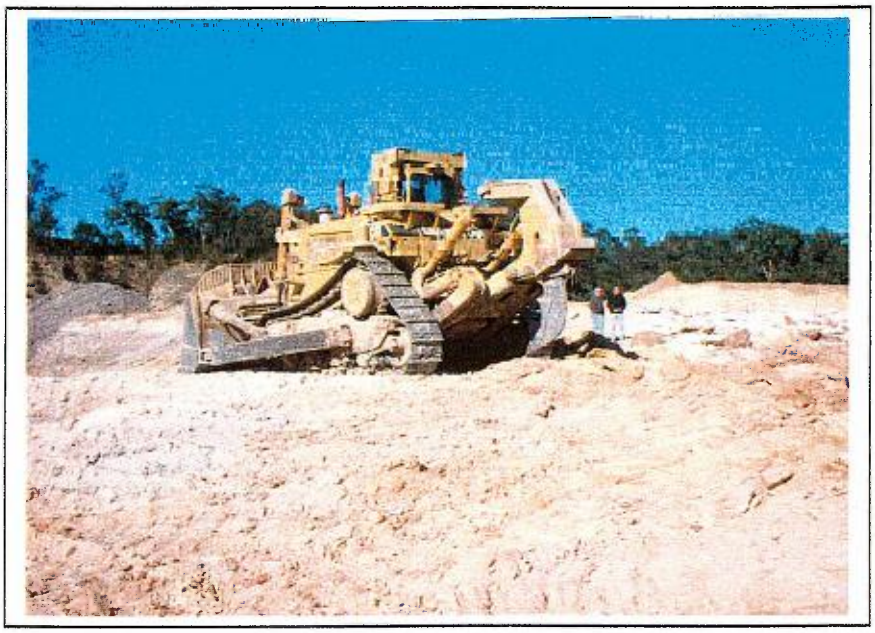


Plate 10

D11 bulldozer used in ripping sandstone.

Plate 11

A Front-end Loader is used to load the crushed sandstone into trucks.

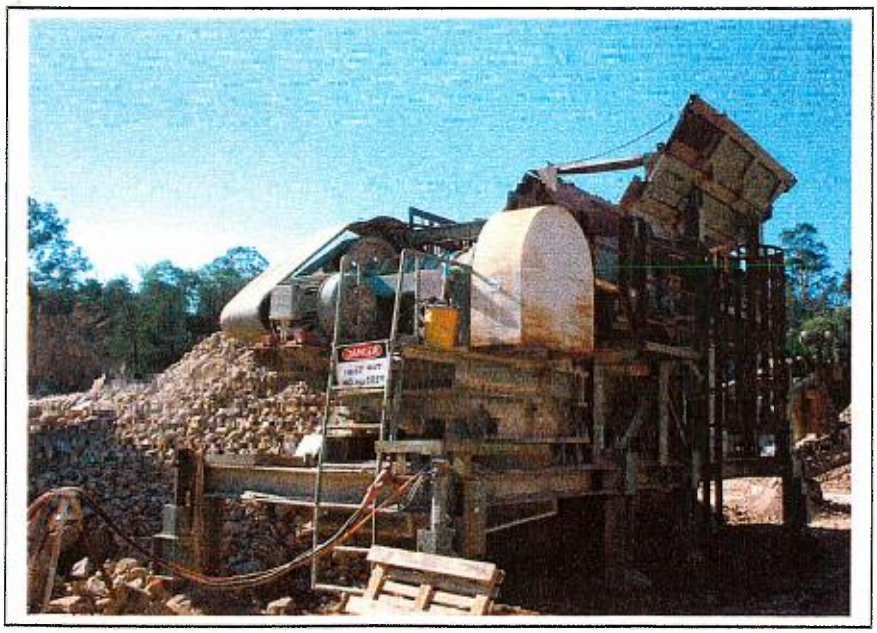


Plate 12

An example of the crushing facilities to be located within the pit of the quarry.

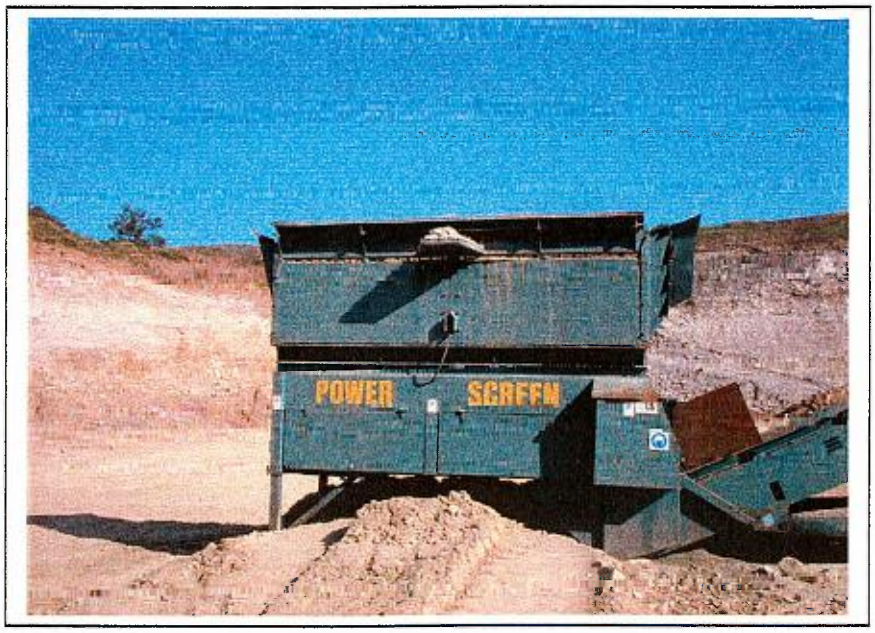


Plate 13

An example of a screen used to separate out boulders from the finer sized sandstone prior to processing.

Plate 14

An example of the type of circular sandstone cutter used in extracting dimension stone.

Plate 15

Example of trucks being loaded at a similar sandstone quarry.

Plate 16

Dimension sandstone cutting face exposed from previous operations located in the south-west corner of the quarry.

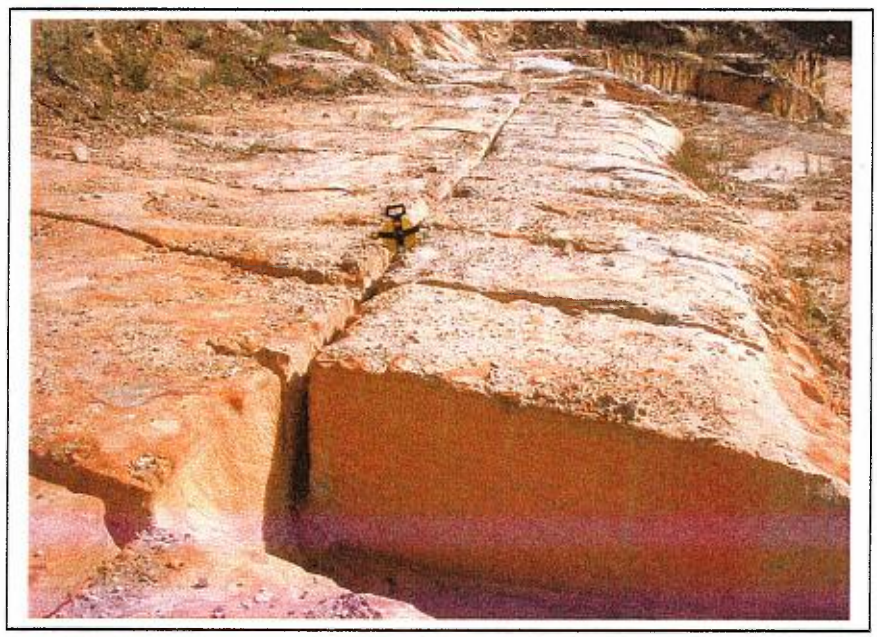


Plate 17

Dimension stone blocks ready to be extracted from the quarry floor.

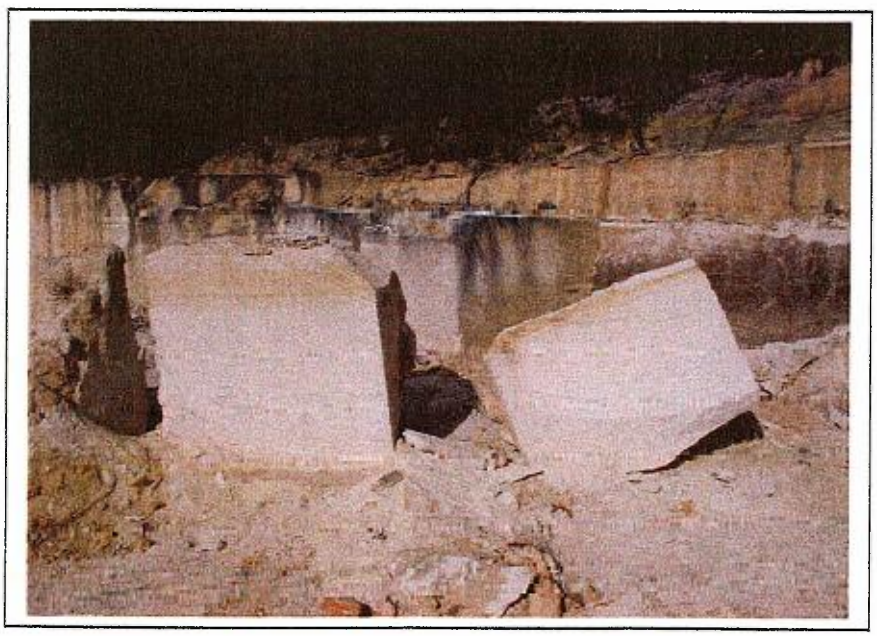


Plate 18

Close-up of exposed sandstone blocks ready for export off-site.

6.6.5 Rate of Extraction

The rate of extraction (and life of the operation) according to the above described scenarios will be dependent on a number of variables and these include:

- Market demand
- Adverse weather on-site (ie, working conditions)
- Availability of plant
- Cost of extraction

The impact of these effects will make extractive rates highly variable in the short-term (ie. from week to week and month to month basis). However, over the long term, it is anticipated that extraction will average out to approximately 10,000 – 20,000 tonnes per month.

6.6.6 Stockpiling

Several classes of material will be subject to stockpiling and include the following:

- Shale (it may be encountered in limited quantities)
- Sand
- Processed sandstone
    - armour rock (oversize)
    - gabion rock (50mm to 150mm)
    - 75mm
    - 40mm

Sandstone will be stockpiled on-site prior to off-site haulage. It is anticipated that individual stockpiles will not exceed 3000 tonnes. Stockpiles will have a maximum height of 5 metres.
It is anticipated that sandstone cut for dimension stone will be carried out on a campaign basis. It is likely that stockpiles amounting to several hundred tonnes (representing 50 -100 blocks) will be common.

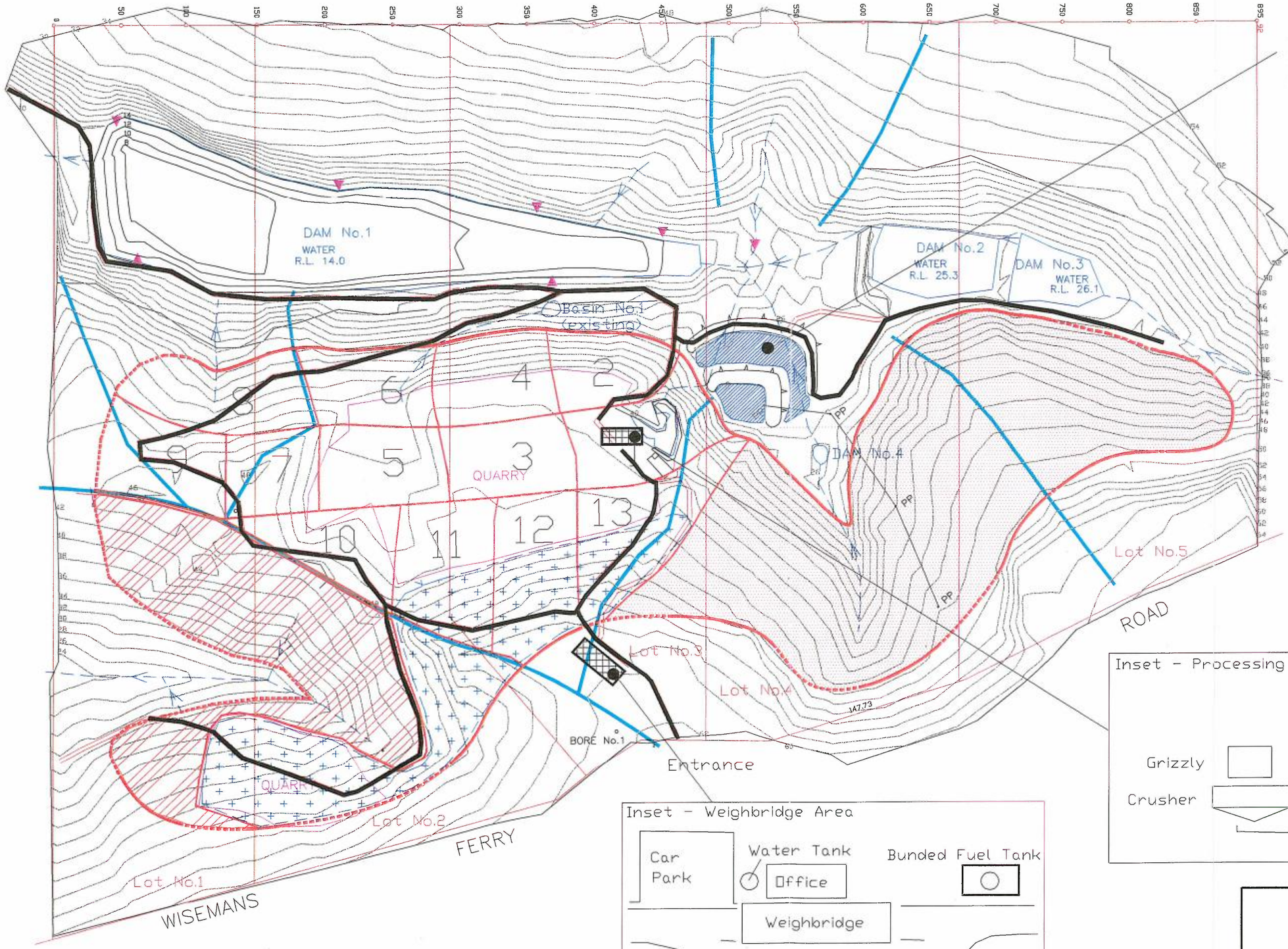
6.6.7 Equipment and Proposed Infrastructure

The quarry equipment and plant inventory will consist of the following:

1 x D11 Bulldozer*
1 x Cat Wheel Loader (4.5 m^3 capacity)
1 x Coarse Screen
1x Mobile Crusher (aperture size allows the treatment of rock 420mm x 300mm in size)
1 x water truck
1 x 30 tonne Kato Hydraulic Excavator (incorporating dimension stone cutter)*
1x Weighbridge
1x Mobile Office
1x Fuel tank enclosure

(* these units will have limited use and will be worked on contractual basis)

The proposed location of the fixed equipment and infrastructure is illustrated in Figure 12. Most of the above equipment is illustrated in Plates 10 -15.



LEGEND

- Principal Access Roads
- 3 — Stage 1 Extraction showing extraction cell and number
- Stage 2 Extraction
- Stage 3 Extraction
- Stage 1B Dimension Stone Extraction

Surveying by McElwee Associates Pty Ltd

Figure 12

Cattai Sandstone Quarry

QUARRY INFRASTRUCTURE

Nepean Quarries Pty Ltd

6.7 Operational Issues

6.7.1 Introduction

The following sections describe on-going operational issues associated with the quarry proposal, the methodology to be employed and other environmental issues.

6.7.2 Landscaping and Rehabilitation

6.7.2.1 Introduction

The proposed final landscape is illustrated in Figure 9. The design of the final landscape has been based on several parameters which include:

- Achieving a stable landform;
- Extraction being limited to 15 metres below the natural surface;
- Ensuring that the final drainage pattern is compatible with the existing drainage; and
- Providing a suitable surface for eventual rehabilitation.

Rehabilitation requirements are therefore dictated significantly by the bio-physical environment of the final landscape and the effectiveness of the planned revegetation is dependent upon the nature of the underlying soil and/or rock base. Based on the findings of the flora/fauna experts, a Ecological Plan of Management for the quarry has been designed and is detailed in Section 12.9. In summary, the rehabilitation of the site will be considered in terms of a suitable time frame and species plantings.

6.7.2.2 Time Frame for Rehabilitation

A proposed time frame for rehabilitation is outlined below in Table 2 and should be read in conjunction with Table 1 and Figure 9. The time frame should be considered approximate only at this stage, as the timing of extraction is the main determinant for the rehabilitation activities. This is particularly the case for projected activities beyond say 5 years.

TABLE 2: REHABILITATION OBJECTIVES AND SCHEDULE OF PLANTINGS

Revegetation Category	Location*	Years 1-2	Years 3-5	Years 6-10	Years 11-15	Years 16-20	Years 20-22
Stage 1A	Cell 2	→					
	Cell 4		→				
	Cell 6			→			
	Cell 8			→			
	Cell 9			→			
Stage 2					→		
Stage 1B			→	→	→	→	
Stage 1A	Cell's 7, 10 to 13 and 5,3, & 1				→		
Stage 3					→	→	
Final Rehabilitation							→

*See Figure 8

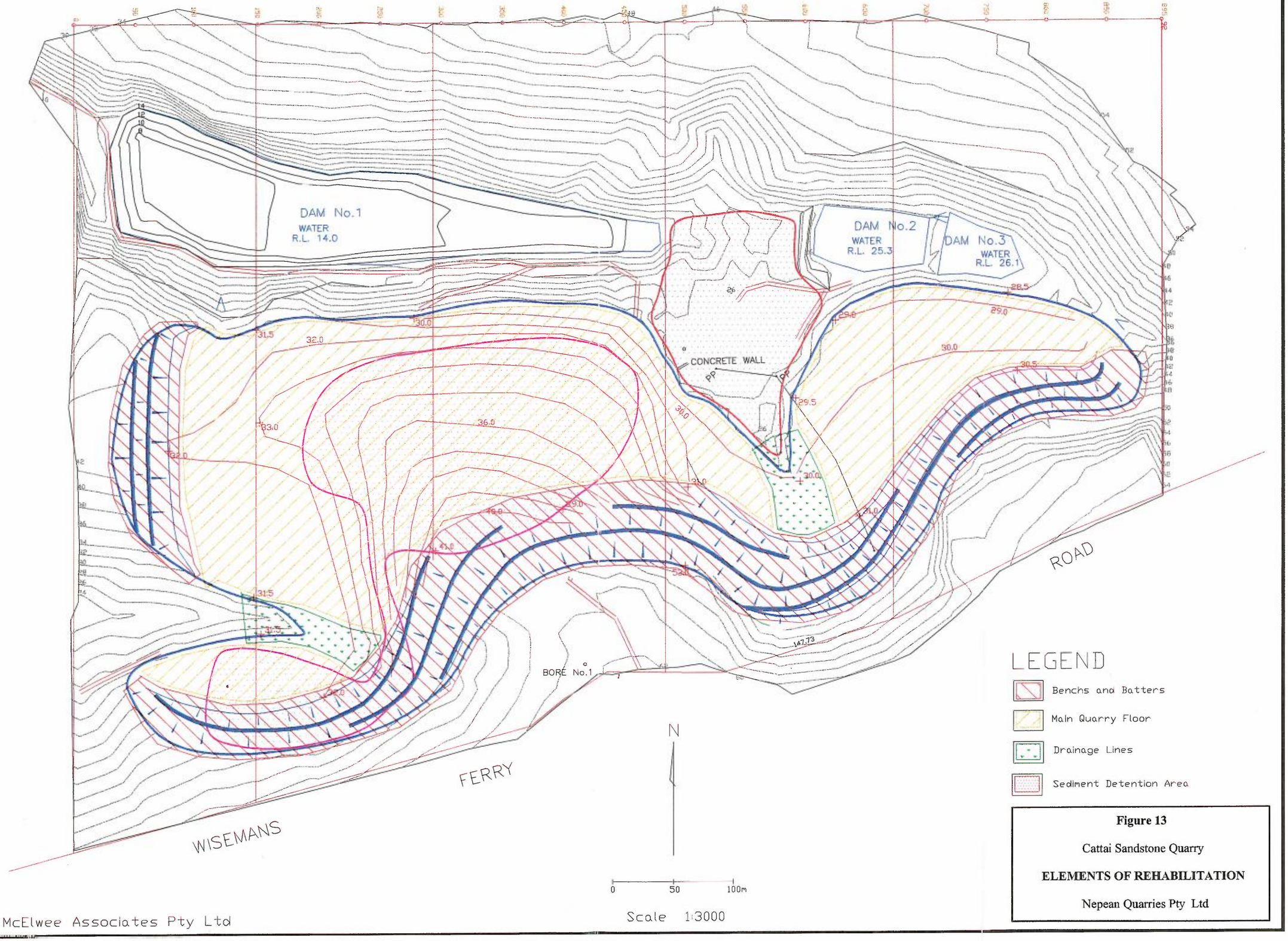


Figure 13

Cattai Sandstone Quarry

ELEMENTS OF REHABILITATION

Nepean Quarries Pty Ltd

Surveying by McElwee Associates Pty Ltd

6.7.2.3 Rehabilitation Management

Rehabilitation will be based on the recommendations of the Flora and Fauna expert which is detailed in Section 12. In summary, rehabilitation will require the adoption of a specific revegetation regime which is based on the elements that make up the final landform. These elements are illustrated in Figure 13 and each element encompasses a specific matrix of species unique to that element.

6.7.3 Operational Hours and Scheduling

During periods of extraction, actual working hours will be as follows:

Monday to Friday:	6.00 am to 5.00 pm	} Machinery and trucks not to
Saturdays:	6.00 am to 1.00 pm	} commence until 7.00 am
Sundays & Public Holidays:	No operations permitted	

Whilst there is no formal scheduling of activities, it is possible to predict the duration of certain activities during the coarse of normal operations, thus;

Bulldozer ripping – The D11 can rip approximately 1500 tonnes of sandstone per day. Given the high cost of the hire, this machine is used on a campaign basis and is brought in for a minimum period of 20 days. This enables 30,000 tonnes to be readied for crushing in any one campaign.

Mobile Crusher and Screening – The crusher's output is approximately 1,000 tonnes per day which is matched by the powerscreen. Crushing is also carried out on a campaign basis. In most cases, stockpiles of around 3,000 tonnes for each product will be generated.

6.7.4 Project Life

The proposed sandstone project has an estimated life of around 20 years based on the estimated sandstone reserves and an annual extraction rate of around 185,000 tonnes over the life of the project. However, as already indicated previously, there are several parameters to be considered which will effect the ultimate life of the project.
The rate of extraction is dependent upon the "marketplace" and therefore the life of the operation could vary considerably as these conditions change over time. A minimum project life of 20 years is being sought under this proposal. In addition, consent for a further two years post-extraction is also being sought in order to complete necessary rehabilitation measures.

6.8 Project Infrastructure and Personnel Issues

Transportation

Transport on and off-site will consist of passenger vehicles conveying site personnel involved in the day-to-day running of the site (ie. management, extraction and processing), as well as transport trucks conveying the product.
All vehicles will continue along existing access roads when entering and leaving the property. A comprehensive discussion of transport-related issues is detailed in Section 17.

Employment

Employment will be created in the area by the continuation of quarrying operations, with the majority of employees and services sourced locally. Flow-on economic effects are likely to be distributed in the surrounding district.

Safety and Security

The company will maintain existing safety procedures and policies with respect to the extended operations, and is conscious of the need to protect worker and community safety. This is discussed in detail in Section 21.
Quarry batters will be maintained at a safe slope of between 1:1 and 1:2 in most locations on the southern side of the quarry. The angle of the batters is constrained by the topography of the site, which in some locations is greater than 1:1 (several rock outcrops and overhangs up to 4-5 metres in height are present) and the limited depth of extraction.

Waste Disposal and Management

Any foreign material found during extraction will be disposed of off-site to a licensed landfill, along with any household type rubbish produced by employees using the on-site office or work-shop facilities. Section 21 details additional measures with respect to waste disposal.

Powerline

A powerline is located in the eastern portion of the proposed extraction area and was installed by one of the previous operators of the quarry to operate machinery including pumps at the depot site. This equipment has since been removed, with only the concrete base remaining.

It is the intention of the proponent to eventually remove this powerline and associated infrastructure including the transformer and powerpoles as they are not required and would impinge upon extraction at the eastern end of the proposed quarry. Application will be made to Integral Energy at the appropriate time. However, it is unlikely that such an application will be made within the next 10 years.

PART C: PLANNING REQUIREMENTS

SECTION 7 STATUTORY PLANNING AND CONTROLS

7.1 Introduction

The assessment process for the Project is described below. In summary the Project requires Development Consent under the Baulkham Hills Shire Council LEP and constitutes a Designated Development under Schedule 3 of the Environmental Planning and Assessment Regulation 2000 which requires the preparation of an Environmental Impact Statement (this document).
Activities to be conducted in association with the Cattai sandstone quarry are also subject to a number of statutory requirements. Principle of these is the Environmental Planning and Assessment Act (1979) and the Protection of the Environment Operations Act (1997). This legislation relates to the planning of projects through the preparation of an EIS to ensure that any proposed operations are not detrimental to the environment.

7.2 Local Planning Policies

7.2.1 Baulkham Hills City Council Local Environment Plan (1991)

This plan (or LEP) applies to the whole of the Shire and consolidates all the planning controls currently applicable to the Baulkham Hills Council area. The plan is supplemented by a range of land use and/or area specific development control plans and contribution plans.

Local Government Land zoning- Current Plan

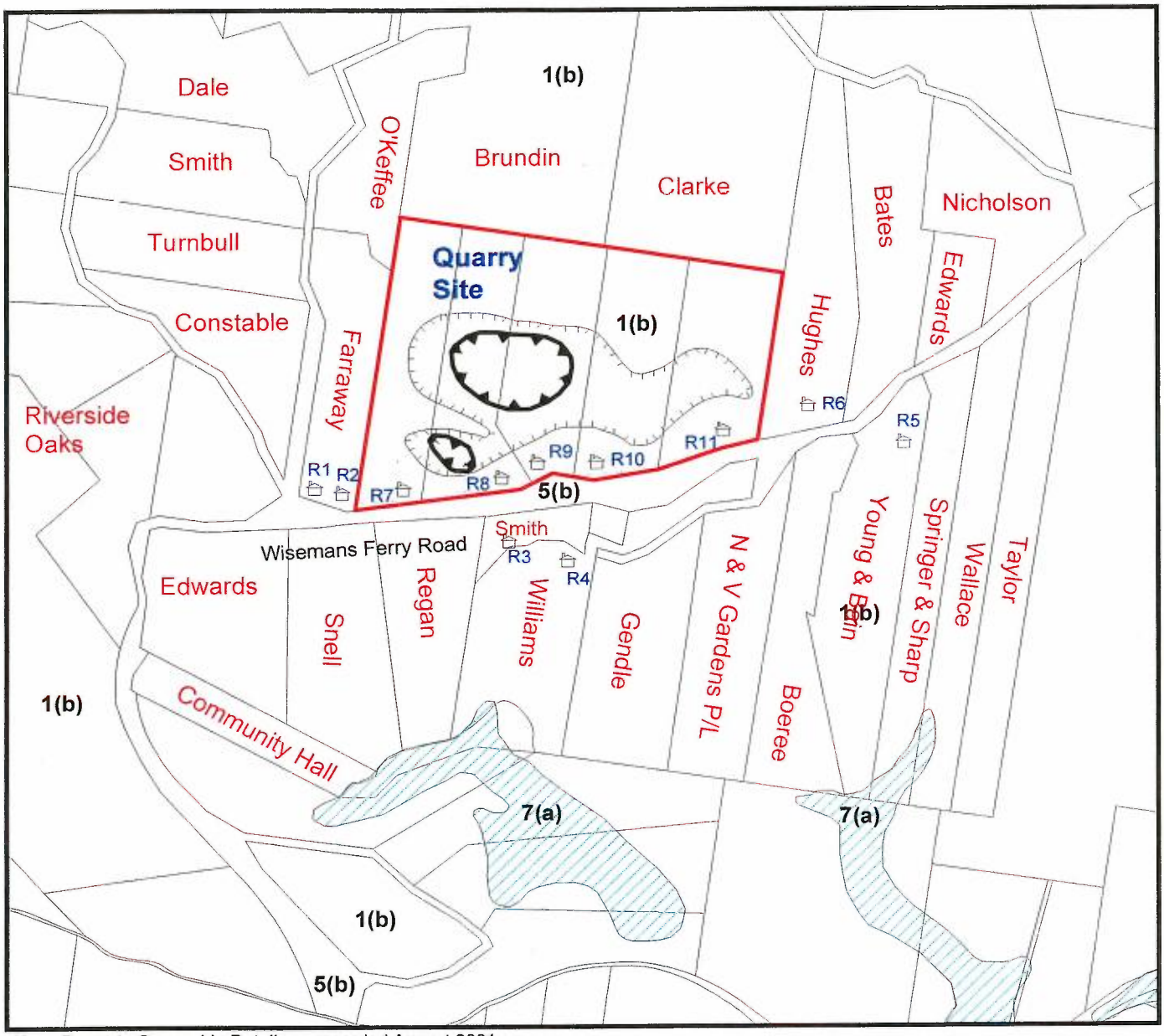
The Town Planning Department of the Baulkham Hills Shire Council (BHSC) indicates that the Project Site is located within Zone 1(b) – "Rural (1b)" See Figure 14.

The objectives of this zone are:

Zone 1(b)

(a) to ensure that existing or potentially productive agricultural land is not withdrawn unnecessarily from agricultural production; and
(b) to ensure that development is carried out in a manner that minimises risks from natural hazards and does not unreasonably increase demand for public services and public facilities; and
(c) to provided for urban support functions; and
(d) to protect and enhance those areas of particular scenic and environmental value, and
(e) to maintain the rural character of the locality without adversely affecting the carrying out of agricultural activities; and
(f) to make provision for tourist facilities in appropriate locations.

Special provisions in this zoning category include Clause 34 - Extractive Industries. The establishment and operation of extractive industry is permissible within this zoning category, subject to council consent.



Note: Property Ownership Details as recorded August 2001

LEGEND

	= Property boundary
	= Outline of Existing Quarry
	= Proposed Final Outline
7(a)	= Lagoon/Wetland Areas
5(b)	= Road Reserve
1(b)	= Rural 1(b) Zone
R1	= Residential Location

N

300m

HARVEST SCIENTIFIC SERVICES

Figure 14

Cattai Sandstone Quarry

PROPERTY OWNERSHIP & ZONING

Nepean Quarries Pty Ltd

7.3 Development Control Plan 500: Extractive Industries

Compliance with Baulkham Hills Shire Council's code for Extractive Industries is outlined in Table 3.

TABLE 3: COMPLIANCE WITH DCP 500

DCP Requirement	Issue Addressed in EIS Section
Community Participation	
- Community participation undertaken	23.2
- Industry in relation to sustainable links	3.1, 3.3
Setbacks	
- Extraction should be setback to protect natural features, roads, adjacent property's, electricity lines, and for the protection of acoustic & scenic amenity	15.5, Figures 7 & 9
Transport	
- Controlled and limited access to main roads	17.4, 17.6
- Transport routes & access points should conserve local amenity	17.6
- Safe and direct internal roads	24.9
- Internal roads should be based on recognised road construction standards	24.9
Water Resources	
- Maintain and monitor drainage outlet points	10.4.3
- Groundwater flow and quality	11.3, 11.6
- Water Management Strategy	10.4.4.3
- Annual Water Management Plan	24.4
- Groundwater Impact Assessment	11.5
- likely impact on groundwater	11.5
- freeboard above wet weather high ground water level	11.5
Visual Amenity & Scenic Quality	
- Minimise visual impacts by appropriate setbacks	15.5
- Final rehabilitation should integrate with the surrounding landuse patterns	15.5
- Extraction should protect significant visible features	15.5
- Extraction should protect the natural and rural landscape	15.5
- Minimise sources of visual pollution	15.5
- Landscape Site Analysis	15.4
Flora and Fauna	
- impacts on threatened species, populations & ecological communities	13.4, 13.5, Vol.2. Rep.1
- buffer to protect any habitats of threatened species, populations and ecological communities	13.8, 13.10, Vol.2, Rep.1
- contingencies to ameliorate impact on habitats of threatened species, populations and ecological communities	" "
- prevent regional loss of significant native vegetation and fauna communities, threatened species, populations and ecological communities	13.2, 13.3, Vol.2, Rep.1 13.10, Vol.2, Rep.1
- Flora & Fauna Assessment	13.3
- Flora/Fauna Monitoring Programme	13.9.7

Heritage and Archaeological Resources	
- Identify areas of archaeological sensitivity	14.3
- scientific, educational, landscape & cultural value of Aboriginal sites	14.3
- buffer from archaeological sites	14.4
- conservation of non-Aboriginal sites	14.5
- Archaeological Study	14.2
	Vol.2, Rep.2
Soil Conservation	
- limit extent of cleared areas by soil stabilisation techniques	10.4
- drainage control measures to divert upstream runoff, and to control subject site runoff	10.4
- maintain downstream pre-existing flow rates, volumes & quality	N/A
- sediment control dam design details	10.4.4.2
- Sediment & Erosion Control Plan	10.44, Figure 19
Acoustic Management	
- effective acoustic buffer to residences & public places	16.48
- noise control measures	16.48/24.7
- low noise emission extractive techniques	16.48
- noise emissions to meet EPA standards	24.1
- Acoustic Impact Assessment report	24.7, Vol 2, Rep.4
- Annual Acoustic Management Plan	24.1
Air Quality Management	
- potential sources of air pollution	12.3.2
- air pollution control measures	12.5
- Air Quality Assessment report	Vol.2, Rep.3
Extraction Programme	
- orderly sequence of extraction	6.6.3
- environmentally sensitive extraction method	6.6.3
- Extraction Programme Plan	6.6.3
Rehabilitation	
- extraction areas should be progressively rehabilitated	
- rehabilitation should take into account requirements for plant growth/reproduction given prevailing soil and geology	6.6.4, 6.7.2, 24.2, 24.8
- rehabilitation should be performed under the direction of a qualified person	6.6.4, 24.2, 24.8
- rehabilitation should commence prior to proceeding onto the next extraction area	6.6.4, 13.9, 24.2
- Soil stockpiles should be appropriately formed & shaped to ensure viability	24.6, 24.8
- maintain until rehabilitation is well established	13.9, 24.8
- Rehabilitation Strategy	6.6.4, 24.2
- Annual Rehabilitation Management Plan	13.9, 24.1
Social & Economic Assessment	
- economic linkages between extractive industry and businesses	19.2
- social impacts	19.3
- social impact controls	
- Economic Appraisal Report	19.3
- Social Impact Assessment	19.3
- Social Impact Management Plan	19.3
	19.4

Ecologically Sustainable Development - implement the principles of the National Strategy for Ecologically Sustainable Development - Council, public authorities & community participation	Section 20 Section 23
Post Extraction Land Use - useable and stable final landform - promote a range of post extraction land uses - rehabilitation of extraction sites will integrate with the characteristics of the surrounding terrain	24.3 18.2 6.6.4
Maroota	N/A
Section 94 Contributions	17.8
Environmental Management Systems - Annual Management Plans - Annual Acoustic Management Plan - Annual Rehabilitation Management Plan - Annual Water Management Plan - Annual Waste Management Plan - Annual Social Impact Management Plan - Annual Environmental Management Plan	24.7 24.1 24.4 24.1, Appendix 1 N/A Section 24

N/A = Not Applicable

7.4 Environmental Planning and Assessment Act

7.4.1 Part 4 of the Environmental Planning and Assessment Act 1979 and Designated Development

Part 4 of the Environmental Planning and Assessment Act provides the legislative requirements for proposals requiring development consent. The Project is deemed to be Designated Development in accordance with Schedule 3 of the Environmental Planning and Assessment Regulation 2000. Section 50(6) of the EP&A Act specifies that a development application for designated development must be accompanied by an Environmental Impact Statement (this document). The proposal is defined as a Designated Development because of the following features:

- The proposal will involve the extraction of an amount of sandstone not exceeding 200,000 tonnes per annum;
- The proposed extraction area covers approximately 24 ha, and a resource of approximately 3.5 million tonnes of sandstone is indicated. Of the extraction area, approximately 8ha is already disturbed by previous mining activity; and
- The proposed extraction of crushed sandstone will be by bulldozer ripping, whereas dimension stone will be extracted utilizing a rock-cutter ('Paeodovan' wheel) attached to a hydraulic excavator. None of the extraction methods include blasting. Extracted sandstone will be processed on-site with a mobile crusher and powerscreen.

Compliance with the specific requirements of Schedule 3 of the EP&A Act is detailed in Table 4.

TABLE 4: COMPLIANCE WITH SCHEDULE 3 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Item No.	Description	Relevance	Applicability to Proposal
1	Processing of more than 30 000 cubic metres of material	Yes	The proposed operation will process around 80 000 cubic metres per annum
2	Disturbance of a surface area more than 2 hectares	Yes	Existing disturbed areas and proposed extraction areas total 24 hectares
3	a) Operations located within 40m of a watercourse, wetland or environmentally sensitive area	Yes	The operations will occur within 40m of drainage lines on the property
	b) within 200m of a coastline	No	Not in a coastal location
	c) in an area of contaminated or acid sulphate soil	No	No acid sulphate or contaminated soils known
	d) Land sloping > 18°	Yes	In parts, extraction will occur on slopes > 18°
	e) Involving Blasting	No	No blasting will be conducted on the property
	f) within 500m of another extractive industry operated within the last 5 years	Yes	Sand mining was conducted on the property within the last five years
The designation of extractive industries does not include the following:			
a)	Land on which SREP. No.11 (Penrith Lakes Scheme) or WDREP No.1 (Extractive industries, Western Division)	No	The area of operations is not contained within these planning instruments
b)	Maintenance dredging involving the removal of up to 1000m^3 of alluvial material	No	Dredging of any sort is not part of the proposal
c)	Extractive industries undertaken in accordance with a plan of management approved by the Director of Planning and adopted by the consent authority involving less than 1000 m^3.	No	The proposal does not relate to a specific planning directorate or management plan
d)	Continued operations within the meaning of State Environmental Planning Policy No. 37-continued mines and extractive industries	No	A new application for development consent is prepared as part of this proposal
e)	The excavation of contaminated soil for treatment at another site, or:	No	No contaminated soil exists on site and all soil will remain onsite for use in rehabilitation purposes
f)	For use in artificial waterbodies, contaminated soil treatment works, turf farms, or waste management facilities or works	No	No contaminated soil exists on site and all soil will remain onsite for use in rehabilitation purposes

7.4.2 Integrated Development

The proposed activity is also defined as 'Integrated Development' under the EP&A Act. Integrated development requires development consent and also at least one approval, permit, licence, authority or consent from the relevant approval body under specific clauses in associated legislation set out in Clause 91(1) of the Act.

The following approvals have been identified as being required:

- Protection of the Environment Operations Act 1997 – Environment protection licence for water quality discharges
- Rivers and Foreshores Improvement Act (1948) - Part 3A Permit (operations within 40 metres of a prescribed stream)
- Water Act (1912) – (management of sedimentation ponds).

7.4.3 Protection of the Environment Operations Act (1997) (POEO Act)

This Act amalgamates the provisions of the Pollution Control Act 1970, the Noise Control Act 1975, the Clean Air Act 1961, the Clean Waters Act 1970 and the Environmental Offences and Penalties Act 1989 into a single statute. LBL aims to license the 'annual load' of discharges to air, water, and land rather than the current emphasis on 'concentration' based licensing or license should the activity fall within the ambit of a Schedule 1 activity. The Cattai quarry proposal can be considered as satisfying the following defined activities, viz:

- Crushing, grinding or separating works (>30,000 tonnes per year), and/or
- Extractive industries (>30,000 cubic metres per year).

As the proposed quarry will exceed these limits the EPA will therefore be an approval body for the project.

7.4.4 Rivers and Foreshores Improvement Act (1948)

Under this act, excavation of material within 40 metres from the top of the bank of 'rivers' will require a Part 3A permit. Following an inspection of the site by DLWC staff (Appendix 2) the proposed extraction area plans were reviewed with the aim of determining which watercourses south of and including the main drainage line to the north are called 'rivers' for the purposes of the Act. Under the conditions of a Part 3A permit, a minimum native vegetation riparian zone of 20 metres from the top of the bank is required. In general terms,

- The majority of extraction will occur >40 metres from the main drainage line located in the northern portion of the Project Site, although in the eastern portion extraction may be within 40 metres of the drainage line;
- Other parts of the proposed extraction will be located to within 20 metres of the drainage lines illustrated on Plan (Figure 6); and
- The Part 3A permit will also need to cover the proposed sedimentation ponds.

Application for a Part 3A permit will be prepared following the submission of this application to Baulkham Hills Shire Council.

7.4.5 State Significant Development

Consideration of the project as a State Significant Development ('SSD') was assessed. In order for an extractive industry to merit SSD, one of the following requirements needs to be met:

- The total resource is greater than 5 million tonnes;
- The proposed extraction rate is greater than 200,000 tonnes per annum.

Approval is being sought for the extraction of an amount not exceeding 200,000 tonnes of sandstone products. The above criteria therefore do not apply.

7.5 Regional Planning

Sydney Regional Environmental Plan No.9 (2)

Sydney Regional Environmental Plan No. 9 – Extractive Industry (SREP No.9) was first gazetted in October, 1986 and amended in 1997. The plan aims to help develop extractive resources close to the Sydney metropolitan area so that the cost of supplying materials to the community can be kept to a minimum. It also aims to control the development of extractive industries on certain lands and ensure operations are carried out in an environmentally sustainable manner. Whilst the Cattai Quarry is not directly located within a designated REP-9 area, the quarry has been in existence for a long time and is recognized on both Local and State Government planning documents.

Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River

The objects of this plan were to provide the Hawkesbury-Nepean Catchment Management Trust (HNCMT) with a concurring role in respect to certain types of development to ensure the impacts on future uses are considered in a regional context. SREP 20 states that consent is required from the authority before carrying out certain types of development. The matters of consideration (Heads of Consideration) in deciding whether concurrence should be granted in regards to a proposed development are:

- Whether any feasible alternatives exist on the site;
- Any potential for groundwater contamination
- Adequacy of surface water controls
- Long term stability of the final landform; and
- Adequacy of the site management plan

Despite the disbanding of the Hawkesbury Nepean Catchment Trust in April 2001, the principles of SREP 20 still stand, with the responsibility for implementation of this policy now resting with the Lower Hawkesbury Landscape Unit of the NSW Department of Land and Water Conservation (DLWC), based in Windsor (pers. comm. Tony Towers, 31/5/02). Concurrence on this development was undertaken with the DLWC, and their requirements for this EIS are presented in Appendix 2.

7.6 State Policy and Legislation

There are a number of acts and statutory regulations which have been assessed in regards to their applicability to this proposal. These include the following:

Water Management Bill 2000

The object of this bill is to provide for the protection, conservation and ecologically sustainable development of the water sources of the state. The bill covers areas water resource planning (catchment management plans), public works (such as flood mitigation) and private water usage rights such as farm dams and irrigation needs. The act sets up administration in the form of the water advisory council and management committees which oversee approvals. Approval may be required in the case of a mining or quarrying operation where an aquifer is to be penetrated, or the natural drainage and river systems are to be interfered with. In such cases, the works are classified as a *controlled activity*, and written approval or exemption from approval is required from the Minister. As the proposed quarry subject to this EIS will not be intersecting the water table, and no drainage or flood mitigation works are to be carried out, concurrence with the Minister under the provisions of this Act is not necessary.

NSW State Rivers and Estuaries Policy

This aim of this policy is to encourage sustainable development, halt declining water quality, loss of riparian vegetation, damage to river banks and channels, loss of biodiversity and declining natural flood mitigation. In addition, this policy seeks to encourage projects which will restore the quality of the river and estuarine systems by activities such as rehabilitating remnant habitats, re-establishing vegetation buffer zones adjacent to streams and wetlands, restoring wetland areas, rehabilitating estuarine foreshores and ensuring adequate streamflows to maintain aquatic and wetland habitats.

This proposal is aligned with the aims of this policy as water quality in the area, riparian vegetation, river banks and drainage regimes will not be adversely affected by the proposal, and proposed rehabilitation of previous extraction areas will enhance the quality of the local vegetation and drainage regime.

NSW Wetlands Policy

The NSW Wetlands Management policy was released in 1996 to encourage the community to work in partnership with the government towards '*The ecologically sustainable use, management and conservation of wetlands in NSW for the benefit of present and future generations*'. Implementation of this policy is through the NSW Wetlands Action Plan, developed by the Wetlands Action Group. This proposal is aligned with the aims of this policy, as it seeks to preserve wetland areas on the property, preventing the degradation of these areas and neighbouring wetlands by pollution and other forms of disturbance from the operations.

NSW Weirs Policy

The NSW Weirs Policy is a further component of the State Rivers and Estuarine Policy which has been in place since 1991. The goal of this policy is to halt the installation of new weirs and reduce the environmental impact of existing weirs on ecosystems. This policy does not relate to this proposal as no weirs are to be constructed as part of the project.

Farm Dams Policy

This policy relates to the rights of property holders to construct dams on their property. The Hawkesbury Nepean system currently has an embargo on the construction of dams on third order streams or larger. This policy does not apply to this proposal as no dams will be constructed on the property.

Catchment Management Act (1989)

Under this Act, the Hawkesbury-Nepean Catchment Management Trust (HNCMT) was established. The main objectives of the Trust were:

- To encourage the protection and where appropriate, restoration of the Nepean-Hawkesbury Catchment river system;

- To facilitate the ecologically sustainable use, development and management of natural resources within the catchment; and

- To foster orderly and proper physical, environmental and socio-economic planning and management as a basis for the well being of the people and all life within the catchment.

The operations of the Hawkesbury-Nepean Catchment Trust were absorbed into the DLWC in April, 2001. Despite this, the principles of the Catchment Management Act are still in place as it has not been nullified or superseded. In December 1999, the Minister for Land and Water Conservation announced that the community-government partnership in natural resource management would be strengthened by the establishment of 18 new Catchment Management Boards across New South Wales. The new boards now replace 43 of the 45 catchment management committees and the five regional catchment committees. This revised committee structure was effective from the 1st of January, 2000 (DLWC, 1999).

Draft Hawkesbury Lower Nepean Catchment Blueprint 2002

A draft strategic plan for the management of the Hawkesbury Nepean Catchment and River System was developed by the former Hawkesbury Nepean Catchment Management Trust. In accordance with a direction from the Minister for Land and Water Conservation, the draft Strategic Plan has been used as the basis for the content of the draft Hawkesbury Lower Nepean Catchment Blueprint. The Local Government Advisory Group, established in June 2001 and representing councils in the catchment area, has been appointed to develop and implement a consistent approach to the management of the catchment.

This blueprint sets out targets and actions and outlines a timeframe for the achievement of specific natural resource improvements. Key stakeholders will regularly review and report on results, with monitoring of success and failure providing the basis for improving management of the catchment (LGAG, 2002). The Catchment Blueprint aims to achieve:

- Better river health by improving stormwater and sewage management to reduce pollutants and sediments entering waterways, by implementing a program for environmental flows and by caring for riparian vegetation;
- Conservation of most at-risk areas of native vegetation and aquatic habitat;
- Closer alignment of biophysical capabilities of the land and its use by improved management of urban and rural development; and
- A more involved community contributing to improved catchment health.

There are a number of principles that underlie all the actions in the Blueprint, these include:

- Acknowledgment of traditional ownership and custodianship of land by Aboriginal peoples;
- State and local governments are to deliver on their core natural resource management responsibilities;
- Government agencies to be better integrated in relation to planning, decisions and transparency; and
- An integrated education component to raise awareness of issues and provide stakeholders with best practice models of environmental practice.

All targets and actions relating to this blueprint support the principles of ecologically sustainable development, the principles of which apply to this project. A discussion of this project in relation to ESD principles is presented in Section 19.

The Department of Urban Affairs and Planning 'Shaping Western Sydney' (Department of Urban Affairs and Planning, 1998)

This document in regard to extractive industries has a number of proposed actions which are of relevance:

- continue to identify significant economic resources in the Sydney Regional Environmental Plan No.9 for Extractive Industry
- extract resources ahead of development
- manage extraction to ensure acceptable environmental outcomes and appropriate end use.

DUAP Shaping Our Cities (1998)

This document is a 'blueprint' for the future planning of the Greater Metropolitan Region of Sydney which incorporates the Baulkham Hills Shire Council area. The document recognises that the region is a growing area and as such, presents challenges with respect to curbing urban sprawl.

The document furthermore provides an updated framework for planning priorities and is the precursor for a series of regional planning strategies which will be released in the future.
Ecologically sustainable development is cited as the best means by which to manage natural resources and urban areas and a number of strategies are outlined to achieve this. These strategies include:

- Seeking out ways to improve urban design,
- Acquiring additional open space where appropriate and integrating them with the existing parks and bushland areas,
- Conserving scarce or non-renewable resources and minimising waste generation,
- Conserving and protecting the Regions biodiversity,
- Improving and maintaining air quality, and
- Continuing the enhancement of water quality and waterway environments.

Several of the above points are of relevance to this proposal. The Cattai sandstone resource is considered to represent an increasingly important resource because 'greenfields' quarry developments within close proximity to the main consumers will become more difficult to develop. Development of a new quarry elsewhere would mean increased traffic and greater site disturbance. It is therefore in the interests of all parties and the above strategies, to utilise the existing quarry for as long as possible. By doing so, biodiversity will be enhanced (because of the proposed rehabilitation measures) and consequently, air quality will improve over the long term.

State Environmental Planning Policy (SEPP) 11 "Traffic Generating Developments"

Extractive industry is listed under Schedule 1 of this policy as being a type of development requiring consultation with the NSW Roads and Traffic Authority (RTA). Consultation with the RTA has been undertaken and their requirements incorporated into this EIS. Refer to Section 17 for further details.

State Environmental Planning Policy (SEPP) 19 "Bushland in Urban Areas"

This policy applies in the Baulkham Hills Council area, and its provisions will be taken into account in assessing this development.

State Environmental Planning Policy (SEPP) 33 "Hazardous and Offensive Industry"

The proposal is not classified as a potentially hazardous or offensive industry. The definition of a Hazardous Industry in relation to this policy is a development that if operated without employing any measures to reduce its impact would pose a significant risk:

(a) to human health, life or property; or
(b) to the biophysical environment.

The definition of an offensive industry under this policy (DUAP, 1994) means a development for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), would emit a polluting discharge in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land in the locality.

In instances where an industry was classified as potentially hazardous, then a *Potential Hazard Analysis* would need to be carried out and the report submitted as part of the development application. Should hazardous material transport be a component of an application, then comparison with various screening thresholds is required. If the number of traffic generated movements for hazardous materials are above the annual or weekly cumulative vehicle movements, then a route evaluation study should be completed. These particular screening thresholds do not apply in this instance as the quarry will not be transporting hazardous materials.

The proposal for sandstone extraction will not pose a significant risk to humans or the biophysical Environment.

7.7 Relevant Commonwealth Acts and Regulations

Environment Protection and Biodiversity Conservation (EPBC) Act 1999

Under the EPBC Act, the proposal may be referred to the Commonwealth if the proposal has, or is likely to have a significant impact on a matters of national environmental significance (NES). An assessment of the Project against the nominated matters of NES is provided below:

(a) World Heritage properties – There are no World Heritage properties near the proposed development

(b) RAMSAR wetlands – There are no RAMSAR wetlands near the proposed development

(c) Listed threatened species and communities – One species listed as vulnerable (*Tetratheca glandulosa*) under Sect. 179 of the EPBC Act was located in the study area (see comment below).

(d) Migratory species protected under international agreements – No migratory species of the type described is likely to be affected by the development proposal

(e) Nuclear actions – the proposal does not constitute a nuclear action

(f) The Commonwealth Marine Environment – The proposal does not affect a marine environment

Note: The flora species listed as vulnerable under the Act will not be significantly impacted upon by the proposal as the population is not regionally significant, and is present in other locations nearby. This species will be restored to the area as part of the Ecological Restoration Plan. Consequently, it is considered that the project does not require referral to the Commonwealth Minister of the Environment under the EPBC Act.

7.8 Conclusions

The proposed quarry and its extension will operate within a clearly defined planning framework where all quarry activities will be subject to a number of statutory requirements. These requirements will ensure the quarry operates without making an adverse impact on the environment.

PART D: ENVIRONMENTAL SETTING, SAFEGUARDS & IMPACTS

SECTION 8 LANDFORM, SOILS & GEOLOGY

8.1 Topography

The regional topography and drainage is illustrated in Figure 15. The quarry site and its immediate surrounds consists of an eroded sandstone landscape of relatively steep hills, narrow ridges and deep valleys, generally aligned in an east-west to north-west/south-east direction. Areas adjacent to the site consist of flood plains of the Nepean River and a series of related features including swamps, wetlands, lagoons and minor streams.
The quarry area is located on northerly facing slope which overlooks a significant east-west drainage line. The majority of on-site slopes tend to face the north and north-west leading down to the main existing dam. Slopes vary from 1% to 55% across the site.

8.2 Soils

8.2.1 Introduction

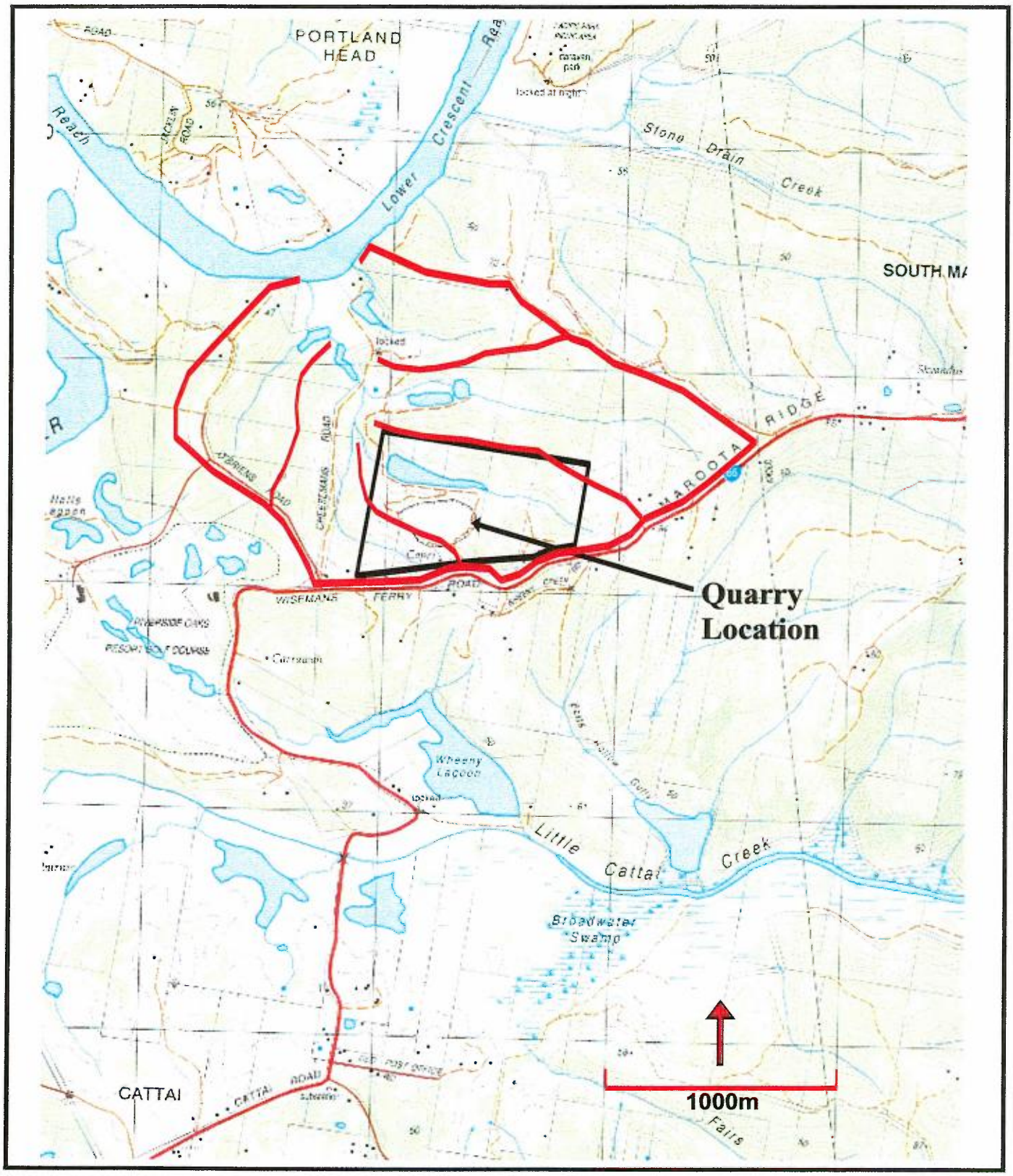
Several soil landscape groups are recorded within and adjacent to the project site area and include the following:

- Freemans Reach Soil Landscape Group (fe)
- Lucas Heights Soil Landscape Group (lh)
- Hawkesbury Soil Landscape Group (ha)
- Gymea Soil Landscape Group (gy)

However, the dominant soil types recorded on the project site are the Lucas Heights Soil Landscape Group and Freemans Reach Soil Landscape Group (Bannerman and Hazelton, 1990). The Lucas Heights Soil Landscape Group is derived from the Ashfield Shales, whereas the Freemans Reach Soil Landscape Group is derived from the present active floodplain of the Hawkesbury River. The soil landscape groups are illustrated in Figure 16.
Based on the field inspections however, the soil landscapes within the vicinity of the quarry have stronger affinities with soils of the Gymea Soil Landscape Group.

8.2.2 Site Soil Conditions

The property was investigated by 5 auger holes (ie. AH1-AH5). Each auger hole was logged within the proposed quarry extraction area. The purpose of logging and sample analysis was to determine the suitability of soil for future rehabilitation activities. The soil profiles were logged and recorded as geotechnical logs. Their location is indicated in Figure 7 and the logs are attached as Appendix 5 of this report.



From: Wilberforce 1:25000 Topographic Sheet 9030-1N (Third Edition). NSW Dept. of Information Technology & Management.

Catchment Boundary

HARVEST SCIENTIFIC SERVICES

Figure 15

Cattai Sandstone Quarry

REGIONAL TOPOGRAPHY AND DRAINAGE

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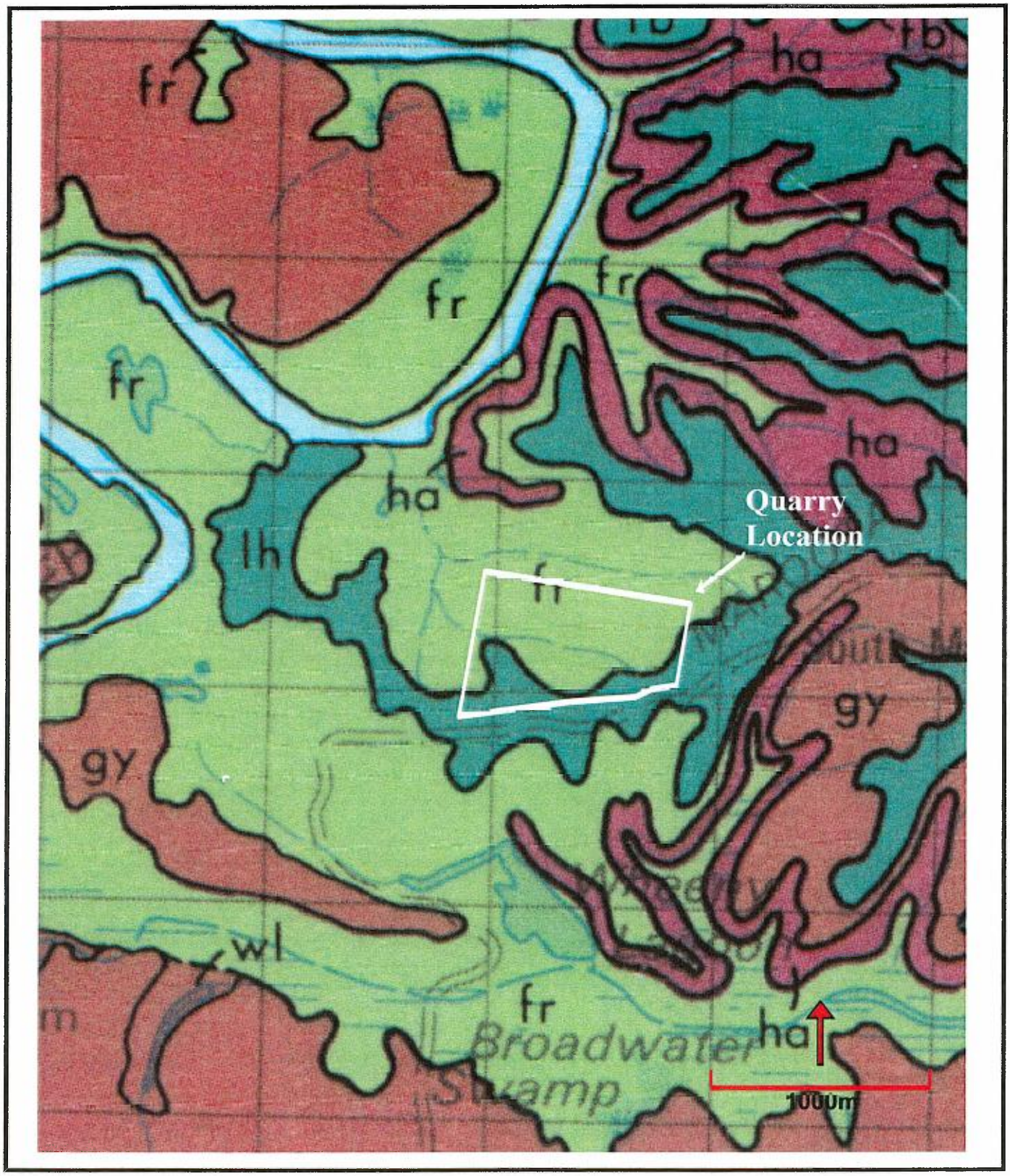

From: Soil Landscapes of the Penrith 1:100,000 Sheet. Soil Conservation Services of NSW.

Figure 16

Cattai Sandstone Quarry

REGIONAL SOIL LANDSCAPES

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Development of the soil profile is poorly developed on the property. A typical profile of the soil is as follows:

- Sandy loam. 0mm to 300mm. Light brown/yellow. Loose consistency with sandstone fragments to 40mm in size.
- Sandy Clay. 300mm to 500mm. Minor clay in very sandy matric. Large percentage of well weathered sandstone fragments.

8.2.3 Soil Analysis – Physical Attributes

A sample was taken from the top 0-300mm from each auger hole (designated AH) except AH4 (ie. AH1 [sample CQ1A], AH2 [sample CQ2], AH3 [sample CQ3], AH5 [sample CQ5]). Further, one sample from a depth of 400-500mm was taken from AH1 (ie. sample CQ1B). Laboratory analysis of the samples was performed by Sydney Environmental and Soil Laboratory (See Appendix 5 for soil laboratory results). A summary of the relevant physical characteristics are presented in Table 5.

TABLE 5: SOIL PHYSICAL CHARACTERISTICS

Auger Hole and Sample No.	Clay %	Silt %	Fine Sand %	Coarse sand %	Gravel %	Dispersion %	Organic Matter %
AH1/CQ1A	14.6	13.6	28.0	32.8	10.9	40	3.87
AH1/CQ1B	56.3	12.8	20.1	10.2	0.4	31.7	N.A.
AH2/CQ2	4.0	4.0	17.3	72.5	2.3	100	2.03
AH3/CQ3	11.7	4.9	17.7	63.2	2.4	50	0.53
AH5/CQ5	3.9	3.9	17.7	62.4	12.0	100	2.50

The above results indicate that soils at a depth of 0-300mm have a texture predominantly made up of a coarse sandy loam. Soils at a depth of 400-500mm have a texture predominantly made up of a fine sandy clay.

8.2.4 Soil Analysis - Chemical Attributes

Chemical characteristics and values from the soil sampling are summarised in Table 6 below:

TABLE 6: SOIL CHEMICAL CHARACTERISTICS

Sample No.	pH ($CaCl_2$)	EC (Electrical Conductivity) mS/cm	eCEC (cmol/kg)	Exchangeable Sodium Percentage
CQ1A	4.2	0.04	2.96	4.70
CQ1B	4.2	0.07	N.A.	N.A.
CQ2	4.2	0.03	1.55	4.50
CQ3	4.2	0.03	2.27	4.40
CQ5	4.0	0.03	1.72	5.20

- The pH values indicate that the soils are moderately acidic. This could result in high available Aluminium which can be toxic to plant growth. This condition is manageable when dosed with adequate quantities of lime (e.g. 600-800g/sqm).

- EC refers to the electrical conductivity of the soil and differs from Hydraulic conductivity in that it is an indicator of the flow of ions in the liquid phase of the soil. High electrical conductivity (>0.4mS/cm [>4 dS/m]) in a soil is undesirable for plant growth. On-site soils have a low electrical conductivity.

- The Cation Exchange Capacity is a measure of the soils ability to adsorb positively charged ions (cations - Mg, Ca, Na, K, etc) at a given pH which can be used by vegetation or kept within the soil. A cation exchange capacity of greater than 15cmol/kg is recommended. Site values indicate that the sample exhibited a low CEC. The addition of lime at a rate of at least 300-400g/sqm will improve the calcium levels and reduce the available aluminium. To reduce the levels of exchangeable sodium, gypsum is required at a rate of 200g/sqm.

- The Exchangeable Sodium Percentage (ESP) levels of on-site soils indicates that the soils are generally not sodic (soils with %Na values greater than 5 are said to be sodic). This property refers to the ability of the soil to swell on wetting which restricts plant root development.

Acid Sulphate soils are not an issue for this project, as they generally occur in estuarine areas and where the geology is marine-derived shale containing pyrite. The geology within the project area is restricted to Hawkesbury Sandstone.

8.2.5 Soil Analysis - Fertility

Table 4 lists some important fertility parameters which help categorise the ability of the soil for vegetation growth. These characteristics and values have been obtained from on-site soil sampling and are summarised below in Table 7:

TABLE 7: SOIL FERTILITY CHARACTERISTICS (mg/kg)

Sample No.	P	Ammonium	Nitrate	S	Fe	Zn	Cu	Mn
CQ1A	1.1	3.6	<2.50	21.1	106.6	0.8	1.5	4.4
CQ1B	N.A.	N.A.	N.A.	N.A	N.A.	N.A.	N.A.	N.A.
CQ2	<0.8	3.6	<2.50	15.4	91.9	0.8	1.7	1.9
CQ3	1.1	3.6	2.8	25.6	77.7	6.5	1.5	0.7
CQ5	<0.8	4.5	<2.50	19.2	96.6	1.8	1.7	5.2

- Phosphorous, Ammonium and Nitrate levels are low which is beneficial for the growing of most native plant species.
- Levels of Sulphate & Iron are acceptable.
- Zinc, Copper and Manganese levels are low, and should be improved by the application of trace elements. Additional soil recommendations are provided in Appendix 6.

8.2.6 Land Capability

Land capability is defined by the NSW Soil Conservation Service (Houghton & Charman, 1986) as "the ability of land to accept a type and intensity of use permanently, or for specified periods under specific management without permanent damage". It is an expression of the effect of biophysical land resources, including soils and climate, on the ability of land to sustain use without damage under various uses. A system of land classification has been developed which takes into account a range of factors including local climate, soils, geology, geomorphology, soil erosion, topography and the effects of past land uses. The classification system indicates the potential of the land for such uses as crop production, pasture improvement and grazing. The range of classifications vary from Class I (land suitable for a wide variety of uses on fertile soils – includes prime agricultural land) to Class VIII (land unsuitable for agricultural or pastoral pursuits).

The land within the application area has been classified by NSW Agriculture using the above classification principles (NSW Agriculture, 1995). The land within the application area is described as Class 4 or 5. These classes are described as follows:

Class 4: Land suitable for grazing, but not cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.

Class 5: Land unsuitable for agriculture or at best suited only to light grazing. Agricultural production is very low or zero as a result of severe constraints, including economic factors which preclude land improvement.

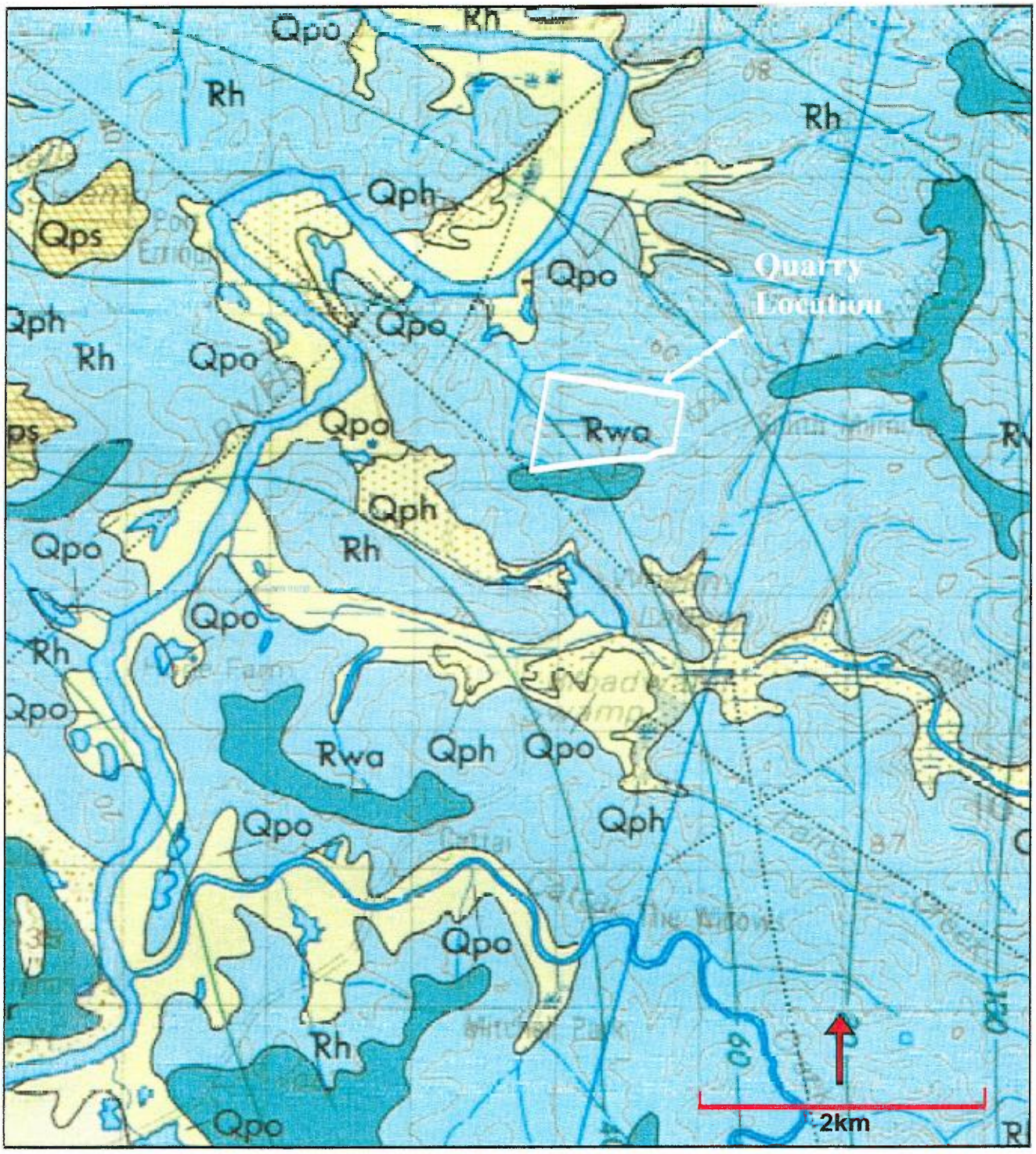
8.3 Geology

8.3.1 Regional Aspect

The regional geology is dominated by Hawkesbury Sandstone, of ~~Permian~~ Triassic Age. The Hawkesbury Sandstone was deposited in a fluvial environment potentially in a braided stream setting. Shale bands within the sandstone are typically channel fill sediments, forming lenses within the sandstone, itself typically coarse grained and predominantly quartzose in composition, exhibiting cross-bedding in places.

Stratigraphically above the Hawkesbury Sandstone is the Ashfield Shale, which dominates much of the landscape south of the project area, with a remnant patch located to the south of the project area, near Wisemans Ferry Road. The Ashfield shale is a member of the Wianamatta Group of sediments, consisting of dark grey to black claystone and siltstone, which may have been deposited as a freshwater lake or in a still, shallow water environment.

To the south-west of the Cattai area, fluvial sediments are common along the floodplain areas of the Nepean River, in the vicinity of Richmond township. The base of these alluvials is the Londonderry Clay, of Tertiary Age. Overlying this unit are several younger groups of sediment (Quaternary), found along the creeks (Cattai Creek) and wetlands of the region. The regional geology is illustrated in Figure 17.



From: Geology of the Penrith 1:100,000 Sheet.
Geological Survey of NSW.

Figure 17

Cattai Sandstone Quarry

REGIONAL GEOLOGY

Nepean Quarries Pty Ltd

HARVEST SCIENTIFIC SERVICES

8.3.2 Local Geology

A number of investigations have already been carried out on the property, including surface mapping, drilling and sampling on the property. These investigations confirm surface exposures and indicate that the sandstone is typically white to orange in colour and is composed primarily of medium to coarse grained quartz.
Minor amounts of quartz pebbles, clays and feldspar also occur. Patterns and colouring in the sandstone vary across the property, with the common white-orange appearance (obvious in core and cuttings) often exhibiting cross-bedding with purple and yellow colour bands. Restricted pockets of shale are anticipated and can be seen in the core. These are up to 60cm in thickness and consist of laminated mudstones or siltstones, however the majority of bands are only a couple of centimetres thick.
The surface geology is detailed in ground traverse mapping illustrated in Geological Sections 1 and 2 with the vertical profile detailed in the geological log of Drill Hole C3 (A total of 4 cored drill holes (C1 to C4) have been completed at the quarry. The position of the geological traverses and drill holes are indicated on Figure 7. Aspects of the quarry geology are illustrated in Plates 19 to 21.

8.4 Geotechnical Issues

Due to the inherent stability of the Hawkesbury Sandstone which is based on its massive nature, there are no specific geotechnical issues relating to the proposal, provided the proper measures are taken with regards to site design and construction.
As indicated in Section 6.8, the configuration of the final quarry walls fall within acceptable safety guidelines which provide adequate stability, enable easy and safe extraction techniques and provide a good 'platform' for an effective rehabilitation program.

8.5 Assessment of Impact

Impacts on the geological aspect of the site are considered to be benign. There are no geological values that may be threatened as the site is located within a sandstone unit that is widespread and common throughout the Sydney Basin. The sandstone is already highly disturbed and future quarrying and rehabilitation is designed to ameliorate the harshest aspects of the operation.
With respect to the soils on the site, potential impacts may occur if there are no controls in place to prevent their escape into the downstream drainage environment. This issue will be dealt with in more detail in the following sections. Suffice it to say that a number of control measures are to be implemented to limit any soil loss off the site.

8.6 Controls and Safeguards

With respect to the final on-going quarrying operations, bench and batter design are such as provide maximum safety with respect to ground stability as well the prevention of vehicle roll-over. No specific safeguards are considered necessary with respect to the geological values of the quarry area. A number of controls are to be implemented with respect to the soil resources of the site. These will be encompassed in the Soil and Water Management Plan and other interrelated measures.

Plate 19

Massive sandstone exhibiting cross-bedding a feature typical of the Hawkesbury Sandstone.

Plate 20

Core from hole No. CS-3, a log of which is included in Appendix 4.

Plate 21

Core hole CS-1 showing a thin shale band represented by the grey stone (top right hand corner).

8.7 Conclusions

The Cattai quarry sandstone has been subject to previous extraction campaigns and has been shown through testing to be of high quality for use in the construction industry. Consumers in north and north-western Sydney will benefit from the supply of these local, low cost construction materials.
The sandstone is easily extractable with minimal disturbance to local residences as no blasting will be used. The Cattai quarry site is valuable in the quarrying sense as it will not only supply crushed sandstone but will further provide a supply of dimension stone.
There are no significant issues relating to drainage, soil or geological aspects that will be an impediment to proposed quarrying operations.

SECTION 9 METEOROLOGY

9.1 Introduction

Meteorological data presented in this report has been drawn from records collected at Glenorie (Post Office) and Richmond (Hawkesbury Agricultural College) by the Bureau of Meteorology (Queensland Department of Primary Industry and Bureau of Meteorology, 1999).

9.2 Temperature

Figures for the maximum and minimum daily temperatures for each month for Richmond are found in Table 8 below:

TABLE 8: DAILY AVERAGE TEMPERATURES

Maximum(Degrees Celsius)					
Jan 29.5	Feb 28.7	Mar 27.1	April 24.0	May 20.3	June 17.7
July 17.2	Aug 18.8	Sept 21.5	Oct 24.3	Nov 26.9	Dec 29.0
Minimum					
Jan 17.5	Feb 17.5	Mar 15.7	Apr 12.1	May 8.0	June 5.3
July 3.6	Aug 5.1	Sep 7.6	Oct 11.1	Nov 13.9	Dec 16.1

9.3 Rainfall

The average rainfall and number of rain days for each month for Glenorie are presented in Table 9 below.

TABLE 9: RAINFALL AND RAIN DAYS

Average Monthly Rainfall (mm)					
Jan 103	Feb 103	Mar 102	April 84	May 80	June 89
July 57	Aug 58	Sept 53	Oct 69	Nov 74	Dec 77
Average Number of Rain Days					
Jan 9	Feb 9	Mar 9	Apr 8	May 7	June 8
July 6	Aug 7	Sep 6	Oct 8	Nov 8	Dec 8

9.4 Evaporation

The Evaporation data (Richmond) below in Table 10 demonstrates that evaporation exceeds rainfall for most of the year.

TABLE 10: EVAPORATION

Average Monthly Evaporation (mm)					
Jan 226.3	Feb 170.8	Mar 151.9	April 111	May 80.6	June 66
July 80.6	Aug 99.2	Sept 126	Oct 161.2	Nov 198	Dec 238.7

9.5 Wind

Details regarding the wind environment (Glenorie) include the following:

- During Summer, winds with speeds of up to 31-40km/hr blow predominantly from the east, ie. approximately 30% of winds;
- During Autumn, winds blow mainly from the west and north-west with speeds of 31-40km/hr, representing almost 40% of winds;
- During Winter, westerly and north-westerly winds dominate (representing approximately 45% of winds) with speeds up to and in excess of 40km/hr; and.
- During Spring winds swing from the north-west (with speeds in excess of 40km/hr) around to the east (with speeds of 31-40km/hr).

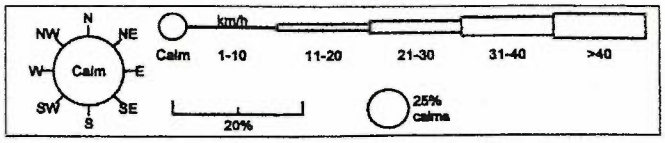
Features of the wind pattern are depicted in a series of wind rose diagrams shown in Figure 18.

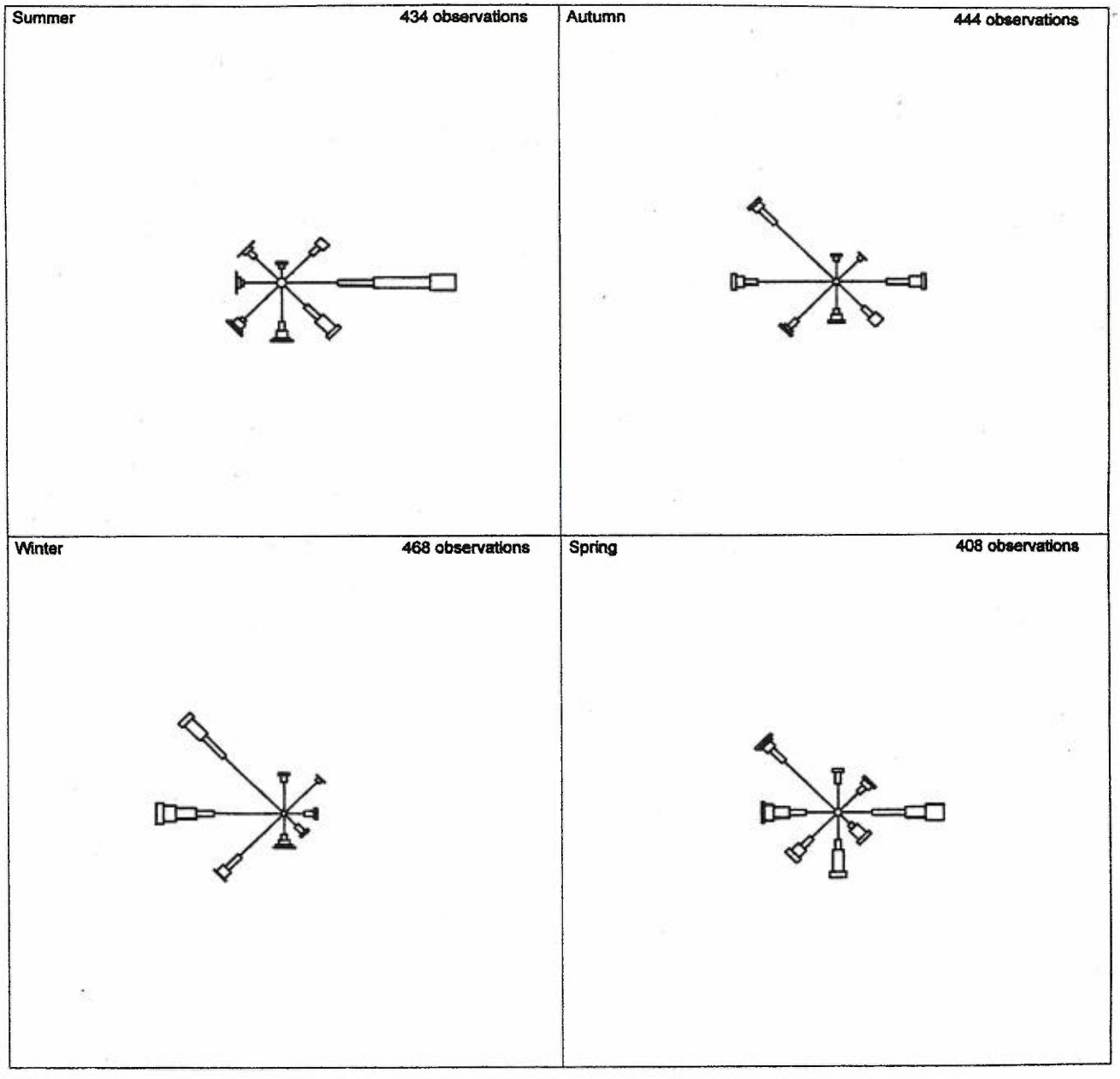
9.6 Miscellaneous Climatic Phenomena

Observations for these climatic conditions from Glenorie are found in Table 11.

TABLE 11: DROUGHT RECORDS

Drought	Period	Duration (months)	Total Rainfall (mm)
1	Jan 1915 to Sep 1916	21	1014
2	Jan 1918 to Nov 1920	35	1809
3	Mar 1922 to Mar 1923	13	607
4	Sep 1923 to Apr 1925	20	1014
5	Jun 1936 to May 1937	12	600
6	Feb 1938 to Feb 1939	13	600
7	Apr 1939 to Feb 1942	35	1563
8	Dec 1943 to May 1945	18	940
9	May 1946 to Nov 1947	19	883
10	Jun 1953 to Jul 1954	14	673
11	Jul 1956 to Dec 1957	18	809
12	Jul 1964 to Aug 1965	14	681
13	Nov 1967 to Jan 1969	15	803
14	Jan 1979 to Nov 1980	23	1094
15	Feb 1982 to Sep 1983	20	1065
16	Oct 1990 to Nov 1991	14	649
17	Nov 1993 to Dec 1994	14	762
18	Mar 1997 to Mar 1998	13	579





From: Bureau of Meteorology 2001. Wind Roses for Glenorie Old Northern Road.

Figure 18

Cattai Sandstone Quarry

WIND DIAGRAM

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9.7 Constraints Assessment

The chief identifiable project constraint is related to wind blown dust generated from the quarry both during operational as well as dormant periods. Given the direction of prevailing winds in a generally north-westerly direction, special consideration will have to be given towards the reduction of all dust generative sources. Drought periods are not an issue, as water can be derived off-site by water-tankers if on-site reservoirs are diminished.

SECTION 10 DRAINAGE AND SURFACE WATERS

10.1 Regional and Local Drainage

10.1.1 Regional Drainage

The regional drainage regime is dominated by the Hawkesbury River which is located to the north-west of the project area. Significant but lesser drainage lines include Little Cattai Creek and Stone Drain Creek. All of these eventually drain into the Hawkesbury River. In addition, a multitude of intermittent drainage lines flow directly to the Hawkesbury River.

10.1.2 Local Drainage

The Project Site and immediate adjacent propertyies are located within a relatively small catchment (Figure 15). The catchment consists of intermittent drainage lines and dams (no named creeks) which eventually drain to the north and into the Hawkesbury River. This catchment is bordered to the south by Wisemans Ferry Road (which follows the Maroota Ridge), to the west by Cheesman's Road and to the east by an unnamed unsealed access track.

Drainage on the project site is dominated by two east-west trending drainage lines. The main drainage line hosts a large water storage dam (Dam 1) and several smaller dams (Dams 2 and 3), the location of which is indicated in Figure 7. The second main drainage line is located in the south-western corner of the site. This drainage line contains no dams on-site. All drainage leaving the Project Site flows through several ponded or swamp areas prior to decanting into the Hawkesbury River which is located approximately 850 metres NNW of the site.

10.2 Site Drainage Characteristics

10.2.1 Overview

The project site can be subdivided into 8 sub-catchments. The size of each subcatchment is defined in Table 12 below and their locations are illustrated in Figure 7.

TABLE 12: ON-SITE SUBCATCHMENTS

Subcatchment	Existing Area (ha)
1	8.73
2	0.58
3	3.34
4	8.77
5	8.61
6	10.33
7	2.02
8	7.65

Catchments 2, 7 and 8 will not be impacted upon by the proposed extraction activities whereas Catchments 1, 3, 4, 5 and the southern half of catchment 6 will be affected. Much of the previously extracted area falls within Catchments 4 (the Main Excavation area) and 1, whereas sediment deposition as a result of these activities is located within Catchment 5.

10.2.2 Main Excavation Area

The Project Site contains two existing previously extracted shallow sandstone excavations (See Figure 7). The larger excavation which is located near the centre of the site has drainage which is currently directed to both ends of the excavation. Drainage to the north-east corner of this excavation area flows to a constructed basin with an overflow down to the main dam (Dam No.1). Drainage to the north-western end of the excavation is directed through two rock-check dams which then drains to a constructed basin (Basin No.1) located downslope and adjacent to the existing access track. Overflow from this basin also flows to the main dam.
The other (much smaller) sandstone excavation (located in the south-western corner of the site) drains down to the existing intermittent drainage line located immediately to its north.

10.2.3 Secondary Excavation Area

This area is located in the south-eastern corner of the project area and straddles Lots 1 and 2. This excavation area has been exploited solely for dimension stone, with disturbed areas being limited to several benched areas which have been subjected to clearing and then cutting. All runoff is directed to the secondary drainage line which exits the project site at the south-eastern boundary. There are currently no sediment controls in place.

10.3 Constraints Assessment

The main constraint in relation to internal runoff is the potential for 'dirty water' to escape off site and enter the external drainage, thereby polluting downstream drainage lines and ecosystems. This is particularly the case during quarry expansion activities when areas of disturbance are at their maximum. The potential for pollution is considered to manifest itself in sediment laden waters which could transport a range of specific pollutants such as oil and grease. Furthermore, nutrients attached to sediment particles washing into the on-site drainage lines & dams represent an undesirable outcome and excessive silts in the drainage system also have implications with respect to downstream ecosystems. In general terms, these impacts are considered to have a high priority in terms of the environmental integrity of the site.
Secondary concerns relate to the management of on-site water flows with the view to preventing disruption to the orderly operation of the quarry.

10.4 Operational Safeguards and Controls

10.4.1 Introduction

Prior to sandstone extraction proceeding, it is necessary to construct and/or install an number of sediment detention and control measures. The main function of these devices is to control the water quality that leaves the working area and enters the natural drainage system. A secondary function of these devices is to maintain the stability of the existing and surrounding soil profile and prevent erosion and sediment loss. All of these principles are covered under the auspices of a Soil and Water Management Plan.

The following sections describe the general principles which underpin the SWMP and the various devices that will be utilised.

10.4.2 Existing Controls

Soil and water management devices installed by the previous operators include the construction of the following;

- Four dams, including the Main Dam located in the primary drainage line;
- Two sediment detention basins each with a capacity of approximately 100 cubic metres;
- Drainage channels; and
- Drop-down erosion control structures.

The position of these devices are indicated on Figure 7.

Sediment from these operations were discharged into a flat area located below the main extraction area (between and adjacent to dams 1 and 2). Sediment accumulated in this area without any significant controls and then discharged into Dam 1.

10.4.3 Planned Controls – General Concept

The Soil and Water Management Plan for the quarry area will be based on the following:

- A primary sediment detention basin will be established and located within the flat area between Dams 1 and 2. This will be the main water quality control mechanism for the whole site for the life of the project;
- All run-off from catchments 2,3,4,5 and 6 will be directed to this sediment detention basin;
- All extraction will occur as described in Section 6 with run-off being directed into this basin;
- The north-south drainage line located in Lot 5 will be diverted around the basin;
- Existing sediment control measures will be repaired where appropriate; and
- Runoff from within catchment 1 will be controlled by localized smaller scale devices during initial activities. During latter stages, a series of drainage lines will be constructed to take runoff into the main drainage control system.

These principles are detailed in the Soil and Water Management Plan which is included in this EIS as Figure 19. The following section describes in detail, design considerations for the various devices that are to be used within the context of the Soil and Water Management Plan.

10.4.4 Design Features for Soil and Water Management

10.4.4.1 Overview

To control runoff during storm events a number of soil and water management devices will be required. These controls will form the basis of the Soil and Water Management Plan illustrated in Figure 18. The most significant of these devices is the sizing and location of sediment retention basins to control sedimentation during surface disturbance activities such as land clearing, soil stripping and road construction. These basins will collect water from a particular storm event over a pre-designated area which may potentially flush out sediment/nutrients, thus filtering runoff on-site and protecting nearby waters. The basin will allow any potentially nutrient loaded sediment to also settle out for later removal. The basin will thus retain potential pollutants:- suspended solids and nutrients. Solids will be removed when the capacity of any one basin is reduced by 30%. The following section outlines the calculations undertaken to determine basin sizes.

This diversionary bund will be located immediately downslope of the main extraction area upon the quarry commencing operations. It will be moved up or down slope as conditions dictate.

This existing sediment retention basin will be restored and used until extraction in Cells 2 to 4 has been completed. It will then be decommissioned and replaced by the main diversionary bund.

This diversionary bund to be progressively established with the extraction of each cell. It is located at the base and leading edge of the extraction area.

Sediment retention basin No 2 to be decommissioned upon commencement of extraction. A drop-down structure will be constructed from its current position to the new Primary sediment retention basin.

This diversionary bund will be constructed and connected to the main bund that discharges to the primary sediment retention basin once extraction commences in this area.

DAM No.1
WATER
R.L. 14.0

DAM No.2
WATER
R.L. 25.3

DAM No.3
WATER
R.L. 26.1

DAM No.4

Basin No.1 (existing)

Basin No.2 (existing)

QUARRY

Sediment Storage

PP

PP

ROAD

Lot No.5

Lot No.3

Lot No.4

Lot No.2

Lot No.1

WISEMANS

FERRY

BORE No.1

DAM

This diversionary bund will be constructed to discharge sediment laden runoff arising from the dimension stone area to the main sediment retention basin. Levels will be initially reduced by approximately 3-4 metres at the base of slope to enable the correct fall to be constructed.

All runoff from Stage 3 area will be directed through Dam 4 and then along a diversionary channel, to Dam 2. This will remain in place until Stage 1 and Stage 2 have been completed.

A small sediment retention basin will be constructed to catch run off from the dimenstion stone area. The capacity of this basin is approximately 280 m3. The overflow will be protected by rip-rap.

Clean water diversionary bund. This bund short-circuits run-on from up-slope and diverts it to Dam No 2. This bund will be relocated up or down slope as conditions dictate.

N

0 50 100m

Scale 1:3000

A small sediment retention basin will be constructed to catch run off from the Stage 2 area when it becomes required. The capacity of this basin will vary between approximately 200 and 500 m3. The overflow will be protected by rip-rap.

Primary Sediment Retention Basin. The minimum required volume of this basin is 1468 m2. However, there is room to enlarge this to well over 3000 m2, assuming a minimum depth of 1.0 to 2.0 metres. The basin will consist of a sediment storage zone as well as a sediment settlement zone. The overall design will adhere to the guidleines detailed in the 'Blue Book'.

LEGEND

- Sedimen detention basin
- Sediment fencing
- Haybale barriers
- Rip rap (coarse crushed sandstone)
- Constructed drainage direction

Figure 19

Cattai Sandstone Quarry

SOIL AND WATER MANAGEMENT PLAN

Nepean Quarries Pty Ltd

Surveying by McElwee Associates Pty Ltd

It should be noted that these calculations are based on the disturbance of one hectare of surface land. In the event that the area disturbed is greater or lesser, the size of the basin should be adjusted proportionally. However, based on the proposed 'cell' extraction method, the total amount of newly disturbed land will be less than 1 ha

10.4.4.2 Sediment Retention Basin Volume Determination

This Section defines the appropriately sized sediment retention basins required for surface activities such as topsoil stripping and stockpiling, road and/or track construction. Sizing of the sediment retention basin has been based on formula defined in the NSW Department of Housing - Managing Urban Stormwater - Soils and Construction - the 'Blue Book' (NSW Department of Housing, 1998).

By determining predicted runoff from the site, along with estimated soil loss levels it is possible to define the optimum size for sediment retention basins. Calculations are performed to equate the required settling zone volume and the sediment storage zone volume which results in the total basin volume. The 5 day 90th percentile rainfall event and the Revised Universal Soil Loss Equation (incorporating the 2yr ARI 6 hour storm event) are used in the determination. These and other soil based parameters used in this determination are detailed in Table 13.

TABLE 13: SITE SOIL CONSTRAINTS AND VALUES

Constraint and/or Characteristic	Value and/or rating
Rainfall erosivity value	2500 (Cattai)
Soil erodibility factor – K factor	0.022 to 0.043 (Gymea soils)
Typical slope gradient (%)	8
Calculated Soil Loss (tonnes/ha/yr)	156 to 305
Soil Texture Group	Type F
Runoff coefficient (Cv)	0.50
Dispersion %	20 (see Note1)
Total dispersed clay (%)	>20
Site Area (ha) 'A'	1.0
Disturbed Site area (ha)	1.0
R (90^{th}%ile 5-day rainfall event (mm))	47.6 (Wilberforce)

Note 1. Based on laboratory data (Table 2)

Hence, the sizing of a sediment retention basin for a nominated area of 10,000 square metres (ie. 1 hectare) is based on the following calculations:

Total Volume = Settling Zone + Sediment Storage Zone

Where Settling zone volume = 10 x Cv x R x A A = Catchment area
= 10 x 0.50 x 47.6 x 6
= 1428 m^3

Sediment storage volume = (0.17 x A x Soil loss)/1.3* A = Disturbed area
= 40 m^3

Total Volume = 1468 m^3

*using the maximum value

In this case, the contributing part of Catchment 4 (which accounts for approximately 70% of the total catchment area) has been used to estimate the size of settling zone volume.
This is a worst case scenario and seeks to redress past quarrying practices which has left a vast area open to the elements. The proposed operations will not open up such a large portion of land and will in fact focus future activities on small and containable working areas.
It is also noted that that the sediment storage volume relies on a Soiloss estimation. Based on the soil data in Section 8.2.3, documented soil data from the Blue Book and the Universal Soil Loss Calculation, the approximate soil losses from a 1ha disturbed area may vary between 156 and 305 tonnes/ha/year (Appendix 6). It should be noted that this soil loss result is based on the assumption that no soil and erosion management practices have been applied. However, the use of sediment retention basins and the application of appropriate standard devices as defined in the following sections can reduce these potential soil losses significantly.

The above calculations therefore indicate that the primary sediment retention basin will require a capacity of 1468 cubic metres at any one time and until all of the land located within Stage 1A operations have been completed. A smaller retention basin (with a design capacity of 280 m3 has been designed for activities located in the smaller catchment located on the south-western corner of the project site.

The depicted Soil and Water Management Plan (Figure 18) has been prepared on the basis of the quarry configuration for Stage 1A, 1B and 2 portrayed in Figure 7. This is because Stage 3 quarrying is unlikely to commence for another 10 years and site conditions may well have changed during that time in response to upgraded environmental and/or regulatory requirements. However, the same principles as outlined above will be utilised during Stage 3 quarrying.
Furthermore, for the purposes of design and basin calculations, all soil and water management devices have assumed the maximum area of disturbance. However, it should be noted that these devices require a continuous adaptation to the site's configuration and activities at any one time. For this reason, the Environmental Management Plan (Section 24) is the most appropriate avenue for detailing these activities on a regular basis.

10.4.4.3 Other Soil and Water Management Measures to be Adopted

A number of other specific measures are detailed which are all part of the Soil and Water Management Plan and illustrated in Figure 19, viz:

- Strategic positioning of diversion drains to divert clean runon around the quarry extraction. These diversion drains will be constructed from existing soil with a 'V' shape and a depth of 500mm;
- Sediment fencing will be temporarily installed as indicated;
- Barrier fencing will be installed as indicated;
- Access for all contractor vehicles and equipment during clearing and bund construction is to be restricted to a defined path delineated by string and flagging tape (barrier fencing);
- Crushed sandstone ('rattle pad') to be installed on the access road which leads to the western end of the site. This will act as a control device as it will encourage the shaking off of mud caked tyres leaving the site;
- Sediment fencing is to be installed downslope from all temporary stockpiles of cleared material (topsoil, clay and rock);
- Grass or vegetation filter strips (preferably at least 10 metres wide) of retained vegetation are to be maintained on the down-slope side of all bunding construction activities where possible, and
- Revegetate with turf or seed any exposed surfaces and bunds immediately after construction.

Soil and Water Management Works Sequence

- Before any work commences ensure plans are on hand and all equipment and materials likely to be required are available for use;
- Ensure diversion of surface runon from the area outside the working quarry face, with the use of diversion bunds;
- Construct quarry sediment retention basin;
- Ensure that drainage continues to be efficiently directed towards the proposed quarry sediment retention basin. Consideration may need to be given to ripping one or more diversionary drains into the quarry floor which will then direct all internal pit runoff towards the sediment retention basin;
- Rock check dams are to be positioned on the quarry floor diversion drain to reduce waterflow velocities in the channel thus minimising the erosive effect of any runoff. The rock check dam should have a minimum height of 0.4m, and a width of 1m and can simply consist of a small mound of sandstone aggregate with approximate diameter of 50 to 100mm. These are to be semi-permanent structures which will aid in filtering out any particulate matter,
- Ensure that any runoff with the potential to flow to external quarry areas during land clearing activities is diverted to a temporary sediment retention basin, and that the capacity of the sediment basin is adequate;
- Remove vegetation and strip topsoil from the area to be worked. Ensure topsoil is utilised or conserved for use at a later date. Topsoil bunds or spoil piles should be no more than two to three metres in height;
- Ensure slopes of embankments (batters) are stable to prevent collapse of banks during operations;
- Install barrier fencing to limit access to the newly excavated area, bunding and surrounds. Maintain surrounding as existing grassland; and
- Areas planted with vegetation and grasses (such as bunds) to be watered regularly and monitored until an effective cover has been properly established. Follow-up with additional topsoil, seed or fertiliser if required.

Site Monitoring and Maintenance

The Quarry Manager should delegate a person to inspect all aspects of the Plan regularly, paying particular attention to:

- Ensuring diversion drains and bunds are operating effectively, and carry out any necessary repairs;
- Removal of spilled material from hazard areas, including access roads and in close proximity to drainage lines. Removal of trapped sediment from retention basins, sediment fences, bunds and other structures. Measures used to return stormwater system to its operating capacity;
- Ensure construction of additional erosion control devices to ensure compliance with water control plans, and
- The site superintendent (or nominated person) should keep a log book, noting the condition of all structures, any remedial works carried out, the capacity of the sediment retention basins and rainfall. The book should be kept on site and be made available to any authorised person who may request it.

These issues will be more fully dealt with in the SWMP.

10.5 Assessment of Impacts

The greatest potential for pollution lies in the activities associated with surface works associated with the quarrying operation, as runoff from such activities could reach the main drainage lines and escape off-site. Hence, the implementation of an effective Soil and Water Management Plan is crucial in limiting all such impacts to the property itself.
It is therefore considered that provided all of the above controls (under the auspices of the SWMP) are implemented, any potential adverse impacts on the Hawkesbury River and other nearby drainage systems can be eliminated.

10.6 Water Quality Assessment

10.6.1 Introduction

Water sampling has been conducted on the project area once a month over a period of 6 months (ie. 12/7/01 – 14/12/01). The eight sample sites include on-site dams, bores, basins, dam spillways and drainage lines, including a dam located on the adjacent property to the west. Sample locations are indicated on Figure 20.
The purpose of the sampling was to provide background data on water quality which can be used as a benchmark during future operations of the quarry. Laboratory analysis of water from the sampling points was restricted to several environmental parameters as detailed below.

10.6.2 Constraints Assessment

Pollutants which are potentially associated with sandstone quarries in general include:

- fuel spillages from plant;
- oil spillages from plant;
- treated effluent from on-site septic tank/absorption trench;
- suspended solids for quarry floor and batters; and
- Nitrogen and Phosphorous from stockpiled soil.

10.6.3 Assessment of Sampling

A full sweep of water quality parameters were analysed by Australian Laboratory Services (ALS) at the commencement of the water sampling program. This was followed by monthly sampling and the testing of a more limited range of parameters.(EC, TDS, Salinity, Temperature & pH). The full set of results are attached as Appendix 7 and a summary of the results are presented in Table 14.

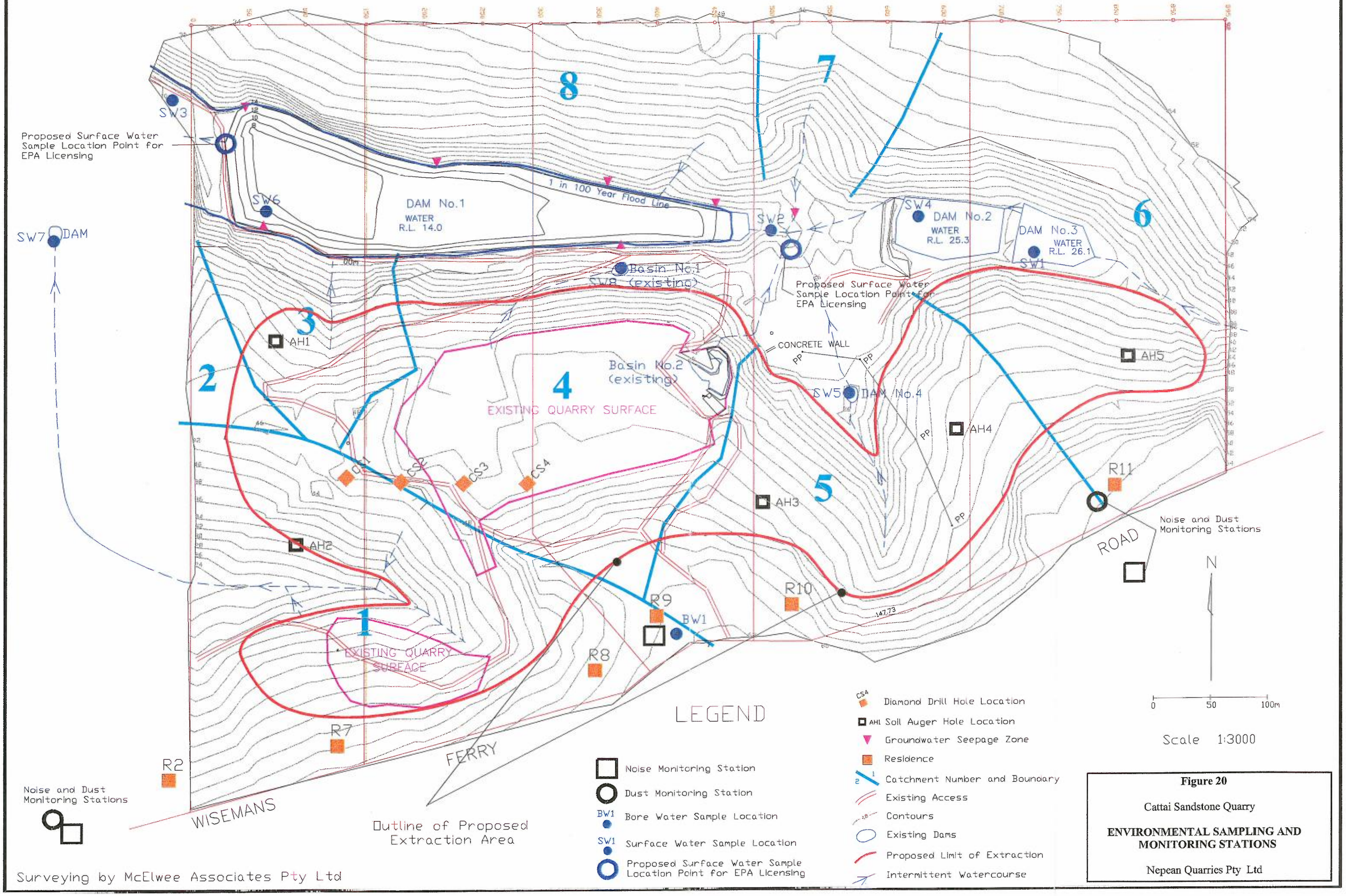


Figure 20

Cattai Sandstone Quarry

ENVIRONMENTAL SAMPLING AND MONITORING STATIONS

Nepean Quarries Pty Ltd

TABLE 14: SURFACE AND GROUNDWATER QUALITY

Sample No.	Location	EC (µS/cm)	pH	Suspend-ed Solids (mg/L)	BOD (mg/L)	Total N (mg/L)	Total P (mg/L)	Chloro-phyll a (mg/m^3)	Oil & Grease (mg/L)
SW1	Dam No.3	91.6	8.3	N/A	N/A	N/A	N/A	N/A	N/A
SW2	Drainage leading to Dam No.1	237	4.08	<1	<2	0.25 (or 25µg/L)	<0.01 (or <1µg/L)	1 (or 0.01µg/L)	<5
SW3	Drainage leaving Dam No.1	108	6.59	5	<2	1.02 (or 102µg/L)	0.02 (or 2µg/L)	2 (or 0.02µg/L)	<5
SW4	Dam No.2	106	7.6	N/A	N/A	N/A	N/A	N/A	N/A
SW5	Dam No.4	75.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SW6	Dam No.1	95	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SW7	Dam located on adjacent property to the west	56	6.14	6	<2	0.72 (or 72µg/L)	<0.01 (or <1µg/L)	10 (or 0.1µg/L)	<5
SW8	Basin No.1	30.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BW2	Bore No.1	379	4.86	236	<2	1.29 (or 129µg/L)	0.02 (or 2µg/L)	<1 (or <0.01µg/L)	<5

* Note that 100µg/L is equal to 1mg/L, and 0.01µg/L is equal to 1mg/m^3.

Key: EC = Electrical Conductivity
BOD = Biochemical Oxygen Demand
Total N = Total Nitrogen as N (TKN & NOX)
Total P = Total Phosphorous
N/A = parameter not analysed for that particular sample.

By comparing the above results with standard water quality guidelines (ANZECC, 1992), and the NSW EPA guidelines for Extraction Industries (See Table 15), the following observations can be made:

- The Electrical Conductivity (salinity) levels of all samples are below 1500µS/cm which is acceptable for the Protection of Aquatic Ecosystems,
- pH levels of samples SW2, SW7 and BW2 are moderately acidic whereas all other samples are within the acceptable range of 6.5-9.0. The acidic water samples are considered to be a product of runoff derived from naturally occurring topsoils which typically have a pH value of around 4 in the local geographic area.
- Suspended Solid (or Non-filterable residue) levels for all samples are less than 50mg/L which is a basic requirement of the NSW EPA for extraction activities (See Table 15 below), the only exception was the groundwater sample (BW2) which had a Suspended Solids level of 236mg/L. This is considered to be probably due to contamination of the sample as a result of the sampling technique.
- Oil & Grease in all samples tested at <5mg/L which conforms with NSW EPA requirements (See Table 15 below).

- Levels of Faecal Coliforms (see Appendix 7) in samples SW3 (1 faecal coliform/100mL) and SW7 (11 faecal coliforms/100mL) indicate that these waters are unsuitable for human consumption. No faecal coliforms are allowable (ANZECC, 1992). However, levels of faecal coliforms in samples SW3 & SW7 are acceptable for both Primary and Secondary contact recreational activities. Levels of faecal coliforms in all other samples tested were zero faecal coliforms/100mL.
- Levels of BOD in all samples tested was less than 20mg/L.
- Samples SW3, SW7 & BW2 contained levels of Total Nitrogen greater than the NSW EPA allowable value of 35µg/L. All other samples tested where within acceptable levels.
- Levels of Total Phosphorous in all samples tested were less than 700µg/L.
- Chlorophyll a levels in all samples tested did not exceed the NSW EPA allowable value of 7µg/L.

The EPA's guidelines for Extraction Industries require that discharges to receiving waters should not exceed certain levels. These are indicated below in Table 15.

TABLE 15: EPA WATER QUALITY REQUIREMENTS

Parameter	NSW EPA Guideline
BOD	<20mg/L BOD
Non-filterable residues (NFR)	<50mg/L
pH	6.5-8.5
Oil & Grease	Not visible
Total Nitrogen	<35µg/L
Total Phosphorous	<700µg/L
Chlorophyll-a	<7µg/L

The results to date therefore indicate that the existing water quality is generally satisfactory for recreational contact, but is not potable. High levels of Total Nitrogen and Faecal Colloforms suggest that parts of the catchment are is subject to low level sewer discharges from nearby residences.

On-going water sampling is considered important in order to detect over the long term, any irregularity in water quality that may arise as a result of quarry operations, or alternatively that may occur as a result of activities external to the quarry. To this end, water sampling has been conducted on an on-going basis since studies were initiated. The results of this work can be found in Appendix 7 and are illustrated in Figure 21.

10.6.4 Operational Controls and Safeguards

To ensure that the EPA water quality requirements are adhered the implementation of the previously discussed Soil and Water Management Plan is required. This Plan, which in addition to its functions of preventing soil loss to the environment and aiding in the stability of the quarry, would also be applied with the view of maintaining if not improving water quality aspects of the operation. With respect to water quality issues, correct management of the site will ensure that:

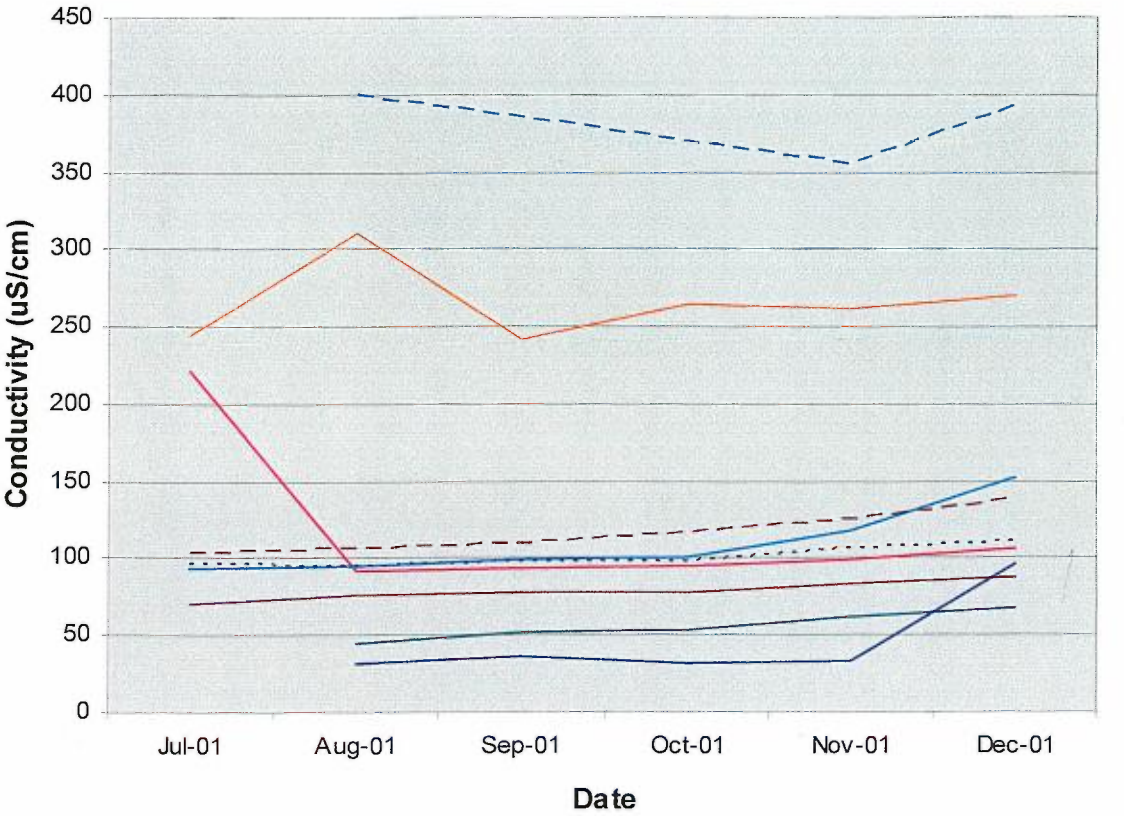


Figure 21

Cattai Sandstone Quarry

WATER QUALITY ASSESSMENT

Nepean Quarries Pty Ltd

- The quantity of water contaminated with suspended solids is minimal;
- All water with suspended solids is contained on site and processed through appropriate stormwater sediment devices before being discharged;
- Erosion of soil and sediment around the site is minimised through the implementation of an appropriate soil and water management plan; and
- All fuels, lubricants and oils are stored in an appropriately bunded and secure area to prevent accidental discharge into the environment, with measures in place to deal with accidental spills.

The potential for fuel/oil spillages from plant will be limited as all machinery is regularly maintained. Furthermore, fuel storage on-site will be stored on a contained concrete floor with a roof. Personnel using the site office will have access to a proposed on-site portable toilet closet and these wastes will be collected on a regular basis and disposed of off-site by a licensed contractor. Any suspended solids from the quarry or stockpiles is contained on-site proposed sediment retention basins. Solids retrieved from these storages is to be used during the rehabilitation program.

As the proposed sediment retention basin described in Section 10.4.4.2 is to be the main water quality control feature, its overflow is nominated as a sampling point for EPA licensing purposes. The other proposed licensing point is the discharge point for Dam 1. These sampling points are indicated in Figure 20.

10.6.5 Assessment of Impacts of Quarry on Water Quality

It is considered that the correct and efficient implementation of the Soil and Water Management Plan will mitigate any potential impacts that the Quarry may generate. This Plan, in conjunction with a well developed revegetation plan will ensure that no pollutant laden sediments will leave the Project Site.

10.7 Flooding Potential

Quarry operations at the Project Site will not be impacted upon as a result of the nearby Hawkesbury River. The 1 in 20 year (5%) flood level for the Hawkesbury River in this area is located at 10.7 metres AHD and the 1 in 100yr (1%) flood level is located at 13.3 metres AHD. The position of the 1 in 100 year flood is indicated on Figure 7. The dam wall of Dam No.1 has an RL of 14m and as such will prevent both 1% & 5% flood events progressing any further up the main drainage.
All proposed quarry extraction and associated activities are located at least 10 metres above Dam 1 and hence will not be affected by any flooding event.

SECTION 11 GROUNDWATER

11.1 Introduction

An assessment of the groundwater regime is required in order to determine whether the planned quarrying activities will have an impact on groundwater resources in the area. Data has been obtained from the Department of Land and Water Conservation and other available sources.

DCP 500 of Baulkham Hills Shire Council outlines several objectives regarding water resources affected by extractive operations. Objectives outlined in Section 2.4 of the DCP include:

- To conserve the integrity and quality of the groundwater resources of the Shire;
- To protect groundwater dependent and riparian ecosystems and natural habitats;

Also stated in these requirements is that extraction should not occur within 2 metres of the wet weather high groundwater level (or otherwise indicated by the Department of Land and Water Conservation).
The DCP also states the need for a *Water Management Strategy* and a *Groundwater Impact Assessment Report*. Both of these requirements have been incorporated into this section of the EIS. In addition, an *Annual Water Management Plan* is to be included as part of the ongoing environmental management of the site.

11.2 Regulatory Aspect

The right to the control, management and use of groundwater in NSW is vested in the Minister responsible for water resources, under the Water Administration Act 1986.
The Minister's functions are largely exercised by the NSW Department of Land and Water Conservation (DLWC).
Development and use of land is the one consistent element in the list of potential threats to groundwater. Land use planning legislation and instruments therefore provide some control over the uses to which land is put. Land use planning in NSW is administered by the Department of Urban Affairs and Planning (DUAP), in cooperation with local government authorities under the Environmental Planning and Assessment Act 1979 (EP&A Act).

The protection of groundwater from contamination is primarily governed by the Protection of the Environment Operations Act (1998) which makes it an offence to pollute waters, including groundwater. The Environment Protection Authority (EPA) administers these two Acts. However, individuals, Local and State Government Agencies can bring legal action under this legislation.

Groundwater Studies have been conducted in the Maroota Area (DLWC, 1996, 1998, 2001) in response to local residents reporting declining flows from springs and falling water levels in excavations and, to a lesser extent, in bores. Given the extent to which the community relies on groundwater resources, these observations have been a source of significant concern. In response to these concerns and the adoption of the NSW Government Water Reforms in 1997, the DLWC commenced a study with a view to developing a Water Sharing Plan for the area.

A study of Maroota's groundwater resources was proposed following consultation between the DLWC and Cattai and Berowra Catchment Management Committees and the Hawkesbury Nepean Catchment Management Trust, State and Local Government Authorities, representatives of the extractive industry, and community groups.

The study involved setting up monitoring bores and analysis of groundwater quality. The results of the study are reported in the most recent report Technical Status Report (DLWC, 2001) which revealed:

- The Maroota Sand Shallow Aquifer is a finite resource, limited in groundwater storage, defined by the cyclical input of rainfall recharge, and heavily developed;
- The sustainable yield of the Shallow Aquifer and the current (and pending) licensed entitlements are comparable;
- The Hawkesbury Sandstone Deep Aquifer has limited storage. However, due to the greater area of recharge and lower levels of development (as compared to the Shallow Aquifer) this resource is not yet under immediate stress;
- The derivation of aquifer and spring vulnerability is both subjective and relative, and requires continuing refinement as updated information becomes available;
- Ecosystem definition in the Maroota area requires further work to address issues raised by a recent ecology study;
- The existence of a perched aquifer interval at around 200m AHD in several locations around the Maroota Trigonometrical Station suggests a significant water resource may exist at that elevation; and
- Anecdotal evidence of depleted spring flows has not been supported by field measurements, and it is doubtful that the prevention of mining above the water table would improve the current situation.

The management strategy currently adopted in the Maroota area (through the use of local government development control plans) in the area is that mining not be permitted to proceed deeper than the water table with provision for a two (2) metre freeboard and to ensure that water tables are not subsequently exposed due to fluctuations in their level. The subject of this EIS is located well outside the Maroota sands area. The findings of this report therefore do not directly relate to this proposal, although in a general sense, many of the findings are valid with respect to groundwater resources within this part of the Sydney Basin.

The DLWC in co-operation with the Hawkesbury Nepean Catchment Management Trust have also outlined a number of guidelines regarding the treatment of groundwater issues for any development located within the Hawkesbury – Nepean Catchment (DLWC and HNCMT, 1998). Depending upon the groundwater vulnerability of the project site, an assessment of groundwater issues may be required.
Based on the above definitions, a moderately high level of vulnerability may be assigned for the Cattai Quarry area. In this case a demonstrated groundwater protection system may be required following an assessment which would incorporate the following:

"*The work should include a desk study, detailed site investigation, and implementation of an on-going monitoring program. In addition, the protection design system incorporating natural attenuation, hydraulic barriers, physical barriers etc., needs to be demonstrated, to be effective.*
The proposal will need to include a feasibility plan for a clean-up, in addition to a detailed monitoring and ongoing assessment program."

The classification of a 'Moderately-high' level of groundwater vulnerability is based on regional mapping and does not take into account the specific aspects of the project site.

In addition, Groundwater vulnerability maps (which the above classification was based on) do not directly consider the chemical nature of the pollutant in assessing vulnerability. They are concerned only with the hydrogeological setting which makes the groundwater susceptible to contamination from a surface source. When a development application is being prepared or considered, it is important that the impact of the development, on both surface and groundwater resources is assessed. It is important to know who uses these resources (beneficial use) and what the current quality of the water is. Potential groundwater polluting developments should not be allowed within highly vulnerable areas. Where such activities are proposed, significant engineering measures would be necessary to minimise the risk of pollution.

Moderately High vulnerability ranked groundwater resources for the Hawkesbury-Nepean Catchment refers to a large portion of the area and includes shallow aquifers associated with moderate slopes, higher rainfall and higher recharge. The soils are often moderately to highly permeable, with a moderate to high cation exchange capacity and a depth to water of less than 10 metres.

In general the large area covered by this class corresponds to the Hawkesbury Sandstone geological unit. This vulnerability ranking covers most of the sandstone terrain including the sandstone strata of the Narrabeen Group. The vulnerability ranking is based on the 'DRASTIC' Technique, which is an acronym for:

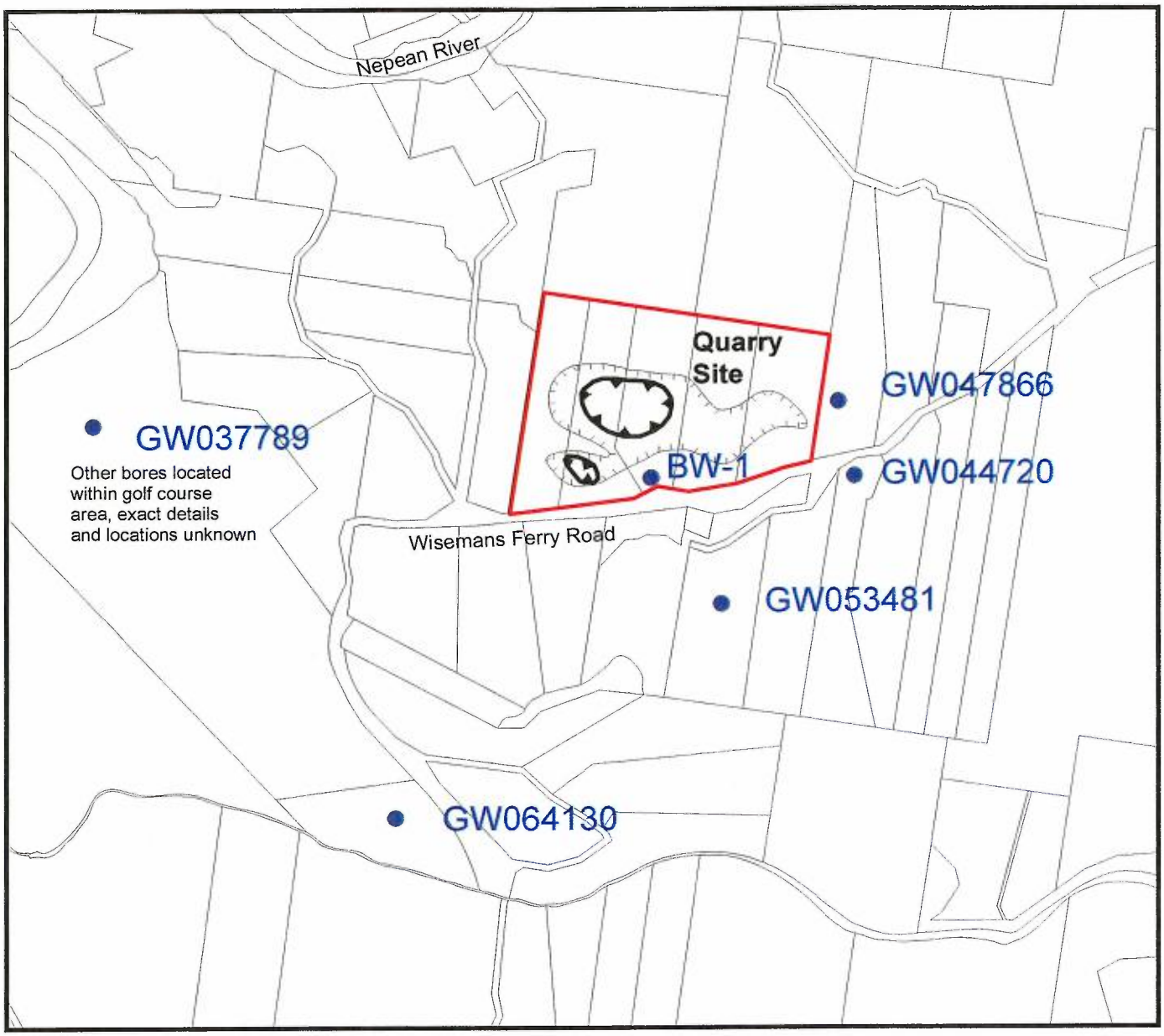
D – Depth to Groundwater
R – Recharge
A – Aquifer Medium
S – Soil Medium
T – Topography
I – Impact on Vadose Zone
C – Conductivity of Aquifer

Variations in these parameters enable groundwater conditions to be ranked from Low to Very High Vulnerability. Taking into consideration the local parameters used in the 'DRASTIC' technique, it can be concluded that the groundwater vulnerability for the Cattai site may be lowered from *Moderately High* to *Moderate* due to the relatively steep topography of the site and the significant depth to groundwater for the majority of the property.

Moderate vulnerability ranked groundwater resources refers to areas associated generally with moderate slopes, in hard rock terrain, water tables greater than 10 metres with moderate recharge. No one combination of vulnerability factors is responsible for this class, but it is observed that moderately vulnerable aquifers are consistent with moderate classes in the component maps.

In this case, detailed site investigation and monitoring is required:

"For moderately high vulnerability areas, or where the previous levels of investigation indicate a demonstrated risk to groundwater, a detailed groundwater site investigation is required. The work should include an ongoing monitoring program, details on the protection design factors, (natural attenuation, physical barriers, etc.) in addition to the previous levels of investigation"



LEGEND

= Property Boundary

= Groundwater Bore Location

= Outline of Existing Quarry

= Proposed Final Outline

N

400m

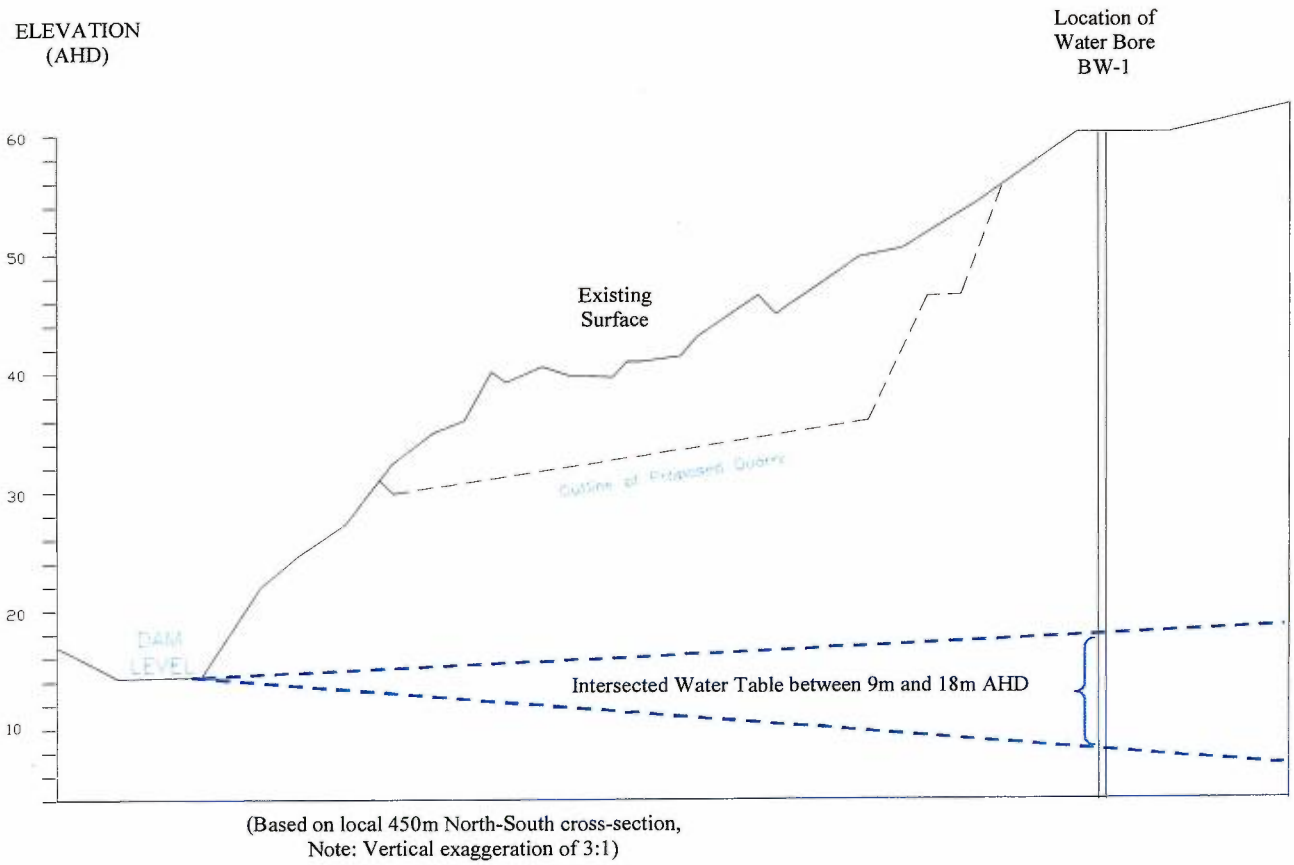
HARVEST SCIENTIFIC SERVICES

Figure 22

Cattai Sandstone Quarry

GROUNDWATER BORE LOCATIONS

Nepean Quarries Pty Ltd



(Based on local 450m North-South cross-section,
Note: Vertical exaggeration of 3:1)

Figure 23

Cattai Sandstone Quarry

WATER TABLE IN CROSS SECTION

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11.3 Existing Groundwater Data and Observations

An assessment of groundwater resources was made utilising the resources of the Department of Land and Water Conservation. Details from 8 boreholes have been recorded, all located within a 2 kilometre radius of the quarry site and a summary of pertinent details is provided in Table 13. Three of these bores are located to the south-east of the quarry, within 400 metres of the previous central extraction area. The location of all bores is indicated in Figure 22.

Depth to the water table (defined as the Static Water Level - SWL) at the closest registered bore to the quarry site (GW047866, 1981) is recorded at 40 metres from an elevation of around 70 metres (translating to a depth of 30 metres AHD).

On the other side of Wisemans Ferry Road, the water bore (GWO44720, 2000) did not encounter water until a depth of 118 metres was reached, from an initial surface elevation of approximately 80 metres. This indicates a water table below 0.0 metres AHD, which may indicate inaccuracy of results, or site-specific hydrogeological conditions resulting in a lower or absent identifiable water table. Both of these bores encountered water within a medium grained, grey sandstone.

Observations from the bore located on the property subject to extraction activities (BW-1) indicate that the groundwater level is fairly consistent (see Figure 23), with depths ranging from 45 metres to 54 metres from surface (16-8 metres SWL) during the period from August to December, 2001. This bore is not recorded on DLWC records.

Bore No. GW037789 located on the golf course property to the west, intersected limited water at a depth of 3 metres. This was located within clay-shale and did not have significant flow rates.

TABLE 16: LOCAL GROUNDWATER BORE DATA

Bore Hole No	Location		Purpose	Water Bearing Zones	Thick. (m)	Salinity	Yield L/s	Total Depth (m)
	North	East		From-To (m)				
GW 037789	6288100	305495	Industrial	3.0-4.2 17.0-17.3 43.2-44.1	1.2 0.3 0.5	N/A	0.08 0.16 0.95	46
GW 044720	6287940	307825	Domestic/ Stock	118-118.5 128-128.5 132-132.5 144-144.5	0.5 0.5 0.5 0.5	360 340 300 300	0.2 0.2 0.2 0.1	150
GW 047866	6288175	307775	Domestic	39.8-40.2 61.7-62.1	0.4 0.4	N/A	0.03 0.09	66
GW 053481	6287537	307415	Domestic/ Stock/ Irrigation	N/A	N/A	" "	N/A	N/A
GW 064130	6286860	306420	Domestic/ Stock	15.1-17.0 87-90	1.9 3.0	Good Good	0.03 0.34	97.5
GW 101309	Lot 4/ DP 240610 No Grid Ref. Given		Monitoring	No details	-	-	-	8.5
GW 102835	Same as above (Riverside Oaks)		Industrial/ Recreation Irrigation	No details available				
GW 103091	Riverside Oaks		Same as above	No details available				

N/A = Not Available

The Hawkesbury sandstone is of Triassic Age, overlain by unconsolidated sands and sediments. The Maroota sands on the other hand, occupy most of the settled area of Maroota, the southern boundary of which is present at the proposed quarry site at Cattai. These shallow aquifers are most important in the local area, as a source of water for consumption purposes and in maintaining the riparian systems and wetlands in the area. The saturated thickness of the aquifer in the area is commonly between 2 and 5 metres, though may be up to 10 metres in places.
The water quality of this aquifer is good, characterised by an acidic pH (4.5 to 5.5), a low salinity (usually 30-60mg/l TDS), though the seeps generally have a lower pH and up to 120mg/l TDS. The deeper aquifer is not utilised to the same degree, generally with a higher salinity (up to 500mg/l) and a neutral pH.
Local hydrogeological conditions are controlled by the presence of the more permeable sandstone horizons in the Hawkesbury Sandstone. Hydraulic conductivity is dependent on structural discontinuities such as bedding plane fractures and joints.
Aquifers are commonly developed within the Cattai/Maroota region. Shallow aquifers are found in the Maroota sands and weathered Hawkesbury Sandstone, mostly at depths of between 10 and 40 metres. The perched shallow aquifer of the Maroota Sands is located approximately 7kms north east of the project site. Deeper aquifers occur in the unweathered Hawkesbury Sandstone, usually at a depth of between 100 and 200 metres.

Specific observations relevant to the Cattai Quarry area include:

- The proposed quarry area is free of any springs and groundwater seeps, primarily due to the elevated nature of the quarry in relation to the nearby dam and drainage system, and the uniformity of the geology. Several springs are located around the main dam and the tributaries leading into it, all within 2 metres of the dam surface. The maximum relief within the quarry is approximately 30 metres; and

- The proposed final depth of the quarry will at all times be located significantly above the invert of the drainage line and main dam, and the maximum recorded groundwater table level.

TABLE 17: WATER LEVEL IN BW-1

	10/8/01	14/9/01	12/10/01	9/11/01	5/12/01
Approximate Static Water Level (metres below surface)	54	49	46	45	45
Approximate level of Water Table (AHD)	6	12	15	16	16
Salinity (µS/cm)	400	385	369	355	393

11.4 Constraints Assessment

Potential constraints operating at the quarry are whether the quarry operations have the potential to pollute the existing groundwater regime or alter its general characteristics both locally and on a regional basis. In addition, from an operational sense, the influx of groundwater should it occur, may have a detrimental effect on the efficient conduct of the quarry.
The existing groundwater regime is not anticipated to place any constraints on the proposed operations.

11.5 Assessment of Impacts

The conclusions from the hydrogeological study can be summarised as follows:

- The water table is located relatively close to the invert level of the main dam (Dam 1) – at least within the vicinity of the quarry;
- The proposed 15 metre deep extraction works will not encroach into the high wet weather water level of the groundwater table, as it will be located approximately 10 metres above the level of the main dam and 5 metres above the eastern dams and associated drainage line;
- There is little to no hydraulic gradient in the groundwater profile at the project site. This is evident from the consistent groundwater bore levels recorded, comparison with visible groundwater seeps, drainage lines and dams on the property, and anecdotal evidence. Some seasonal water table fluctuation is observed, however it is highly unlikely the water table will intersect the proposed quarry floor, even following periods of high rainfall;
- No perched water tables have been identified on the site, and are unlikely to occur due to the steep topography and uniformity of the sandstone geology at the site. No sandy plateau areas, elevated swamps, soaks or other indications of perched water tables are located within the proposed quarry area;
- The project site is located well outside the area of the Maroota Sands Shallow Aquifer and will have no impact on this groundwater resource;
- The proposed quarrying operations should not adversely affect neighbouring boreholes, and the local hydraulic gradient in the vicinity of the quarry will not be affected by operations;
- During dry periods the quarry may act as a recharge point, and therefore it is important that sufficient pollution controls are established to prevent the migration of pollutants into the groundwater system;
- Water sampling of the groundwater indicates a low level of salinity and an acidic pH. This is consistent with surface waters in the area, the lower pH resulting from acid soils;

11.6 Controls and Safeguards

Controls and safeguards will comprise of the following:

- The floor of the proposed fuel storage and workshop area is to be maintained at all times and kept clear of any fuel or oil spills. A protocol will be developed to deal with soil or water that may be contaminated with fuel spills in conjunction with a waste management plan;
- All vehicle maintenance involving engine components, oils and fuels is to be conducted away from the premises to minimise the potential for spills;
- Regular inspections of the quarry area for signs of potential contamination, groundwater hazards and seeps will be carried out;
- All rubbish is to be contained in appropriate storage prior to removal by licensed contractors;
- Regular monitoring of the existing water bore for standing water level and salinity will be necessary for the life of the project; and
- All operating equipment (including trucks, FEL's bulldozers and screens etc) will be required to comply with a clean operating policy. That is, the potential for fuel or oil spills during operations is to be minimised.

11.7 Conclusions

The proposed operation of the Cattai sandstone quarry sandstone is not anticipated to have any adverse impact on the surface or groundwater resources of the region, provided the guidelines and recommendations of this report are adhered to, and all existing and proposed soil and water management facilities at the quarry are maintained. The project poses no threat to existing users of groundwater in the region or the water quality of the Nepean River.

SECTION 12 AIR QUALITY

12.1 Overview

The Cattai Quarry is located within the Sydney Airshed, which encompasses a region from north of Richmond to the Blue Mountains in the west and Wilton in the south. Air quality is a result of many influences and interactions including: meteorological conditions, quantity and type of pollutants, rates of diffusion and chemical reactions as well as the landform of the particular area. In general, areas of concentrated pollution relate to industrialised and urbanised areas, where output from motor vehicles and factories is the most significant contributor to pollution.
The principle types of pollutants include smoke, dust and other airborne particles, including oxides of sulphur and nitrogen as well as carbon monoxide, lead, hydrocarbon products and odours.

Potential sources of local air pollution include:

- Dust emissions from other extraction operations in the area
- Dust emissions from earthworks in the area
- Fumes from trucks and other traffic on major local roads
- Odour from agricultural enterprises in the region

The primary influence on air quality from the quarrying operation is potentially due to coarse dust and airborne particles picked up by the wind during vehicle movements on unpaved roads, handling of material during extraction, and processing operations.

12.2 Air Quality Guidelines

12.2.1 Introduction

An appreciation of existing guidelines for the most significant components of air quality are provided and incorporate parameters for odour, airborne particles and deposited dust. Current air quality guidelines are derived from the "*National Environmental Protection Measures for Ambient Air Quality*", developed by the National Environmental Protection council (NEPC) in 1998. These guidelines are based on similar conditions established around the world, and are more stringent than guidelines applied by the EPA in the past. These goals were designed to be achieved over a ten year time frame and include:

- The annual average of 50 µgm/cubic metre for total suspended particulates is not to be exceeded.
- A maximum 24 hour concentration of 50 µgm/cubic metre for total suspended particulates, with five exceedances per year.
- For particulate matter of diameter < 10 microns, a concentration of 50 µgm/m^3 in 24 hrs is not to be exceeded.

The EPA and the Department of Mineral Resources require that respirable dust be no greater than 5.0 mg/cubic metre of air, and that quartz bearing dust be less than 0.2 mg/cubic metre of air.
Coarse airborne particles can accumulate in the respiratory system and aggravate asthma and other health problems. However, it is the fine particles that are more likely to contribute to more serious illness. Only 2% to 4% of dust from mining and quarrying emissions are in the fine particle category, with the remainder being coarse sized particles.

12.2.2 Definitions

Odour

An odour is defined as the property of a substance that gives it its characteristic scent or smell. Odours are very subjective, with responses varying greatly from individual to individual. Whether an odour is perceived as being pleasant or unpleasant is often based on personal opinion.
The sensory perception of odour has four major dimensions: detectability, intensity, character and hedonic tone. With respect to the proposed quarrying operations, the elimination of a number of odour generating substances during the initial processing stage will mean that in relative terms, any odours generated will be related to earthy materials, which for all intents and purposes, have no odour.

Suspended Particles

Suspended particles are dust or aerosol that stays suspended in the atmosphere for significant periods. Its exact definition depends on the monitoring procedure adopted. In general terms suspended particles have a diameter up to 50μm. There is no sharp dividing line between suspended particles and the larger particles of deposited matter that fall rapidly out of the air. Particle sizes which may have adverse health implications are those with a size range of between 1-10 um (PM10).
The EPA has monitored PM10 as part of its state-wide ambient air quality monitoring program. A number of monitoring stations have been established throughout the metropolitan area which have shown that whilst PM10 values have decreased, they still exceed the National Environment Protection Council air quality guidelines.

Deposited Particles

The dust deposition rate is measured as the amount of dust deposited on a horizontal surface as a result of gravitational settling. The units for this parameter are grams/square metre per month (gm/m^2/month). Dust deposition is a measure of the effects of dust on amenity rather than health effects.
To protect against loss of amenity for new developments, the EPA (1990) has set goals for the maximum acceptable increase of dust fallout levels over existing mean annual levels as defined in Table 18.

TABLE 18: NSW CRITERIA FOR DEPOSITED DUST

Existing Dust Levels (gm/m2/m)	Maximum Acceptable Increase over Existing Dust Level ($gm/m^2/m$)	
	Residential Suburban Areas	Commercial and Industrial Areas
2	2	2
3	1	2
4	0	1

12.3 Assessment of Existing Air Quality

12.3.1 Introduction

An assessment of the air quality environment in and around the Cattai Quarry was conducted by air quality experts, Dick Benbow & Associates Pty Ltd (Report #1 Volume 2). The purpose of the assessment was to determine background air quality values, assess the potential for air pollution as a result of the quarry operations and determine the likely impacts of the operation on nearby residences or receptors. These receptors, identified as Receptor 1 and 3 - see Figure 19) were selected on the basis of their proximity to the quarry and/or its future extension.

12.3.2 Estimating Emissions

The assessment by the Consultant considered all of the likely sources of dust and estimated values for each of those sources. Furthermore, all sources have been assumed to generate dust at maximum levels continuously throughout a 10 hour working day, with a half hour transition both before and after the hours of operation. The emission rates used for this assessment were adopted from the USEPA document 'AP42-Compilation of Air Pollutant Emission Factors. Dust Emission Factors for each of the various sources are outlined in Table 19.

TABLE 19: SITE SPECIFIC DUST EMISSION FACTORS

Dust Emission Source	Approx. Number of Sources	Emission Factor TSP	PM-10	Units
Internal Haul Roads – Truck movements	13*	7.99×10^{-4}	2.642×10^{-4}	g/s-m^2
Wind Erosion of Disturbed Areas	3	2.695×10^{-6}	1.345×10^{-6}	g/s-m^2
Active Stockpile	3	4.5×10^{-4}	2.25×10^{-5}	g/s-m^2
Front End Loader	1	0.027	0.0135	g/s
Truck Loading Operating	1	1.044	0.146	g/s
Bulldozing (Working within pit)	1	9.376×10^{-6}	1.6432×10^{-6}	g/s/m^2
Bulldozing (Working out of pit)	1	0.586	0.1027	g/s
Crusher Screen	1	2.022	0.196	g/s

*Road portions 'sub-divided' into a series of linked areas sources (as per model requirements)

12.3.2 Modelling Potential Effects

Using the emission rates set out in Table 18, a computer based modelling program was used to estimate the potential impacts that these dust sources have on the ambient air environment. The computer model used by the consultant is known as the Industrial Source Complex Short Term No 3 (ISCT3) Version #00101. This program uses accepted dispersion modelling algorithms that predict ground level dust concentrations as a function of distance from the dust emission source. The model takes into account the source characteristics in terms of relative location, elevation, dust emission rate and particle size mass distribution of the dust plume from the source. Furthermore, the program utilises meteorological data records to define the conditions for plume rise, transport, diffusion and deposition. The modelling program is currently considered to be the industry standard for predicting particulate plume dispersions, with its use being stipulated by the NSW EPA. Meteorological data used for the programming was based on hourly data (over the course of 12 months) obtained from Campbelltown. Whilst not site specific, the data does originate from the same topographical basin in which the Cattai quarry is located within. Data utilised includes wind speed, wind direction, temperature, stability class and mixing height. This ensured that sufficient meteorological data was available to guarantee that worst case scenario weather conditions were also adequately represented in the model predictions.

Three separate modelling scenarios were used in the estimation of dust impacts from the quarry site. Scenario 1 represents maximum disturbance with all potential dust sources operating (eg, all equipment in the quarry is operating and all surfaces are exposed). Scenario 3 on the other end of the scale, has no equipment working with the relevant sources of dust reduced to a minimum. The purpose of generating these scenarios was to generate as close as possible, various operating scenarios that may be in place at any one time.

12.4 Assessment of Impacts

Following the input of all of the relevant data, maximum dust deposition and concentration rates at the four receptor locations (residences A, B, C & D) were determined. These determinations are outlined in Table 20.

TABLE 20: PREDICTED DUST DEPOSITION AND CONCENTRATION RATES

	Dust Deposition		**Predicted Dust Concentration Rates**		
Receptor	Dust Deposition Objective G/m2/month	Predicted Monthly Dust Deposition g/m2/month (Annual average)	Maximum Annual PM10 Dust Concentration (ug/m3)	24Hr PM10 Dust Concentration (ug/m3)	Maximum Annual TSP Dust Concentration (ug/m3)
SCENARIO 1 – Maximum Operations					
Receptor A	4	0.3	2	7	4
Receptor B	4	0.8	4	20	9
Receptor C	4	0.4	2	12	4
Receptor D	4	2.7	18	36	34
SCENARIO 2 - Maximum Operations (Dozer in pit at current level of extension area)					
Receptor A	4	0.2	2	8	4
Receptor B	4	0.6	4	20	9
Receptor C	4	0.3	2	13	4
Receptor D	4	2.1	18	41	36
SCENARIO 3 – Minimum Operations (No dozer, crusher or screen)					
Receptor A	4	0.3	2	6	3
Receptor B	4	0.7	4	20	7
Receptor C	4	0.4	2	12	4
Receptor D	4	3.0	17	30	26

All results are below the NSW EPA goals for ambient air quality. However, to further ensure that any impacts upon the ambient air environment are minimised, a number of controls and safeguards have been recommended. These are detailed in the following section.

12.5 Controls and Safeguards

The potential for dust impact can be minimised through the application of dust suppression methods including water trucks. The threat of dust pollution can further be minimised by reducing exposure of stockpiles and fines, rapid rehabilitation of abandoned areas, watering of roads and truck routes and the use of barriers to minimise disturbance to any vegetated areas.

Incorporated into the design of the proposal are operational procedures, designed to limit the impact of the operation on the environment. This includes air quality. The primary design controls influential in limiting dust emissions are:

- Watering all exposed surfaces on a regular basis and in times of high temperatures;
- Minimise traffic movements;
- Ensure that required traffic movements are kept within defined speed limits;
- The continued use of the sealed quarry entrance road;
- The existing perimeter and bund walls are to be revegetated as soon as possible; and
- Implement as soon as possible, vegetation screening and other general plantings within the quarry.

A range of other procedures to be adopted will also contribute to air quality improvement including:

Vehicles & Machinery

Regular maintenance to be carried out on all diesel-powered engines. Engine warm-up before operation. All of the existing earth moving machinery is modern and well maintained.

Exposed Surfaces

Various exposed surfaces represent a potential source of airborne particles. Control measures to be implemented for the life of the project include:

- Clearly defined access tracks across the active floor of the extraction area;
- Progressive utilisation or rehabilitation of disturbed areas;
- Appropriate installation and maintenance of all equipment to minimise exhaust emissions;
- All trucks leaving the site are to cover their loads with tarpaulins; and
- Cattle grid or rattle pad to remove excess dirt from the wheels of vehicles leaving the site.

The effectiveness of the above measures can be clearly demonstrated in the modelling. Table 18 reflects the impact of applying wet suppression and therefore lowering the resultant emission rates. Significant reductions in potential impact can be readily demonstrated. The results of these calculations can be demonstrated by contour plots. Figure 24 illustrates the uncontrolled and controlled levels of PM10 and TSP in and around the quarry and receptors A, B, C & D.

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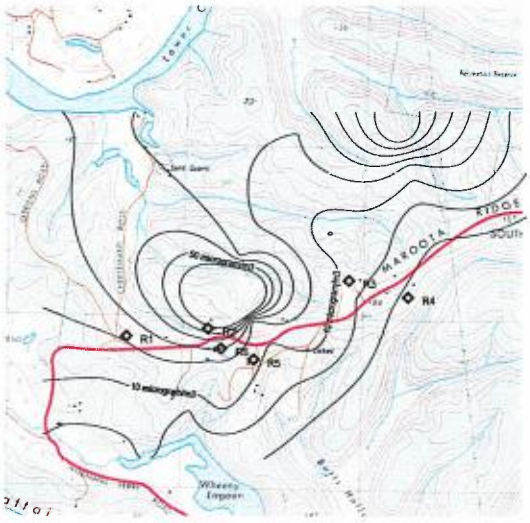
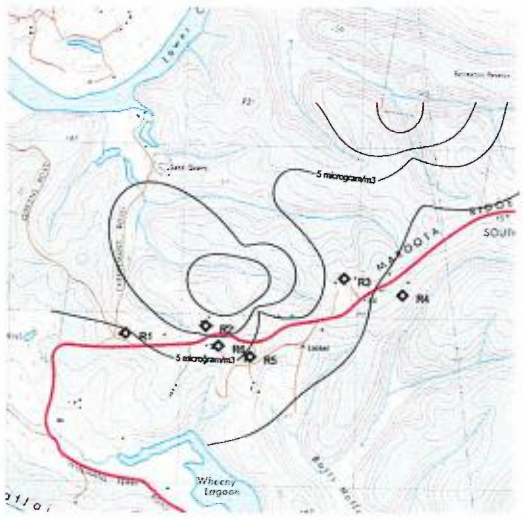


Potential Impact Isopleths:
Scenario 3.
24Hr average concentration PM10

NO CONTROLS



Potential Impact Isopleths:
Scenario 3.
24Hr average concentration PM10

WITH CONTROLS

N

0 10km

HARVEST SCIENTIFIC SERVICES

Figure 24

Cattai Sandstone Quarry

PREDICTED DUST CONTOURS

Nepean Quarries Pty Ltd

TABLE 21: REMODELLED DUST DEPOSITION AND CONCENTRATION RATES

	Dust Deposition		Predicted Dust Concentration Rates		
Receptor	Dust Deposition Objective G/m2/month	Predicted Monthly Dust Deposition g/m2/month (Annual average)	Maximum Annual PM10 Dust Concentration (ug/m3)	24Hr PM10 Dust Concentration (ug/m3)	Maximum Annual TSP Dust Concentration (ug/m3)
SCENARIO 1 – Maximum Operations					
Receptor A	4	0.2	1	4	3
Receptor B	4	0.5	2	8	6
Receptor C	4	0.2	1	4	3
Receptor D	4	1.8	6	21	23
SCENARIO 2 - Maximum Operations (Dozer in pit at current level of extension area)					
Receptor A	4	0.2	1	5	3
Receptor B	4	0.5	2	7	6
Receptor C	4	0.2	1	4	3
Receptor D	4	2.0	7	26	25
SCENARIO 3 – Minimum Operations (No dozer, crusher or screen)					
Receptor A	4	0.2	1	3	2
Receptor B	4	0.3	1	7	4
Receptor C	4	0.3	1	4	2
Receptor D	4	1.2	5	17	15

12.6 Monitoring

One of the recommendations of the air quality consultants was to establish air quality monitoring stations around the quarry. Two stations have been established since August, 2000, the locations of which are indicated on Figure 19. The results of the monitoring are indicated in Table 22.

TABLE 22: MEASURED DUST DEPOSITION NEAR CATTAI QUARRY
(Insoluble Solids – g/m2/month)

Receptor Location	August-September 2001	September-October 2001	October-November 2001	November-December 2001
Receptor 1	0.7	0.6	0.6	3.3
Receptor 2	0.5	0.7	0.8	1.1

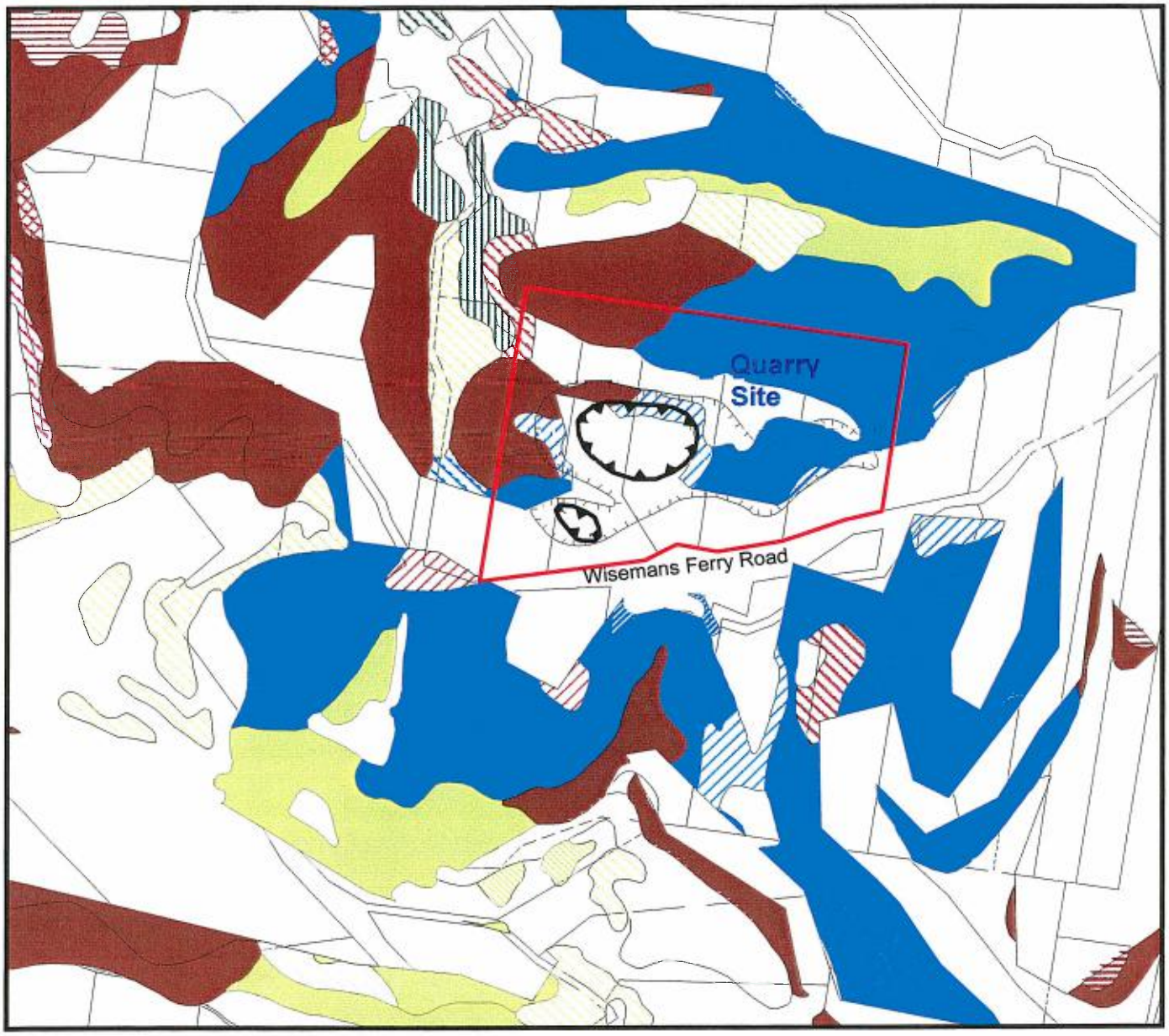
12.7 Conclusions

Whilst the range of data in Table 22 is limited, it nevertheless confirms that the impacts on air quality generated by the quarry are limited and within all acceptable criteria. Monitoring will be on-going however, to ensure that compliance is achieved at all times.

It is concluded that the proposed processing operations will not have an adverse impact on the immediate environment surrounding the Cattai Quarry. It has been demonstrated that potential dust levels generated by the processing facility and the transport of materials to and from it will be negligible. The existing quarry does not create dust, noise or odourous nuisance.

In comparison to existing operations within the quarry, the proposal will not contribute any further to the background dust levels.

Modelling of fugitive dust emissions indicates that the expansion of works will have minimal impact on local air quality. Particulate matter and dust levels attributable to both the current operation and proposed operation will be well within current EPA (and NEPC) air quality goals.



LEGEND

***Endangered Ecological Communities listed on Schedule 1 of the NSW TSC Act as of 1/1/2002**

*Shale/Sandstone Transition Forest
(High Sandstone Influence) A, B, TX, TXR
(Low Sandstone Influence) A, B, TX

*Sydney Coastal Riverflat Forest
(Alluvial Woodland) C, TX
(Riparian Forest) C, TX

Unclassified Vegetation C, B, TX, TXR, TXU

Freshwater Wetlands B, C

A > 10% crown cover & >0.5ha
B < 10% crown cover & >5ha
C non-eucalypt
TX <10% crown cover- agriculture -no major urban development
TXR <10% crown cover- rural residential areas
TXU <10% crown cover-over urban area

= Property boundary
= Outline of Existing Quarry
= Proposed Final Outline

N
300m

Figure 25

Cattai Sandstone Quarry

VEGETATION COMMUNITIES: MAPPING BY NPWS 2000

Nepean Quarries Pty Ltd

HARVEST SCIENTIFIC SERVICES

SECTION 13 ECOLOGY

13.1 Introduction

A flora and fauna assessment of the Quarry area was completed by Anderson Ecological Surveys between the period July 2001 and February 2002 (See Report #2, Volume 2). The assessment was extensive and required the completion of a Species Impact Statement.

13.2 Site Assessment

A complete local and regional overview of the flora and fauna in the area has been compiled by the consultants. In addition, a comprehensive assessment of the impact of the project on the flora and fauna has been included. Survey methods utilised by the consultants included the following:

- Desktop Study
- Botanical Field Survey
- 8-part tests of significance
- Diurnal & nocturnal fauna survey
- Species Impact Statement

Flora:

A list of species, populations and ecological communities of conservation significance potentially located in the area was prepared from references. The vegetation in this area has been mapped by the National Parks and Wildlife Service (NPWS, 2000) in their recent mapping of Western Sydney and their delineation of the vegetation boundaries is illustrated in Figure 25.
A targeted survey for these vegetation communities was then undertaken by the "random meander" method (Cropper, 1993) consisting of walking transects across the site by qualified ecologists. Special efforts was made to survey those areas proposed for the extension to the quarry. This initial survey was later continued informally with opportunistic sightings made during a number of subsequent visits to the site. A comprehensive flora listing was compiled for the whole site, and is included in Report 2, Volume 2.

Fauna:

Fauna species and habitat were assessed by:

- A review of existing information;
- Opportunistic observations;
- Targeted searches and habitat analysis;
- Other methods including spotlighting, call playback, anabat detection and Amphibian surveys

The diurnal (daylight) fauna survey was undertaken from the 23rd to the 25th of August, 2001, with the nocturnal survey conducted on the 23rd and 24th.
Fauna was assessed by recording any incidental observations and noting any other signs of fauna activity. Specific habitat requirements such as food sources, tree hollows, ground litter, fallen timber, dense shrub, wetland areas and soil/rock structures were noted and inspected.

Targeted searches were undertaken for fauna signs such as scats, tracks, scratches and incisions on trees, diggings, owl pellets, whitewash and bird nests. Amphibian survey methods involved call identification and spotlighting around dams and drainages.
Spotlighting was carried out each night for two hours across woodland transects, along with call playbacks and anabat detection, undertaken at dusk.

13.3 Survey Findings

13.3 1 Regional Ecology

Since European settlement of the Cumberland Plain area, the native vegetation has been extensively cleared, initially for agricultural purposes, and more recently for residential, commercial and industrial land uses. The quarry is located in the north-western corner of the Cumberland Plain region, in the area known as the Hawkesbury District. Despite a large proportion of this area being cleared land, large expanses of bushland remain, particularly in areas surrounding the Hawkesbury River. State reserves and National Parks are located in the region, with the Marramarra National Park located to the east, and the Yengo and Dharug National Parks situated approximately 20kms to the north.

13.3.2 Project Area - Flora

The flora community within the project area has been classified by Anderson Ecological Surveys as Sydney Sandstone Ridgetop Woodland on the basis of species present, geographic locality, prevailing soils, geology and topography, and previous classifications of vegetation in the area. This conflicts with the NPWS mapping which suggests a Shale/Sandstone Transition Forest (Figure 24). However, work completed by Anderson Consulting is also supported by previous reports indicating Sydney Sandstone Woodland for this area (UBMC, 2001). Vegetation communities mapped on the project site are illustrated in Figure 26.
The vegetation at the site has been highly disturbed in the past. The disturbed areas are generally very cleared with occasional native species. Exotic species detected during the survey are more common in these areas, dominated by Andropogon virginicus.
Overstory species comprise Eucalyptus punctata (Grey gum), Angophora bakeri, Corymbia gumnifera, Corymbia eximia and Eucalyptus piperita (Sydney peppermint). Eucalyptus piperita is present in the gullies where there is more sandstone outcrop. The understorey layer is dominated by Banksia spinulosa, Kunzea ambigua, Leptospermum trinervium, Lambertia formosa, Hakes sericea, Hakea dactyloides, Grevillea mucronulata, Grevillea oloeides and Grevillea sphacelata. Ground covers include Cymbopogon refractus, Imperata cylindrica, Microlaena stopoides, Themeda australia, and Entolasia stricta A full listing of flora species is provided in Report 2, Volume 2.

13.3.3 Project Area - Fauna

The site contains predominantly native vegetation, with introduced species and weeds mostly confined to the disturbed areas relating to previous extraction. Potential species habitats include overstorey species with hollows and a well developed shrub layer. A notable feature are the gullies and sandstone outcrops, which provided potential fauna habitat, along with the dams along the main drainage line. A total of twenty five species were recorded on the site.

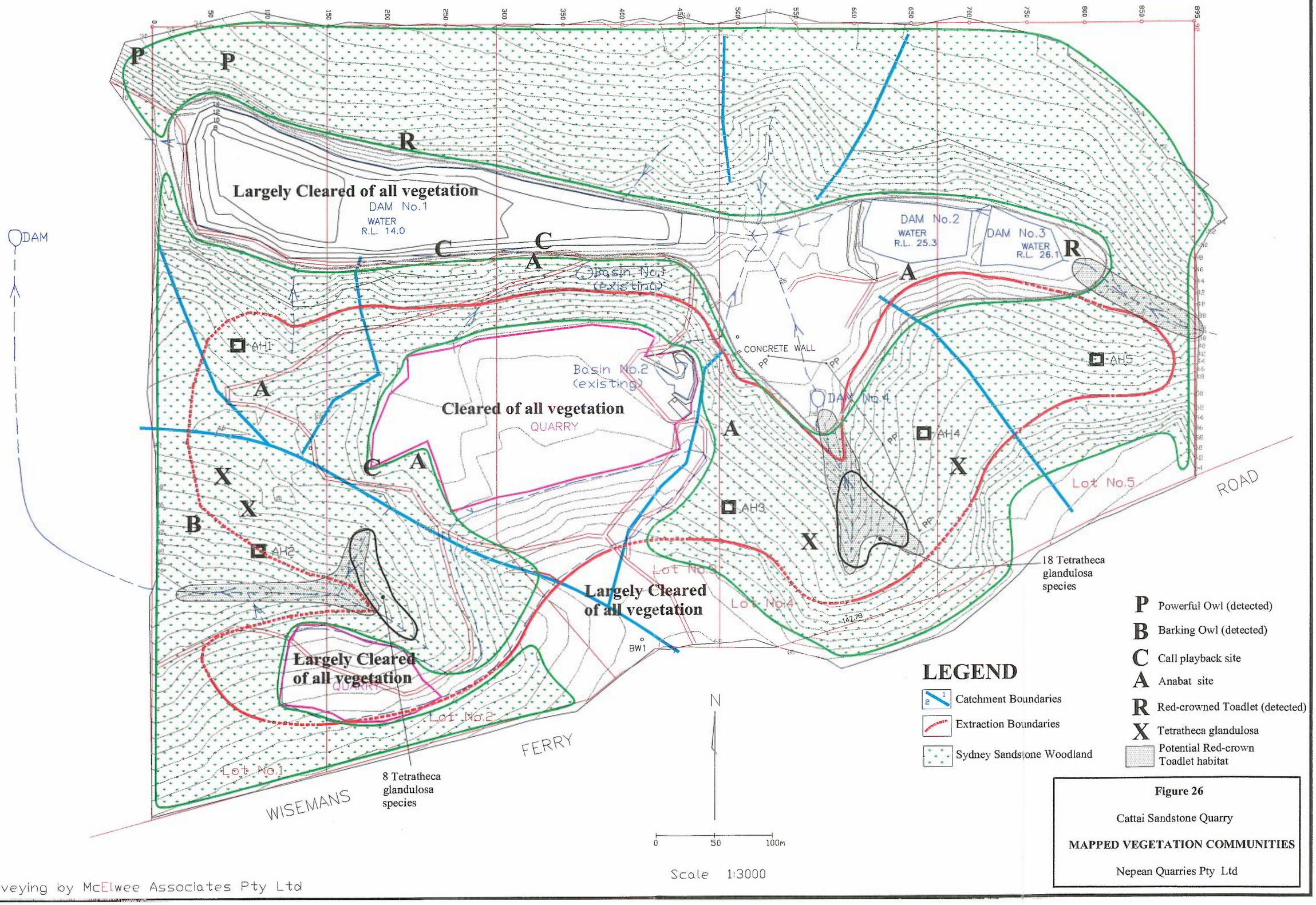


Figure 26

Cattai Sandstone Quarry

MAPPED VEGETATION COMMUNITIES

Nepean Quarries Pty Ltd

Surveying by McElwee Associates Pty Ltd

A summary of all fauna found on the site is listed in Appendix 3 of the Anderson Ecological Surveys report (Volume 2 Report 2. This list includes fauna observed as part of this EIS process as well as information gleaned from past surveys. Table 23 also indicates specific methods applied in the assessment of the most significant species found on the site.

TABLE 23: METHODS APPLIED FOR INDIVIDUAL SPECIES AND ASSESSMENT

Common Name	***Scientific Name***	Call Playback	Anabat Detection	Spotlighting	Diurnal Herpto-fauna	Amphibians	Diurnal Bird	Habitat Searches and Assessment
Barking Owl	Ninox connivens	*		*				*
Black-tailed Gotwit	Limosa limosa						*	*
Broad-headed Snake	*Hoplocephalus bungaroides*				*			*
Bush Stone Curlew	Burhinus grallarius	*		*				*
Comb-crested Jacana	Irediparra gallinacea						*	*
Common Bent-wing Bat	Miniopterus schreibersi		*					*
Eastern Little Mastiff Bat	Mormoptetus norfolkensis		*					*
Eastern Pygmy Possum	Cercartetus nanus			*				*
Giant Burrowing Frog	Heleioporus ausraliacus			*		*		*
Glossy Black-Cockatoo	Calyptorhynchus lathami						*	*
Greater Broad-nosed Bat	Scoteanax rueppelli		*					*
Great Pipistrelle	Falsistrellus tasmaniensis		*					*
Green and Golden Bell Frog	Litoria aurea			*		*		
Heath Monitor	Varanus rosenbergi				*			*
Koala	Phascolarctos cinereus	*		*				*

Common Name	***Scientific Name***	Call Playback	Anabat Detection	Spotlighting	Diurnal Herpto-fauna	Amphibians	Diurnal Bird	Habitat Searches and Assessment
Large-eared Pied Bat	Chalinolobus dwyeri		*					*
Littlejohn's Frog	Litoria littlejohni					*		*
Major Mitchells Cockatoo	Cacatua leadbeateri						*	*
Masked Owl	Tyto novaehollandiae	*		*				*
Powerful Owl	Ninox strenua	*		*				*
Red-crowned Toadlet	Pseudophryne australis			*		*		*
Southern Brown Bandicoot	Isoodon obesulus			*				*
Square-tailed Kite	Lophoictinia isura						*	*
Squirrel Glider	Petaurus norfolcensis			*				*
Superb Parrot	Polytelis swainsonii						*	*
Swift Parrot	Lathamus discolor						*	*
Tiger Quoll	Dasyurus maculatus			*				*
Yellow-bellied Glider	Petaurus australis	*		*				*

13.3.4 Woodland Assessment

The vegetation present on the site is consistent with Sydney Sandstone Ridgetop Woodland. No threatened species other than *Tethratheca glandulosa* and no Endangered Ecological Communities were detected. The site has been relatively well surveyed and it is unlikely that any potentially threatened flora species were not detected. The site has been extensively disturbed by past activities, with few native species remaining. There is approximately 6 ha of the site which is in poor condition, 2 ha in moderate condition and 16ha in good condition.

13.4 Conservation Significance (Matters pursuant to Sec 5A EP & A Act 1979)

13.4.1 Results of 8-Part Tests

FLORA

In order to determine if species, populations or ecological communities are considered likely to be on the site, analysis of site records and habitat was undertaken in accordance with requirements of Schedule 1 & 2 of the Threatened Species Conservation Act (1995). Resources of the National Parks and Wildlife Service of NSW were utilised, with a grid search of a 20km square area conducted, centring on the project site. Habitat requirements of the various species listed on the TSDC Act or the EPBC Act were assessed to determine the need for an 8-Part test to be conducted. The following flora species were subject to an Eight Part Test of Significance:

- Acacia bynoena
- Acacia gordonii
- Darwinia biflora
- Deyeuxia appressa
- Epacris purpurascens (var. purpurascens)
- Grevillea parviflora
- Kunzea rupestris
- Leucopogon fletcheri (ssp. fletcheri)
- Melaleuca deanei
- Micromyrtus blakelyi
- Pimelea curviflora (var. curviflora)
- Tetratheca glandulosa
- Zieria involucrata

Of the above species, only *Tetratheca glandulosa* was detected on the site. The majority of the species listed are visually conspicuous and it is unlikely that they were not detected during the flora survey. No other viable local populations of these species were identified.

The local population of *Tetratheca glandulosa* was detected as approximately 30 specimens, and as such this constituted a viable local population, which was considered to be at risk from the proposed activities. As such, a Species Impact Statement was undertaken to determine whether there would be a significant impact on the species as a result of this proposal.

No other species, or population or ecological community listed in schedule 1 or 2 or the TSC Act was sampled on the site. The Survey effort was considered sufficient to conclude that no other scheduled plant taxa or population is likely to be on the site.

FAUNA

The site is within the known distribution of a number of fauna species of conservation significance. Published habitat requirements (involving a 20km grid search of the NPWS database) were compared to habitat available and an assessment of the potential for the species to occur on the site was made and is detailed in the ecological report (Report #2, Volume 2).

The site was considered to contain the necessary habitat resources for a number of species of conservation significance (as detailed from the published literature), and a detailed analysis of potential habitat and impacts was evaluated in accordance with requirements of the TSC Act.
The density of the overstorey species conforms to potential Koala habitat as defined under SEPP 44, however the land does not represent core Koala habitat as defined by this SEPP and neither examples nor evidence of this species were recorded.

The following fauna species were subject to an Eight Part Test of Significance:

- Barking Owl (Ninox connivens)
- Powerful Owl (Ninox strenua)
- Broad-Headed Snake (Hoplocephalus bungaroides)
- Eastern Little Mastiff Bat (Mormopterus norfolcensis)
- Eastern Pygmy Possum (Cercartetus nanus)
- Eastern False Pipistrelle (Falsistrellus tasmaniensis)
- Giant Burrowing Frog (Heleioporus australiacus)
- Glossy Black Cockatoo (Calyptorhynchus lathami)
- Greater Broad-nosed Bat (Scoteanax rueppelli)
- Heath Monitor (Varanus rosenbergi)
- Koala (Phascolarctos cinereus)
- Littlejohn's Frog (Litoria littlejohnii)
- Masked Owl (Tyto novaehollandiae)
- Red-Crowned Toadlet (Pseudophyrne australia)
- Squirrel Glider (Petaurus norfolcensis)
- Tiger Quoll (Dasyurus maculatus)
- Yellow-bellied Glider (Petaurus australia)

The completion of the 8-part tests found that there is potential to significantly impact several threatened species and that a Species Impact Statement should be undertaken. Particular species with either populations detected on site or potential/identified habitats with the potential to be impacted upon by the proposal included:

- Broad-Headed Snake (Hoplocephalus bungaroides)
- Red-Crowned Toadlet (Pseudophyrne australia)
- Eastern Little Mastiff Bat (Mormopterus norfolcensis)
- Eastern Pygmy Possum (Cercartetus nanus)
- Littlejohn's Frog (Litoria littlejohnii)
- Tiger Quoll (Dasyurus maculatus)
- Squirrel Glider (Petaurus norfolcensis)
- Yellow-bellied Glider (Petaurus australia)

The main issues which led to the completion of a Species Impact Statement were:

- The detection of the threatened flora species *Tetratheca glandulosa* as thirty specimens
- The detection of the Powerful and Barking Owls responding to call playback;
- The detection of the Red-crowned Toadlet within some of the drainage lines on the site.

13.4.2 Results of Species Impact Statement

Tetratheca glandulosa

This species is not at its limit of known distribution, it occurs in all other directions within the Hawkesbury area. This species is well represented in the Dharug and Yengo National Parks, Parr State Recreation Area and Ourimbah State Forest. The site is considered to be of Local Significance but not Regional Conservation Significance, and although the habitat for this species will be disturbed in the short to medium term, it will restored and this species reinstated as part of the Ecological Restoration Plan (ERP). This species also occurs as ten individuals along the northern side of O'Briens Road within 400 metres to the west of the site. There is much potential habitat in the surrounding area for this species however it is considered inadequately conserved in the Baulkham Hills LGA

Red Crowned Toadlet (Pseudophyrne australia)

This species has potential breeding habitat in the drainage lines heading north from the proposed extraction area. Foraging habitat occurs across this site. It is likely that population numbers will be reduced in the medium term. However the progressive restoration of the habitat for this species aims to maintain this species on site.

Barking Owl (Ninox connivens) & Powerful Owl (Ninox strenua)

These species have potential foraging habitat on the site, the call detection of both these species indicates that the site provides an important part of their foraging habitat. There are no potential Owl nesting sites on the site and no roosts were located. The value of this site for this species is through its prey base, which will be reduced in the medium term, however provisions are made in the Ecological Restoration Plan to restore habitat for these prey species. The importance of this site for these species is considered to be moderate, due to the large home ranges of these species and the surrounding suitable foraging areas. Progressive restoration of the disturbed areas will result in a negligible impact on these species.

13.5 Assessment of Impacts

13.5.1 Potential Impacts - Flora

No threatened community is present and the only threatened species likely to be effected is *Tetratheca glandulosa*. If left untouched this species would continue on this site however as mentioned earlier the management of threatened species on privately owned lands is difficult and generally requires the co-operation of the landowners. If left undeveloped this site could be grazed which has the potential to significantly impact on this species survival. The best conservation option for the conservation of threatened species in general would be to protect and actively manage all sites with threatened species present. This is however not possible and the proposed management for the protection and reinstatement of this species on this site as part of the Ecological Restoration Plan is considered a viable option for this species. The Ecological Restoration Plan (ERP) is included as Appendix 7 of the Ecological Assessment (Report 3, Volume 2) and is designed to maintain this species on this site as part of the staged mining process. Pre and post mining monitoring is an integral part of this staged ERP for this species and this will allow feedback in terms of the adequacy of the measures undertaken and allow fine tuning of the process.

Although habitat for this species will be disturbed in the short to medium term it will be restored and this species reinstated on this site as described in the Ecological Restoration Plan (ERP). There will be impacts on this species however the aim is to achieve no net loss of this species on this site. While mining is a large impact on an ecosystem, with adequate and timely restoration as part of an integrated mining approach restoration to pre-mining conditions can be achieved. The impact is considered medium term as habitat is restored and with good pre and post mining monitoring vegetation structure and diversity can be maintained, unlike the impacts of residential development which involve the permanent removal of habitat.

13.5.2 Potential Impacts – Fauna

The fauna species detected on this site include the Red-crowned Toadlet, Powerful Owl and Barking Owl. The Red-crowned Toadlet has potential breeding and foraging habitat on the site whereas the Powerful and Barking Owls only have potential foraging habitat present. A thorough search of the site was made for potential breeding and roost sites for these large owl species both on the site and adjacent to the site. However no potential nest sites were located and no roost sites were located. The location of some of these species is indicated in Figure 26.

Red crowned Toadlet

The Red-crowned Toadlet has potential breeding habitat in the drainage lines that drain to the main creekline. Foraging habitat for this species occurs across this site. The progressive restoration of habitat for this species as described in the Ecological Restoration Plan aims to maintain this species on this site. This includes intensive pre and post mining monitoring to allow for the fine tuning of the restoration of habitat for this species. It is likely that the population numbers on this site will be reduced in the medium term. The progressive restoration of both potential breeding and foraging habitat for this species as part of the Ecological Restoration Plan will result in negligible impact on this species in the medium term.

Powerful and Barking Owls

These species have only potential foraging habitat on this site. The detection of both these species on two occasions however indicates that the site forms an important part of their foraging habitats. The value of the site for these species is through the prey base it provides. This will be reduced in the medium term however provisions are made in the Ecological Restoration Plan to restore habitat for the prey items for these species. This should maintain these species in this area. The importance of this site for these species is likely to be moderate. Good habitat is also present in the surrounding area and due to the large home ranges of these species and the fact that both were detected on the one site prey in the area must be abundant. The progressive restoration of habitat for the prey items for these species as part of the Ecological Restoration Plan will result in negligible impact on these species.

13.5.3 Overview of Impacts

The overall conservation significance of this site is moderate. It is providing potential breeding habitat for the Red-crowned Toadlet along with sheltering and foraging habitat. It is providing foraging habitat for the Barking and Powerful Owls. These are Vulnerable species as listed on the TSC Act (1995). The Vulnerable flora species *Tetratheca glandulosa* is also present and is considered locally significant.

None of the threatened species detected will be significantly threatened by the proposed mining operation. The Ecological Restoration Plan will restore the previously mined/disturbed areas, which comprise 8 ha of the proposed mining area of 24 ha.

These areas are currently largely denuded of all vegetation/fauna habitat and are currently eroded with erosion expected to continue unless restoration is undertaken. This is degrading downslope and downstream areas. Once mining is completed and the entire site restored it will be more stable and viable than it is at present. The mining will be over a very long period of time and incorporate a significant monitoring and restoration effort in relation to flora and fauna species, vegetation and habitat. The progressive nature of the mining along with the pre and post mining monitoring will allow for the fine tuning of the restoration of the site and will also allow for the incorporation of any new techniques in restoration through time.

In summary, the survey conducted by Anderson Consulting indicated the following:

- Vegetation present on the site is consistent with Sydney Sandstone Ridgetop Woodland
- Vegetation on the site has been highly disturbed in the past
- Of the proposed mining area of 24ha, approximately 6ha is in poor condition, 2 ha in moderate condition and 16 ha in good condition
- The only Threatened Species likely to be affected is *Tetratheca glandulosa*, which will be reinstated as part of the Ecological Restoration Plan
- Potential foraging habitat of the Red Crowned Toadlet and the Powerful and Barking Owls will be disturbed, however in the long term these species will not be significantly affected.

13.6 Conclusions

None of the threatened species detected will be significantly threatened by the proposed mining operation. The Ecological Restoration Plan will restore the previously mined/disturbed areas, which comprise 8 ha of the proposed mining area of 24 ha. These areas are currently largely denuded of all vegetation/fauna habitat and are currently eroded with erosion expected to continue unless restoration is undertaken. This is degrading downslope and downstream areas. Once mining is completed and the entire site restored it will be more stable and viable than it is at present. The mining will be over a period of decades and incorporate a significant monitoring and restoration effort in relation to flora and fauna species, vegetation and habitat. The progressive nature of the mining along with the pre and post mining monitoring will allow for the fine tuning of the restoration of the site and will also allow for the incorporation of any new techniques in restoration through time. An Ecological Restoration Plan has been prepared in order to ameliorate these impacts. This plan is considered to adequately compensate for any detrimental impacts and loss of habitat so that there are no overall significant impacts experienced by the site.

13.7 Recommendations for Amelioration of Impacts

In order to ameliorate impacts on the environment and natural amenity of the site consent should be conditional on the preparation of an Ecological Restoration Plan and restoration encompassing the following principles:

- That areas not part of the quarry extension be revegetated with flora appropriate to the original ecological community.
- A weed management plan be prepared and implemented during the lifetime of the project
- The quarry excavation area be appropriately revegetated
- The plan of management have a mechanism for auditing and compliance

13.8 Matters Pursuant to Environment Protection and Biodiversity (EPBC) Act 1999

Under the EPBC Act, the proposal may be referred to the Commonwealth if the proposal has, or is likely to have a significant impact on a matters of national environmental importance. The criteria that require consideration was assessed by Anderson Consulting and the results are outlined as follows:

- World Heritage properties – There are no World Heritage properties near the proposed development,
- RAMSAR wetlands – There are no RAMSAR wetlands near the proposed development,
- Listed threatened species and communities – One species listed as vulnerable (*Tetratheca glandulosa*) under Sect. 179 of the EPBC Act was located in the study area (see comment below).
- Migratory species protected under international agreements – No migratory species of the type described is likely to be affected by the development proposal,
- Nuclear actions – the proposal does not constitute a nuclear action, and
- The Commonwealth Marine Environment – The proposal does not affect a marine environment.

Note: The flora species listed as vulnerable under the Act will not be significantly impacted upon by the proposal as the population is not regionally significant, and is present in other locations nearby. This species will be restored to the area as part of the Ecological Restoration Plan. Consequently, it is considered that the project does not require referral to the Commonwealth Minister of the Environment under the EPBC Act.

13.9 Ecological Restoration Plan

13.9.1 Scope

This section summarises an Ecological Restoration Plan for the Cattai Quarry which is attached to this EIS as part of Report 2, Volume2). The Plan is based on the extraction process achieving the final landscape as described in Section 6.7.2 and illustrated in Figure 9. Furthermore, the Plan is to focus on specific revegetation requirements illustrated in Figure 13 which reflect variations in the nature of the final landscape. Measures discussed are in basic agreement with Section 2.6 of DCP 500 (Baulkham Hills Shire Council, 1997).

13.9.2 Purpose and Objectives

The objectives of the Plan include:

- Minimising the impact of the proposed quarry extension on the surrounding environment in terms of :
- erosion and sedimentation from areas of excavation, areas of stockpiled fill and bunds weed proliferation
- disturbance to the existing habitat of flora and fauna outside the area of operations
- revegetating disturbed areas outside the area of operations to a natural or near natural ecological community appropriate for the habitat,
- managing areas outside the area of operation undergoing natural regeneration so that recovery to a natural or near natural ecological community is achieved,

- Revegetating areas within the area of operations (after those operations have ceased), with native vegetation appropriate to the geophysical characteristics of the site and without compromising the surrounding areas natural communities, and
- To detail auditing and reporting requirements for the implementation and success of the Plan.

13.9.3 Constraints on the Plan

No rehabilitation plan can restore all the components in a natural ecological community, nor is it necessary. Once major components and conditions are recreated additional components will re-establish themselves in a process known as serial succession. However, immature communities early in succession are highly prone to disturbance and inappropriate modification. Therefore ongoing intervention, such as biodiversity enrichment and weed management, is generally required.

This Plan is a long term plan (22 years). It is acknowledged that many factors may change the management plan's timetable and detail over this time frame. These factors include, availability of seed and other propagation material, drought and/or disease, changes in the operations production schedules, new and improved revegetation methods and site specific conditions not anticipated. Therefore the plan timelines should be taken as a guide only and not be considered prescriptive.
This plan provides for a periodic audit of the rehabilitation process which should indicate progress and success in achieving the plans objectives rather than adhering to a detailed timetable.

13.9.4 Flora and Fauna Values

There is currently negligible flora on the previously mined areas. These areas have had no restoration undertaken. Most of these areas are bare rock. The surrounding areas of the site where mining has not been undertaken represent Sydney Sandstone Ridgetop Woodland. These areas are in relatively natural condition. The Sydney Sandstone Ridgetop Woodland would have once occurred on the previously mined area and the list of flora species detected on the rest of the site within this community provides the basis for the suite of species to be used in the restoration.
The fauna value of the previously mined area is negligible. It is largely cleared soil with very few trees, shrubs or ground covers. It has negligible fallen timber, rocky outcrops or waterbodies to provide fauna habitat. The more natural areas of the site outside the proposed Stage 1 area however provide good habitat for a range of common fauna species

13.9.5 Specific Areas and Objectives.

For the purpose of this Plan, a number of rehabilitation aspects have been identified and assigned appropriate management strategies. Management strategies for each aspect are described below.
This strategy is then combined with the various rehabilitation elements as described in Section 6.7.2. The objectives for the rehabilitation is described in the following sections followed by a detailing of the revegetation requirements for each of the described elements.

Habitat and Corridor Values

Objective: To maintain existing habitat and wildlife corridors; to restore disturbed areas to accommodate fauna habitat and create corridors

The development of Stage 1 will remove negligible habitat and will not disrupt any fauna or flora corridor or disrupt the flow of any genetic material. A small portion of disturbed bushland will be removed around the edge of the proposed Stage 1 area. This area of removal is not significant due to the sub-staging of the works within the Stage 1 area allowing for the rehabilitation of vegetation and fauna habitat. The net result of the mining and the implementation of the Ecological Restoration Plan will be an improvement in the site in terms of its flora and fauna values, connectivity, viability and stability.

Topsoil/Litter Quality

Objective: To maintain and preserve topsoil and soil litter for use in rehabilitation

The topsoil on the undisturbed bushland areas of the site has a relatively natural soil profile. The sandstone is a dominant feature of the soil and the low nutrient values of these soils are a result of their parent geology. The soil on the open pit is currently highly compacted. Acid Sulphate Soils are not an issue for this area as it has not been exposed to estuarine influences. There is negligible topsoil in the previously mined areas of Stage 1. Leaf litter in non-existent in the open pit while leaf litter levels in the other disturbed areas within Stage 1 are at low levels with mainly bare soil represented.

Hydrology/Hydraulics

Objective: To preserve the existing hydrology of the site, protect riparian zones and vegetation, and to restore adequate drainage regimes to disturbed areas
The main gully/creekline flows in a westerly direction. It is fed by a catchment area covering the site and areas upstream to the east. There are no main drainage lines to be restored as part of the restoration.

Fire Issues

Objectives: To mitigate against the threat of fires in the area harming revegetation works

In the early stages of the rehabilitation the rehabilitated areas are unlikely to carry an intense fire however it is expected that after approximately 2-3 years an intense fire could be carried which would cause significant damage to the vegetation. A small fire break such as a vehicle width fire trail around the rehabilitation would not be adequate protection from wildfire due to its width and the fact that wildfire can "spot" up to 20km in front of an intense fire front. Such a trail would also leave a significant area of land disturbed and the purpose of this plan is to rehabilitate as much site area as possible. The threat from an uncontrolled wildfire and the potential damage it may cause is difficult to manage in this situation and fire will remain a moderate risk.

Weeds and Weed Sources

Objectives: To prevent the spread of weeds including noxious weeds; to suppress weeds occurring within the rehabilitation areas.

Weed sources are present on the site along the gully around the large dams and in the previously described area which contains the low sediment basins. The use of the topsoil/sediment from these areas will transport a source of weed seed and vegetative material however the use of this soil will provide a better growing medium for plants rather than a base of sandstone/sand which will be the medium present post mining in the Stage 1 area. Weeds will need to be continually suppressed in the early phases of site rehabilitation.

13.9.6 Site Preparation and Planting Methods

13.9.6.1 Site Condition

Post mining, the condition of the site will be poor with a non-natural soil profile in terms of macro and micro structure and chemical properties. Sandstone will remain and any sand/broken sandstone will have been compacted by the use of the heavy extraction machinery, which is used as part of the mining process.

13.9.6.2 Site Preparation

Post mining the site will be denuded of all vegetative material. The surface will represent sandstone and sand and this will be highly compacted. Due to the low nutrient status of these sandstone derived soils the soil will have a extremely low Cation Exchange Capacity (CEC), as there will be lowered organic matter levels present which form the basis for the nutrient holding capacity of these soils. Water infiltration and water holding capacity will be extremely poor due to the base of sandstone/sand combined with its compaction from the extraction process. Due to the compaction of the soil and lack of vegetation the soil will also be extremely prone to erosion. Site preparation will aim to rectify these factors by the following means.

Deep Ripping will be undertaken at spacings of 500mm to a depth of at least 500mm. This will be undertaken across the contour to reduce the erosion risk by increasing water infiltration and reducing surface water velocity. It will also provide an easy medium for the planting of tubestock and aids in their root growth;
Respreading of topsoil recovered from the stripping of the next compartment to be mined; or other nearby sources;
Jute mesh will be used to further stabilise the soil surface. The jute mesh reduces raindrop, wind and sheet erosion by binding the soil. It also allows for the sowing of seed with good levels of seed emergence due to its very open weave. Due to its water holding ability and cover it increases water retention and reduces plant stress through desiccation. It also has the advantage of being biodegradable and enriches the soil with organic matter at the rate of approximately 5 tonnes per hectare. Breakdown generally takes 2-4 years depending on site conditions. This will be overlapped by 150 mm and the extremities pegged down with steel U pegs at 250mm intervals. Three to four infill pegs will be put in every square metre;
Hay bales will be used as contour banks to reduce water velocity and the potential for sediment wash. Silt fences will be used both upslope and downslope of exposed soil areas. These will be placed in strategic locations both upslope, downslope and in the centre of the restoration area. They will be positioned along the contour and be pegged down with stakes.

Due to the ground level wind break they form they will further reduce water loss especially on hot windy days. All sediment control devices will be inspected regularly;
Fauna habitat restoration will be undertaken as described elsewhere.

13.9.6.3 Planting Method

Seeds will be collected from on site as far as possible. This will aid in maintaining any genetic uniqueness in terms of this site. Seeds will be collected as soon as mining commences and will be collected in each season when the various flora have viable seed present. Approximately ten percent of seed will be propagated to allow for the planting of tubestock in areas where there are gaps in the direct seeding. The translocation of the top 200-300mm of topsoil from areas to be mined to previously mined areas (with negligible storage times) will provide the most valuable source of seed and vegetative propagules.
Soil testing for its chemical properties will be undertaken prior to restoration by a NATA Registered Laboratory. Testing to date has indicated that lime/gypsum/dolomite and/or fertiliser will be incorporated into the topsoil to a depth of 100mm as required (Section 7). This surface will be scarified using a scarifier behind a tractor and would be undertaken just prior to planting as the soil has a low nutrient holding capacity and nutrients would be lost through leaching during periods of heavy rain. A low Phosphorus native fertilizer would be used such as Yates Nutricote Standard N20, PO, K10.8 (Pink), designed to give medium term feeding for Natives for approximately 180 days. A mixture of the native seeds given in Appendix 2 combined with sterile Japanese Millet and Rye will be planted. As far as possible local native genetic material will be used. *Tetratheca glandulosa* will be propagated along with their locations mapped so the restoration can replace this species to their former locations and densities. In addition to the propagation of this species translocation will be undertaken of mature specimens. Soil samples and will be taken within the root zones of these specimens to be translocated and these will be analysed in terms of their chemical properties so these properties can be provided at the translocated locations. This will provide the best chance for the successful translocation of these specimens to be successful. The seeds will then be spread by a hand mechanical spreader with sieved topsoil from on site directly onto the loosely woven Jute Matting. The sterile Japanese Millet and Rye will provide cover in both the winter (Millet) and summer (Rye) periods at the sowing rate of 30kg/ha each. They will stabilise the soil and provide a useful microclimate for the germination of the native seed.
As they are sterile and last for only one year they will not become a weed to hinder restoration. Irrigation will be via a pump and travelling irrigator from the dams. The frequency and intensity of irrigation will depend on the season and year and monitoring will be undertaken on a weekly basis for the first 8 weeks to measure soil moisture or until a good ground cover is established. If a good strike rate from direct seeding is not achieved planting of tubestock will be undertaken at the 12 month stage.
No one revegetation technique is superior to another. Different plants favour different methods. The success of the various methods may vary with different conditions. Therefore, in order to maximise yield, a variety of methods and techniques is recommended. These include:

- Direct (machine)/ Hand sown seeding
- Brush matting or Brush layering
- Nursery propagated seedlings (tubestock)
- Clonal (vegetative) propagation
- Use of Bush Litter
- Artificial habitat - Habitat augmentation
- Hydromulching
- Transplanting
- Mulching
- Fertiliser

The current quarry operators administer a number of similar quarries throughout the western Sydney area and have applied effective rehabilitation techniques. An example of rehabilitation of a quarry by the proponent is illustrated in Plates 22 to 24. Specific revegetation details are described in Figures 27 to 28.

13.9.6.4 Species List for Quarry Planting

Anderson Consulting has detailed those species which are to be used in the rehabilitation of the quarry. This list outlined in Table 24 should be read in conjunction with Figure 11 and Section 6.7.

TABLE 24: SUITABLE PLANTINGS FOR QUARRY ELEMENTS

Scientific Name	Common Name	Quarry Floor	Benches	Drainage Lines	Sediment Basins
Acacia binervata	Coast Myall				
Acacia falciformis	Broad-leafed Hickory				
Acacia hispidula		✓			
Acacia linifolia	Flax-leafed Wattle	✓	✓		
Acacia parramattensis	Parramatta Green Wattle				
Acacia suaveolens	Sweet Scented Wattle	✓	✓	✓	
Acacia ulicifolia	Prickly Moses	✓			
Actinotus helianthi	Flannel Flower	✓		✓	
Allocasuarina littoralis	Black She-Oak	✓	✓	✓	✓
Angophora bakeri ssp bakeri	Narrow-leaf Apple	✓	✓	✓	
Angophora hispida	Dwarf Apple				
Banksia serrata	Old Man Banksia	✓		✓	
Banksia spinulosa	Hairpin Banksia	✓	✓	✓	
Blechnum cartilagineum	Gristle Fern			✓	✓
Boronia ledifolia	Sydney Boronia	✓			
Bossiaea heterophylla	Variable Bossiaea	✓			
Bossiaea obcordate		✓			
Caladenia catenate	White Fingers				
Callitris rhomboidea	Port Jackson Pine				
Cassytha pubescens	Common Devil's Twine				
Ceratopetalum gummiferum	NSW Christmas Bush	✓	✓		
Corymbia eximia	Yellow Bloodwood	✓			
Corymbia gummifera	Red Bloodwood	✓			
Cynodon dactylon	Couch				
Cymbopogon refractus	Barbed-wire Grass	✓	✓		
Dampiera stricta		✓			
Davesia corymbose		✓			
Davesia ulicifolia	Gorse Bitter Pea	✓			
Dianella prunia					
Dichondra repens	Kidney Weed				
Dillwynia glaberrima		✓			
Dillwynia retorta ssp retorta	Healthy Parrot Pea	✓	✓	✓	
Dillwynia rudis					
Dodonaea triquetra	Hop Bush	✓	✓	✓	
Eleocharis sphacelate	Tall Spike-rush				✓
Entolasia stricta		✓	✓	✓	
Epacris microphylla	Coral Heath	✓		✓	
Epacris pulchella	NSW Coral Heath	✓		✓	

Plate 22 **Revegetated quarry embankment located on the access road to a previous extraction area in the Cattai quarry.**

Plate 23

Vegetation growing unaided within previous extraction area in Cattai quarry.

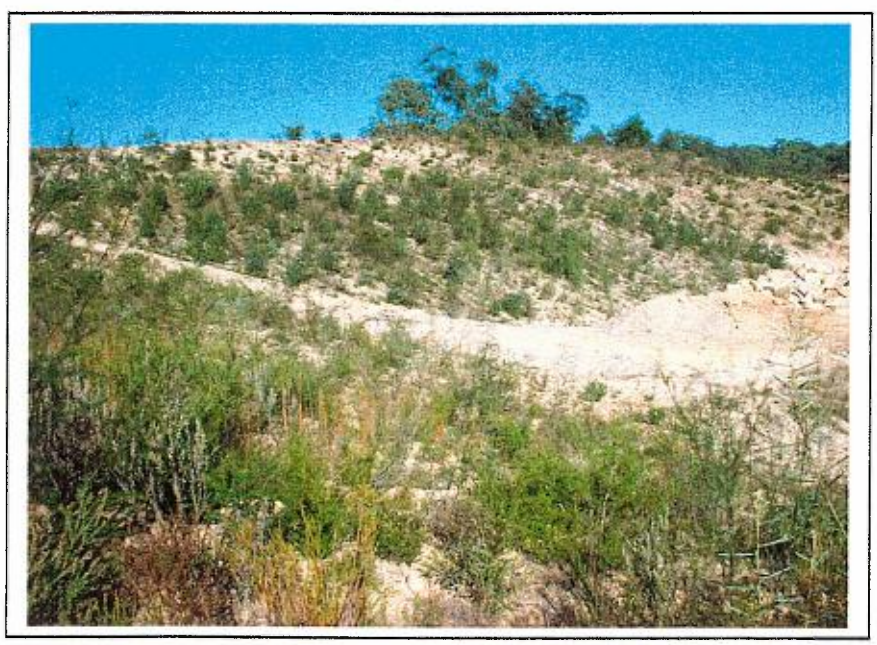


Plate 24

Vegetation regrowth at one of Nepean Quarries' other extraction sites at Kurrajong. Regrowth achieved two years after batters prepared.

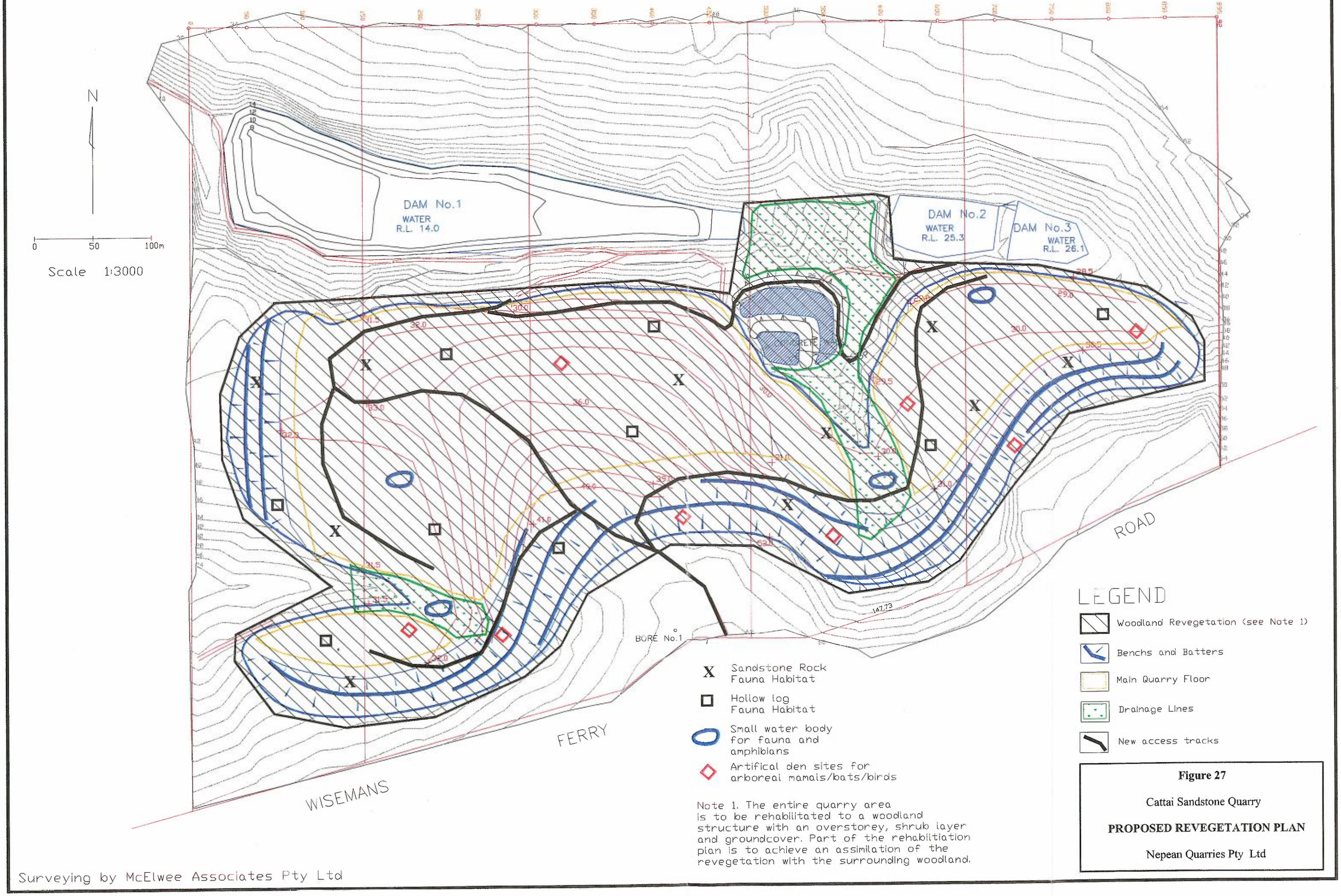


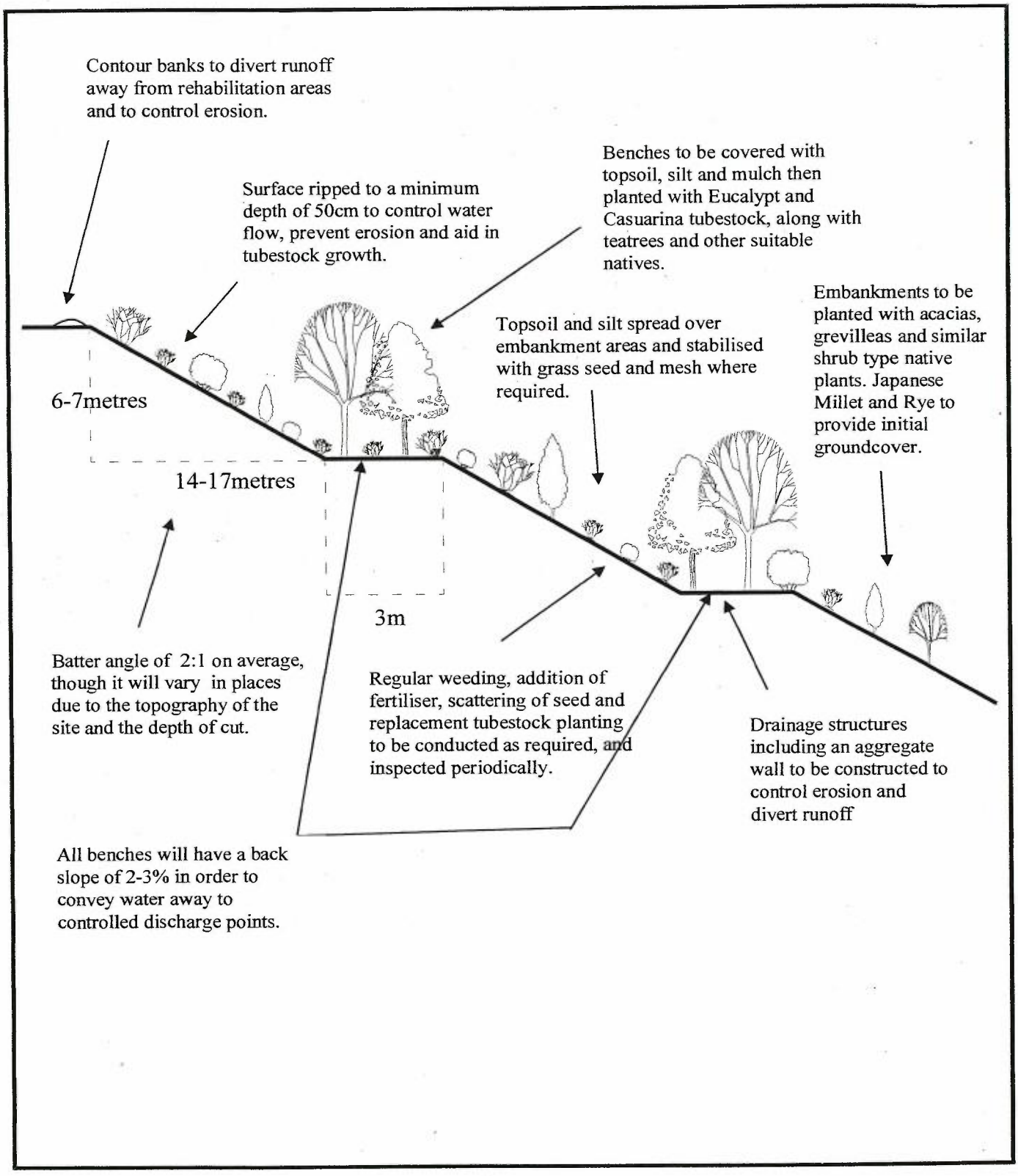
Figure 27

Cattai Sandstone Quarry

PROPOSED REVEGETATION PLAN

Nepean Quarries Pty Ltd

Surveying by McElwee Associates Pty Ltd



Concept from: Anderson Consulting, 2002

Figure 28

Cattai Sandstone Quarry

PROPOSED BENCH AND BATTER PLANTINGS

Nepean Quarries Pty Ltd

Eucalyptus piperita	Sydney Peppermint	✓	✓	✓	
Eucalyptus punctata	Grey Gum	✓			
Gleichenia dicarpa	Pouched Coral Fern			✓	
Glochidion ferdinandi	Cheese Tree				
Gompholobium grandiflorum		✓		✓	
Grevillea mucronulata		✓			
Grevillea oleoides		✓		✓	
Grevillea sphacelate	Grey Spider Flower	✓			
Haemodorum planifolium	Blood Root				
Hakea dactyloides	Finger Hakea	✓	✓		
Hakea sericea	Bushy Needlebush	✓			
Hardenbergia violacea	Hardenbergia	✓	✓		
Hibbertia monogyna	Leafy Guinea Flower	✓		✓	
Imperata cylindrica	Bladey Grass	✓	✓	✓	✓
Isopogon anemonifolius		✓			
Jacksonia scoparia	Dogwood	✓		✓	
Kunzea ambigua	Tick Bush	✓	✓	✓	
Lambertia Formosa	Mountain Devils	✓	✓	✓	
Lasiopetalum macrophyllum		✓			
Lepidosperma laterale		✓	✓		
Leptospermum trinervium	Paperbark Tea-tree	✓	✓	✓	✓
Leucopogon muticus		✓			
Lindsaea linearis	Screw Fern			✓	
Lindsaea microphylla	Lacy Wedge Fern			✓	
Lomandra longifolia	Mat Rush	✓	✓	✓	✓
Lomandra multiflora		✓		✓	
Lomatia silaifolia	Crinkle Bush	✓	✓		
Microlaena stipoides		✓	✓	✓	
Olax stricta		✓			
Ozothamnus diosmifolium	Paper Daisy	✓			
Panicum maximum var maximum	Guinea Grass				
Patersonia sericea	Silky Purple Flag	✓		✓	
Pellaea falcata ssp. falcata	Sickle Fern			✓	
Persoonia levis	Smooth Geebung	✓	✓	✓	
Persoonia linearis	Narrow-leaf Geebung	✓	✓	✓	
Petrophile pulchella	Conesticks	✓			
Pimelea linifolia ssp linifolia	Rice Flower	✓			
Pteridium esculentum	Bracken Fern				
Schoenus brevifolius				✓	
Smilax australis		✓			
Stylidium graminifolium	Trigger Plant	✓		✓	
Stypandra glauca	Nodding Blue Lily	✓		✓	
Tetratheca glandulosa		✓		✓	
Themeda australis	Kangaroo Grass	✓	✓	✓	✓
Trachymene incisa ssp incisa		✓			
Xanthorrhoea resinifera		✓		✓	
Xanthosia tridentate	Rock Xanthosia				

* indicates exotic species

13.9.6.5 Fauna Habitat Restoration

As the fauna habitat restoration will involve some heavy habitat features such as rocks and logs and will require heavy machinery this component will be undertaken before planting. Large sandstone boulders of up to 100cm diameter will be used to create sheltering habitat for *Rattus sp.*, Ground Mammals, Reptiles and species such as the Tiger Quoll whilst shedding thin pieces of sandstone will be used to rehabilitate habitat for reptile and amphibian species. This in turn will provide habitat for the Red-crowned Toadlet as temporary pondages will be created for potential breeding sites. Hollow logs of as large a diameter as possible will also be used to provide sheltering habitat for a range of ground fauna including *Rattus sp.*, Ground Mammals and Reptiles. These habitat features will restore the prey base for the Powerful and Barking Owls by providing habitat for the prey they feed upon.

Dead hollow trees will be placed upright in holes to provide potential hollows for birds, bats and arboreal mammals. This will be undertaken prior to restoration, as it will require heavy machinery, which would damage the vegetation if undertaken once establishment has taken place. Dead trees will be used to provide this habitat feature and these will be sourced mainly from off site as there are no large hollow trees on site. The most hollow part of these trees will be cut to a length of approximately 6 metres. These trees will be placed in a hole in the ground to a depth of 1.0 to 1.5 metres and stand 4.5-5.0 metres upright above ground level. Approximately three of these per hectare will be used. Artificial nest/roost boxes will be attached to these dead stags to encourage their use by the aforementioned fauna. Two will be attached to each dead stag. One will have a large opening suitable for large arobreal mammals such as possums or large birds and the other will have a smaller opening more suited to microchiropteran bats and small birds.

Small pondages/drainage lines will be constructed as part of the surface preparation. These will provide habitat for amphibian species such as the Red-crowned Toadlet. These will utilise sandstone rocks to provide a more natural situation. Jute matting will be used as part of the construction of these small pondages.

13.9.7 Compliance, Monitoring and Reporting

Central to effective rehabilitation is monitoring of progress and reporting of compliance. The Plan recommends annual reporting to Council of the following;

- Works undertaken in the previous 6 months (i.e Plantings, weed control)
- Assessment of the effectiveness of site revegetation to date
- Assessment of the effectiveness of Sediment Control Devices
- Planned works for the next 6 months.

Reporting should include photo records from a number of permanent photo points and a description of wildlife habitat. Reporting could be made by the contractor undertaking the works provided they are suitably qualified and acceptable to the consent authority.

PART E: CULTURAL AND ECONOMIC ENVIRONMENT

SECTION 14 ABORIGINAL AND EUROPEAN CULTURAL HERITAGE

14.1 Background

An archaeological survey was conducted to determine if any items of conservation significance were present. The work was conducted by Julie Dibden of NSW Archaeology, a practicing consultant Archaeologist (see Report #3 in Volume 2 of this EIS).

14.2 Methodology

Both field investigations and existing data review was carried out during the archaeological assessment of the project.

Review of Documentation

A range of documentation was used in assessing current archaeological and historical knowledge for the area in which the quarry is located and the surrounding region. Literature sources included the New South Wales National Parks and Wildlife Service (NSW NPWS) Register of Aboriginal Sites and its associated catalogue of archaeological reports.

The background research was used to determine if known Aboriginal sites were located in the vicinity of the development and to facilitate site prediction on the basis of known regional and local site patterns and to place the area within an archaeological and research management context.

The results indicated that there are no previously recorded sites known to exist within the boundaries of the proposed quarry area (NPWS ASR: 31st July 2001). However, nineteen Aboriginal sites are listed on the Aboriginal Site register as being present within a 25 square kilometre area (with the study area being positioned at the centre). A predictive model based on prior local and regional archaeological work resulted in an assessment that the study area is of moderate archaeological potential.

Aboriginal Consultation & Field Inspection

Three local Aboriginal organisations were consulted and included:

- Deerubbin Local Aboriginal Land Council;
- Darug Custodial Aboriginal Corporation; and
- Darug Tribal Aboriginal Corporation

Representatives from organisation subsequently accompanied the consultant archaeologist on a field inspection of the site during two days in August, 2001. During the survey, one aboriginal site was identified (Report 2, Volume 2).

The survey entailed walking across all areas of development impact, with the aim to achieve as near to a comprehensive survey of the impact zone as feasible, locating archaeological material situated in both open contexts and sandstone shelters if present. All horizontal sandstone exposures were inspected for evidence of engraved imagery and grinding grooves. Vertical sandstone exposures containing overhangs or shelters were inspected for evidence of pigment imagery and surficial archaeological material. Additionally, an assessment was made as to whether or not shelter sites could be assessed which may contain potential archaeological deposits (PAD). Otherwise ground exposures were examined for evidence of archaeological material. An assessment was also made of prior land disturbance and survey coverage variables.

European Heritage

A search of heritage registers maintained by Baulkham Hills Shire Council was conducted (information can be found in the relevant LEP). Following a field inspection, together with property owner consultation, it was confirmed that no items of European heritage significance are located within the project area.

14.3 Findings of the Survey

One Aboriginal site was located during the survey (see Figure 7 for location). This site, which has been assessed to be of low-moderate archaeological significance, is located on the north east boundary of the proposed development area. A second site, previously identified site was visited which is located approximately 50 metres outside the north west boundary of the National Parks and Wildlife study area. Details of these sites are indicated in Table 25.

TABLE 25: SIGNIFICANCE ASSESSMENT OF ABORIGINAL SITES

Name	Archaeological significance	Criteria
Cattai Sandstone Extraction Quarry Site 1	Low-moderate local	Common site type; low-moderate research potential; moderately disturbed by track construction and usage.
NPWS Site No. 45-5-363	Low local	Common site type; grossly disturbed; low research potential.

Large areas of the study area were found to be significantly disturbed by prior sandstone extraction activities and accordingly, this part of the study area was assessed to be of low archaeological potential and significance.
An area which measures approximately 400 metres by 200 metres representing the centre of the quarried area, has had sandstone removed to a depth of up to 8metres. The archaeological potential of this area is assessed to be nil on the basis of this prior land disturbance which has resulted in the removal of all of the original land surface.

Further areas of original land surface which has since been disturbed by minor sandstone extraction, sandstone storage or access track construction were also assessed. This area is distributed more widely across the study area, particularly to the west and east of the extraction area. The archaeological potential of this area is assessed also to be low on the basis of prior land disturbance given the disturbance of the original land surface and removal of some of the sandstone.

14.4 Potential Impacts

The site identified within the boundaries of the property is located well outside the proposed boundary of the extraction area, and will not be impacted on by the proposed operations. It comprises a small assemblage of stone artefacts located on an old, unformed vehicle track. The site is situated at the northern boundary of the site area near to its eastern end. The site is on a ledge elevated approximately 5 metres above the gully bottom at a distance of approximately 35m south of a Dam 3.

Seventeen stone artefacts were found distributed over an area of track which measures approximately 15 metres by 3 wide. Raw materials present are predominantly chert (indurated mudstone) and silcrete with one artefact made from quartzite. Artefacts included flakes, chips, cores, core and flake fragments.

14.5 Controls and Safeguards

There are no cultural heritage constraints on the project at present. However should any items of potential significance be discovered, appropriate action will be taken to safeguard them. Sections 84 and 90 of the *National Parks and Wildlife Act 1974* (as amended) provide statutory protection for any physical/material evidence of Aboriginal occupation of NSW and places of cultural significance to any Aboriginal community. It is an offence to knowingly disturb a 'relic' without the prior written consent of the Director-General of the NSW National Parks and Wildlife Service (NPWS).

In the event of Aboriginal Archaeological material being uncovered during earthworks associated with the proposed development, work in the vicinity will cease immediately and advice sought from the National Parks and Wildlife Service and the local Aboriginal Land Council(s).

14.6 Conclusions

The proposed extraction area represents an area considered to be of low archaeological potential. Despite this, evidence of Aboriginal occupation of the area has been identified during surveys conducted for this project. All sites identified were in areas previously disturbed, either by earthworks associated with prior extraction activities or other developments, and the sites were all assessed to be of low or low-moderate archaeological significance.

Based on the results of the current assessment of the known and potential archaeological resource of the quarry area, and providing the recommended management strategies are adhered to, there are no anticipated long term or unavoidable archaeological constraints to the proposed development. The area does not require any further archaeological assessment for the purposes of determining archaeological potential.

SECTION 15 VISUAL AMENITY

15.1 Visual Character of the Region

Most of the area designated for the proposed quarry is bushland. The broader area is classified as rural with a number of residences located within close proximity to the site - see Figures 3 and 7. Prominent features in the area include residences, sheds, and unsealed access tracks, a golf course, sealed roads and dams.

The main area around the quarry site is dominated by minor plateau areas, steep gullies and minor rock escarpments. These features are combined with intermittent drainage lines and dams which drain to the Hawkesbury River. An overview of the viewshed is presented in Figure 29.

15.2 Visual Character of the Site

The Visual Landscape of the site is dominated by gullies containing intermittent drainage lines, a plateau area, rock outcrops, existing quarry pits and earthen dams. The visual characteristics of the project site can be broken down into a number of elements. These include:

- Existing bushland;
- Main on-site dam;
- Existing quarry extraction areas;
- On-site houses; and
- Wisemans Ferry Road

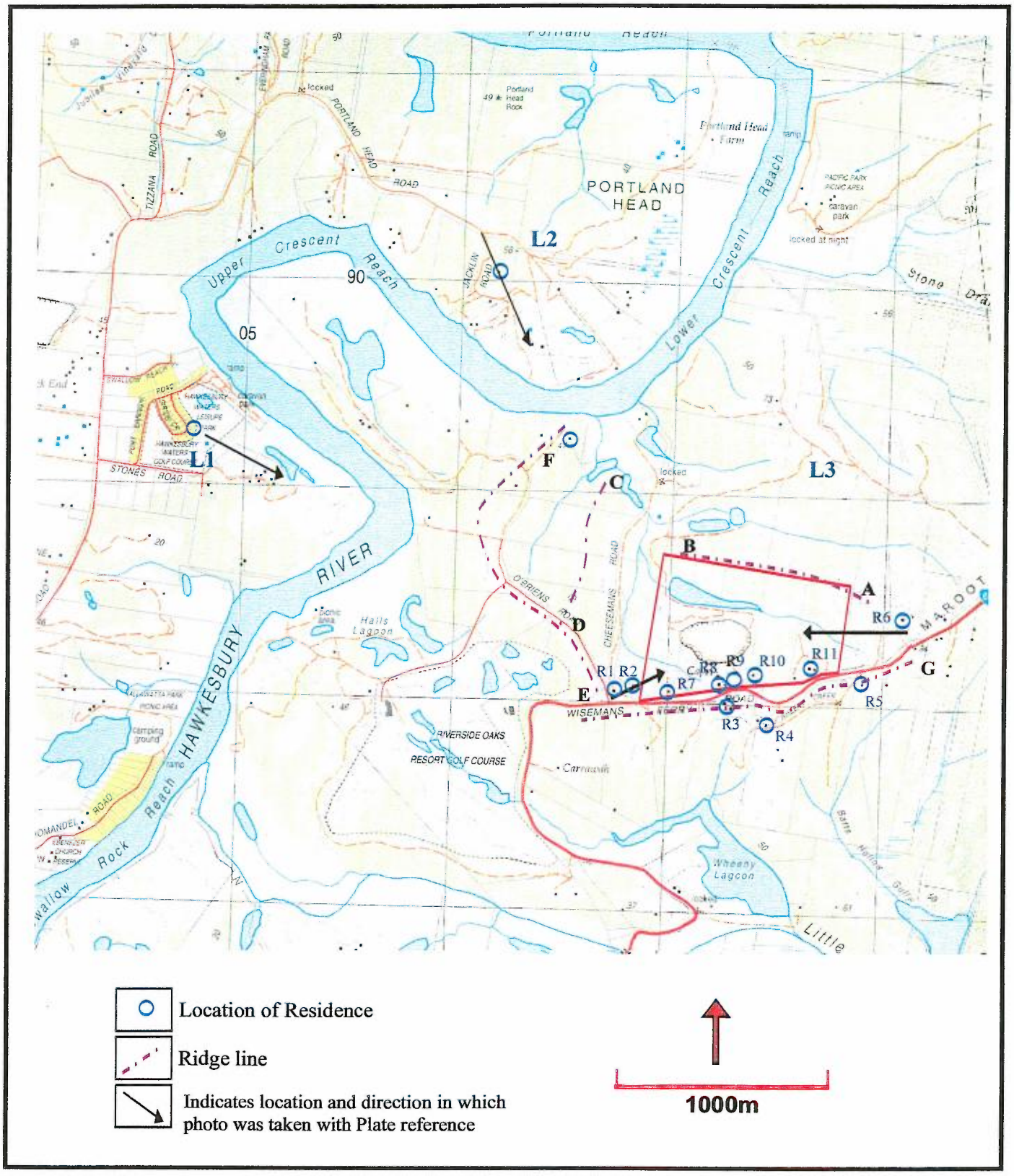
Existing bushland on the project site which surrounds the old quarry pits occurs within several relatively steep gullies which primarily drain to the dams located at the northern end of the site. The entire project site is essentially located within a valley with a significant ridge extending across the northern boundary, with the Maroota Ridge along the southern boundary.

Areas on the site which are presently clear of scrub consist of the two old quarry extraction areas, the existing five residences, and the area adjacent to the main dams where previous sand extraction has occurred.

Dense vegetation is present along all boundaries of the project site except for the land adjacent to the quarry entrance. Thus the proposed quarry will be naturally screened from the majority of neighbouring residences. The majority of residences located to the south of Wisemans Ferry Road (which is located on Maroota Ridge) have their line-of-sight of the quarry blocked as they are on the southern downslope side of the Maroota Ridge.

15.3 Constraints Assessment

The quarry extension proposal may result in adverse visual impacts to some neighbouring properties. An assessment is therefore required to determine which properties may or may not be affected.



From: Wilberforce 1:25000 Topographic Sheet 9030-1N (Third Edition). NSW Dept. of Information Technology & Mgmt.

Figure 29

Cattai Sandstone Quarry

VISUAL CATCHMENT

Nepean Quarries Pty Ltd

HARVEST SCIENTIFIC SERVICES

15.4 Assessment of Visual Impacts

15.4.1 Methodology

In order to determine the visual impacts of the proposed quarry, a detailed study of the existing and proposed final landscape was carried out. This included assessing on-site survey data, combined with field work, contour maps and aerial photos. The main criteria used in this assessment included the following;

- The existing land surface;
- The proposed land surface on completion of quarrying;
- Line of Sight from each Property; and
- Location of the main features of the Project Site (eg. dam, proposed benches etc).

Aspects of the view-shed are illustrated in Figure 29. Their elevations in relation to external visual barriers (ridge lines) and the quarry extremities are listed and compared in Table 26.

TABLE 26: SITE ASSESSMENT LOCATION DETAILS

Location	Approx. Elevation (metres AHD)	Comments
R1	45	Exposure limited by vegetation and topography
R2	42	Potential exposure to south-western part of expansion
R3	60	Properties on south side of Wisemans Ferry Road sheltered
R4	60	Ridgeline of Wisemans Ferry Rd shelters view
R5	60	Quarry not visible from the southern side of the road
R6	75	Limited visibility of Quarry area and dam through trees
R7	49	Owners residence, exposure to southern part of quarry
R8	58	Owners residence, restricted exposure due to tree screen
R9	60	Owners residence, limited exposure due to topography
R10	52	Owners residence, limited exposure due to trees
R11	63	Owners residence, may have exposure to eastern area
L1Ebenezer	25-30	No exposure to quarry, blocked by O'Briens Road ridgeline
L2 Portland Head	40-55 (av.45)	South side of quarry (top) visible above 45m along ridge
L3 Bush Track	45-70 (av.60)	Quarry mostly obscured by ridgeline A-B to the south of L3
L4 Riverside Oaks	10-40	View to quarry obscured by O'Briens Road
Ridgeline A – B	40-45	Restricts view of quarry from the north
Ridgeline C – D	30-50	Some exposure to quarry, no residences in this area
Ridgeline D – E	55-60	No visibility of quarry possible due to topography
Ridgeline D – F	40-45	Limited exposure to quarry from the north end of ridge
Ridgeline E - G	50-70 (av.62)	No exposure of the quarry from Wisemans Ferry Road
Quarry Extremities		
Lot 1	30-46	Some Exposure
Lot 2	30-50	Some Exposure
Lot 3	30-58	Some Exposure
Lot 4	30-50	Some Exposure
Lot 5	30-50	Some Exposure

The following sections detail the potential impacts for each of the selected Residences and the approach that will be taken to ameliorate any resultant impacts.

15.4.2 Assessment of Visual Impacts from Nominated Locations

15.4.2.1 Locations within Close Proximity

The position of these residences are indicated in Figure 26 with a number of relevant visual issues illustrated in Plates 25 to 29.

Residences 'R1' & 'R2' ('Farraway' Property') – The property is located immediately to the west of the Project Site, on the corner of O'Briens Road & Wisemans Ferry Road. Residences R1 & R2 overlook the western part of the proposed extraction area. These two residences are potentially the most affected by the proposed quarry as views of the extracted quarry may become visible from these residences, particularly when the central part of the H-I ridgeline is lowered.

Residence 'R3' (Smith Property) – This residence would have views of the quarry entrance if existing vegetation located on the Smith property was not present.

Residence 'R4' (Williams Property) – This property has its line of sight blocked by Wisemans Ferry Road which is located upslope to the north. Furthermore, views of the proposed quarry from this property are screened out by existing vegetation of the property, road verge vegetation, and vegetation, as well as vegetation located on the southern boundary of the Project site.

Residence 'R5' (Boeree Property) – This property has its line of sight blocked by Wisemans Ferry Road which is located upslope to the north.

Residence 'R6' (Hughes Property) - The property is located immediately to the east of the Project Site and is potentially affected by the proposed quarry. Views of the quarry would be visible from this residence if existing trees/shrubs were not present. Existing natural trees and understorey located on the Hughes property and on the project site restricts the sight line over the project site however. To ensure continued concealment of the proposed quarry a buffer of existing vegetation will be retained on the western boundary of the project site for the life of the project.

Residences 'R7-R11' – These residences (see also Figure 29) are owned and occupied by the owners of the Project Site. These residences have expressed the view that their exposure to the quarry workings in the past has not been an issue for them as they themselves have worked in the quarry. In terms of the proposed extraction, individual residences will be exposed to the full workings of the quarry at varying times and for different periods of time. For example residences R11 and R10 will see few direct visual impacts until the last 5 or so years of the project.

15.4.2.2 Locations at a Distance

The position of these more regional locations (L1-L4) are also indicated on Figure 29.

L1: Ebenezer residences (located on the western side of the Hawkesbury River). An assessment of the residential areas around Ebenezer was made which included those areas located on Coromandel Road, Port Erringhi Road, Sirius Crescent and Stones Road (See Figure 26). The line-of-sight from most of these residences looking towards the proposed quarry will be blocked by Ridgeline DF on which O'Briens Road is located (RL 40-60m AHD).

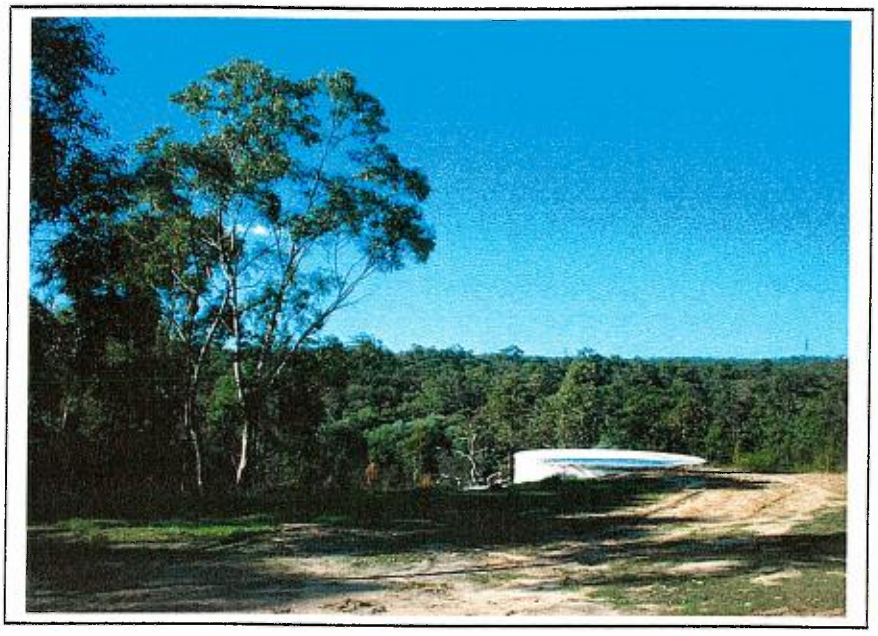


Plate 25

View looking north-east from 'Farraway' Property (R2)

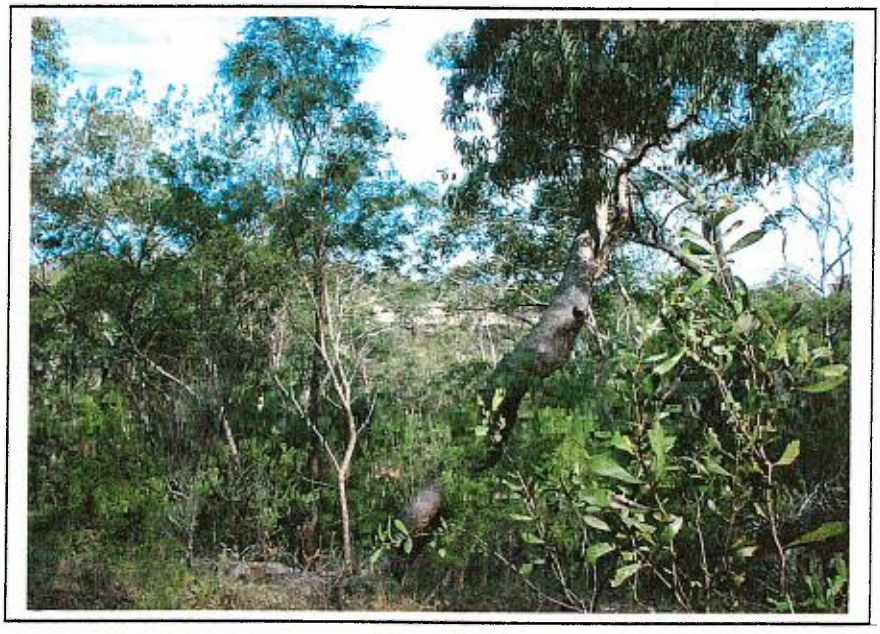


Plate 26

View looking south from L3 towards main quarry area. Existing quarry barely visible (centre field) through woodland.

Plate 27

View looking west upslope from Hughes property (R6) over proposed extraction area.

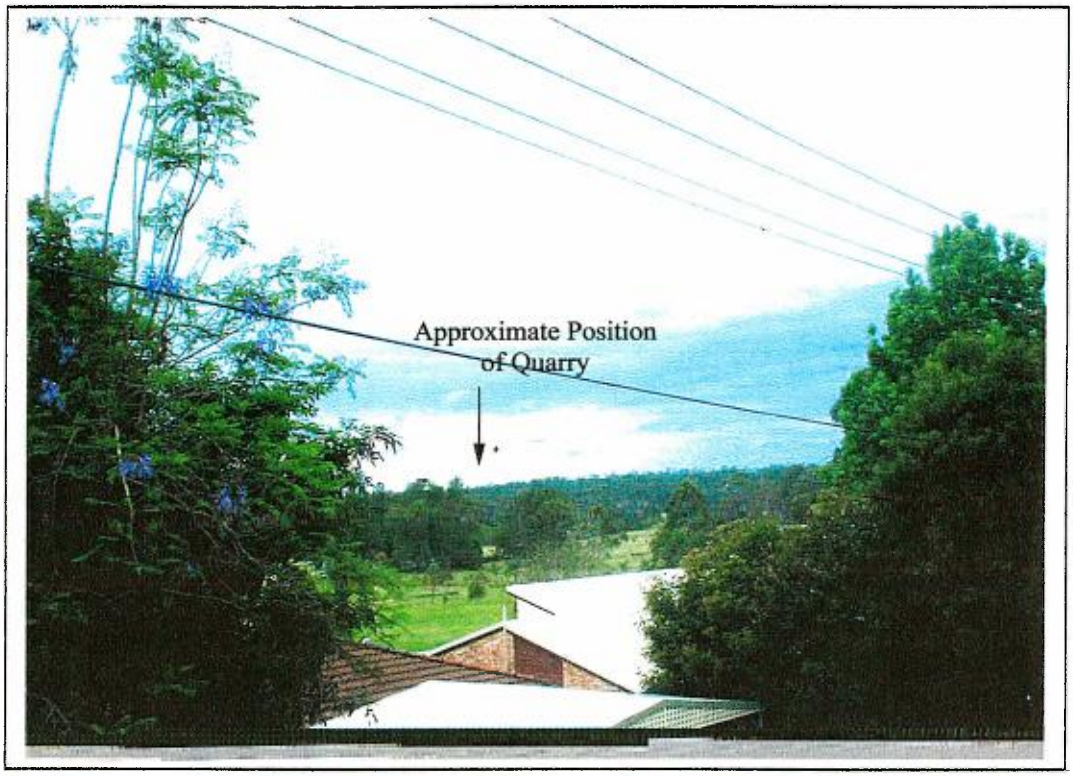


Plate 28 **View looking south-east from Ebenezer residential area on Sirius Crescent. Approximate location of Cattai Quarry indicated by arrow.**

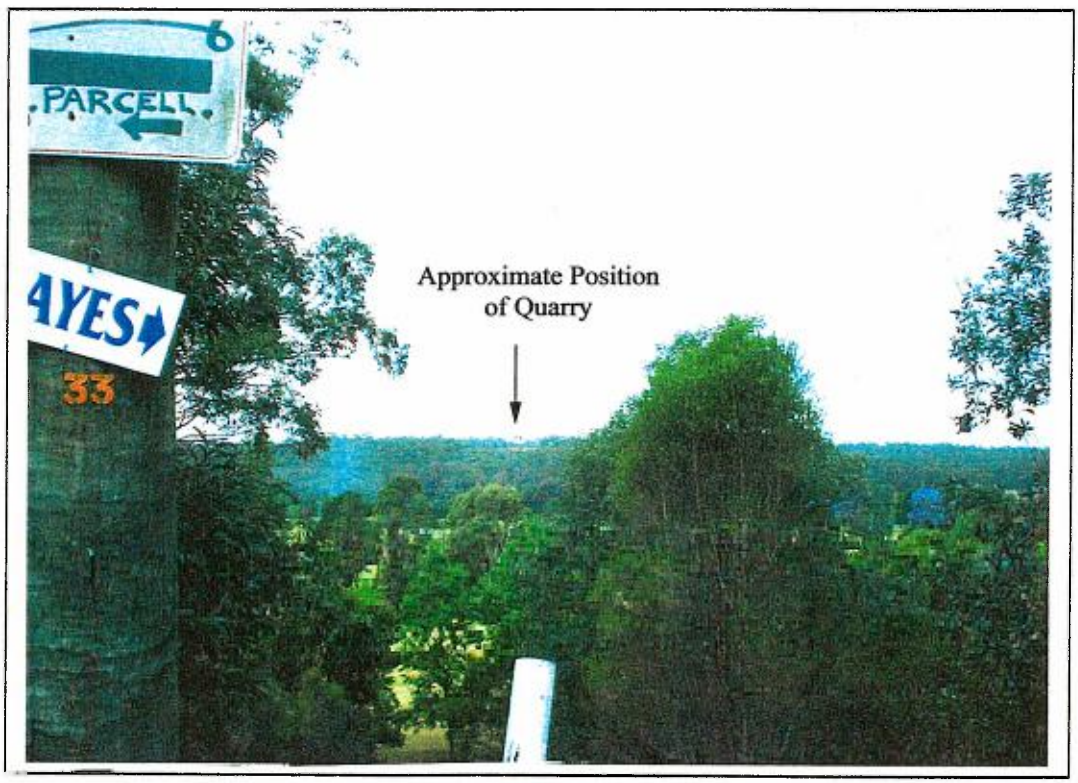


Plate 29 **View looking south from Portland Head Road. Existing quarry exposure is barely discernable on skyline/timber horizon. Approximate position indicated by arrow.**

Note that the Ebenezer residential areas located on the abovementioned roads are positioned on elevations ranging from 10-30m AHD, which are all below that of the O'Briens Road Ridge Ridge Line DF). Plate 28 shows that the quarry is not visible when looking east from Sirius Crescent.

L2: Portland Head residences - A small number of residences on rural property's are located on Portland Head Road and Jacklin Road (on the northern side of the Hawkesbury River). When looking south towards the quarry from these Portland Head residences (See Plate 29 and Figure 26), a very limited band of existing exposed sandstone can be seen in the far distance just below the Wisemans Ferry Road treeline. The visible sandstone is the uppermost elevation (RL 54m AHD) of the previously extracted quarry batters on the Project Site. The same situation is also relevant for a lone residence which is located at the northern end of the O'Briens Road Ridge (DF). No additional visual impacts will be created by the proposed extraction as it will all occur at levels below that which can be currently seen from the abovementioned residences. In addition, since extraction to depth will begin on the existing exposed main old quarry, this will mean that staged rehabilitation/revegetation immediately following extraction will occur across these areas first.

L3: Bush Track. Much of this basically uninhabited portion of the view shed is obscured by the AB ridge line

L4: Riverside Oaks: All of the Riverside Oaks resort is located on the western fall of O'Briens Road (Ridge Line EDF). A small area between Cheesmans Road and Ridge Line EDC does overlook the general quarry area. This area is uninhabited.

15.5 Measures to be undertaken to Ameliorate Visual Impacts

A number of measures will be undertaken to ameliorate the visual impacts of the proposed quarrying. These include the following universal principles:

- Rehabilitation will follow soon after quarrying of an extraction a cell has been completed. No longer will large areas be opened up without the proper controls. Extraction cell areas are all less than 1 hectare in size.

- The current exposed area will never be exceeded. All new work will commence in the already extracted area which will be progressively rehabilitated, thereby reducing the total amount of exposed bare areas;

- Areas of existing vegetation will always be preserved (ie. a minimum 10m buffer of existing vegetation to be retained on the southern, eastern and western boundaries of the project site) and managed in a way to enhance the screening effect of the existing vegetation. Thus where there may be a gap in the screen, additional trees appropriate to the site will be planted.

- The proposed vegetation planting for the internal quarry benches will enable screening to occur roughly over 5, 10 and 15 metres vertically. Given that each bench is located at 10 metre vertical intervals, the approach to revegetation will enable sufficient vertical overlap to generate a very effective screen.

With respect to each of the above discussed residences and/or properties, the following additional measures will be undertaken.

Residences 'R1, R2, R4-R6' - Subject to general revegetation and rehabilitation plan. No significant impacts are envisioned.

Residence 'R3' – Additional plantings to be undertaken on the southern boundary of the project site immediately adjacent to the quarry entrance. No significant impacts are envisioned.

Residences 'R7-R11' – These residences are located on the Project Site. Subject to general revegetation and rehabilitation plan. No significant impacts are envisioned.

Ebenezer residences – No impacts on visual amenity will be created for these residences due to their line of sight being blocked by the O'Briens Road ridgeline.

Portland Head residences – No additional impacts will be created. Subject to general revegetation and rehabilitation plan.

15.6 Conclusions

It is concluded that the quarrying operations combined with the revegetation plan will minimise any visual impacts that the operations may have on the nearest neighbours. The timing and proposed quarrying technique will enable screening by trees and other vegetation to occur rapidly and will at the same time, minimise the exposure of the actual quarried faces.

SECTION 16 NOISE IMPACTS

16.1 Introduction

An assessment of noise impacts for the proposed quarry extension was carried out by Dick Benbow and Associates (DB& A) – their detailed report is attached as Report #5 Volume 2 of this EIS. The purpose of their assessment was to determine the existing acoustic environment and assess the compliance of the proposed operation with the NSW Environment Protection Authority - "EPA" guidelines. The specific scope of their work included:

a) A description of the site and the proposed development;
b) A review of the appropriate noise criteria and guidelines for the development;
c) Assessment of the existing ambient noise environment in the areas surrounding the site;
d) Establishment / justification of project specific noise limits for the development;
e) Assessment of potential noise sources and prediction of potential noise impacts from the development (potential operational and construction-related noise impacts assessed); and
f) Determination of appropriate noise controls and noise management practices (where required).

A number of Receivers were considered as part of the assessment process. Their positions are illustrated in Figure 20 and summarised in Table 27.

TABLE 27: RESIDENTIAL RECEIVERS ASSESSED

Receiver [X]	Approximate Separation Distance (extraction area boundary)	Approximate Separation Distance (processing facility)	Bearing	Indicative Noise Amenity Area
R1	305 m	418 m	SW	Rural
R2	78 m	174 m	S	Rural
R3	260 m	365 m	SE	Rural
R4	392 m	540 m	SE	Rural
R5	218 m	348 m	SSE	Rural
R6	175 m	260 m	S	Rural

X - Receiver nomenclature based on EIS document

It should be noted that several additional receivers are located within near vicinity of the quarry operations. However, each of these residents have a financial interest in the quarry proceeding and have no objections to the proposal taking place. All of these property owners are signatories to the development application. As a result, this noise assessment was limited to those receivers located outside the boundaries of the operation and having no financial interest in the quarry.

16.2 Regulatory Requirements

The NSW Industrial Noise Policy was developed by the NSW EPA primarily for the assessment of noise emissions from industrial sites regulated by the NSW EPA (Table 28). However, the policy can also be used by DUAP and local government to assist in their assessment of potential noise issues and is thus considered appropriate for this proposal.

TABLE 28: ACCEPTABLE NOISE LEVELS

Type of Receiver	Indicative noise amenity area	Time of Day	Recommended L_{Aeq} noise level (dB(A)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban Industrial Interface (existing situations only)	Day	65	70
		Evening	55	60
		Night	50	55
Golf Course	All	When in use	55	60

The above criteria are the basis for the recently released ***Industrial Noise Policy*** published by the Environment Protection Authority of New South Wales (EPA) in January 2000. The policy distinguishes two noise control criteria based on the pre-operational acoustical climate (*background noise*), viz.

a. *Amenity Criterion*, which determines the acceptable A-weighted equivalent sound pressure level ($L_{Aeq,T}$) emanating from a proposed industrial operation on the basis of pre-operational $L_{Aeq,T}$; and

b. *Intrusiveness Criterion*, which determines the acceptable $L_{Aeq,T}$ emanating from the proposed industrial operation on the basis of pre-operational A-weighted ninety-percentile sound pressure level ($L_{A90,T}$).

The policy requires that the $L_{Aeq,T}$ emanating from a proposed industrial operation is corrected for its tonality, high low-frequency content, impulsiveness, fluctuation (night-time operations) and duration, if applicable.

The EPA accepts that the determination and application of noise control safeguards needs to take into consideration many factors, including:

- Variation in response between individuals to a particular noise source;
- Inherently noisy characteristics of many activities;
- Circumstances under which the noise is generated;
- Technical and economic feasibility for noise control; and
- Social importance of the activity.

EPA guidelines for this project are comparable to industrial activities where the following noise conditions apply:

- Duration of activity less than 4 weeks: Noise generated < Background + 20 dBA (nearest residence);

- Duration of activity less than 26 weeks but more than 4 weeks: Noise generated < Background + 10 dBA (nearest residence); and
- Duration of activity greater than 26 weeks: Noise generated < Background + 5 dBA (nearest residence).

The overall EPA criterion is to maintain a maximum noise level within 5dB(A) of the measured background level at the nearest residence. The EPA require a maximum noise level of 50 dB(A) for rural residential areas –see shaded portion of Table 25.

The Mines Inspection Act requires no person to be exposed to noise levels of more than 90 dB(A) for an 8 hour day.

Time Restrictions:

The EPA suggests the following time constraints that should be applied for construction type activities (which are comparable to quarrying work):

Monday to Friday:	7.00am to 6.00pm
Saturday:	7.00am to 1.00pm (If inaudible at residential premises); Or 8.00am to 1.00pm (if audible)
Sundays and Public Holidays:	No work permitted

Quarrying operations at Cattai Quarry will be in line with these guidelines.
(although preliminary activities commence around 6.00 am on weekdays and Saturdays)

16.3 Potential Impacts

Potential impacts on the acoustic amenity of the area may arise from the following:

- Truck arrival and departure from quarry site
- Sandstone ripping by bulldozer
- Crushing and screening operations
- Rock cutting activities
- Trucks traversing the site

16.4 Noise Assessment

16.4.1 Background Noise Monitoring

In order to accurately assess the potential for offensive noise, background noise measurements were taken during the daytime period (consistent with the proposed hours of operation). Representative locations within the nearest potentially affected residences to the subject site were utilised for the monitoring of existing ambient noise levels. The measurements as taken at the representative locations are considered as being indicative of background noise levels at all residential dwellings within the vicinity of the site.

Unattended noise monitoring was completed at several residential locations as well as a round of short-term attended noise monitoring being completed in an effort to characterise the existing ambient noise environment for the area.

The existing ambient noise environment for the area was observed as being consistent with that of a rural area. The passage of traffic (local) was noted as contributing to existing noise levels.

Unattended ambient noise measurements were carried out using statistical Environmental Noise Loggers, type EL-215. The loggers were set to monitor noise levels continuously over 15 minute statistical intervals for a period of approximately seven days. The instruments were calibrated and no deviations were observed. Attended existing ambient noise level measurements were conducted at two (2) adjacent residential locations.

16.4.2 Description of Monitoring Locations

A number of noise monitoring locations were used in the overall assessment, details on each are given below.

Location A: Resident located to the South West
(Consistent with Receiver R1)

This residence is located approximately 300m from the proposed extraction area boundary and 420m from the proposed processing facility. Attended noise monitoring was conducted at this location during the daytime of the 27th of March, 2002. Unattended noise monitoring was conducted between Thursday 27/09/2001 through to Sunday 07/10/2001. No existing industrial noise was noted.

Location B: Resident located to the South
(Consistent with Receiver R2)

This residence is located approximately 80 metres from the proposed extraction area boundary and 170 metres from the proposed processing facility. Attended noise monitoring was conducted at this location during the daytime of the 27th of March, 2002. Unattended noise monitoring was conducted between Thursday 27/09/2001 through to Sunday 07/10/2001. No existing industrial noise was noted.

Location C: Resident located to the South East
(Consistent with Receiver R4)

This residence is located approximately 300 metres from the proposed extraction area boundary and 420 metres from the proposed processing facility. Unattended noise monitoring was conducted between Thursday 27/09/2001 through to Wednesday 03/10/2001. No existing industrial noise was noted during logger establishment or retrieval.

Each location would be used as reference points for future noise compliance monitoring. The noise monitoring locations are shown in Figure 20.

The existing ambient noise environment at Locations A, B and C is considered as being an adequate representation of the ambient noise environment for the area thereby allowing for an accurate establishment of the project-specific noise design objectives.

16.4.3 Meteorological Conditions

Meteorological conditions during the unattended monitoring period has been obtained through the Bureau of Meteorology's (BOM's) Richmond All Weather Station. Conditions were compared to provide a worst case data set that was then used to filter the recorded noise levels. Noise levels measured during periods noted as recording wind speeds above 5m/s and or precipitation events, have been removed from the data set and therefore not included in the analysis of existing ambient noise levels. Upon analysis of the potentially adverse meteorological conditions – approximately 30% of the conditions were noted as being unsatisfactory.

Meteorological conditions during the attended noise monitoring intervals were noted as being satisfactory. Still conditions were apparent, partial cloud cover was also noted with an approximate temperature of 25 °C.

16.4.4 Noise Monitoring Results

The results of the background noise monitoring are summarised below:

TABLE 29: ATTENDED NOISE MONITORING

Results of Noise Monitoring Program (27/03/2002)(results expressed as dB(A))				
Statistically Analysed Noise Level				Comments / Observations
L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	
Location R1 – Southerly Westerly Receivers (14:18 – 14:33)				
71.3	57.6	58.4	35.5	No industrial noise observed Passage of traffic ≈ 65 – 78 dB(A) (truck) & ≈ 57 – 59 dB(A) (car) Local fauna noted throughout STEADY STATE ≈ 32 – 34 dB(A) (min. ambient) STEADY STATE ≈ 36 – 38 dB(A) (standard fauna)
Location R2 – Southerly Receivers (14:45 – 15:00)				
61.3	54.3	50.5	37.0	No industrial noise observed Passage of traffic ≈ 64 – 65 dB(A) (truck) & ≈ 54 – 55 dB(A) (car) Local fauna sporadically observed – short term noise levels of 40 – 45 dB(A) observed STEADY STATE ≈ 35 – 37 dB(A) (minimum) STEADY STATE ≈ 38 – 42 dB(A) (standard traffic)

No industrial noise was noted during the attended noise monitoring program.

TABLE 30: UNATTENDED NOISE MONITORING

Measured Background Noise Levels – Unattended Noise Monitoring (values expressed as dB(A))						
Date	Average L_{Aeq} Noise Level			Assessment Background Noise Level – L_{A90}		
	Day (7am – 6pm)			Day (7am – 6pm)		
	Location A SW'ly Receivers	Location B S'ly Receivers	Location C SE'ly Receivers	Location A SW'ly Receivers	Location B S'ly Receivers	Location C SE'ly Receivers
Friday – 28/09/2001	52.6	54.9	48.7	31.5	28.0	28.5
Saturday – 29/09/2001	51.3	52.2	46.6	32.9	30.9	31.0
Sunday – 30/09/2001	51.3	53.9	46.3	33.5	32.5	30.5
Monday – 01/10/2001	50.3	53.4	58.6	32.5	31.2	31.0
Tuesday – 02/10/2001	52.4	55.0	50.3	33.7	32.8	31.2
Wednesday – 03/10/2001	54.8	55.5	52.9	34.5	37.3	32.3
Thursday – 04/10/2001	50.1	54.1	na	31.3	29.0	na
Friday – 05/10/2001	52.1	55.4	na	30.5	29.0	na
Saturday – 06/10/2001	60.5	54.6	na	33.0	32.0	na
Sunday – 07/10/2001	56.0	58.6	na	39.1	37.6	na
Median Value	**52.4**	**54.9**	**50.3**	**32.9**	**31.2**	**31.0**

16.4.5 Project Specific Noise Limits

Noise limits for the development can now be established based on the guidelines provided in the NSW INP and the measured background noise levels. In measuring existing ambient noise levels at the residential locations, and including amenity limits, any potential cumulative impacts will be accounted for. The measured noise levels and the observations presented demonstrate the local industrial noise sources are not influencing the existing ambient noise environment for those receivers with a direct line of site to the proposed operational areas.

Project specific noise limits presented are based on the results of the background noise monitoring at the resident to the site and the requirements outlined by the NSW EPA. The selected criteria and calculated limits are presented in Table 31, below:

TABLE 31 PROJECT SPECIFIC RESIDENTIAL NOISE LIMITS

(VALUES EXPRESSED AS DB(A))

Receiver	Indicative Noise Amenity Area	Period	Acceptable Noise Level	Measured L_{Aeq}	Measured L_{A90}	Intrusive Limit ($L_{Aeq,15minute}$)	Amenity Limit † (L_{Aeq})
R1 (south west)	Rural	Day	50	52.4	32.9	38	50
R2 (south)	Rural	Day	50	54.9	31.2	36	48
R4 (south east)	Rural	Day	50	50.3	31.0	36	50

NOTE - results of unattended noise monitoring program used to establish project-specific noise limits

† - the criterion was established based on the measured L_{Aeq} – 10 dB(A) (due to no industrial noise being apparent at the noise monitoring locations).

The limits shown shaded above are the governing noise limits applicable to the proposed site. These limits are for noise emissions without tonal or other annoying characteristics.

Based on the existing ambient noise environment within the vicinity of R1, the slightly higher noise design objective of 38 dB(A) was applied to this single potentially affected receiver. The design objective of 36 dB(A) established for Receiver's R2 & R4 were applied to all other surrounding potentially affected residents. This approach maintains the conservative theme established throughout this assessment.
Further to this, the day time noise design objectives were also applied to the minimal operations apparent during the 6am – 7am shoulder period. Given the short term nature of operations during this time frame, ensuring off-site noise impacts remain below the set noise design objectives will ensure the local acoustic amenity is not compromised.

16.4.6 Predicted Noise Impacts

The noise sources associated with the proposed development have been investigated through discussions with the proponent and inspections undertaken at similarly configured facilities. The primary noise sources associated with the proposal include the use of the stationary plant (on-site processing facility), and mobile sources (such as earthmoving equipment - bulldozer, front end loader etc), and the rock saw.
The octave band sound power levels for the sources identified have been calculated from the on-site measurements of sound pressure levels primarily undertaken by Dick Benbow & Associates at similar facilities. It is recommended that post-commissioning compliance monitoring be undertaken so as to validate all assumptions made within this section of the document. Additional variables, such as annoying characteristics, can also be assessed in detail at this stage and ensured that these are not present. The relevant sound power data is outlined in Table 32.

TABLE 32: OPERATING NOISE LEVELS OF EQUIPMENT

Noise Source Data Sound Power Levels (L_{Aeq})										
Source	**dB(A) / dB(Lin)**	**1/1 Linear Weighted Octave Band Centre Frequency (Hz)**								
		31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Bulldozer	**105.7 / 114.0**	101.4	111.0	106.2	104.3	102.9	102.0	96.8	93.1	83.6
FEL	**111 / 120.4**	112.7	115.3	116.4	108.6	103.7	105.8	105.1	98.4	95.8
Water Truck	**99.7 / 112.7**	-	111.1	106.3	97.9	96.0	95.7	92.0	89.6	84.7
Dump Truck	**101.4 / 108.0**	102.7	100.5	100.7	97.9	99.0	96.9	93.9	87.1	77.3
Excavator Idle – Rock Saw	**104.2 / 108.1**	88.2	104.7	99.7	93.4	93.4	93.6	97.5	100.2	94.0
Rock Saw	**121.0 / 121.0**	96.1	107.9	104.1	102.3	109.1	109.7	114.2	116.5	111.7
Crusher	**95.5 / 104.3**	96.5	94.7	101.3	93.5	93.6	88.8	87.2	83.2	79.0
Conveyor Motor	**91.8 / 108.3**	108.0	91.5	88.2	91.1	89.7	86.7	83.9	78.9	71.6
Power Screen	**106.1 / 106.4**	80	83	87	89	99	104	99	91	81

It should be noted that the rock saw source data was measured during 'dry-cutting'. It is the experience of Dick Benbow & Associated that 'wet-cutting' results in a reduction of noise emission potential. The 'wet-cutting' process is planned to be utilised as part of the sandstone quarry re-development.

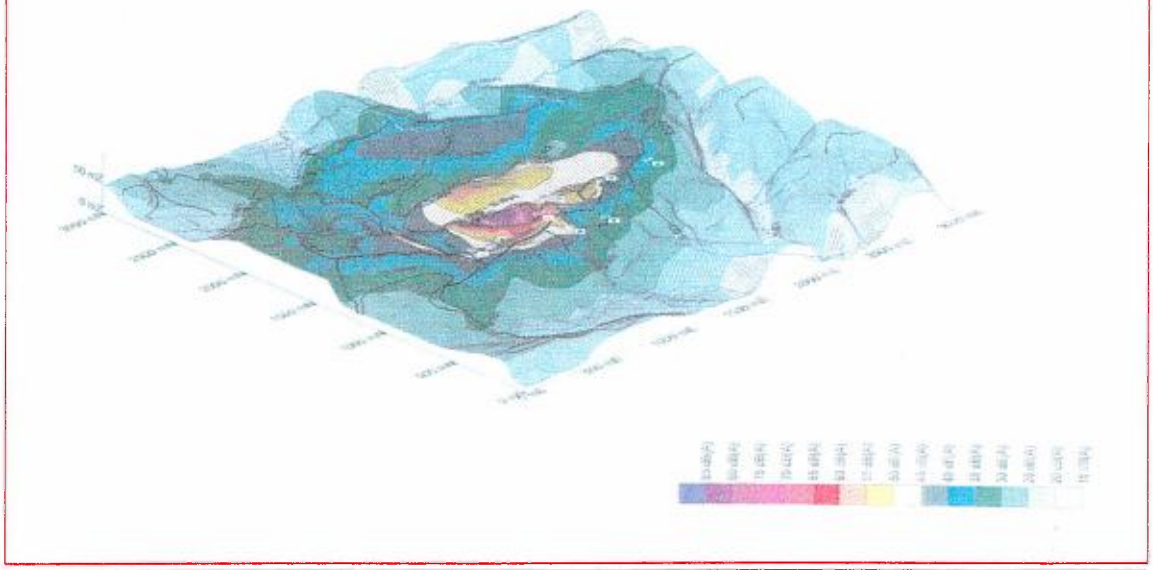
16.4.7 Operational Noise Modelling

Noise emissions from the proposed operations were modelled using ENM for Windows Version 3.06. This model is recognised by the NSW EPA for modelling environmental noise emissions from stationary sources and has been used by DBA on many projects achieving highly accurate and repeatable results.

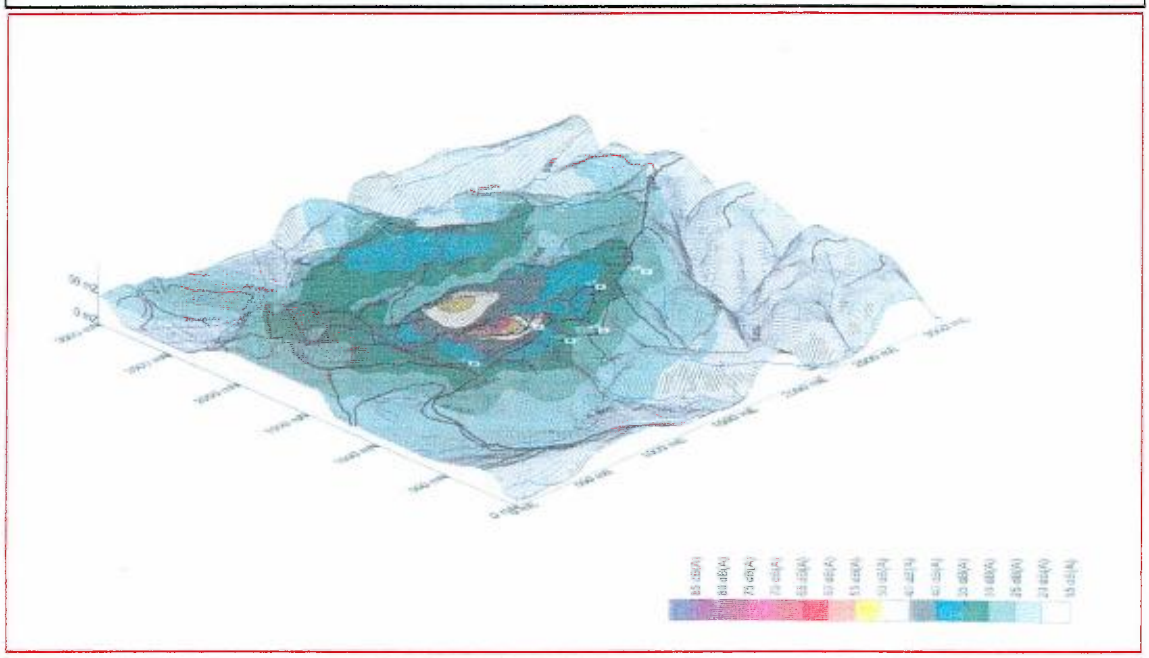
Noise modelling scenarios were developed based on what was considered to be maximum operating conditions during the daytime period. In achieving compliance with the set design objectives under maximum daytime operations, no annoyance to the local community will be apparent. Control options specifically targeting noise emissions from the operations whilst at the surface will need to be implemented for those items exceeding the criterion.
The results of this modelling are presented in Table 33 and illustrated in Figure 30.

TABLE 33: PREDICTED L_{AEQ} POTENTIAL OPERATIONAL NOISE IMPACTS, NO CONTROLS

Meteorological Condition	Receiver Location					
	R1	R2	R3	R4	R5	R6
Daytime Noise Design Objective	38	36	36	36	36	36
Scenario 1a (processing operations)						
Cond. A (Still conditions)	40.5	52.1	35.2	30.7	25.2	30.6
Cond. B (Northerly @ 3m/s)	46.4	55.2	38.3	35.1	29.9	35.4
Cond. C (North E'ly @ 3m/s)	49.0	54.2	32.6	27.0	26.4	33.3
Cond. D (Easterly @ 3m/s)	48.3	52.0	30.3	25.8	22.7	29.9
Cond. E (Westerly @ 3m/s)	36.1	52.1	43.2	0	28.0	31.1
Cond. F (North W'ly @ 3m/s)	38.8	54.2	42.9	43.8	30.7	34.2
Cond. G (Inv. @ 3°C/100m)	44.6	52.6	38.6	35.9	27.1	32.1
Scenario 2a (extraction operations @ surface)						
Cond. A (Still conditions)	47.4	59.1	38.8	33.8	29.4	32.6
Cond. B (Northerly @ 3m/s)	52.2	61.0	41.7	38.4	33.9	37.9
Cond. C (North E'ly @ 3m/s)	55.3	60.0	28.6	24.7	30.0	35.1
Cond. D (Easterly @ 3m/s)	54.6	57.7	26.7	23.0	26.0	36.7
Cond. E (Westerly @ 3m/s)	42.5	59.6	48.9	48.4	32.9	33.9
Cond. F (North W'ly @ 3m/s)	46.0	60.8	47.2	47.8	35.4	37.3
Cond. G (Inv. @ 3°C/100m)	47.9	57.6	42.0	39.1	31.2	34.0
Scenario 2b (extraction operations @ depth)						
Cond. A (Still conditions)	36.5	45.1	31.9	27.2	27.3	31.4
Cond. B (Northerly @ 3m/s)	38.9	48.8	33.0	28.6	31.4	35.0
Cond. C (North E'ly @ 3m/s)	41.1	47.0	29.3	24.8	27.8	33.1
Cond. D (Easterly @ 3m/s)	40.3	44.1	27.3	23.1	24.5	34.6
Cond. E (Westerly @ 3m/s)	33.3	45.9	36.8	33.1	30.5	32.3
Cond. F (North W'ly @ 3m/s)	35.6	48.3	36.2	32.4	32.6	34.6
Cond. G (Inv. @ 3°C/100m)	37.7	46.1	33.0	29.2	28.5	32.0



Noise Contours with no Controls



Noise Contours with Controls

HARVEST SCIENTIFIC SERVICES

Figure 30

Cattai Sandstone Quarry

NOISE MODELLING

Nepean Quarries Pty Ltd

Table 33 (continued):

Meteorological Condition	Receiver Location					
	R1	R2	R3	R4	R5	R6
Daytime Noise Design Objective	38	36	36	36	36	36
Scenario 3a (processing + extraction @ surface)						
Cond. A (Still conditions)	48.2	59.9	40.4	35.5	30.8	34.7
Cond. B (Northerly @ 3m/s)	53.2	62.0	43.3	40.1	35.4	39.8
Cond. C (North E'ly @ 3m/s)	56.2	61.0	34.1	29.0	31.6	37.3
Cond. D (Easterly @ 3m/s)	55.5	58.7	31.9	27.6	27.7	37.5
Cond. E (Westerly @ 3m/s)	43.4	60.3	49.9	49.9	34.1	35.7
Cond. F (North W'ly @ 3m/s)	46.8	61.7	48.6	49.3	36.7	39.0
Cond. G (Inv. @ 3°C/100m)	49.6	58.8	43.6	40.8	32.6	36.2
Scenario 3b (processing + extraction @ depth)						
Cond. A (Still conditions)	42.0	52.9	36.9	32.3	29.4	34.0
Cond. B (Northerly @ 3m/s)	47.1	56.1	39.4	36.0	33.7	38.2
Cond. C (North E'ly @ 3m/s)	49.7	55.0	34.3	29.0	30.2	36.2
Cond. D (Easterly @ 3m/s)	48.9	52.7	32.1	27.7	26.7	35.9
Cond. E (Westerly @ 3m/s)	37.9	53.0	44.1	44.7	32.4	34.8
Cond. F (North W'ly @ 3m/s)	40.5	55.2	43.7	44.1	34.8	37.4
Cond. G (Inv. @ 3°C/100m)	45.4	53.5	39.7	36.7	30.9	35.1

Comments

Significant potential off-site noise impacts were noted for R1 and R2. In particular, noise impacts as associated with the mobile noise sources. The short-term use of the rock saw was also noted as being a primary contributor to the predicted noise levels for R2. These predicted impacts are expected to be significantly reduced by the application of mitigation measured described below.

16.4.8 Measures to Ameliorate Noise Impacts

Based on the DBA assessment, a number of procedures will be undertaken to achieve the desired noise levels both in the near and long term. These will include the following;

Site-Specific Earth Berms

Berm placement will be required at key areas throughout the site. It is anticipated the berm shaping and placement will require further refinement (in the form of a site-specific environmental noise management plan) during the operations. The requirements for berm placement will be reviewed in conjunction with the implementation of an acoustically treated front end loader and / bulldozer and further noise testing.

Wherever possible, screening operations will be undertaken directly adjacent the stockpiles on site. Shielding the screening operations will result in a substantial reduction for adverse off-site noise impacts.

- Processing Area: The berm will be required to be a minimum of 3 metres higher than the existing R.L. surrounding the processing plant along the western to eastern vectors. It may be possible to utilise stockpile material for noise attenuation within this area. However, the stockpiles will need to be continuous and of sufficient height so as to provide an acceptable acoustic shadow zone.

- Extraction Cells: The berm will be required to be a minimum of 5 metres higher than the existing R.L. An R.L. + 3 metre berm will also be required immediately to the north of Receiver 2 (worst case impacted resident). However, the practicality and acoustic benefits of this berm is expected to require additional consideration prior to final placement. It is expected that negotiations will need to be held with the receiver prior to site commissioning.

- Rock Saw Operations: Additionally, it is recommended that the rock saw be operated adjacent a 2 metre high berm while cutting. Although the use of the rock saw will be limited, the acoustic impacts associated with its use are potentially significant. It is recommended that acoustic shielding is provided as close as possible to the rock saw operations. The shielding should be configured so as to direct noise away from the southerly located receivers. Adherence to this aspect will be critical when the rock saw is elevated and cutting sandstone along an exposed bench.

- The rock saw operations should also be carried out through the use of the 'wet-cutting' technique. Preliminary measurements undertaken by Dick Benbow & Associates indicate that reduced noise emissions are apparent. Values of 10 – 12 dB(A) were noted. A value of 5 dB(A) has been conservatively assumed as part of the re-modelling procedures. It is recommended that a post commissioning noise source validation program be undertaken in order to verify this. Factors such as any annoying characteristics can also be readily determined at this stage.

- Mobile Sources: Whilst at the surface, the front end loader and bulldozer should also be operated with the exhaust facing away from the nearest potentially affected receivers. The use of the bucket as an acoustic shield has been used with success on similar sites in the past. This will increase the total noise attenuation achieved from the on-site operations. These are additional safeguard measures which not been relied upon in the calculation of predicted noise levels.

- Acoustic Treatment of Mobile Sources: The front end loader operated throughout the site will require the application of an acoustic grade muffler as well as insulation of the engine block. The final degree of noise control applicable to this assumed continuous noise source can be refined (and possibly reduced) upon completion of several noise source validation measurements. An 5 dB(A) reduction has been assumed as part of the re-modelled results presented within Section 7.3. It is the experience of Dick Benbow & Associates that noise reductions of up to 8 dB(A) are achievable upon acoustic treatment of mobile sources. Largely dependent on the results of the post-commissioning noise source validation measurements, acoustic treatment may also need to be applied to the sites' water truck.

Management Practices

It is essential for industrial sites located within the vicinity of residential areas to actively manage noise emissions and to minimise any potential problems. In addition to the noise control options outlined above, the following management practices and noise mitigation techniques are to be implemented during the operational phases of the proposed site.

Adherence to each factor detailed below is critical to the continued long-term successful operations of the site.

Extraction Techniques

The proponent is to be encouraged to use the extraction cell technique as a means of facilitating acoustic shielding around worked extraction areas. Dick Benbow & Associates were involved in the development of this technique and have observed the effectiveness of the method on reducing noise from extraction equipment. The technique was developed primarily for extraction using an excavator / front end loader. It will be possible to develop the extraction process in a manner which maximises the use of the working face for shielding.

Extraction should be oriented such that the working face provides some shielding for the residences to the south of the site. This will also ensure that the exhaust outlets of the equipment will rarely point towards the residences. This technique should also be applied during the short-term placement and shaping of the berms – planned to be undertaken through the use of a bulldozer. This technique will need to be applied when in the vicinity of the southern boundary.

Reasonable Work Practices

Given the nature of on-site operations, and the predicted noise levels under worst-case operations, care should be taken when mobile auxiliary equipment is operated within exposed areas of the site. Unnecessary revving, or extended periods of 'noisy' work time, are to be avoided.

Auxiliary Mobile Equipment

The calculations showed that the auxiliary equipment such as the manoeuvring of the transport trucks / excavator are potentially a significant contributor to noise emissions from the site when operating on the exposed internal access areas. Truck drivers entering and leaving the site will be employees. As such, site management are to ensure all drivers consider the community where possible. Furthermore, site management are to ensure that all equipment accepted on to the site complies with the relevant regulations and guidelines in regards to noise emissions. In particular, care should be taken to ensure all road transport trucks conform to the NSW EPA set noise control guidelines.

Speed limits are to be applied throughout the site. As consistent with the dust impact assessment completed for the proposal, a 10 km/h maximum speed is not unreasonable to apply to the site. For the purposes of re-modelling, a 5 dB(A) noise reduction has been applied to all on-site road transport trucks travelling at the set site-specific speed limit.

Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA)

The adoption of BMP and BATEA practices are encouraged by the NSW EPA and are specifically addressed in the Industrial Noise Policy. BMP includes some of the factors discussed within this section but also includes the encouragement of a general staff attitude to reducing noise emissions. All staff are to be aware of the problems associated with noise.

Equipment Selection

BATEA involves the incorporation of the most advanced and affordable technology to minimise noise emissions. All plant is to be selected after considering noise emissions from the items of equipment.

Noise emissions should be an important consideration when selecting equipment for the site. All equipment is to be well maintained including mufflers, enclosures, bearings, etc, in order to ensure unnecessary noise emissions are eliminated.

Compliance Monitoring / Source Noise Level Validation

As part of the site's Best Management Practice (BMP) principles, it is recommended that post commissioning noise monitoring be undertaken. The noise compliance monitoring will ensure that any assumptions made in the modelling are verified and will also allow an opportunity for liaison with the local community. Factors such as annoying characteristics associated with the site-related noise emissions can be assessed in detail at this stage.

A post commissioning study that includes monitoring of residential and boundary noise levels will establish a history of noise emissions, prove that the site is diligent in monitoring emissions, highlight areas where noise control is required and assist in supporting future development plans.

Long-term noise monitoring is also beneficial for assessing any 'creep' effects associated with site-related noise sources. Creep effects usually occur due to deteriorating equipment/machinery and/or employee complacency or varied operating practices. During the compliance monitoring program initiated for the site, assessment of the noise emissions will be assessed in detail. Adherence to the relevant NSW EPA legislation will be required.

On-going environmental management of the quarry will see additional measures being undertaken to reduce noise wherever possible and practicable. Some of these measures include:

- Shielding crushing and screening facilities closer to quarry walls and/or deeper in the quarry floor and using stockpiles as additional screening;
- Requiring trucks entering and leaving the site to travel at slow speeds (30km/hr) when entering and leaving the site;
- Ensuring exhaust mufflers are maintained to limit tonal noise emissions; and
- Design and grade access roads to prevent unnecessary noise from empty trucks.

16.5 Remodelled Noise Results

The model was re configured with the above listed site-specific noise controls in place.

TABLE 34: PREDICTED L_{AEQ} POTENTIAL OPERATIONAL NOISE IMPACTS, WITH CONTROLS

Meteorological Condition	Receiver Location					
	R1	R2	R3	R4	R5	R6
Daytime Noise Design Objective(dB(A))	38	38	36	36	36	36
Scenario 1a (processing operations)						
Cond. A (Still conditions)	31.4	35.9	31.7	26.3	21.8	26.4
Cond. G (Inv. @ 3°C/100m)	33.8	37.0	33.7	29.8	23.8	28.1
Scenario 2a (extraction operations @ surface)						
Cond. A (Still conditions)	32.0	37.4	26.6	22.1	24.1	27.4
Scenario 2b (extraction operations @ depth)						
Cond. A (Still conditions)	26.4	33.0	21.0	16.3	22.2	25.6
Scenario 3a (processing + extraction @ surface)						
Cond. A (Still conditions)	34.7	38.6	32.9	27.7	26.1	29.9
Scenario 3b (processing + extraction @ depth)						
Cond. A (Still conditions)	32.6	36.0	32.0	26.7	25.0	29.0

As can be seen, significant reductions in the potential for off-site noise impact have been achieved. These results are illustrated in Figure 30.

Comments

The set criterion was generally noted as being achieved throughout. Significant potential for exceedance was noted for R2 (located immediately to the south), with the set criterion being marginally infringed for during specific worst case operating scenarios only. However, the following points are to be noted:

- The potential for 'prolonged' exceedance of the set noise design objective was noted for the southerly receivers during the works with extraction area surface establishment only.
- The nature of the existing site contours dictate that the implementation of additional acoustic berms for the acoustic protection of R2 would not be possible.
- If possible, site management should investigate the possibility of restricting the operating times while undertaking the initial surface works. Limiting excessive noise emissions to 'louder' periods of the day (such as between 10 am – 4pm) may aid in reducing the potential for off-site residential annoyance.
- As the works progress to a lower R.L., additional attenuation would be achieved. As such, the statistical equivalent of noise design objective infringement would significantly reduce.

- The existing ambient noise levels for the southern receivers are such that the proposed surface extraction works would be expected to be either inaudible to barely audible for short periods of time only.

- The extensive acoustic controls are expected as being both reasonable and feasible for the site. Significant reductions were achieved upon implementation of the extensive acoustic control options.
- A worst case conservative approach was adopted as part of the modelling conducted. As such, the presented values are considered as being within the acceptable limits of error.
- Upon implementation of the recommended source controls/management practices, significant reductions in the potential for adverse off-site noise impacts have been achieved.
- The recommended management practices, and development of a noise management plan (including corrective actions and noise abatement procedures) would further reduce the potential for adverse off-site noise impact.
- The noted exceedances of the conservatively set criterion for R2 were noted as primarily caused by the operations of the rock saw (noise impacts of approximately 33 dB(A) were predicted). This source will not be constantly in operation, with several site-specific noise control options recommended during the machinery's short-term use. Prior to post commissioning noise compliance and noise source validation programs, site management should inform the local community of any proposed sandstone cutting works. Additionally, the sandstone cutting operations should be time tabled so as to ensure early operations (preferably prior to 10am) do not take place.
- A community consultative programme should be undertaken in accordance with the guidance provided within the NSW EPA's INP. Such a programme would assist in the management of potential off-site annoyance during the short term surface works.

16.6 Conclusions

Based on the results of the noise assessment, several site-specific noise abatement techniques and management practices have been detailed. Upon implementation of the required controls, site operations can be reasonably expected to be inaudible to barely audible throughout the local community, due to the nature of the existing ambient noise environment, during the day time period (Monday – Friday).

The worst case (conservatively based modelling) has shown that slight exceedances were noted for the isolated receivers located immediately to the south only (Receiver R2). However, the elevated levels were generally apparent during surface works only. The results indicated that the extraction operations progress, additional noise attenuation will be achieved.

It should also be noted that surface works within each extraction cell would only be present for an estimated 2 – 3 week period. Based on this, the restriction of operating times within this area for the short duration of rehabilitation will be required to be considered by the proponent. Restricting the 'noisy' activities will significantly reduce the potential for off-site annoyance.

With the implementation of the recommended control options and operating regimes, and the inclusion of specific on-site management practices, noise emissions from the site are considered to comply with the broad objectives and guiding principles as set within the current NSW EPA guidelines, and will not be expected to cause annoyance to the local community. The use of the cell extraction technique for sand/sandstone operations in close proximity to residential areas has been used with success by other proponents in the nearby town of Maroota and elsewhere.

SECTION 17 TRAFFIC ASSESSMENT

17.1 Introduction

A traffic assessment was carried out to determine current traffic levels in the local area, and evaluate the impact that the proposal may have on the local and regional traffic environment. Sandstone will initially be extracted at a rate of between 10,000 and 20,000 tonnes per month, dependant on the overall demand for sandstone products. The following traffic statistics are based on a the maximum monthly figure.

The main issues addressed by this assessment included the following:

- Existing traffic volumes on the local roads utilised by the quarry traffic;
- Likely hourly and daily heavy vehicle movements generated by the quarry;
- Proposed access to and from the site;
- Standard of roads in the area;
- Potential increases in volumes of traffic and heavy vehicles in the area as a result of the proposal; and
- Safety issues

Additional requirements were set out by the Roads and Traffic Authority (Appendix 2).

17.2 Available Traffic Data

17.2.1 Local Traffic Levels

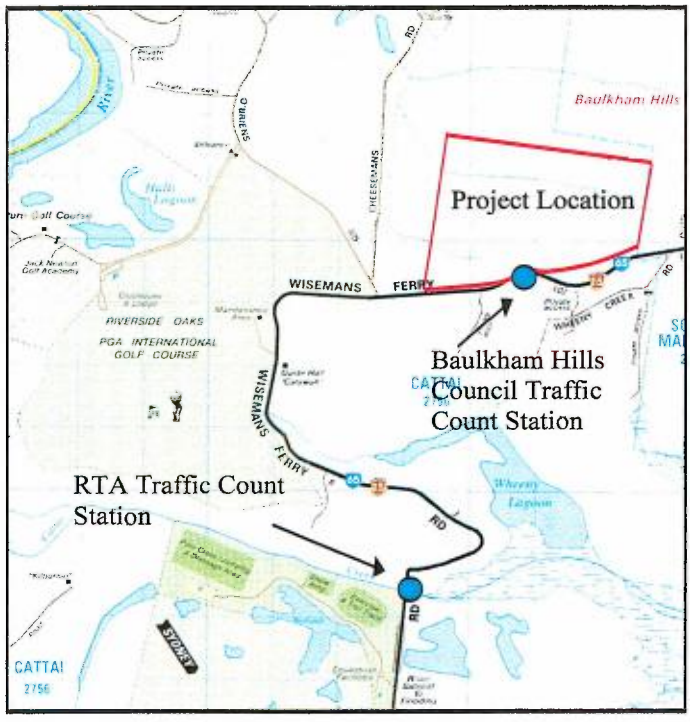
Figure 31 illustrates the regional road network and the position of a Roads and Traffic Authority (RTA) measuring station where counts were recorded over a 52 week period in 1999. Also shown is the location of the Baulkham Hills Shire Council measuring station, where counts were recorded between the 5th and 13th of September, 2001. This survey is attached as Appendix 8. The Average Daily Traffic (ADT) flows from each count location are presented in Table 35.

TABLE 35: EXISTING DAILY TRAFFIC FLOWS – WISEMANS FERRY ROAD

Location	ADT	Percentage of Heavy Vehicles
Pitt Town Road, McGraths Hill (RTA, 1999)	11531	Not Available
Wisemans Ferry Rd, Cattai Ck Bridge (RTA, 1999)	2428	Not Available
Wisemans Ferry Rd, outside Quarry site (BHSC, 2001*)	1552	13

* Traffic count conducted by Baulkham Hills Shire Council, September 2001 – see Report 4, Volume 2. Monday to Friday count shown.

From Table 22, 13% (or 202 movements) of all traffic movements can be attributed to Heavy Vehicles (of the same type and style to be used by the Company).



Location of Traffic Count Stations

Existing and Predicted Traffic Movements on Wisemans Ferry Road (outside quarry entrance)

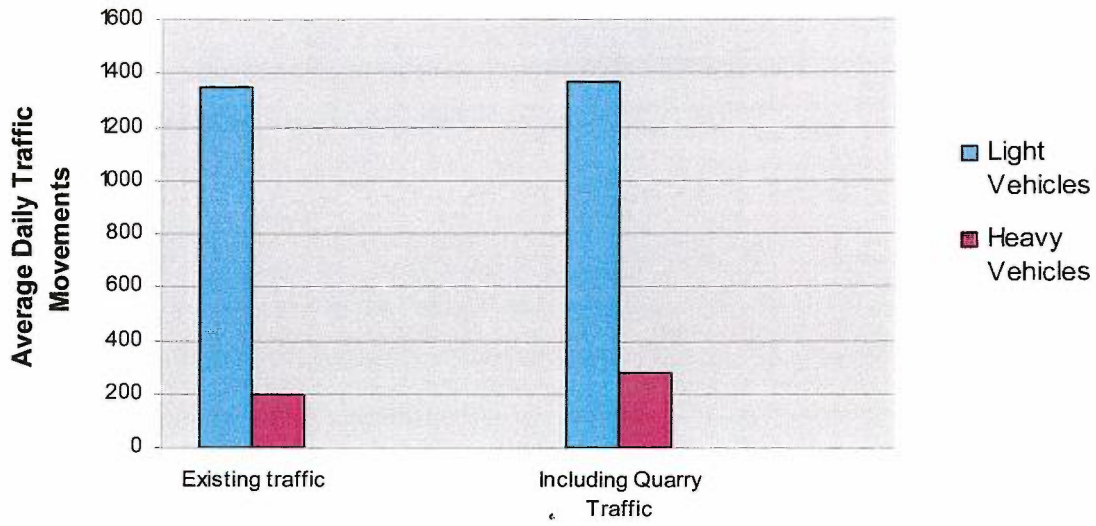


Figure 31

Cattai Sandstone Quarry

TRAFFIC INFORMATION

Nepean Quarries Pty Ltd

17.3 Potential Traffic Levels

Based on survey data for other quarries of a similar scale operated by the proponent, the amount of sandstone products exported from the site will vary from month to month, with anywhere between 2,000 to 20,000 tonnes being produced. It is estimated that at least 90% of trucks entering the quarry will have a 28 tonne capacity although the average weight of each load leaving the site will be approximately 25 tonnes. These are typically type 7, 8 and 10 type vehicles according to the AUSTROADS Vehicle Classification 1994 (RTA, 1994).
Potential traffic levels have been calculated on a worst case scenario of 20,000 tonnes of sandstone products being exported during any one month. Utilising the traffic survey data collected by Baulkham Hills Shire Council, this level of production would result in approximately 1,600 truck movements per month, which translates to approximately 72.7 (say 73) movements on a daily basis. A breakdown of the potential daily and monthly traffic movements are outlined in Table 36.

TABLE 36: ESTIMATED AVERAGE MAXIMUM DAILY VEHICLE MOVEMENTS

Vehicular Movements			
Type of Vehicle		Frequency of Vehicle Movement	
		Daily	Monthly
Haulage Trucks	3 Axles - Articulated or larger	73	1600
Employee Vehicles & Other	2 Axles – Passenger Type	12	264
Total (Estimated) Movements		**85**	**1864**

*Movements per day means vehicle travelling in or out of quarry site

The above figures are averaged over the year based on 5.5 working days per week. Actual daily and monthly figures may vary due to times the quarry may be closed for public holidays, inclement weather, or other reasons.

17.4 Transport Routes

The main transport routes for the proposed operations are as follows:

- Trucks will exit the site onto Wisemans Ferry Road and travel west then south;
- Vehicles will then head south along Wisemans Ferry Rd where it becomes Cattai Road and then Pitt Town Road;
- At the intersection of Windsor Road, approximately 80% of trucks will turn left and travel towards Blacktown (pers. comm. Nepean Quarries Pty Ltd)

Hence, access onto Wisemans Ferry Road will continue at the same location that was utilised for the previous operation. All trucks will enter and leave the quarry from a westerly direction.

17.5 Assessment of Traffic Survey Results

Approximately 90% of existing traffic utilising Wisemans Ferry Road is represented by passenger-type vehicles, with average daily traffic flows outside the quarry of approximately 1550 vehicles (Monday to Friday). Of this traffic, around 13% can be attributed to heavy vehicles, some of which are assumed to operate out of quarries at Maroota (Table 35).

For Wisemans Ferry Road, an increase of approximately 26% will be attributed to the quarry with respect to heavy vehicle movements and 5% with respect to all traffic movements.
The projected contribution from quarry traffic will drop to approximately 0.73% when the vehicle count (RTA) on Pitt Town Road at McGraths Hill is applied (Table 35).

On a day to day basis, traffic volumes relating to the quarry will vary. On some days there will be no traffic from the quarry, and other days, at times of peak demand, there may be twice the regular volume of traffic.
It should be noted that Wisemans Ferry Road is a transport link for numerous sand extraction operations in the Maroota area, which contribute to the majority of heavy vehicles movements along this road.

TABLE 37: COMPARISON BETWEEN EXISTING AND PREDICTED TRAFFIC LEVELS ON WISEMANS FERRY ROAD

Average Daily Vehicle Movements outside Quarry	Total Vehicle Movements	Total Heavy Vehicle Movements	% Contribution to Total Local Traffic	% Contribution - Total heavy Vehicles
Existing Wisemans Ferry Road Traffic	1552	202	-	-
Predicted Quarry Component	85	73	-	-
Total	1637	275	5.2	26.5

* Based on statistics gathered during traffic survey, September, 2001. Monday to Friday count only.

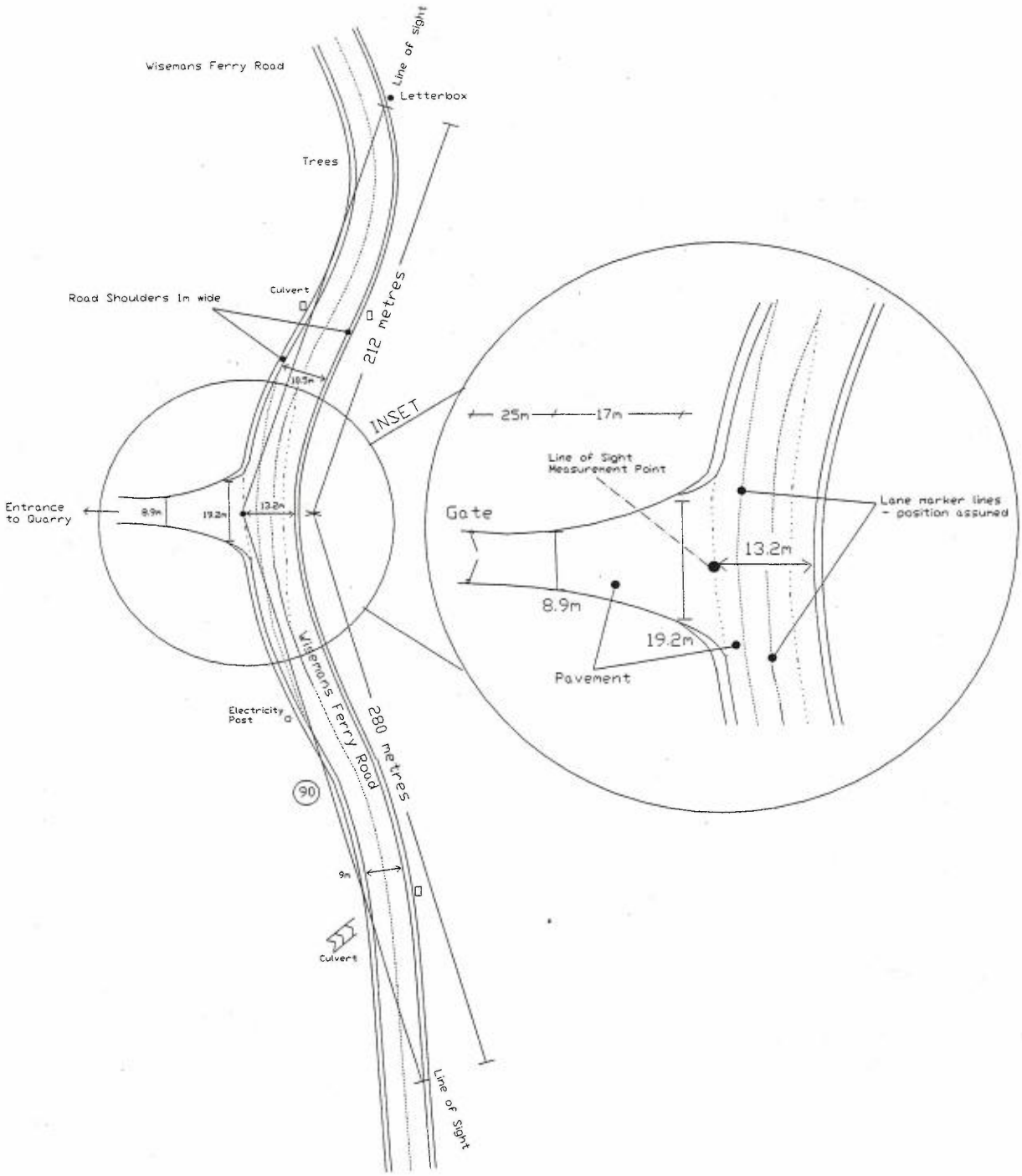
The above data is graphically depicted in Figure 31.

17.6 Quarry Entrance

The entrance to the quarry is off Wisemans Ferry Road, just past the entrance to the Riverside Oaks golf course. This will remain the only entrance point for the life of the operation. The access road is sealed from the intersection to the edge of the quarry and trucks approaching Wisemans Ferry Road from within the quarry have reasonable visibilities to both the east and west. Details of the entrance are illustrated in Figure 32 and Plates 30 to 33.

17.7 Road Conditions within Baulkham Shire Council

It is noted that in the traffic survey conducted by Baulkham Hills Shire Council (Appendix 2) the speed limit at the site is quoted to be 80km/hr and it is this speed used in the histogram shown. However, the existing speed limit at the site (as indicated by roadside signage), is 90kilometres/hour with information from the traffic survey indicating that 76% of vehicles travel under 80km/hr with an estimated 95% under 90km/hr. The average speed recorded outside the site being 74km/hr. Guidelines for safe traveling speeds and sight distances between vehicles is described in the Austroad standard (RTA, 1994).



Note: Diagram not to scale

Figure 32

Cattai Sandstone Quarry

QUARRY ENTRANCE

Nepean Quarries Pty Ltd

Plate 30 **Entrance to quarry looking east along Wisemans Ferry Road and showing recent work.**

Plate 31 **View from entrance to quarry facing west along Wisemans Ferry Road.**

Plate 32 **View of the approach to the quarry from the west. Allowance has been made for truck turning lanes but these were not yet marked at the time of writing.**

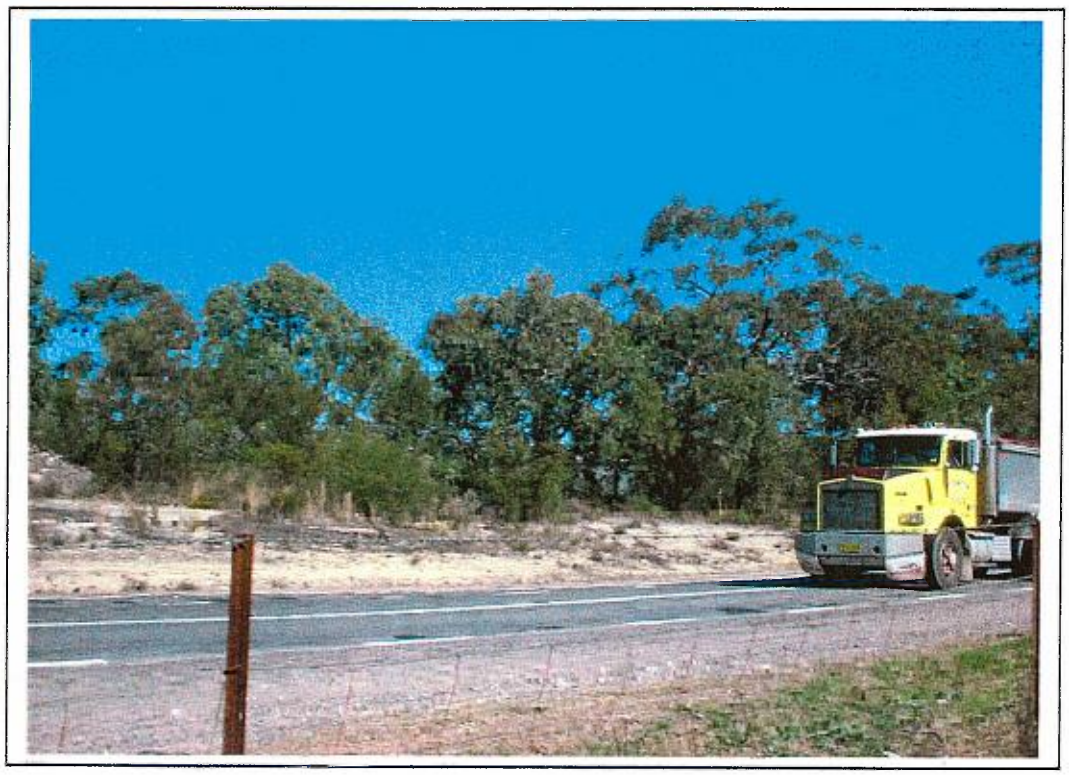


Plate 33 **Truck on Wisemans Ferry Road near quarry entrance.**

Wisemans Ferry road is currently being upgraded (June 2002) with the road being widened and new pavement being applied. In the vicinity of the quarry entrance, the road has been widened to accommodate turning lanes on both sides of the road. The lanes had not yet been marked out at the time of writing, and the anticipated appearance of the lanes as illustrated in Figure 32 is indicative only. Road conditions within close proximity of the quarry were examined with respect to the applicability of the guidelines. The two main criteria are:

Approach Sight Distance (ASD) – This is the minimum requirement to provide the driver of a vehicle adequate distance to observe the roadway layout, including pavements markings etc, in sufficient time to react and stop if necessary before entering the conflict area.

Safe Intersection Sight Distance (SISD) – This is the minimum standard which should be provided on a major road. It provides sufficient distance for an approaching vehicle to decelerate to a stop if a vehicle on a minor road enters onto the road in a collision situation.

For vehicles travelling along Wisemans Ferry Road the Speed limit is 90km/hr. The required ASD and SISD sight distances are presented in Table 38.

TABLE 38: SIGHT DISTANCE CRITERIA*

Pavement Design Speed limit km/hr	ASD Metres	SISD Metres
70	85	140
90	130	210

*Extracted from Austroads Tables 5.1, 5.2 and 5.3 from Part 5, Intersections at Grade

The limit of Sight Distance for the southern approach is approximately 280 metres and the northern approach approximately 212 metres. The SISD available on each approach to the quarry entrance complies with the current Austroads standard.

17.8 Potential Impacts

It is concluded that the proposal does not involve a significant increase on existing volumes of general traffic utilizing Wisemans Ferry Road. However, there will be a moderate increase in the number of heavy vehicles utilizing this road which will be dependent on extraction rates. The rate of sandstone extraction in turn will be governed by supply and demand factors, which will be the principal influence on volume of sales.

The impact of the operations on the general amenity of the area should be gradual, as production is slowly increased approaching the target level. This may take up to twelve months, with the development of a market for the products the primary factor in output volumes.

The potential impacts of the traffic on the nearby residential areas should also be limited due to the low density of residential development in the general area. In addition, the existing volumes of heavy vehicles utilising the main road is, in comparison to the potential contribution from the quarry, relatively high. Hence, the re-commencement of production at Cattai should not be all that noticeable.

Based on the above assessment, a local area Traffic Management Plan is not considered necessary. In addition, these low traffic levels indicate that there is no potential for an increase in toxicity levels of loads transported on arterial or local roads and consequently, the preparation of a pollution incident management strategy is not appropriate.

The main issues raised by the community relate to road safety and damage to roads in that additional trucks on local roads will have potential to impact on the safety of other users of the road. Such an observation is true for any traffic generating activity. Furthermore, increased traffic will generate further wear and tear on the road system, which ultimately has to be paid by local and state government agencies who act on behalf of all ratepayers.
It is however considered that if the project is deemed to be justified these issues become matters for management, both by the regulatory agencies as well as the Company.

17.9 Controls & Safeguards

In response to general community concerns about increased traffic on local roads, the following recommendations are made as a result of the traffic assessment, viz:

- That the speed limit in the vicinity of the quarry be lowered to 60 km/hr;
- All drivers contracted to haul material for the Company be advised of the need for safe operation at all time;
- additional signage be erected highlighting the quarry entrance

A traffic protocol is to be established for the quarry, with all operators, employees and contractors made aware of conditions. Such conditions will include allowable operating hours for the quarry, the establishment of 'drive friendly' procedures, including limiting of exhaust braking, and maintenance of exhaust systems on trucks. *Give Way, Stop* signs and other appropriate warning signs will be installed in the vicinity of the quarry entrance, and the access road will be maintained to minimise excess noise created by empty trucks encountering potholes and uneven surfaces.
The impact of heavy vehicles on the local roads is likely to have a cumulative effect on the pavement quality, and for this reason a Section *94* contribution should be levied on the operation by Baulkham Hills Shire Council. In other localities, this charge is $0.65 per tonne and it is considered that this is an appropriate level for this operation. This contribution should then be applied solely to Wisemans Ferry Road. At an extraction rate of 20,000 tonnes per month, the amount of funding available from this source would be $156,000 per year. Such a figure should be adequate to cover on-going maintenance of the road within the Shire boundaries.

17.10 Conclusions

It is concluded that the proposal does not involve a significant increase on existing traffic volumes but does represent a moderate increase in heavy vehicular movements utilising Wisemans Ferry Road. The rate of sandstone extraction will be governed by supply and demand factors, which will be the principal influence on volume of sales.
With the application of suitable traffic controls and safeguards, the impact of traffic on the existing infrastructure and local amenity will be minor. Implementation of the *Traffic Management Protocol*, with regular revision of the effectiveness of traffic management safeguards and the cumulative impact of the project on the transportation network will be an essential component of ongoing Environmental Management.

SECTION 18 LAND OWNERSHIP AND LANDUSE

18.1 Existing Landuse

Immediate Quarry Area

The site's current land use is currently limited to dormant bushland containing the remnants of extraction activities which ceased several years ago. That portion of the land fronting Wisemans Ferry Road has been partially developed for residential use and remains little changed from its earliest settlement.
The quarry area dominates the landscape within the property boundaries – however, given its location downslope from the Wisemans Ferry Road and the remnant tree screening that already exists, there is little evidence of the quarry's presence for the casual observer driving along Wisemans Ferry Road.

Surrounding land usage

Landuse in the surrounding district is varied. Bushland still dominates the regions around the quarry but is sprinkled with a number of varied land uses. The developed land consists of recreation facilities, including several golf courses located to the east of the Project Area (Figure 2). Other land uses include public reserves, wetlands and recreation areas including the Cattai National Park, located approximately 5 kilometres to the south–west of the project area. Small-scale agricultural enterprises and rural-residential areas are also located within close proximity to the site.

18.2 Existing Ownership

Site Ownership and Residences

The site comprises Lots 1-5 DP 240610, Wisemans Ferry Rd, located approximately 4kms north of Cattai post office. The total Project area is around 54 hectares and is divided into 5 lots each of about 10.8 ha and owned by interests associated with the Curran and Westland Families. Nepean Quarries Pty Ltd and the owners of Lots 1-5 have executed a licence agreement which enables the Company to extract sandstone from the entire Project area.

Several family members live on the property, with the location of these residences depicted in Figure 6 as Residences R7 to R11. These residents are located in close proximity to the proposed extraction boundary, and all support the project.

The freehold title on the land is limited to a depth of 15.24 metres, below which the land is owned by the Crown. The extraction proposal has been designed around this constraint and hence no extraction is to take place below 15 metres from the natural surface.

Surrounding Land Ownership and Residences

All of the land in the vicinity is freehold, with rural-residential and commercial holdings located in close proximity to the project area. Land ownership and zoning is outlined in Figure 14 and Table 39.

TABLE 39: OWNERSHIP OF RESIDENCES LOCATED IN CLOSE PROXIMITY (400M) TO THE QUARRY

Residence Number	Lot/DP	Owner (s) Surname	Approximate Distance to Proposed Quarry Boundary
R1	71A/414946	Farraway	200m
R2	As Above	Marance	150m
R3	102/601198	Williams	250m
R4	1/507771	Gendle	350m
R5	677/1010494	Young & Bain	750m
R6	2/585842	Hughes	180m
R7-11	1-5/240610	Curran and Westland Family	varied

18.3 Future Land uses

Potential future land uses for the quarry site are potentially many once the extraction area is revegetated and landscaped. Possible alternatives may include:

- Park and playing fields (or similar recreation);
- A storage area/depot for bulky goods;
- A shooting range;
- Industrial facility/factory site.

However, based on the current need for rehabilitation to follow very closely the extraction process, the entire quarry site will be more or less revegetated at the end of the quarry life. It is thus proposed that this revegetation be retained - therefore rendering the future lands use for the entire site to a bushland setting. Any chages to this landuse will require a new development application after all quarrying and rehabilitaiton activities have ceased and the Company no longer has an interest in the land.
Future land uses for the general area will include the continued development of rural residential dwellings, hobby farms, recreational facilities (such as golf courses), limited agricultural enterprises and extraction operations.

18.4 Potential Impacts

On Current Land Use

The proposed re-establishment of quarrying operations would not have any deleterious affects on the lifestyle and livelihood of the property owners, who are in favour of the proposal.
Furthermore, the proposal is unlikely to have any measurable effect on surrounding property uses or property values. This conclusion is based on the suggested absence of any significant environmental impacts including dust and noise as well as on the visual amenity of the area.

On Future Land Use

Future land usage in the area is unlikely to be impinged upon by the proposed recommencement of quarrying operations.
Future land use and development of the surrounding areas will be predominantly restricted by council zoning regulations and the steep nature of the topography in the area, which will limit extensive residential development.
Future land use at the quarry site will be compatible with the rural setting of the area and be in accordance with the interest of local residents, community groups and regulatory authorities.
It is noted that the completion of quarrying activities will not ressult in a deep pit, which is the traditional outcome for quarrying activities. Rather, the finished landscape will be dominated by a gently sloping plateau with an eastern benched area. Once revegetated, this landscape should blend in well with the nartural contours of the area.

18.4 Controls and Safeguards

In the course of applying traffic management, noise and air quality controls, soil and water management controls, visual amenity and other various safeguards, the issue of current and future land use impacts is considered to be adequately addressed. Concerns raised by the property owners, local residents and Statutory Authorities will be incorporated into the planning and operational stages of the project.

18.5 Conclusions

It is not anticipated that the proposed quarry extension will have any adverse impacts on existing or future land use in the areas surrounding the site, provided the various environmental safeguard measures are implemented.

SECTION 19 SOCIO-ECONOMIC ISSUES

19.1 Existing Community Profile

Regional Characteristics

The social and economic characteristics of the region can be described by parameters including population predictions and characteristics, employment rate, income, household size and age of the population

Baulkham Hills Shire covers approximately 380km^2 stretching from North Parramatta and Carlingford in the south, to Wisemans Ferry in the North. Two-thirds of the land is used for rural purposes including farming and other agricultural activities.

Population Characteristics

Baulkham Hills Shire is made up of 28 suburbs and has a population of 131,000, with the majority of residents living in the southern part of the Shire. Since the late 1990's, Kellyville and Rouse Hill have been one of the major growth areas for new housing in the Sydney Metropolitan area. By 2021 the population is predicted to reach 180,000, a growth of 40% from the present level.

The average age of residents is 34 years, with the dominant age groups being those from 45-49 years and 15-19 years. Twenty five 25% of the Shire's residents were born overseas, with 16% from a non-English speaking background.

Employment and Economic Activity

The objectives in relation to social and economic issues are set out in DCP 500 at Section 2.13, *Social and Economic Assessment.* These objectives are:

- To facilitate and encourage community participation;
- To encourage and promote employment associated with, or linked to Extractive Industries.

The quarry will employ several local people in its day to day operations, with associated employed generated in transport with flow-on benefits in the construction industry.

Approximately 26% of residents of Baulkham Hills Shire Council work within the shire (ABS, 1996), representing 46% of all people employed in the shire. The remainder travel outside of the area for work.

TABLE 40: EMPLOYMENT IN THE SHIRE'S PRIMARY ECONOMIC SECTORS

Employment Sector	1998-1999	2002
Agriculture	1 205 (6%)	1 163 (6%)
Manufacturing	6 707 (32%)	6 350 (30%)
Wholesale/Retail	12 977 (62%)	13 624 (64%)

Of the Wholesale/Retail industry, the majority work in property and business services.

19.2 Social Profile of the Community

Socio-Economic Impact on the Local Community

The Socio-Economic impact of the proposal on the local community is hard to me[redacted]ut probably of very limited effect on the immediate community. In terms of the genera[redacted]tt Town and Windsor areas however, the following items are suggested as a guide to so[redacted]e flow-on benefits a project like this one will add to the community:

- The Project will involve expenditure on plant and equipment, some of which will be locally derived;
- The project will employ several local people and supports several businesses; and
- The availability of local, cheap construction material will have flow-on benefits with respect to the development of significant local projects (eg. road upgrades and a number of local subdivisions). Thus, the cost of importing crushed aggregate from more distant quarries will ultimately flow back to the Council's ratepayers in the form of higher rates.

Employment Opportunities

The Development will generate income within the local and wider communities by providing wages, salaries and other forms of payment to employees of local and regional firms and businesses.

Direct Employment opportunities include:

- Earthmoving Contractors (on-site)
- Site Personnel (weighbridge & machinery operators)
- Haulage Contractors

It is estimated these employment sources alone will provide 4 full time and up to 6 part-time jobs, with additional employment generated indirectly by servicing companies such as: Mechanics, Fuel Companies, Trucking and haulage companies, Electricians, Environmental Contractors and other specialised services.

19.3 Evaluation of Social Impact

DCP 500 recommends a Social Impact Assessment and an Economic Appraisal Report be submitted to Council. However, these requirements are directed at major new 'greenfields' developments, where a new social climate will be impacted upon by the operations with residents who have not previously been confronted with an extractive resource development. Given the relatively small number of residents that may be impacted upon, together with the community consultation already undertaken, it is suggested that a formal report is not warranted.

Effects on Local Business

Local businesses in the larger Windsor area will benefit from the above contracting and supply businesses. Cattai is a rural suburb and supports no specific industry.

Impact on the Amenity of the area

The location of the quarry is relatively sheltered topographically, situated within a valley with ridgelines extending across the northern boundary, the Maroota Ridge along the southern boundary (Wisemans Ferry Road) and ridges to the east and west.
The nearby residents are located to the south, with the majority of those not associated with the quarry located on the southern side of the ridge, and out of sight. The quarry has been operated previously, and the majority of local residents would be familiar with the type of operations undertaken at the site. The potential impacts on local residences are discussed further in Sections 14 (Visual Amenity) and Section 15 (Noise). The project is unlikely to have any significant long-term impact on the amenity of the area and over time, the quarry benches will be rehabilitated and the surrounding area planted with vegetation screens which will minimise impacts.

Impact on Property Values in the Area

Other than the immediate surrounding area, the project is unlikely to have any significant long-term impacts on property values in the area. The quarry has been operating previously at the site for many years and its location is appropriate for the setting and zoning.

19.4 Conclusion

The overall socio-economic benefits to the community are positive, with most relevance to the greater Windsor area. Whilst relatively small in terms of direct employment opportunities, the quarry nevertheless represents an essential component of raw material supply in the region, and will provide a number of flow-on cost benefits to the community. Due to the scale of the operations and likely impacts, a Social Impact Management Plan is not considered necessary.

PART F: OTHER ENVIRONMENTAL MATTERS

SECTION 20 CURRENT ECOLOGICAL ISSUES

20.1 Ecologically Sustainable Development

Under the *Environmental Planning and Assessment Act*, it is necessary to justify the proposal taking into account '*the biophysical, economic and social considerations and the principles of ecologically sustainable development*".

The DUAP EIS Guidelines for Extractive Industries and Quarries (DUAP, 1996) defines the approach as:

"*Ecological sustainability requires a combination of good planning and effective and environmentally sound approach to design, operation and management. The proponent should have regard to the principles of ESD throughout the whole process life cycle...*'

The *Local Government Amendment (Ecologically Sustainable Development)* Act, 1997 requires councils to:

- Consider the principles of ESD when exercising approvals; and
- To prepare annual management plans to be consistent with ESD principles

Ecological Sustainable Development (ESD) describes development which uses, conserves, and enhances the community's resources in such a way that ecological processes are maintained, and existing and future quality of life preserved and improved. In NSW, ESD is defined by the *Protection of the Environment Administration Act* 1991, which established the NSW Environment Protection Authority (EPA).
Production of quarry products contribute to the well-being of society as they represent the basic fabric of construction projects such as houses, roads, shopping centres, sporting and entertainment facilities. Quarrying is also important for regional development and employment.
It is the objective of ESD to protect the environment and ensure compatibility between extraction and the environment. Because extraction involves non-renewable resources, the first step towards ESD involves ensuring efficient use of identified resources and achieving maximum resource utilisation. The proposed recommencement of the Cattai Quarry is in line with these objectives.

20.2 Climate Change and Greenhouse Issues

Under ESD principles, climate change and greenhouse issues relate to the conservation of biodiversity and ecological integrity. The proposed project would be positive for the environment as revegetation of the site over time will make a contribution to the reduction of greenhouse gases. Furthermore, if a new quarry were to be constructed at a different location, then it is likely that a new area of vegetation will need to be removed for access roads, processing and storage facilities as well as the extraction area. Hence, the recommencement of an existing quarry is a preferable option.

20.3 Valuation and Pricing of Environmental Resources

This principle involves consideration of the materials proposed to be quarried and the surrounding environmental resources which may be affected, e.g. air, water, flora.
The value placed by the Company on the environmental resources of the area is evident by the extent of research, planning and implementation of environmental safeguard measures designed to protect these natural resources.

20.4 Biological Diversity and Ecological Integrity

This principle describes life forms and usually consists of three levels: genetic diversity, species diversity and ecosystem diversity. Ecological integrity describes the condition of an ecosystem in its natural state. Biodiversity can be considered on the development site and beyond it.
Although minor impacts will occur on a local scale through the removal and disturbance of vegetation, from a long-term perspective the integrity of the site will be maintained and a final landform suitable for post-extractive uses achieved. The area will be rehabilitated with species endemic to the area, and the species diversity improved through selective plantings. The end result of which should be the linking in with existing ecosystems and the promotion of habitat for the flora and fauna that existed on the site prior to extraction taking place.

20.5 Intra and Inter-Generational Equity

The objective of this principle is that "...the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations" (IGAE, 1992).

The principle of Intra-generational equity requires that the economic and social benefits of the development be distributed appropriately among all members of the community. The proposal has been formulated to ensure that no part of the community will be disadvantaged by the project, and the benefits will be maximised throughout the community. This will be achieved through well-proven safeguards implemented as part of the extraction project. The non-material well being of existing and future residents of Cattai will continue to be maintained throughout the project and beyond, with the Company committed to ongoing cooperation with the local community to assist in achieving the desired quality of life.

The Company's proposal has been planned to ensure efficient recovery of hard rock and the production of a range of high quality materials for use in the construction industry. These products and the infrastructure (such as roads) created by them will significantly benefit the local and wider population, for both present and future generations as roads typically have a life of 50 to 100 years or longer. The progressive rehabilitation of the site will ensure that the existing degraded quarry landscape is enhanced and modified for improved visual amenity and use by future generations. The environmental protection measures employed will guarantee that the existing environment is not threatened by the project, and is preserved for the benefit of inter-generational equity.

20.6 Precautionary Principle

This principle states that where there are serious threats to the environment, lack of scientific knowledge and certainty should not be used as a reason for postponing measures to prevent damage to the environment.

Decisions should be guided by:

- Careful evaluation to avoid, wherever practicable , serious or irreversible damage to the environment; and
- An assessment of the risk-weighted consequences of various options (IGAE,1992)

To satisfy this principle, attention must be paid to anticipation and prevention of environmental damage. For this purpose, the company(s) have engaged a number of specialist consultants to examine the possible impacts and recommend safeguards to ensure the minimisation of environmental impacts.
Experience has been gained by the quarry operators at other operations, of the types of issues that apply to extraction operations and appropriate solutions to mitigate against environmental damage. This knowledge, along with fresh input from various consultants, is incorporated into the design of the proposal. It is the understanding of the proponent that all measures with respect to the precautionary principle have been considered in the environmental assessment of the site, and no aspect of the proposal potentially representing a serious threat to the environment at the project site has not been adequately investigated.

20.7 Cumulative Impacts

Cumulative environmental impacts are now being considered for a large number of industries including sandstone extraction. It has been suggested that extractive industries may conflict with other potential land uses, including agriculture, recreational and residential developments.

20.8 Conclusion

The extension of the Cattai Quarry has been designed to enable the extraction of one of the Region's recognised high quality sandstone resources in an environmentally sustainable manner.
The proposal would enable the continued production of high-quality sandstone products for use in the building and construction industries, within acceptable criteria and minimising adverse impact on the surrounding environment.

This EIS has found that the development can be undertaken without adverse impacts on the surrounding biophysical, social and economic environments of the region.

SECTION 21 WASTE & ENERGY STATEMENT

21.1 Waste Generation

21.1.1 Construction and Commissioning Phase

Potential wastes produced during the commissioning phase of the development might include:

- Green waste (timber, vegetation);
- Topsoil and overburden;
- Concrete, bricks and other infrastructure remnants; and
- Oil or fuel containers

The potential impacts of such waste includes soil erosion, spreading of weed species, soil and water contamination from oils and fuels and degradation of visual amenity.

21.1.2 Operational Phase

Additional wastes generated during the operational phase of the project will be derived from the office/weighbridge area and the extraction area, potentially including:

- Small amounts of putrescible and solid waste from the offices and employees;
- Sediment from the sediment retention basins located in the extraction area; and
- Rocks, boulders and overburden from the extraction process

21.2 Mitigation and Safeguards

- The Environmental Management Plan will detail measures for the disposal of waste materials. As a minimum, any wastes that cannot be recycled economically will be disposed of at a licensed landfill, in accordance with *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (EPA, 1999);

- Construction and Operational crews will also be instructed to undertake best practise methods to ensure that no general wastes are left on site;

- Putrescible and solid wastes generated will be stored in small waste bins and removed by an appropriate contractor on a regular basis;

- Sediment from the sediment sumps will be removed by an appropriate contractor on a regular basis when required;

A draft Waste Management Plan has been compiled as required by DCP 500 and is attached as Appendix 9.

21.3 Energy Statement

21.3.1 Excavation/extraction operations

The proposed excavation, extraction and processing operations will require the use of the following equipment in the extraction of sandstone products.

- 1 bulldozer (D 11)
- 2 front-end loaders
- 1 crusher
- 1 'powerscreen'
- 1 'Paedovan wheel' (circular cutter)

Additional vehicles required on a part time basis include a water truck and a grader. It is estimated that up to 14,000 litres of diesel will be utilised per month, with around 1,000 litres used per day when in maximum production.

Product Transportation

To transport the Company's products, it is estimated approximately 200,000 litres of diesel fuel will be utilised annually. This is based on a mximum of 1,600 truck movements/month – see Table 23. Average transport distance to market has been estimated at 35 kilometres.

21.4 Energy Conservation

The energy usage by the quarry operators fulfils the requirements of the Environmental Planning and Assessment Regulation 1994 and the State Government's Energy Policy which focuses on:

- Ensuring liquid fuel is used efficiently and its use minimised where possible;
- Maximising the use of electrical energy for stationary plant and equipment; and
- Practical energy management and conservation measures

Features of the project relating to energy consumption include:

- Recycling of water for use on roads;
- Reduction of transport distances and subsequent fuel consumption if product required for local jobs was trucked from outside the area;
- Use of evaporation ponds at project sites to limit transport needs for water

21.5 Conclusion

The minimisation of transport distances, operational energy requirements and fuel usage is in the best interest of the quarry operators and the community, for cost saving purposes along with environmental benefits. The Cattai Quarry Project will maximise energy efficiency by minimising transport distances to local markets and implementing staged extraction and processing operations. This method of operation is the most efficient way of extracting the material and therefore maximises energy conservation principles.

SECTION 22 RISK AND SAFETY

22.1 Introduction

Nepean Quarries Pty Ltd as the quarry operator and through its existing operations, is fully aware of the importance of protecting the safety of the community, as well as its employees and contractors. The Company has implemented an Occupational Health and Safety Policy for all of its quarries which will be repeated at this quarry. Furthermore, the Company will continue to adopt new practices where necessary and in response to any unique conditions presented specifically by operations at this quarry.

22.2 Guidelines for Assessment of Risks

DCP 500 does not specifically address requirements for risk assessment - however in the '*preferred format*' for the EIS, one of the issues mentioned is "*risks, safeguards and contingency arrangements*".

The EIS Guidelines (DUAP, 1996), under Section 10 - Hazard Issues, lists the following potential hazards:

- Accidental release of toxic substances, explosions or fires,
- Natural events, including bushfires, landslip, flooding or subsidence.

Considering that the quarry will not use explosives, the risks relate primarily to Occupational Health and Safety issues (OH&S), with minor risks relating to environmental hazards from fuel spills, fires and similar events. OH&S issues will be covered in the Company's Safety Management Plan for the site. This plan will be in place prior to any operations commencing on site.

22.3 Community Health & Safety

Potential health issues relating to the proposal relate primarily to air quality and noise and would be no different to those already identified from the current operations, arising from dust emissions, quarry noise and transportation.
Based on experience elsewhere, it is considered unlikely that the proposed quarry extension would make any observable or quantifiable difference to the health of the surrounding community. Specific environmental aspects include;

Air Quality

Air quality modelling under taken by Dick Benbow & Associates (Report #2, Volume 2) suggests that dust impacts from the proposed operations would be low or negligible. Predicted airborne dust levels would readily comply with guidelines published by the NHMRC and the EPA.

Noise Levels

The investigation by Dick Benbow & Associates (Report 3#, Volume 5) has predicted that noise levels attributable to the proposal will comply in general with current EPA criteria at the nearest residences, provided certain measures are undertaken.

Transportation

Adverse health impacts arising from the transport of quarry material are unlikely to result from the proposal due to the limited number of residences in close proximity to the operations, and the low volume of traffic to be generated by the quarry operation. When considered in the context of the relatively high volumes of traffic already utilising Wisemans Ferry Road (including heavy vehicles), the operation should have no significant impact on community health and safety.

22.4 Assessment of On-site Hazard Potential

A number of potential hazards have been identified on site, or are anticipated which are described below. Measures to address these issues are detailed in the following section.

Fire & Explosion Potential

Potentially hazardous sources of fire and explosion may arise from fuel depots, electrical shorts in mechanical devices and switchboards, as well as accidental grass and brush fires. The site will contain an above ground 20,000 litre diesel storage tank, to be installed in a bunded area adjacent to the workshed. The fuels area will be classified as a *Dangerous Goods Store* and will require compliance with applicable standards and legislation.

Electrical Hazards

Potential sources of electrical hazard relate to the possible contact with overhead wires located in the eastern portion of the proposed extraction area, as well as contact with buried cables and machinery circuits. The site will be checked with the appropriate authorities fro all buried services prior to work commencing.

Noise Hazard

Potential noise hazards are likely to result from poorly maintained exhaust mufflers, processing machinery as well as noisc sources derived from the extraction, transport and processing components of the operations.

Air/dust hazards

Airborne silica generated from the ripping, processing and transportation of sandstone is a potential hazard for those employees directly involved in these processes, and is a potential cause of the respiratory condition known as silicosis. This hazard is dealt with under the auspices of the Occupational Health and Safety requirements.

Water hazard

Potential water hazards include pooled water in the quarry floor, as well as water runoff and pollution of the nearby drainage lines and dams on the property from fuel spills and sediment discharge.

Slopes and Batters

Slope and batter angles, whether working faces or final landforms will be maintained at a safe working angle for the appropriate machinery. Benches will be kept at a safe width to enable vehicles to pass each other.

Personnel Safety

Matters relating to Occupational Health and Safety, include the wearing of hard hats and steel capped boots on site. These matters are set out in the quarry operators Safety Management Plan, which is based on the Mines Inspection Act – General Rule 2000. In accordance with these requirements, the operator will:

- Induct all employees on site safety procedures and requirements, and ensure all visitors are aware of procedures and sign the visitors book;
- Operate and manage the site in accordance with documented procedures, undertaking regular reviews of site manuals and procedures;
- Undertake regular maintenance of all mobile and fixed plant, and;
- Inspect and maintain emergency response equipment.

22.5 Safeguards and Controls

Fire

All vehicles and powered equipment used in operation will be diesel powered, thereby reducing significantly the potential for flammable and/or explosive incidents. All items of danger will be positioned appropriately and checked periodically for faults and hazard potential by qualified persons. Clearing of dry fuel such as grasses and vegetation will be carried out, where necessary, to prevent bushfire hazard.

Electrical

All electrical equipment will be installed and monitored by qualified and competent persons, with any faults or problems promptly reported and attended to.

Noise

Noise regulations under the Mines Inspection Act, state that no worker must be exposed to levels of more than 90dB(A) for an 8 hour day. This requirement is to be met by the operator(s), and may include provisions for noise proofing on vehicle cabins and machinery, as well as the use of Personal Protective Equipment (earmuffs).

Dust

The process will be designed to generate the least amount of dust, however appropriate safeguards and monitoring will be implemented where appropriate.

Water

An appropriate Water Management Plan has been prepared and all sumps and pooled water are to be pumped out in case of significant storm events. The water will be conveyed to one or more sediment retention dams and then discharged into Dam 1 subject to quality guidelines.

Personnel

Appropriate fencing and warning signs will be positioned around the perimeter of the property, as well as the excavation area, to warn personnel and intruding members of the public. Appropriate personal protective equipment is to be part of the operators Safety Management Plan.

22.6 Conclusion

In conclusion, it is considered that through proper management of the site, risk can be successfully managed and adverse environmental impacts prevented. The proponent has extensive experience at managing risk and safety aspects of similar operations, and operating procedures and training by experienced personnel at other sites will be effectively transposed to the new quarry site.

PART G: COMMUNITY CONSULTATION

SECTION 23 CONSULTATION

23.1 Formal Procedures

The formal procedures for consultation in NSW are described by the Environmental Planning and Assessment Act (1979).
Formal consultation was undertaken with the following government authorities:

- Baulkham Hills Shire Council (BHSC)
- Hawkesbury City Council (HCC)
- Department of Urban Affairs & Planning (DUAP)
- Environment Protection Authority (EPA)
- Department of Mineral Resources (DMR)
- Department of Land and Water Conservation (DLWC)
- NSW Department of Agriculture
- NSW National Parks and Wildlife Service (NPWS)
- Roads and Traffic Authority (RTA)

Their responses are attached in Appendix 2.

23.2 Community Consultation

Consultation with the community was undertaken as part of the EIS process and involved the following steps:

- Neighbours within approximately 1 kilometre of the quarry were advised of the proposal via a letter mailed in September, 2001 and again in March 2002. This letter also included an information leaflet and an invitation to an information night.

- An information leaflet was distributed to all residents within the Cattai area, from Pitt Town to South Maroota (approximately 200 leaflets), including an invitation to the information night. An update on the project was also posted on this Firm's Webpage.

- An Information Night was held on 17th October, 2001 at the Cattai Public School. This involved a presentation on all aspects of the proposal. Thirty-seven people excluding quarry representatives attended.

Copies of the letters and leaflet are provided in Appendix 10. The general approach taken with respect to community consultation follows broadly the guidelines outlined by the NSW Minerals Council (NSW Minerals Council, undated).

A pre-lodgement meeting was held with Baulkham Hills Sire Council officers on 29th May, 2002 to discuss various aspects of the proposal and review a draft of this EIS. A number of matters were raised and discussed and amendments where appropriate were incorporated into the final EIS.

At the time of writing, the DA and EIS were scheduled to be lodged with Baulkham Hills Shire Council by the end of June, 2002 bringing to an end, the informal consultation process. The EIS will be placed on exhibition for a minimum period of four weeks, during which time the general public will be able to make submissions. Following the consideration of all submissions, both from the public and other statutory agencies, the Council will be in a position to determine the application.

23.3 Outcomes of Community Consultation

Responses to the quarry extension proposal has focused predominantly on several aspects, viz:

- The potential traffic impacts on local roads;
- Noise and dust generation;
- Visual impacts;
- Potential for pollution of the Hawkesbury River; and
- The overall long term environmental impacts that may arise as a result of the proposal

Overall, significant concerns have not been raised in relation to the proposal, and the Company has not received any comments or letters from residents expressing concerns at this stage. This may be due to several factors:

- The quarry has been in operation for many years (on and off since the 1950's). Operation of the quarry has thus become part of the 'landscape' and residents are familiar with the type of activities that will be occurring; and

- The southern boundary to the quarry is marked by Wisemans Ferry Road, which is a busy regional road, conveying trucks from extractive operations in the Maroota Area. This road is the focus of the local economy and contributes significantly to the background noise. Noise measurements have demonstrated that the road traffic 'hum' makes a significant contribution to the background noise levels and will mask much of the activity associated with the proposed quarry.

The above observations are based on conversations with landholders in the area, and the interpreted community impact of this proposal to date. In addition, the Company has been effective in demonstrating to the community that the proposal will not result in adverse environmental impacts, and that steps will be taken to ameliorate wherever possible any adverse environmental impacts.

23.4 Community Concerns Addressed

All of the concerns expressed in the previous section have been dealt with throughout this EIS. In particular, the views expressed by several residents have been adopted by the quarry operators in relation to:

With respect to the future operation of the quarry, the operators have undertaken to advise all neighbours and parties that have expressed interest to date by way of a six-monthly newsletter. This will document the progress of the approval of the quarry and monitor its performance according to environmental and other goals set in this EIS and the Environmental Management Plan.

PART H: ENVIRONMENTAL MANAGEMENT PLAN

SECTION 24 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

24.1 Elements of the Environmental Management Plan

Section 2.18 of DCP 500 - Environmental Management Systems outlines the objectives of good environmental management practices:

- To ensure Extractive Industries consistently perform to good environmental management practices;
- To ensure the ecological sustainability of extractive industry sites;
- To implement internationally and nationally recognised environmental management systems; and
- To ensure all objectives of this DCP are achieved

The EMP will be completed and submitted to Baulkham Hills Shire Council once all of the relevant regulatory bodies (including the Council) have had an opportunity to review the EIS and outline their requirements for the operation of the quarry. Once the conditions of consent have been formalised by Council, the EMP can be completed.

The Environmental Management Plan ('EMP') will specify in detail, the manner in which the quarry should be managed and operated with respect to environmental and operational issues. The EMP will be provided for the benefit of the operating staff, contractors and regulators and represents an amalgamation of all of the environmental safeguards contained in this Environmental Impact Statement together with existing conditions which may be appropriate.

Each of the environmental requirements will be cross-referenced to its source so that if at a future date conditions change, the EMP can be readily modified to incorporate the new conditions. The EMP also contains details of environmental monitoring to be carried out and procedures for reporting the environmental performance of the quarry.

The Environmental Management Plan:

- identifies the environmental effects of site operations;
- confirms the environmental controls to be implemented;
- specifies any conditions of consent;
- indicates how the conditions are to be met; and
- specifies a monitoring program.

An integral part of the EMP is the implementation of environmental controls and development of an ongoing monitoring programme. Aspects of the EMP are its flexibility to respond to change, environmental conditions, community concerns and authority regulations. The EMP will be regularly updated and a reporting procedure developed in consultation with relevant control authorities.

The components of the EMP will include the following:

Meteorology - Meteorological information for the area will be obtained annually from the Bureau of Meteorology and supplemented with wind and rainfall data collected on site.

Water Quality - Surface water and groundwater sampling. The monitoring frequency and analytical requirements will be subject to EPA licence requirements. Water sampling is currently being undertaken on a monthly basis. This section will also include maintenance of Soil and Water Management devices and compliance with DLWC conditions and applicable legislation. Details relate to Section 9 of this EIS.

Noise - Noise will be monitored to confirm that operations comply with EPA guidelines and the conditions of consent. Monitoring will be repeated periodically if problems are experienced at adjoining properties. Various mitigation measures discussed in Section 15 of the EIS related to Noise Management will be incorporated.

Odour and Dust - Odour and dust will be monitored in accordance with accepted practice. Dust sampling is currently being undertaken on a monthly basis. Compliance with conditions set out in Section 11 of the EIS, include watering and maintenance of roads.

Fire Control - Water contained in the on-site water storages, and tanker trucks fitted with water sprays will be available for fire fighting purposes and dust suppression.

Traffic - All vehicles (categorised as a truck or small vehicle) entering the site will be recorded and this information will be used to indicate average and peak daily, weekly and annual traffic levels. Various protocols governing the management of trucks as outlined in Section 16 will be incorporated.

Landscaping & Rehabilitation - Disturbed areas will be monitored and maintained to ensure that the final landscape is properly stabilised and that the site is effectively screened from surrounding areas.

Pollution Controls - All pollution and drainage structures will be regularly checked and maintained by site personnel.

In addition, other components of the EMP suggested under DCP 500 may include:

- Waste Management;
- Community Issues (Social Impact Management);
- Statement of Compliance and updated site (rehabilitation) plans

24.2 Rehabilitation Summary

DCP 500, in Section 2.12, Rehabilitation, sets out the objectives:

- To ensure extraction sites are fully rehabilitated in an orderly, progressive and controlled manner;
- To maintain and enhance the scenic, heritage and environmental quality of the Shire;
- To conserve and protect the environment of threatened species, and;

- To facilitate and ensure a final landform capable of supporting sustainable agricultural production or other post-extraction landuse compatible with the rural/residential character of the region.

Strategies to be implemented in order to achieve the objectives of the DCP include:

- All disturbed areas will be maintained during operational use to prevent environmental degradation, and rehabilitated progressively throughout the life of the operation;
- The final land use will see the project site revert to a rehabilitated extraction site, which will be completely stabilised and revegetated;
- Revegetation will be conducted using native plants, grass covers and indigenous tree species in consultation with ecological consultants to ensure compatibility with surroundings;
- Weeds to be controlled in accordance with the *Noxious Weeds Act 1993.*
- The requirements of the DLWC, NSW Agriculture, NSW National Parks and Wildlife Service and Baulkham Hills Shire Council are to be incorporated into the rehabilitation strategy.

24.3 Final Landform

The final landform within the project site will be significantly altered as a result of the proposed extraction. The most significant impact on the existing topography will be the advancement of the previous open cut boundary, primarily to the west and east. The surface of the land subject to extraction will be lowered up to a maximum of 15 metres, tapering away to the existing surface at the western margin.
Because of the unique setting of the quarry and the nature of the extraction constraints, the final landform will not result in a well defined pit or 'void' as is the case with most other quarries. Rather, the extraction will result in a relatively large expanse of ground with a uniform gentle fall to the north (towards the main east-west drainage line). A benched zone will demarcate the quarries southern and western boundary. Revegetation of the surface will eventually yield a benign landscape devoid of any real scarring.

24.4 Water Resources

Surface Water

Soil and water management techniques will ensure that existing drainage will not be adversely affected by the operations.
It is anticipated that because of the implementation of a number of operational controls during the life of the quarry (by the Soil and Water Management Plan), the surface run-off and drainage in and around the site will be highly controlled.
A comprehensive water testing program will continue to be carried out to assess the impact of the operations on any surfacewater in the region, and to ensure that the project poses no threat to the surface water quality in the region.

Groundwater

The project poses no threat to the groundwater of the area, provided the standard controls are maintained, as outlined in Section 10. Ongoing monitoring of the water bore by the operators will track water levels and water quality.

24.5 Air Quality

Environmental Management measures to prevent air quality decline as a result of the project include:

- Watering of roads during periods of hot and dry weather;
- Limiting of soil clearing and stockpiling;
- Control and regular monitoring of exhaust emissions on vehicles;
- Monitoring and recording of results from dust deposition gauges;
- Adherence to scheduled operating hours for trucks and bulldozing activities;
- Adherence to a policy of having loads covered when trucks leave the site; and
- Rapid revegetation of exposed soils, rock and abandoned sites and roads.

24.6 Soil and Water Management

Introduction

The design and operational safeguards outlined in Section 9 will ensure that the soil resources on the site are properly removed, stored, and replaced as dictated by the requirements of the operation.

Implementation of Soil and Water Management Plans

Soil and water management plans are to be implemented during the following stages of the operation, viz:

- Construction of quarry site extension;
- Construction or improvement of road access;
- Construction of Site Office/Weighbridge area;
- Establishment and operation of crushing or processing facilities; and
- Decommissioning of any of the above facilities.

Water testing will be carried out where appropriate, to test the suitability of waters that may be released into the environment. The following checklists provide operators with a means of managing the site during, prior and after extraction activities have commenced at any one particular area.

Construction Instructions

Other items that will require specific attention include:

Stockpiling

As construction takes place, all topsoil will be preserved in one or more separate stockpiles and be surrounded at the base with sediment fencing. Stockpiles are to be maintained at a height no greater than 1.5m, and weeds are to be regularly suppressed as they appear on them. Extracted clay and rock will be stockpiled separately and is to be protected by sediment fencing.

Containment of Formation Waters

Depending upon the quality of these waters, they will be released into the natural environment or allowed to evaporate. Testing of these waters will be carried out for a range of parameters, prior to release. These parameters include pH, salinity and TDS.

Decommission of extraction sites, easements, site offices, and access roads

Roads:

All roads will be 'roughened' by tractor ripping and covered with topsoil. Depending upon the season, additional native grass mixes may be required to promote growth and cover. Any temporary structures including the sediment basins will be removed.

Requirements for decommissioning include:

- Thoroughly clean-up work area;
- Remove all pegs, stakes, strings & wires;
- Reseed any areas of activity where vegetation has been damaged;
- Remove all equipment and materials; and
- Ensure compliance with all statutory approvals;

In addition, ancillary devices such as the sediment basins and bunding must be removed and reseeded when no longer required.

Storage of Soil and Water Management supplies

Soil and Water Management supplies are to be stored at the quarry site and are to include:

- Star pickets and wooden stakes
- Sediment fencing
- Seed mix
- Miscellaneous tools

Verification

The implementation of all SWMP's will be supervised by the Site Manager (SM) or his nominee. Upon the successful implementation of each plan, the SM will note as such in the Environmental Management Plan ('EMP'). A similar notation will be made at the time of decommissioning any of the SWMP devices.

Environmental Auditing

The Site Manager will inspect each site during its operational phase and check for the satisfactory implementation of devices and their on-going integrity. All site inspections together with any relevant comments will be recorded in the EMP. Regular auditing of the environmental performance of the quarry will be conducted.

24.7 Noise Mitigation Measures

Based on accepted practice, a number of measures with regard to noise controls and safeguards are to be implemented. These are summarised as follows:

- Design of quarry extraction layout in order to take advantage of acoustic properties of the operations, where possible;
- Construction of appropriate bunds where necessary to act as acoustic shields;
- Location of all quarry equipment in areas where acoustic dampening is the most effective,
- Upkeep and management of the quarry equipment inventory (eg. exhaust mufflers on all vehicles and equipment to be maintained so that tonal noise emissions are adequately controlled), and
- "Drive Friendly" procedures to be established for all trucks and vehicles entering and leaving the site. These restrictions include limiting exhaust braking and adherence to operating hours.

24.8 Visual Controls and Landscaping

Introduction

The landscaping and rehabilitation activities during and after quarrying operations will involve the re-establishment of woodland type revegetation on all disturbed areas. A selection of trees and shrubs as outlined in the Ecological Management Plan will be planted to minimise erosion and visual impact, taking into account matters of appropriate timing and species allocation.

General Replanting Controls:

The following controls will be observed during the life of the extraction project:

- Progressive rehabilitation and revegetation of the site;
- Landscaping as embodied in the revegetation program will be initiated for the site;
- Revegetation to be used will be based on the use of native species endemic to the property.

The visual amenity of the property and the surrounding land will not be compromised as a result of the operations.

All final extraction benches will be landscaped utilising fast-growing trees and shrubs. In addition, all bunds will be seeded and planted with appropriate vegetation to ensure the rapid re-vegetation of disturbed areas and that the final quarry landform blends in with its surroundings.

Noxious Weed Control

The control of noxious weeds is often a concern for quarrying activities. A list of noxious weeds and control methods will be provided as part of the Environmental Management Plan. An effort is to be made to suppress weeds that may be appearing around the site.

24.9 Controls for the Installation of Services

Power

Electric power will need to be connected to the site office and weighbridge area, which will be located in close proximity to existing powerlines. No additional electric power (or facilities) will be required for the re-establishment of the extraction program.

Water

Water for use in the operations will be limited to that required for office use and for dust suppression. Water from Dam 1 will be available when required for dust suppression.

Access Roads

Internal access roads will be kept to a minimum and be restricted to the operational areas of the quarry floor and where appropriate, on quarry benches. The majority of access tracks required for the project are all ready in place from previous operations, and no significant additional clearing is anticipated. Construction of all internal roads should be based on recognised road construction standards, taking into account aspects of drainage, safety and utilising direct routes to minimise vegetation clearing and disturbance.

Access onto Public roads

The existing access onto Wisemans Ferry Road will continue to be the only access to and from the quarry site. A 'rock rattle pad' or similar will be installed to prevent dirt from truck tyres being deposited along Wisemans Ferry Road.

Fire Control

Water contained in the on-site storages, and tanker trucks fitted with water sprays will be available for fire fighting purposes and dust suppression. The local Volunteer Fire Brigade will be made aware of the operation at the commencement of operations.

24.10 Traffic Controls and Safeguards

Assessment of traffic data for Wisemans Ferry Road and link roads to be utilised by the quarry traffic reveals existing high traffic volumes. It is therefore considered that the traffic impact generated by the project will not be overly significant, in comparison to 'background' traffic levels (see Section 16).
The primary traffic management issue arising from the project is the turning of trucks from the site, heading west along Wisemans Ferry Road.

24.11 Flora and Fauna

Despite the likely minimal impact on flora and fauna in the area, care will be taken to preserve native flora outside the quarry area and ensure fauna habitats are maintained. The revegetation plan will eventually enhance the biodiversity of the site.

24.12 Survey Control Plan

The quarry site will be surveyed on an ongoing basis by a registered surveyor to establish elevation and position, according to applicable standards.

PART I: EVALUATION OF PROPOSAL

SECTION 25: CONCLUSIONS

25.1 Need for the Project

The need for the project is based on the long-term demand for reliable sources of construction materials. Such materials are utilised by the building and infrastructure industries including government authorities for use in road construction, residential developments and other projects.

25.2 Likely Benefits

The benefits of the project proceeding are considerable and include the following:

- The continuation of a beneficial industry within an area that accepts its presence (because it has been established for a long period of time) and within land that is suitably zoned.
- The implementation of the rehabilitation program will see the potential biodiversity in the area enhanced because of the revegetation that is being planned for both the final extraction area as well as the immediate surrounding area.
- Avoidance of moving to an alternative site which may be more distant from the markets and potentially invoking undesirable environmental consequences.
- Underpinning the economic viability of the quarry operators as well as providing employment opportunities both directly and indirectly within the local community.

25.3 Justification

The existing quarry area and its proposed extension is located in an area designated as rural, which allows extractive industries to be undertaken subject to consent.
Consideration of the various aspects of the operation on the existing environment indicates that on a regional basis, there will be little if any significant long-term impact from the proposal.
On a site-specific basis, quarrying will result in the alteration of the land form, ensuing a change to the general contour of the site within the confines of the property. There will also be some effect imparted on the ecology of the site, eventually resulting in an enhancement of the vegetation community.

25.4 Supply and Demand Trends

The quarry operators are of the view that the demand for sandstone from the project area will be sufficient to justify the proposal, as the main use of the sandstone is and will remain for infrastructure development. The quarry operator will be well placed to supply the demand arising from the steady increase of the population within the northern Metropolitan regions of Sydney.

25.5 Alternatives

Ultimately, there are always alternatives to any extraction development at any one site. In the case of this development proposal, consumers can look to other quarries to satisfy their requirements. However, the present quarry site was chosen because of a perceived need for this particular sandstone product in the area due to the major civil projects that are due to commence in the area, or have already begun. Such projects include the upgrading of Windsor Road, the Parramatta to Chatswood Rail Link, the Western Sydney Orbital and others.
That the quarry has produced sandstone-related products previously is testimony to its viability and therefore feasibility as a going concern.
The consumer market place has dictated that sandstone products from the site are in demand and subject to the business being able to profit from the operation (subject to a range of environmental and planning controls) it will continue operating.
On a local basis, other sandstone deposits are known to occur. However, development of these would result in a new area being developed, which in turn would mean additional expenditures and potentially adverse environmental implications.

25.6 Consequences of not Proceeding with the Project

Should the proposal not proceed, the following consequences are envisaged:

- The extraction of a resource of approximately 3 Mt of crushed sandstone suitable for the construction and building industry would not occur;
- The extractive resource will not be developed further, therefore restricting supply in the area;
- The availability of a cost-competitive source of sandstone for the Sydney region would cease to exist;
- Transporting material from more distant sources would result in increased pollution and transport costs, and a higher impact on roads and road users;
- The potential for employment of locals in the quarrying operation will be lost, and employment at other operations may be jeopardised;
- The regional economic benefits of the proposed quarry extension would be lost; and
- The company would be disadvantaged financially with respect to property, plant, equipment and other costs relating to this proposal.

A further consequence of not proceeding with the project is that the business will not be able to implement all of the environmental controls which have been recommended in the Environmental Impact Statement. Implementation of these controls is an on-going process and requires the viability of the operation and the co-operation of the quarry operators.

On an environmental basis, failure to implement the controls discussed in the body of the report may be detrimental to the immediate surrounds as well as the Nepean River drainage systems.

Supply of sandstone of the type found at the site will be limited, resulting in a constriction of supply. This may result in an increase in the price of similar product which would have to be imported from other quarries.

25.7 Conclusion

The safeguards and mitigation measures that form part of this proposal have either been utilised in the past at the quarry, or successfully applied by the proponent at other quarrying operations, and have been demonstrated to be minimise the impacts on the environment in line with a management framework incorporating the requirements of regulatory authorities, the community and the operators.

It is concluded that the proposed recommencement of operations at the quarry should be allowed to proceed because it will not adversely impact on the environment and will in due course improve it. It has been shown that subject to a number of environmental controls discussed in this EIS, the proposal will over time, enhance the biodiversity in and around the property. At the same time, the proposal will create a viable business providing revenue and employment to the local community.

PART J: REFERENCES

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APPENDIX 1

Department of
Urban Affairs and Planning

Development and Infrastructure
Assessment
20 Lee Street
Sydney NSW 2000
GPO Box 3927
Sydney NSW 2001

Facsimile: 02 9762 8707

Mr Mart Rampe
C/-Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Dear Mr Rampe,

Proposed Sandstone Extraction – Wiseman's Ferry Road, Cattai, Baulkham Hills Local Government Area
Our Ref : S90/ 05211

Thank you for your letter of 7 September 2001 and completed Form A seeking consultation with the Director-General for the preparation of an Environmental Impact Statement (EIS) for the above development.

Under clause 73(1) of the *Environmental Planning and Assessment Regulation 2000* (the Regulation), the Director-General requires the EIS to address the issues listed below.

Specific Issues

- details of the existing ambient air, noise and water (surface and ground water) conditions at the site and in locations likely to be impacted by the proposal, especially nearby properties;
- details of the predicted ambient air and noise conditions during construction and operation of the proposal, especially as a result of excavation activities at the proposed site and comparison with relevant EPA criteria. This shall particularly consider any nearby private properties and dwellings;
- potential impacts on ground and surface water, including details of all potential sources of water pollution, impacts from run-off and sedimentation. Particular attention must be paid to any potential impacts from this proposal on the Hawkesbury River, the Cattai Creek catchment and other nearby water courses;
- an assessment of the impacts associated with the disturbance of soil and details of methods to mitigate these impacts. This shall include an assessment of any potential acid sulphate materials and consideration of the *Acid Sulfate Soils Manual* (1998);
- a description of the pollution control equipment (air, noise, and water) and environmental management measures proposed to be adopted to mitigate any potential impacts, particularly on nearby residents. These measures shall also include details of effective stormwater management over all areas of the development and measures to retain run-off on-site;
- details of proposed monitoring methods to assess the ongoing performance of the proposal;
- details of proposed contingency plans in the event of equipment failure or incorrect predictions;
- details of the expected generation of traffic, including frequency of truck movements, size of trucks, noise impacts and any impacts on other road users. This assessment must also include any predicted impacts on the existing roads and an assessment of the adequacy of the on-site and connecting roads to accommodate any increase in traffic;
- details of the development and use of the extracted sandstone and associated impacts, such as impacts resulting from the road transportation of the extracted material;
- description of any visual impacts, particularly in relation to the riverine scenic corridor of regional significance, and methods to mitigate these impacts;
- details of the waste management practices including disposal/ storage of refuse material and waste water, and environmental management measures proposed to be adopted;

- assessment of the potential impacts on any Aboriginal heritage items and other cultural features, and where relevant, measures to minimise these impacts;
- proposals for progressive and final rehabilitation of the extraction and stockpile sites, especially to deal with sediment control and stormwater run-off;
- consideration of the objectives and provisions of relevant environmental planning instruments including State Environmental Planning Policy (SEPP) 11 "Traffic Generating Development", SEPP 19 "Bushland in Urban Areas," SEPP 33 "Hazardous and Offensive Industry", Sydney Regional Environmental Plan Number 20 "Hawkesbury and Nepean Catchment" (particularly Clauses 6(2), 6(3), 6(6), 6(7), 11(16)), Baulkham Hills Local Environment Plan 1991, the *Acid Sulfate Soils Manual* (1998) and "*Shaping Western Sydney –the planning strategy for Western Sydney*";
- impact on flora and fauna, critical habitats; threatened species, populations or ecological communities, or their habitats. The assessment should involve the following steps:
  - i) conduct baseline surveys, and consult relevant databases and listings by the Scientific Committee;
  - ii) describe the types and condition of habitats in, and adjacent to, the land to be affected by the proposal;
  - iii) prepare a list of species, populations or ecological communities, or their habitats, that may occur on the site, and conduct targeted surveys for these;
  - iv) apply the "8 part test" (section 5A of the EP&A Act) to species, populations or ecological communities, on their habitats, that may be affected by the proposal. The EIS must justify any decision to not apply the test to all of the species, populations or ecological communities identified in step iii);
  - v) prepare a Species Impact Statement for any critical habitats; species, populations or ecological communities, or their habitats that are likely to be significantly affected by the proposal (note: An SIS must be prepared in accordance with any requirements of the Director-General of National Parks and Wildlife Service).
- Details of greenhouse gas assessment, incorporating the following:
  - i) a discussion of the types of greenhouse gases being emitted;
  - ii) a discussion of the alternative options considered for:
    - the chosen fuel source, and
    - the technology adopted to reduce greenhouse gas emissions;
  - iii) justification for the chosen fuel source and technology in terms of greenhouse gas emissions;

Attachment No.1 outlines the statutory matters that must be included in any EIS under clauses 71 and 72 of the Regulation.

The Department's EIS Guidelines "Extractive Industries – Dredging and other extraction in Riparian and coastal areas" should also be consulted in the preparation of the EIS. These Guidelines are available for purchase from the Department's Planning Centre, 20 Lee Street, Sydney or by calling (02) 9762 8044.

Development Applications (DAs) are "integrated development" under the *Environmental Planning and Assessment Act 1979* where certain licences or approvals are required from bodies other than the consent authority. Your Form A identified that this proposal will require an Environmental Protection Licence from the Environmental Protection Authority (EPA). The EIS should also address the detailed requirements of the EPA (see attached letter).

If further integrated approvals are identified before the Development Application is lodged, you must conduct your own consultation with the relevant agencies to identify their requirements for the EIS.

You should consult with Baulkham Hills Shire Council and take into account any comments Council may have in the preparation of the EIS. The EIS should also address other issues that emerge from consultations with relevant local, State and Commonwealth government authorities, service providers and community groups, particularly EPA, Department of Land and Water Conservation (particularly the Penrith office to address any issues on behalf of the now disbanded Hawkesbury-Nepean Catchment Management Trust), Roads and Traffic Authority, National Parks and Wildlife Service, Department of Mineral Resources and the local Aboriginal community group(s).

Under the *Commonwealth Environment Protection Biodiversity Conservation* Act (EPBC Act) 1999, approval of the Commonwealth Minister for the Environment is required for actions that may have a significant impact on matters of National Environmental Significance, except in circumstances which are set out in the EPBC Act. Approval from the Commonwealth is in addition to any approvals under NSW legislation. If you need approval under the Commonwealth Act, your EIS will be expected to assess the impacts on these matters.

When lodging your Development Application, you must lodge at least one copy of the Development Application and supporting documentation (including a fee of $250) for each of the agencies from whom you need an integrated approval. The EIS should be accompanied by a floppy disk containing an electronic file of the Executive Summary of the EIS. The document can be in any format amenable to conversion to the portable document format (.pdf) and should be optimised for viewing on a PC screen.

It should be noted however, that if the Development Application to which these requirements relate is not made within two years of the date of this letter, you must consult further with the Director-General prior to lodging the application.

Please contact Stacy Warren on (02) 9762 8157 if you require any further information regarding the Director-General's requirements for the EIS.

Yours sincerely

Gordon Kirkby 17/12/01

Gordon Kirkby
Acting Assistant Director
Development and Infrastructure Assessment
As Delegate for the Director-General

Note: Matters of National Environmental Significance under the EPBC Act are:

i) World Heritage properties
ii) RAMSAR wetlands
iii) threatened species or ecological communities listed in the EPBC Act
iv) migratory species listed in the EPBC Act
v) the environment in a Commonwealth marine area
vi) nuclear actions

DEPARTMENT OF URBAN AFFAIRS AND PLANNING

Attachment No. 1

STATUTORY REQUIREMENTS FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT UNDER PART 4 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

In accordance with the *Environmental Planning and Assessment Act 1979* (the Act), an environmental impact statement (EIS) must meet the following requirements.

Content of EIS

Pursuant to Schedule 2 and clause 72 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation), an EIS must include:

1. A summary of the environmental impact statement.
2. A statement of the objectives of the development or activity.
3. An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity.
4. An analysis of the development or activity, including:
   (a) a full description of the development or activity; and
   (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and
   (c) the likely impact on the environment of the development or activity, and
   (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment, and
   (e) a list of any approvals that must be obtained under any Act or law before the development or activity may be lawfully carried out.
5. A compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4(d).
6. The reasons justifying the carrying out of the development or activity in the manner proposed; having regard to biophysical, economic and social considerations, including the following principles of ecologically sustainable development:
   (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
   In the application of the precautionary principle, public and private decisions should be guided by:
      (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
      (ii) an assessment of the risk-weighted consequences of various options,
   (b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations,
   (c) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,
   (d) Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:
      (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
      (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
      (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

An environmental impact statement referred to in Section 78A(8) of the Act shall be prepared in written form. The prescribed form to accompany the environmental impact statement must comply with the

requirements of clause 71 of the Regulation and be signed by the person who has prepared it.

Procedures for public exhibition of the EIS are set down in clauses 77 to 81 of the Regulation.

Attention is also drawn to clause 283 of the Regulation regarding false or misleading statements in EISs.

Note

If the development application to which the EIS relates is not made within 2 years from the date of issue of the Director-General's requirements, under clause 73(6) of the Regulation the proponent is required to reconsult with the Director-General.

– ✧ –

APPENDIX 2

11 September 2001

Mr M Rampe
Principal Consultant
Harvest Scientific Services
PO Box 100

PICTON NSW 2571

Our Ref:

Dear Mr Rampe

Proposed Extractive Industry - Sandstone Quarry
Property: Lots 1 – 5, DP 240610, Wisemans Ferry Road, Cattai

I refer to our previous meeting on 31 July 2001 and your firm's correspondence dated 24 August 2001 requesting confirmation as to Council's requirements for the preparation of the Environmental Impact Statement (EIS) for the proposed extractive industry – sandstone quarry.

This is to advise that the site is zoned Rural 1(b) pursuant to the provisions of Baulkham Hills Local Environmental Plan 1991. The establishment and operation of an extractive industry is permissible upon land zoned Rural 1(b), subject to Council's consent. The proposed extractive industry / quarry is also classified as a "Designated Development – Extractive Industry", pursuant to the provisions of Schedule 3 of the NSW Environmental Planning & Assessment Regulations 1994. Accordingly, the proposed extractive industry requires the preparation of an Environmental Impact Statement (EIS).

In this regard, the EIS shall include (but not necessarily be limited to) the following issues / matters:-

1. The preparation of the EIS shall be in accordance with the requirements of the Director – General of the NSW Department of Urban Affairs & Planning and the Department's "Guidelines for Extractive Industry – Quarries".

2. The EIS shall provide a comprehensive review as to the proposal's relationship with the "Designated Development – Extractive Industry" provisions, under Schedule 3 of the NSW Environmental Planning & Assessment Regulations 2000. This shall include a detailed review of the proposed excavating / quarrying methods (including as to whether or not blasting is proposed) and the processing of the sandstone material (ie into various type of sandstone products). The EIS shall provided a detailed explanation as to what components of the "Designated Development – Extractive Industry" provisions are triggered by the proposal, including the proposed quarry's proximity to the downstream dam / waterbodies and/ or the 18 degree slope trigger.

3. The proposal is also likely to be classified as an "Integrated Development" pursuant to the provisions of Section 91 of the NSW Environmental Planning & Assessment Act 1979 since the formal consent may be required from a number of statutory agencies, including

(but not necessarily limited to): (i) NSW Department of Land & Water Conservation (DLWC), under Part 3A of the Rivers & Foreshores Improvement Act 1948 given the proposal's proximity to the downstream waterbodies (ii) NSW National Parks & Wildlife Service under Section 90 of the National Parks & Wildlife Act 1974 (in the event that the proposal involves the removal or destruction of any aboriginal artefacts) and (iii) NSW Environment Protection Authority under the Protection of the Environment Operations (POEO) Act 1997.

4. The EIS shall identify the maximum yearly extraction rate and the total life of the extraction (based on the total resource in the quarry site). The EIS should also identify the subsequent timeframe for the completion of rehabilitation works upon the site.

5. The EIS shall address the proposal's relationship with the objectives and specific planning controls contained in Sydney Regional Environmental Plan No. 20 – Hawkesbury – Nepean River, particularly in terms of its impact on environmentally sensitive areas, water quality & water quantity issues. The proposal shall also specifically address any potential impacts upon the downstream dam, tributary watercourse feeding into the Lower Crescent Reach of the Hawkesbury River & the Hawkesbury River itself.

6. The EIS shall incorporate a comprehensive review of the proposal's relationship and compliance with all of the requirements contained in Council's Development Control Plan No. 500 – Extractive Industries. This review should also include a table of compliance detailing the proposal's compliance with DCP No. 500 and any justification in respect to any variation concerning any of the requirements contained in DCP No. 500.

7. The EIS shall contain a comprehensive flora & fauna impact assessment report (prepared by a suitably qualified & experienced flora & fauna expert) for all threatened flora & fauna species and endangered ecological communities, pursuant to the Threatened Species Conservation Act 1995. This flora & fauna impact assessment report shall include an 8 Part Test for all threatened flora & fauna species and their habitats (ie recorded within a 10 kilometre radius of the site, based on the NSW National Parks & Wildlife Service database) and any endangered ecological communities. This detailed review shall include (but is not limited to) the following fauna species:- (i) Red-crowned Toadlet (*Pseudophryne australis*) (ii) Giant Burrowing Frog (*Helieoporus australiacus*) (iii) Yellow – bellied Glider (*Petaurus australis*) (iv) Powerful Owl (*Ninox strenua*) (v) Masked Owl (*Tyto novaehollandiae*), (vi) East Coast Freetail Bat (*Mormopterus norfolkensis*) (vii) Swift Parrot (*Lathamus discolor*) (viii) Black Bittern (*Ixobrychus flavicollis*) and (ix) any JAMBA or CAMBA migratory bird species and any other relevant endangered or vulnerable species in a 10 kilometre radius.

8. The flora & fauna impact assessment report in the EIS shall also indicate as to whether or not any action may potentially impact upon any matter of 'national environmental significance', under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999. This will also require the submission of written evidence from Environment Australia as to its requirements for the consideration of potential impacts upon any matter of 'national environmental significance', including nationally listed threatened species and ecological communities, RAMSAR wetlands and JAMBA or CAMBA or other nationally listed migratory bird species.

9. The EIS shall also provide a comprehensive review as to the proposal's potential impact upon any wetland, the Hawkesbury River and / or any tributary of the Hawkesbury River

in terms of eutrophication or sedimentation impacts. This issue should also include any proposed mitigation measures for dealing with any impacts upon any such waterbodies.

10. The submission of a comprehensive noise impact statement in the EIS (prepared by a suitably qualified & experienced noise / acoustic consultant) addressing the L90 'background' noise level and the likely L 1, L10 & Leq noise levels associated with the sandstone extraction and processing operations within the site, including any cutting or blasting operations. The noise impact assessment report shall specifically review the proposal's impact upon adjoining properties (not associated with the development) in a minimum radius of 1 kilometre from the site boundaries.

11. The submission of a comprehensive traffic impact assessment report (ie maximum truck movements per day & truck movements per annum) and proposed haul routes associated with the quarrying operation. This report shall also indicate the type and size of trucks delivering or picking up sandstone products to / from the site, including any trucks delivering raw sandstone products from other quarries within the NSW and / or interstate for further processing / cutting (if applicable).

    Note: In the event that no other sandstone quarry products are to be further processed on-site, a statement to this effect will be required in the EIS.

12. The submission of a site plan (minimum 10 copies) and supporting written evidence showing the extent and depth of the proposed quarry area, central processing area and other facilities within the site. The site plan shall be at a 1:200 or 1:500 scale and shall include specific existing contour heights & proposed contour heights in the quarry extraction area.

13. The submission of a comprehensive staging plan (at a 1:200 or 1:500 scale) showing the proposed staging of cutting of the quarry area and associated proposed progressive rehabilitation plans and strategy program. The progressive rehabilitation plans shall indicate the proposed short-term and long-term soil conservation measures and final landuse proposals (eg orchards, native planting revegetation etc).

14. The submission of a final landform / landuse plan and supporting written evidence detailing the proposed final landform configuration, consistent with abutting landholdings.

15. The EIS shall also include a detailed assessment / analysis of the extractive industry operation with respect to its visual impact upon surrounding properties and the scenic quality of the locality. This visual assessment / analysis should be supported by appropriate photomontages & visual analysis diagrams / plans.

16. The EIS shall provide a comprehensive review of the proposal's relationship with and impact upon the local groundwater resources, including the depth of the groundwater table and any perched groundwater tables within the site. This will require direct consultation and written documentation from the Department of Land & Water Conservation (DLWC). The EIS must also confirm that the extractive industry operation will be restricted in depth to guarantee a 2 metre freeboard above the high (wet weather) groundwater table level, at any part of the site (ie including any perched groundwater tables).

17. The EIS shall contain copies of written advice from all relevant statutory agencies, including:- (i) NSW Department of Land & Water Conservation (DLWC) (ii) NSW Environment Protection Authority (NSW EPA) (iii) NSW National Parks & Wildlife Service (NPWS) (iv) NSW Department of Mineral Resources (v) NSW Roads & Traffic Authority (vi) NSW Department of Urban Affairs & Planning and (vii) Hawkesbury City Council.

18. Any other additional relevant issues.

This advice is provided on the basis of your firm's correspondence dated 24 August 2001 which states that the initial production rate of the quarry will be in the order of 150,000 tonnes per annum and hence, Council is the consent authority, rather than the Minister for Urban Affairs & Planning. The Minister for Urban Affairs & Planning declared (ie by declaration in the NSW Government Gazette No. 102 of 3 September 1999) pursuant to Section 76A(7) of the NSW Environmental Planning & Assessment Act 1979 that the following development to be "State Significant Development":-

"*An extractive industry, if in the opinion of the consent authority:*

1. *The resource has been identified as being of State or regional significance in a strategic plan adopted by the Director – General; or*

2. *The total resource (the subject of the development application) is greater than 5 million tonnes; or*

3. *The proposed extraction rate is greater than 200,000 tonnes per annum; or*

4. *The project is to be located in an "environmentally sensitive area of State significance."*

Accordingly, the maximum production rate (an not in the initial production rate) for the quarry must be specifically mentioned in the relevant sections of the EIS, particularly in relation to the overall resource details & production capacity of the extractive and processing components of the operation. In the event that the EIS indicates that the annual production rate is greater than 200,000 tonnes per annum, the Minister will be the consent authority.

Additionally, a formal pre-lodgement meeting will be required to be held with Council staff, prior to the completion or lodgement of the final EIS and application.

Should you have enquiries or wish to discuss this matter further, please contact the undersigned on 9843 0279.

Yours faithfully

Ron Zwicker
TOWN PLANNING CO-ORDINATOR
C:\DATAWRKS\TEMP\608741\608741.doc

NSW EPA

Notice No: 1011537

Mr G Noonan
Manager – Assessments and Major Hazards Branch
DUAP
GPO Box 3927
Sydney NSW 2001

Dear Mr Noonan

RE: Proposed Extractive Industry Lot 1-5 DP 240610 Wisemans Ferry Road, Cattai, Baulkham Hills

I refer to your request for the Environment Protection Authority's (EPA) requirements for the environmental impact statement (EIS) in regard to the above proposal received by the EPA on 12 September 2001

The EPA has considered the details of the proposal as provided by DUAP and has identified the information it requires to issue its general terms of approval in Attachment 'A'. In summary, the EPA's key information requirements for the proposal are:

1. Measures proposed to be taken to mitigate noise impacts on and off the site,
2. Measures proposed to be taken to avoid dust pollution,
3. Measures proposed to be taken to avoid water pollution

Based upon the information provided to the EPA, the applicant will require an environment protection licence in regard to the following: -

- Carry out scheduled development work
- Carry out scheduled activities (excluding waste transporters)

The applicant will need to make a separate application to the EPA to obtain this licence.

To assist the EPA in assessing the EIS it is requested that the EIS follow the format of DUAP's EIS guidelines, and clearly identify the specific EIS requirements as outlined in Attachment A.

The EPA requests that the applicant provide 3 copies of the DA/EIS when lodging its application with the EPA. These documents should be lodged at the Parramatta Office located at Level 7 79 George St, Parramatta. If you have any queries regarding this matter please contact Frank Mersal on 9995 6830.

Yours sincerely

24-9-01

LES JOHNSTON
A/PRINCIPAL OFFICER – SYDNEY INDUSTRY

ATTACHMENT A

EXECUTIVE SUMMARY

The executive summary should include a brief discussion of the extent to which the proposal achieves identified environmental outcomes.

A. THE PROPOSAL

1. Objectives of the proposal

- The objectives of the proposal should be clearly stated and refer to:
  a) the size and type of the operation, the nature of the processes and the products, by-products and wastes produced.
  b) a life cycle approach to the production, use or disposal of products.
  c) the anticipated level of performance in meeting required environmental standards and cleaner production principles.
  d) the staging and timing of the proposal and any plans for future expansion.
  e) the proposal's relationship to any other industry or facility.

2. Description of the proposal

General

- Outline the production process including:
  a) the environmental "mass balance" for the process – quantify in-flow and out-flow of materials, any points of discharge to the environment and their respective destinations (sewer, stormwater, atmosphere, recycling, landfill etc).
  b) any life-cycle strategies for the products.
- Outline cleaner production actions, including:
  a) measures to minimise waste (typically through addressing source reduction).
  b) proposals for use or recycling of by-products.
  c) proposed disposal methods for solid and liquid waste.
  d) air management systems including all potential sources of air emissions, proposals to re-use or treat emissions, emission levels relative to relevant standards in regulations, discharge points.
  e) water management system including all potential sources of water pollution, proposals for re-use, treatment etc, emission levels of any wastewater discharged, discharge points.
  f) soil contamination treatment and prevention systems.
- Outline construction works including:
  a) actions to address any existing soil contamination.
  b) any earthworks or site clearing; re-use and disposal of cleared material (including use of spoil on-site).
  c) construction timetable and staging; hours of construction; proposed construction methods.

d) environment protection measures, including noise mitigation measures, dust control measures and erosion and sediment control measures.

Air

- Identify all sources of air and dust emissions from the development.
- Provide details of the project that are essential for predicting and assessing air impacts including:
  a) the quantities and physico-chemical parameters (eg concentration, moisture content, bulk density, particle sizes etc) of materials to be used, transported, produced or stored.
  b) an outline of procedures for handling, transport, production and storage.
  c) the management of solid, liquid and gaseous waste streams with potential for significant air impacts.

Noise and vibration

- Identify all noise sources from the development (including both construction and operation phases). Detail all potentially noisy activities including ancillary activities such as transport of goods and raw materials.
- Specify the times of operation for all phases of the development and for all noise producing activities.
- Provide details of road alignment (include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations – diagrams should be to a scale sufficient to delineate individual residential blocks.

Water

- Provide details of the project relevant to any water impacts of the development such as drainage works and associated infrastructure; land-forming and excavations; working capacity of structures; and water resource requirements of the proposal.
- Outline site layout, land contours, staging of proposed excavations and demonstrating efforts to avoid proximity to water resources (especially for activities with significant potential impacts eg effluent ponds) and showing potential areas of modification of contours, drainage etc.
- Outline how total water cycle considerations are to be addressed showing total water balances for the development (with the objective of minimising demands and impacts on water resources). Include water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

Waste and chemicals

Provide details of:

- the quantity and type of both liquid waste and non-liquid waste generated, handled, processed or disposed of at the premises;
- liquid waste and non-liquid waste management at the facility, including:
  a) the transportation, assessment and handling of waste arriving at or generated at the site.
  b) any stockpiling of wastes or recovered materials at the site.
  c) any waste processing related to the facility, including reuse, recycling, reprocessing (including composting) or treatment both on- and off-site.
  d) the method for disposing of all wastes or recovered materials at the facility .

e) the emissions arising from the handling, storage, processing and reprocessing of waste at the facility.

f) the proposed controls for managing the environmental impacts of these activities.

- spoil disposal with particular attention to:
  a) the quantity of spoil material likely to be generated;
  b) proposed strategies for the handling, stockpiling, reuse/recycling and disposal of spoil;
  c) the need to maximise reuse of spoil material in the construction industry,
  d) identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material; and
  e) designation of transportation routes for transport of spoil.
- procedures for the assessment, handling, storage, transport and disposal of all hazardous and dangerous materials used, stored, processed or disposed of at the site, in addition to the requirements for liquid and non-liquid wastes.
- the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.
- where applicable the on site fuel storage, bunding and refuelling controls intended to be implemented.

ESD

- Demonstrate that the planning process and any subsequent development incorporates objectives and mechanisms for achieving ESD, including:
  a) an assessment of a range of options available for use of the resource, including the benefits of each option to future generations.
  b) proper valuation and pricing of environmental resources.
  c) identification of who will bear the environmental costs of the proposal.

3. Rehabilitation

- Outline considerations of site maintenance, and proposed plans for the final condition of the site (ensuring its suitability for future uses).
- Detail when the site is intended to undergo rehabilitation and how long this process is expected to take.

Consideration of alternatives and justification for the proposal

- Consider the environmental consequences of adopting alternatives, including alternative:
  a) sites and site layouts
  b) access modes and routes
  c) materials handling and production processes
  d) waste and water management
  e) impact mitigation measures, particularly air quality and noise measures
  f) energy sources
- Selection of the preferred option should be justified in terms of:
  a) ability to satisfy the objectives of the proposal.

b) relative environmental and other costs of each alternative.

c) acceptability of environmental impacts.

d) acceptability of any environmental risks or uncertainties.

e) reliability of proposed environmental impact mitigation measures.

f) efficient use (including minimising re-use) of land, raw materials, energy and other resources.

B. THE LOCATION

General

- Provide an overview of the affected environment to place the proposal in its local and regional environmental context including:

  a) meteorological data (eg rainfall, temperature and evaporation, wind speed and direction).

  b) topography (landform element, slope type, gradient and length).

  c) surrounding land uses (potential synergies and conflicts).

  d) geomorphology (rates of landform change and current erosion and deposition processes).

  e) soil types and properties (including erodibility; engineering and structural properties; dispersibility; permeability; presence of acid sulfate soils and potential acid sulfate soils).

  f) ecological information (water system habitat, vegetation, fauna).

  g) availability of services and the accessibility of the site for passenger and freight transport.

Air

- Describe the topography and surrounding land uses. Provide details of the exact locations of dwellings, schools and hospitals. Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion models.
- Describe surrounding buildings that may effect plume dispersion.
- Provide and analyse site representative data on the following meteorological parameters:

  a) temperature and humidity

  b) rainfall, evaporation and cloud cover

  c) wind speed and direction

  d) atmospheric stability class

  e) mixing height (the height that emissions will be ultimately mixed in the atmosphere)

  f) katabatic air drainage

  g) air re-circulation.

Noise and vibration

- Identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches, and hospitals. A map must be provided identifying noise sensitive areas.
- Identify the land use zoning of the site and the immediate vicinity and the potentially affected areas.

Water

- Describe the catchment including proximity of the development to any waterways and provide an assessment of their sensitivity/significance from a public health, ecological and/or economic perspective.

Soil Contamination Issues

- Provide details of site history – if earthworks are proposed, this needs to be considered with regard to possible soil contamination, for example if the site was previously a landfill site or if irrigation of effluent has occurred.

C. IDENTIFICATION AND PRIORITISATION OF ISSUES (SCOPING OF IMPACT ASSESSMENT)

- Provide an overview of the methodology used to identify and prioritise issues. The methodology should take into account:
  a) relevant NSW government guidelines
  b) industry guidelines
  c) EISs for similar projects
  d) relevant research and reference material
  e) relevant preliminary studies or reports for the proposal
  f) consultation with stakeholders.
- Provide a summary of the outcomes of the process including:
  a) all issues identified including local, regional and global impacts (eg increased/ decreased greenhouse emissions).
  b) key issues which will require a full analysis (including comprehensive baseline assessment).
  c) issues not needing full analysis though they may be addressed in the mitigation strategy.
  d) justification for the level of analysis proposed (the capacity of the proposal to give rise to high concentrations of pollution compared with the ambient environment or environmental outcomes is an important factor in setting the level of assessment).

D. THE ENVIRONMENTAL ISSUES

The potential impacts identified in the scoping study need to be assessed to determine their significance, particularly in terms of achieving environmental outcomes, and minimising environmental pollution.

1. Describe baseline conditions

General

Provide a description of existing environmental conditions for any potential impacts.

Air

- Provide a description of existing air quality and meteorology, using existing information and site representative ambient monitoring data. The use of particular meteorological data sets should be substantiated.

- Information provided must satisfy the EPA document *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales.*

Noise and vibration

- Determine the existing background (L_{A90}) and ambient (L_{Aeq}) noise levels in accordance with the NSW Industrial Noise Policy.
- Determine the existing road traffic noise levels in accordance with the NSW Environmental Criteria for Road Traffic Noise, where road traffic noise impacts may occur.

The noise impact assessment report should provide details of all monitoring of existing ambient noise levels including:

- *Details of equipment used for the measurements,*
- *A brief description of where the equipment was positioned,*
- *A statement justifying the choice of monitoring site, including the procedure used to choose the site, having regards to the definition of 'noise sensitive location(s)' and 'most affected location(s)' described in Section 3.1.2 of the INP;*
- *Details of the exact location of the monitoring site and a description of land uses in the surrounding areas,*
- *A description of the dominant and background noise sources at the site,*
- *Day, evening and night assessment background levels for each day of the monitoring period,*
- *The final RBL value,*
- *Graphs of the measured noise levels for each day should be provided,*
- *A record of periods of affected data (due to adverse weather and extraneous noise), methods used to exclude invalid data and a statement indicating the need for any re-monitoring under Step 1 in Section B1.3 of the INP,*
- *Determination of L_{Aeq} noise levels from existing industry.*

Water

- Describe existing surface water quality – an assessment needs to be undertaken for any water resource likely to be affected by the proposal and for all conditions (eg a wet weather sampling program is needed if runoff events may cause impacts). Methods of sampling and analysis should conform to EPA document - *The Approved Methods of Sampling and Analysis of Water Pollutants in New South Wales.*
- Water quality objectives should be based upon ANZECC 2000 guidelines. Reference must also be made to the water quality objectives for the Hawkesbury – Nepean river system as contained in the Department of Land and Water Conservation Document - *Surface Water Quality Assessment of the Hawkesbury –Nepean Catchment 1995-1999.*
- Provide historic river flow data where available for the catchment.
- Provide site drainage details and surface runoff yield.

- Describe the condition of the local catchment eg erosion levels, soils, vegetation cover, etc.
- Outline baseline groundwater information, including, but not restricted to, depth to watertable, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment.

2. Assess environmental impacts

General

- For any potential impacts relevant to the assessment of the proposal, provide a detailed analysis of the impacts of the proposal on the environment including the cumulative impact of the proposal on the receiving environment especially where there are sensitive receivers.
- Describe the methodology used and assumptions made in undertaking this analysis (including any modelling or monitoring undertaken) and indicate the level of confidence in the predicted outcomes and the resilience of the environment to cope with the predicted impacts.
- The analysis should also make linkages between different areas of assessment where necessary to enable a full assessment of environmental impacts eg assessment of impacts on air quality will often need to draw on the analysis of traffic, health, social, soil and/or ecological systems impacts; etc.
- The assessment needs to consider impacts at all phases of the project cycle including: exploration (if relevant or significant), construction, routine operation, start-up operations, upset operations and decommissioning if relevant.

Air

- Undertake and provide an air assessment in accordance with the EPA document *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*.
- Identification of all sources of air pollutants including all fixed and mobile plant. Source locations should be marked on a plan that reflects the different stages of the extractive operation.
- Detailed dust emission inventory calculations showing the methodology and emission factors used.
- A detailed description of the methodology used to assess air quality impacts of the proposal. The use of a particular dispersion model and model parameters used should be justified and discussed. The dispersion model input/output files should be included.
- Air quality impact predictions should include plans showing incremental levels of 24 hour average PM10 concentrations, annual average dust deposition rates and annual average total suspended particulate concentrations at key times throughout the development of the extractive operation including worst cases.
- An assessment on the impact of the proposal on the local and regional air quality. Reference should be made to the *National Environment Protection Measure for Ambient Air* when assessing regional impacts. Local impacts should be assessed by considering background levels plus the predicted incremental impact with reference to the NHMRC total suspended particulate goal of 90 $\mu g/m^3$ (annual average) and the following dust criteria:

Dust Deposition Criteria (Total Solids)

Existing Dust Level g/m²/month annual average	Maximum Acceptable Increase Over Existing Dust Level g/m²/month (annual average)	
	Residential - Suburban	Other
2	2	2
3	1	2
4	0	1

- An assessment of cumulative air quality impacts and a description of the methodology used.
- An assessment of the potential air impacts on air quality of odours.
- The source and control strategies for episodic dust/odour emissions.
- The proposed mitigation and management measures to minimise the generation of dust/odour and other air pollutants.
- A proposed monitoring program to determine the effectiveness of mitigation measures and to verify predictions, including provision for the investigation into complaints.

Noise and vibration

Noise and vibration

- Determine the project specific noise levels for the site. For each identified potentially affected receiver, this should include:
  - determination of the intrusive criterion for each identified potentially affected receiver,
  - selection and justification of the appropriate amenity category for each identified potentially affected receiver,
  - determination of the amenity criterion for each receiver,
  - determination of the appropriate sleep disturbance limit.

Maximum noise levels during night-time period (10pm-7am) should be assessed to analyse possible affects on sleep. Where $L_{A1(1min)}$ noise levels from the site are less than 15 dB above the background L_{A90} noise level, sleep disturbance impacts are unlikely. Where this is not the case, further analysis is required. Additional guidance is provided in Appendix B of the NSW Environmental Criteria for Road Traffic Noise.

- Determine expected noise level and noise character (eg: tonality, impulsiveness, vibration, etc) likely to be generated from noise sources during
  - site establishment
  - construction
  - operational phases
  - transport including traffic noise generated by the proposal
  - other services.

The noise impact assessment report should include noise source data for each source in 1/1 or 1/3 octave band frequencies including methods or references used to determine noise source levels.

- Determine the noise & vibration levels likely to be received at the most sensitive locations (these may vary for different activities at each phase of the development). Potential impacts should be determined for any identified significant adverse meteorological conditions. Predicted noise levels under calm conditions may also aid in quantifying the extent of impact where this is not the most adverse condition.

The noise impact assessment report should include:

- *A plan showing the assumed location of each noise source for each prediction scenario,*
- *A list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site,*
- *Any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc,*
- *Methods used to predict noise impacts including identification of any noise models used. Where modelling approaches other than the use of the ENM or SoundPlan computer models are adopted, the approach should be appropriately justified and validated,*
- *An assessment of appropriate weather conditions for the noise predictions including references to any weather data used to justify the assumed conditions,*
- *The predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario under any identified significant adverse weather conditions as well as calm conditions where appropriate,*
- *For developments where a significant level of noise impact is likely to occur, noise contours for the key prediction scenarios should be derived,*
- *An assessment of the need to include modification factors as detailed in Section 4 of the INP.*

- Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional mitigation measures.

The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation.

- Where relevant noise/vibration criteria cannot be met after application of all feasible and reasonable mitigation measures the residual level of noise impact needs to be quantified by identifying:
  - locations where the noise level exceeds the criteria and extent of exceedence
  - numbers of people (or areas) affected
  - times when criteria will be exceeded;
  - likely impact on activities (speech, sleep, relaxation, listening, etc)
  - change on ambient conditions.
  - the result of any community consultation or negotiated agreement.
- For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the EIS.

- Where blasting is intended, the following details of the blast design should be included in the noise assessment:
  - bench height, burden spacing, spacing burden ratio
  - blast hole diameter, inclination and spacing
  - type of explosive, maximum instantaneous charge, initiation, blast block size, blast frequency.

Water

- Identify and estimate quantity of all pollutants that may be introduced into the water cycle by source and discharge point including residual impacts after mitigation measures are implemented.
- Describe the effects and significance of any pollutant loads on the receiving environment.
- Determine changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, wetland hydrologic regimes and groundwater).
- Describe water quality impacts and their significance resulting from changes to hydrologic flow regimes (such as nutrient enrichment or turbidity resulting from changes in frequency and magnitude of stream flow).
- Identify any potential impacts on quality or quantity of groundwater describing their source and significance.
- Identify potential impacts associated with geomorphological activities with potential to increase surface water and sediment runoff or to reduce surface runoff and sediment transport. Also consider possible impacts such as bed lowering, bank lowering, instream siltation, floodplain erosion and floodplain siltation.
- Identify impacts associated with the disturbance of acid sulfate soils and potential acid sulfate soils.

Soil contamination issues

- Identify any likely impacts resulting from the construction or operation of the proposal – this should include the likelihood of:
  a) disturbing any existing contaminated soil
  b) contamination of soil by operation of the activity
  c) subsidence or instability
  d) soil erosion
  e) disturbing acid sulfate or potential acid sulfate soils.

Waste and chemicals

- Assess the adequacy of proposed measures to minimise natural resource consumption and minimise impacts from the handling, transporting, storage, processing and reprocessing of waste and/or chemicals.

ESD

- Identify gaps in information and data relevant to significant impacts of the proposal and any actions proposed to fill those information gaps so as to enable development of appropriate management and mitigation measures.

Cumulative impacts

- Identify the extent that the receiving environment is already stressed by existing development and background levels of emissions to which this proposal will contribute.
- Assess the impact of the proposal against the long-term air, noise and water quality objectives for the area or region.
- Identify infrastructure requirements flowing from the proposal (eg water and sewerage services, transport infrastructure upgrades).
- Assess likely impacts from such additional infrastructure and measures reasonably available to the proponent to contain such requirements or mitigate their impacts (eg travel demand management strategies).

3. Management and mitigation of environmental impacts

General

- Use environmental impacts as key criteria in selecting between alternative sites, designs and technologies, and to avoid options having the highest environmental impacts.
- Describe any mitigation measures and management options proposed to minimise identified environmental impacts associated with the proposal including an assessment of their effectiveness and reliability and any residual impacts after these measures are implemented.
- Outline any proposed approach (such as an Environmental Management Plan) that will demonstrate how commitments made in the EIS will be implemented. Areas that should be described include:
  a) operational procedures to manage environmental impacts
  b) monitoring procedures
  c) training programs
  d) community consultation
  e) complaint mechanisms including site contacts
  f) strategies to use monitoring information to improve performance
  g) strategies to achieve acceptable environmental impacts and to respond in event of exceedances.

Air

- All calculations and data relating to the derivation of site-specific emission limits.
- Outline specifications of pollution control equipment (including manufacturer's performance guarantees where available) and management protocols for both point and fugitive emissions. Where possible, this should include cleaner production processes.

Noise and vibration

- Determine the most appropriate noise mitigation measures and expected noise reduction including noise controls and management of impacts for both construction and operational noise. This will include selecting quiet equipment and construction methods, noise barriers or acoustic screens, location of stockpiles, temporary offices, compounds and vehicle routes, scheduling of activities, etc.
- For traffic noise impacts, provide a description of the ameliorative measures considered (if required), reasons for inclusion or exclusion, and procedures for calculation of noise levels including ameliorative

measures. Also include, where necessary, a discussion of any potential problems associated with the proposed ameliorative measures, such as overshadowing effects from barriers. Appropriate ameliorative measures may include:

a) use of alternative transportation modes, alternative routes, or other methods of avoiding the new road usage
b) control of traffic (eg: limiting times of access or speed limitations);
c) resurfacing of the road using a quiet surface
d) use of (additional) noise barriers or bunds
e) treatment of the façade to reduce internal noise levels buildings where the night-time criteria is a major concern.
f) more stringent limits for noise emission from vehicles (ie. using specially designed "quiet" trucks and/or trucks to use air bag suspension);
g) driver education;
h) appropriate truck routes;
i) limit usage of exhaust breaks;
j) use of premium mufflers on trucks;
k) reducing speed limits for trucks;
l) ongoing community liaison and monitoring of complaints; and
m) phasing in the increased road use.

Water

- Assess impacts of the proposal using guidelines determined in accordance with Section D1.
- On-site sedimentation ponds must be designed to contain a 90-percentile five-day rain event in accordance with The Department of Housing's document *Managing Urban Stormwater - Soils and Construction.*
- Outline stormwater management to control pollutants at the source and contain them within the site. Also describe measures for maintaining and monitoring any stormwater controls.

Outline erosion and sediment control measures directed at minimising disturbance of land, minimising water flow through the site and filtering, trapping or detaining sediment. Also include measures to maintain and monitor controls as well as rehabilitation strategies.

Describe waste water treatment measures that are appropriate to the type and volume of waste water and are based on a hierarchy of avoiding generation of waste water; capturing all contaminated water (including stormwater) on the site; reusing/recycling waste water; and treating any unavoidable discharge from the site to meet specified water quality requirements

- Outline pollution control measures relating to storage of materials, possibilities of accidental spills (eg preparation of contingency plans), appropriate disposal methods, and generation of leachates.

Describe hydrological impact mitigation measures including:

a) site selection (avoiding sites prone to flooding and waterlogging, actively eroding or affected by deposition)
b) minimising runoff
c) minimising reductions or modifications to flow regimes
d) avoiding modifications to groundwater.

- Describe groundwater impact mitigation measures including:

a) site selection
b) retention of native vegetation and revegetation
c) artificial recharge

d) providing surface storages with impervious linings

e) monitoring program.

- Describe geomorphological impact mitigation measures including:

a) site selection

b) erosion and sediment controls

c) minimising instream works

d) treating existing accelerated erosion and deposition

e) monitoring program.

Waste and chemicals

- Outline measures to minimise the consumption of natural resources.
- Outline measures to avoid the generation of waste and promote the re-use and recycling and reprocessing of any waste.
- Outline measures to support any approved regional or industry waste plans.

Soil issues

- Describe and assess the effectiveness or adequacy of any soil management and mitigation measures during construction and operation of the proposal including:

a) erosion and sediment control measures

b) proposals for site remediation – see *Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998)

c) proposals for the management of these soils – see *Assessing and Managing Acid Sulfate Soils*, Environment Protection Authority 1995; note that this is the only methodology accepted by the EPA).

E. LIST OF APPROVALS AND LICENCES

- Identify all approvals and licences required under environment protection legislation including details of all scheduled activities, types of ancillary activities and types of discharges (to air, land, water).

F. COMPILATION OF MITIGATION MEASURES

- Outline how the proposal and its environmental protection measures would be implemented and managed in an integrated manner so as to demonstrate that the proposal is capable of complying with statutory obligations under EPA licences or approvals (eg outline of an environmental management plan).
- The mitigation strategy should include the environmental management and cleaner production principles which would be followed when planning, designing, establishing and operating the proposal. It should include two sections, one setting out the program for managing the proposal and the other outlining the monitoring program with a feedback loop to the management program.

G. JUSTIFICATION FOR THE PROPOSAL

- Reasons should be included which justify undertaking the proposal in the manner proposed, having regard to the potential environmental impacts.

MINERAL RESOURCES NEW SOUTH WALES

NSW DEPARTMENT OF MINERAL RESOURCES
Minerals and Energy House, 29-57 Christie Street
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Phone (02) 9901 8888 Fax (02) 9901 8777
DX 3324 St Leonards www.minerals.nsw.gov.au
ABN: 68 040 288 347

Mark Griffiths
Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Our Ref: L01/0453

Dear Sir,

Proposed Sandstone Extraction Project – Lots 1-5 DP 240610, Wisemans Ferry Road Cattai, Nepean Quarries P/L

I refer to your recent letter on the above matter.

Attached are the Department of Mineral Resources's requirements for an Environmental Impact Statement.

If you have any queries on this matter please contact Mr Jyrki Pienmunne of the Geological Survey on (02) 9901 8367.

Yours faithfully,

SRL

Steve Lishmund
Manager, Land Use and Resource Assessment

19/9/01

DEPARTMENT OF MINERAL RESOURCES
EIS RESOURCE DATA

The Department of Mineral Resources considers that it is in the best interests of the proponent to fully assess the resources which are subject of the proposal. This means that a thorough geological assessment should be undertaken to determine the nature, quality and extent of the resource. Failure to undertake such an assessment could lead to operational problems and possibly failure of the proposal.

Resource Assessment

The following issues need to be addressed in the environmental impact statement (EIS):

1. A summary of the regional and local geology including information on the stratigraphic unit or units subject of the proposal.

2. The amount of material available for extraction and the method or methods used to determine this amount (e.g. drilling, trenching, geophysical methods). Plans and cross-sections summarising this data, at a standard scale, showing location of drillholes and/or trenches, and the area proposed for extraction, should be included in the EIS. Relevant supporting documentation such as drill logs should be appended. Major resource proposals should be subject to extensive drilling programs to identify the nature and extent of the resource.

3. Characteristics of the material or materials to be produced:

a) For clay/shale extraction proposals, ceramic properties such as plasticity, drying characteristics (e.g. dry green strength, linear drying shrinkage), and firing characteristics (e.g. shrinkage, water absorption, fired colour) should be addressed.

b) For sand extraction proposals, properties such as composition, grainsize, grading, clay content and contaminants should be indicated. The inclusion of indicative grading curves for all anticipated products as well as the overall deposit is recommended.

c) For hard rock aggregate proposals, information such as grainsize and mineralogy, nature and extent of weathering or alteration, and amount and type of deleterious minerals, if any, should be indicated.

d) For other proposals, properties relevant to the range of uses proposed for the particular material should be indicated.

Details of tests carried out to determine the characteristics of the material should be appended. Such tests should be undertaken by NATA registered testing laboratories.

4. An assessment of the quality of the material and its suitability for the anticipated range of applications should be given.

5. The amount of material anticipated to be produced annually should be indicated. If the proposal includes a staged extraction sequence details of the staging sequence needs to be provided. The intended life of the operation should be indicated.

6. If the proposal is an extension to an existing operation, any past annual production data (by financial year) for all products should be supplied in support of the proposal.

7. An assessment of alternative sources to the proposal and the availability of these sources. The impact of not proceeding with the proposal should be addressed.

8. Justification for the proposal in terms of the local and, if appropriate, the regional context. Identification of the subject site in relevant planning instruments such as regional environmental plans, should be noted.

9. Information on the location and size of markets to be supplied from the site.

10. Transport routes for the material to the market.

11. The location and size of stockpiles.

Safety Issues

On the safety issues, the following points are made:

1. All operations are to comply with the Mines Inspection Act, 1901, as amended.
2. The company is to nominate a person (or persons) as General Manager and Production Manager as required by the Mines Inspection Act 1901, Section 5 and 5B.
3. The General Manager must appoint trained and competent shotfirers to conduct all blasting operations.
4. The company is required to contact the Regional Inspector of Mines for a list of guidelines and safety issues which are to be addressed and for the required competencies for a Production Manager.

Mineral Ownership

The Mining Act 1992, and its precursors, defines which minerals are owned by the Crown. Many quarry materials are not prescribed minerals under the Mining Act. In general terms this means these materials are owned by the landowner and a mining title is not required for their extraction.

Sand, loam, river gravel, and coarse aggregate materials such as basalt, sandstone, and granite are not prescribed minerals under the Mining Act 1992. Therefore, the Department of Mineral Resources has no statutory authority over the extraction of these commodities, apart from its role under the Mines Inspection Act 1901 (as amended) with respect to safe operation of mines and quarries. However, the Department is the principal government authority responsible for assessing the State's resources of construction materials and for advising State and local government on their planning and management.

Minerals such as *brick clay, kaolin* and *limestone* are prescribed minerals under the Mining Act 1992. The proponent needs to determine whether the material is privately owned or Crown mineral (publicly owned). If it is privately owned, then either a notification under Section 8 of the Mining Act 1992 or, alternatively, a mining lease or mineral claim would be required. If it is a Crown mineral, an application for a mining lease or mineral claim will have to be lodged.

For your information, *brick clay* was proclaimed a Crown mineral on 22 January 1913, *kaolin* was proclaimed a Crown mineral on 15 July 1907 in terms of the Mining Act and *limestone* was proclaimed a Crown mineral on 21 August 1907.

If you are unsure whether a mining title is required for your proposal you should contact the Department of Mineral Resources.

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

Mark Griffith
Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Dear Mark

RE: Proposed Sandstone Extraction – Lots 1-5 (DP240610) Wisemans Ferry Road, Cattai

Thank you for your letter dated 7 September 2001 in which you consulted with the National Parks and Wildlife Service (NPWS) in relation to the above proposal.

The NPWS understands that the proposal involves the extraction of sandstone over 24 hectares at a rate of 10,000-15,000 tonnes per month. It is anticipated that necessary infrastructure will be located outside of the extraction area.

The NPWS has a statutory responsibility for the protection and care of native flora, native fauna and Aboriginal sites, and for the management of NPWS estate. Accordingly, the NPWS has an interest in ensuring that potential impacts to these attributes are appropriately assessed.

Native flora, fauna and threatened species

The NPWS Cumberland Plain Mapping Project indicates that the subject area supports the Shale/Sandstone Transitional Forest Endangered Ecological Community (SSTF). It is also possible that a number of threatened species may occur in the subject area.

The NPWS has concerns that the proposal may significantly impact on a number of threatened species and/or on the SSTF. If it is concluded, under section 5A of the *Environmental Planning and Assessment Act 1979*, that the proposal is likely to have a significant impact on threatened species and/or SSTF, a species impact statement would be required. The proponent for the activity would then need to seek concurrence from the NPWS.

To ensure flora and fauna impacts are adequately identified and can be appropriately assessed, it is advised that the following information be incorporated into a comprehensive flora and fauna survey:

- detailed description and mapping of all vegetation communities in the study area, including the identification of those communities which are of local, regional or state conservation significance;
- the extent of vegetation communities, similar to those to be impacted, which remain in the local area;

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& Planning Division
Level 6
43 Bridge Street
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- the proportion of remaining vegetation communities, similar to those to be impacted, which are protected in local reserves;
- description of known or expected fauna in the subject area, with surveys directed to identifying threatened species;
- identification of fauna habitat likely to be of local, regional or state significance;
- identification of habitat corridors and linkages between areas of remnant vegetation and an assessment of the conservation significance of these in assisting faunal movement through the area; &
- prediction of the likely impacts that future activity may have on the above attributes, including an assessment of the cumulative impacts of the proposal.

Further, you will be aware that the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* can be triggered if nationally listed threatened species may be impacted by the proposal. You should consider whether referral to the Commonwealth Environment Minister is required.

Aboriginal heritage

Section 90 of the *National Parks and Wildlife Act 1974* relates to the need to seek consent of the Director-General of NPWS to destroy an Aboriginal relic or place. It is an offence to knowingly destroy, deface or damage a relic or Aboriginal place without this consent. To determine the potential Aboriginal heritage impacts of this proposal, and therefore whether a section 90 determination is required, the NPWS recommends that a survey and assessment be undertaken in accordance with the NPWS Aboriginal Cultural Heritage guidelines, attached.

The NPWS has also attached, general guidelines for impact assessment that may be of use the proponent in their assessment. These guidelines provide information on any approvals that may be required from the NPWS and a summary of the NPWS databases available.

If you have any queries or require any further information concerning this matter please contact Elise Stocker, Conservation Planning Officer on (02) 9585-6575.

Yours sincerely,

Lou Ewins 18.09.01

Lou Ewins
Manager
Conservation Planning Unit
Central Directorate

NSW NATIONAL PARKS AND WILDLIFE SERVICE

GENERAL GUIDELINES FOR IMPACT ASSESSMENT

The National Parks and Wildlife Service (NPWS) has an interest in the potential impacts of proposals on the following:

- areas of native vegetation;
- areas of potential value as habitat for native fauna;
- sites and places of Aboriginal cultural heritage, including areas of archaeological potential; and
- land dedicated under the *National Parks and Wildlife Act 1974* (*NP&W Act*).

If these attributes are anticipated to be present in your study area and / or likely to be impacted, it is recommended that assessments by a suitably qualified person be undertaken to determine the extent of impact. The NPWS suggests that the following basic details be included in the assessments:

- the qualifications and experience of the person undertaking the work; and
- a detailed description of survey methodology including survey design, sampling methods, weather conditions, time and duration of surveys and location of any survey sites and transect lines.

Specific issues that are recommended to be addressed by the assessments are detailed below.

General information

- description of the proposal and the way in which the environment will be modified;
- map(s) placing the proposal in a regional and local setting;
- applicability of Local Environmental Plans, Regional Environmental Plans and State Planning Policies to the proposal;
- information on the current and past land uses of the site and that of the surrounding area; and

- appropriately scaled maps which identify the location and extent of any areas of native vegetation and fauna habitat and Aboriginal cultural heritage value in relation to the area of proposed development.

Impacts

- prediction of the likely impact of the proposal on land dedicated under the *NP&W Act*;
- prediction of the likely impacts of the proposal on areas and items of natural significance, such as native vegetation and fauna habitat, and on Aboriginal heritage sites and areas of cultural significance. This should include consideration of any off-site impacts; and
- assessment of measures available to minimise the impact of the proposal on these attributes, including potential conservation options, alternative development options and monitoring programs, if appropriate.

Native flora, fauna and threatened species

The following information is considered necessary to assess the potential impact of a proposal:

- detailed description and mapping of all vegetation communities in the study area;
- identification of any vegetation communities or plant species which are of local, regional or state conservation significance (including threatened species, populations, ecological communities or critical habitat listed under the *Threatened Species Conservation (TSC) Act*). The criteria for establishing significance should be documented;
- description of known or expected fauna assemblages within the study area;
- identification of fauna habitat likely to be of local, regional or state significance (including habitat of threatened species, populations, ecological communities or critical habitat listed under the *TSC Act*);
- identification of habitat corridors and linkages between areas of remnant native vegetation which may assist faunal movement through the area and an assessment of the conservation significance of these; and
- prediction of the likely impact of the proposal on the above attributes (quantification of the extent of impact where practical).

In addition to these general requirements, there are specific requirements relating to the assessment of a proposal and its potential impact on threatened species, populations, ecological communities, their habitats and critical habitat.

The provisions of the *TSC Act* and related provisions of the *Environmental Planning & Assessment Act* should be considered when undertaking the assessment of a proposal. In addition to the *TSC Act* itself, further information on the provisions of the

TSC Act may be obtained from the Department of Urban Affairs and Planning Circular No. A13 (12 December 1995). The NPWS has also produced Information Circulars on the *TSC Act* which may be obtained by contacting the NPWS Information Centre on (02) 9585 6333.

Concurrence provisions

Where a consent authority determines that a proposal is likely to have a significant effect on threatened species or their habitats, a species impact statement (SIS) must be prepared in accordance with the requirements of the Director-General of the National Parks and Wildlife Service. If, after considering the SIS, a consent authority intends to grant approval to a proposal that will have a significant effect on threatened species or their habitats then the concurrence of the NPWS is required. If the Minister for Urban Affairs and Planning is the consent authority the concurrence of the NPWS is not required, but consultation must occur with the Minister for the Environment before development consent is granted.

The process and timeframes for development applications that require concurrence are detailed in Division 2 of the *Environmental Planning and Assessment Regulation 1998*.

Aboriginal heritage

General issues

For the purposes of these guidelines Aboriginal heritage is considered to include "relics" and places of significance to Aboriginal communities.

Under the *NPW Act*, a 'relic' is defined as any deposit, object or material evidence (not being a handicraft made for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains (as defined within the meaning of the *NPW Act*). Relics are confined to physical evidence. Aboriginal 'relics' are commonly referred to as Aboriginal sites.

An "Aboriginal place" is a place which has been declared so by the Minister for the Environment because he or she believes that the place is or was of special significance to Aboriginal culture. It may or may not contain physical relics.

It should also be noted that there are places in the landscape which have particular meaning for Aboriginal people, for example, spiritual areas or natural mythological areas. Although these areas are not protected under the *NPW Act*, unless they contain physical remains of Aboriginal occupation or have been declared an 'Aboriginal place', it is recommended that the potential impact of proposals on such places also be considered in the assessment process.

Assessment process

It is recommended that an assessment be conducted of the Aboriginal cultural values of the study area if the proposal involves disturbance to substantially unmodified ground surfaces. If the study area is considered to have archaeological potential or cultural significance then it is recommended that a survey and assessment be undertaken in accordance with NPWS guidelines. These guidelines are contained in the NPWS' publication "Aboriginal Cultural Heritage: Standards and Guidelines", which may be purchased by contacting the NPWS' Cultural Heritage Conservation Division on (02) 9585 6571.

Should any Aboriginal archaeological sites be present in the study area, you should consider the requirements of the *NP&W Act* with regard to Aboriginal relics. Under s90 of the *NP&W Act* it is an offence to knowingly damage or destroy relics without the prior permission of the Director-General of the NPWS.

In assessing Aboriginal heritage values, consideration should also be given to whether the study area is likely to contain places of cultural significance to the Aboriginal community. It should be noted that places of cultural significance to the Aboriginal community are not limited to archaeological sites. An assessment of cultural significance should involve consultation with community representatives and if necessary, documentary research to establish whether there are any places of traditional or historic significance to the Aboriginal community.

Integrated Development Assessment

Under recent amendments to the *EP&A Act*, a range of approvals and licences issued by various agencies have been integrated with the development approval process. Section 91 of the *Environmental Planning and Assessment Amendment Act 1997* lists the approvals of agencies which are included in the integrated development assessment (IDA) process.

This includes Section 90 approvals under the *NP&W Act* regarding consent to knowingly destroy, deface or damage or knowingly cause or permit the destruction or defacement of or damage to an Aboriginal relic or Aboriginal place. Where a relic or an Aboriginal place is known to occur on land prior to the lodgement of a development application, and the development proposal will damage, deface or destroy the relic or Aboriginal place, thereby requiring a consent to destroy from the Director-General of the NPWS, the NPWS will become an approval body.

It should be noted that where a relic or Aboriginal place is found to occur on land after a development application is lodged, separate NPWS approval will still be required under Section 90 of the *NP&W Act*.

The NPWS has prepared detailed guidelines to assist councils and applicants in the IDA process (copies available upon request). The guidelines outline the role of the

NPWS in the IDA process and describe the information that needs to be submitted in an integrated development application. In summary, two types of information are required:

- Aboriginal cultural heritage assessment which involves consultation with the Aboriginal community groups. The NPWS is committed to working in partnership with the Aboriginal community groups in the management of Aboriginal sites and requires community assessment of any Aboriginal site management; and
- Archaeological assessment which involves the assessment of Aboriginal sites and their management based on archaeological heritage criteria.

Environmental impact statements

Where an environmental impact statement (EIS) is required to be prepared for an integrated development, the Director-General of the Department of Urban Affairs and Planning (DUAP) must request each approval body to provide their requirements in relation to the EIS. If the approval body does not provide those requirements within 14 days then the Director-General of DUAP must inform the applicant and the applicant must consult with the approval body to obtain its requirements for the EIS.

If an EIS is to be prepared for an integrated development that involves a Section 90 approval under the *NP&W Act*, the NPWS will be requested to provide its requirements for the EIS. In this situation, the NPWS requirements for the EIS are the same as for any IDA proposal that requires a Section 90 approval under the *NP&W Act*. These requirements are detailed in the attached guidelines.

Databases

The NPWS has two GIS databases which may provide information of use to you if you proceed to undertake further assessment. These are:

- Atlas listing of fauna and flora records in NSW;
- Aboriginal Sites register.

The material from these databases is available upon written application and the receipt of the appropriate fee. If you are interested in obtaining access to the Atlas database, please contact the Data Licensing Officer, GIS Division, on (02) 9585-6684. Records from the Aboriginal Sites register may be obtained upon written application to the Registrar, Cultural Heritage Conservation Division, on (02) 9585-6471.

Further Information

For further information please contact:

Manager, Conservation Planning Unit
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NSW NATIONAL PARKS AND WILDLIFE SERVICE

ABORIGINAL CULTURAL HERITAGE AND THE INTEGRATED DEVELOPMENT ASSESSMENT PROCESS

INFORMATION FOR APPLICANTS

30 June 2000

This information is presented to assist you to lodge an integrated development application with your local council. Part 4 of *Environmental Planning and Assessment Act 1979* has recently been amended. The new *Environmental Planning and Assessment Amendment Act 1997* provides a single system for the development, building and subdivisions aspects of a proposal, and involves the linking of some approvals granted by State government agencies under other environmental legislation. Development proposals which require an approval or licence from one or more of these State agencies (refer to section 91 of the *EP&AA Act)* are known as an integrated approval. The basis of the IDA process involves applicants providing up-front the information necessary for agencies or approval bodies to determine if they will give the general terms of approval necessary for granting additional approvals.

The National Parks and Wildlife Service (NPWS) is one of the State government agencies which has been included in the IDA process, in relation to its responsibilities for Aboriginal relics and Aboriginal places under Section 90 of the *National Parks and Wildlife Act 1974.* Under Section 90, it is an offence to knowingly destroy, deface or damage a relic or Aboriginal place without the consent of the Director-General of the National Parks and Wildlife Service.

The NPWS acknowledges that it is Aboriginal people who should determine the cultural significance of Aboriginal heritage, and the NPWS has a strong commitment to working in partnership with Aboriginal people to manage and conserve Aboriginal cultural heritage. The NPWS recognises that Aboriginal cultural heritage includes both traditional and contemporary associations of Aboriginal people with the environment as well as physical sites.

Aboriginal heritage issues should be addressed upfront as part of the planning process undertaken for developments, and prior to lodgement of a development application. The NPWS requires that options for conserving Aboriginal relics within development footprints be fully explored in discussion with the Aboriginal community as part of the development assessment process. Impacts on Aboriginal relics should only be considered where there are no viable alternatives. The NPWS will require a clear demonstration that alternatives to site destruction have been fully explored.

When is the NPWS an approval body in the IDA process ?

The NPWS is an approval body in the IDA process when a development will impact on an Aboriginal relic or Aboriginal place, thereby requiring a consent to destroy from the Director-General of the National Parks and Wildlife Service. Threatened species, populations and/or ecological communities do not trigger the IDA process as the *Environmental Planning & Assessment (EP&A) Act 1979* and *Threatened Species Conservation Act 1995* eliminated the need for separate licensing or approvals in relation to these issues.

The NPWS is an approval body for a development application under the IDA process when:

1) A 'relic' is known to exist on the land to which the DA applies; and/or the land to which the DA applies is an Aboriginal place, immediately before the DA is made (as per s.91 (2)(a-b), *EP&A Amendment Act 1997);* AND

2) The development proposal will destroy, deface or damage an Aboriginal 'relic' or Aboriginal place, and a consent to destroy from the Director-General of the National Parks and Wildlife Service will be required, as per section 90 of the *National Parks and Wildlife (NPW) Act 1974* (note damage to an Aboriginal relic or place may be direct damage or result from indirect impacts).

Under the *NPW Act,* **a 'relic'** is defined as any deposit, object or material evidence (not being a handicraft made for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains (as defined within the meaning of the NPW Act). Relics are confined to physical evidence.

Aboriginal 'relics' are commonly referred to as Aboriginal sites.

An **"Aboriginal place"** is a place which has been declared so by the Minister for the Environment because he or she believes that the place is or was of special significance to Aboriginal culture. It may or may not contain physical relics.

It should be noted that *the NPW Act* does not provide protection for spiritual areas or natural mythological areas that have no physical remains of Aboriginal occupation, unless they have been declared an 'Aboriginal place'.

For the purposes of the IDA process, the NPWS considers that an Aboriginal site ('relic') may be considered to be 'known' if:

- It is registered on the NPWS Aboriginal Sites Register; and/or
- It is an Aboriginal site known to the Aboriginal community; and/or
- It is located during surveys (eg: archaeological, anthropological) or test excavations conducted prior to lodgement of the DA.

How do I find out if there is an Aboriginal site on the land ?

To find out whether the land you want to develop contains known Aboriginal site/s or an Aboriginal place, you need to:

- Consult with the Aboriginal community groups to identify the location of Aboriginal sites. They may be aware of sites that have not been registered with NPWS.
- Contact the Aboriginal Sites Registrar at NPWS and request a site search to obtain a listing of registered Aboriginal sites. The Register only includes those Aboriginal sites which have been reported to NPWS. **Attachment 1** provides general information on the Aboriginal Sites Register, and a site search request form.
- Undertake an assessment of the known Aboriginal site/s and/or undertake survey of the subject land to locate Aboriginal sites. Test excavations may be required as part of this investigation to verify the location of Aboriginal sites. Such excavations need to be undertaken before the DA is submitted. A permit is required from NPWS for such investigation and if all information is attached to the application the processing time is 8 weeks.

Once you have this information, you need to assess whether the development proposal will impact upon an Aboriginal site or an Aboriginal place. While the *NPWS Act* provides for the destruction of Aboriginal sites, this should always be considered as a last option, and in-situ conservation is the preferred option.

How to find out whether land contains a gazetted Aboriginal place

An Aboriginal place may be considered known if it has been declared by the Minister, and gazetted. Information on whether a proposed development site contains an Aboriginal place may be obtained by contacting the NPWS Aboriginal Sites Register (refer **Attachment 1**).

What information do I need to include with my development application ?

You need to clearly state in your development application to Council whether your proposal would impact on a known Aboriginal site or an Aboriginal place. The flowchart in **Attachment 2** outlines the process for assessing the Aboriginal heritage values of an area to allow you to determine whether your development application will be an integrated development application for Aboriginal sites. It is essential that

the outcomes of the Aboriginal cultural assessment and the technical assessment are integrated. The results of the Aboriginal heritage assessment must be applied to define potential development constraints, and the development concept should these constraints into account. The development application should clearly indicate whether Aboriginal sites will be impacted or not, and if so, what is proposed for each of the impacted sites (this might include salvage excavations, collection of artefacts etc).

If the IDA process is triggered through the presence of known Aboriginal site/s and/or an Aboriginal place that would be impacted by a proposed development, Council will contact the NPWS seeking its general terms of approval. In order to provide general terms of approval the NPWS will need the same level of information required to make the actual decision.

Applicants need to include two types of information in their IDA application:

1. Aboriginal cultural heritage assessment which involves consultation with Aboriginal community groups. The NPWS is committed to working in partnership with Aboriginal community groups in the management of sites and requires community assessment of any Aboriginal sites.

2. Archaeological assessment which involves the assessment of Aboriginal sites and their management based on archaeological heritage criteria.

This information from each of these must be integrated to provide the basis for the final assessment of Aboriginal heritage values and recommendations for management options.

The following advice sets out the NPWS information requirements in more detail. Not all applications will attract the same information requirements. As some of this information is of a technical nature, the NPWS suggests that you consider engaging a reputable archaeologist to assist in the preparation of an IDA.

The NPWS advises that it does not require that a Section 90 consent application be submitted with the Integrated Development Application. The proponent will however be required to apply to the NPWS for a Section 90 consent within three years of the granting of development consent. This is explained in more detail below.

2.1 Aboriginal Cultural Heritage Assessment

Aboriginal sites can be the physical remains of Aboriginal occupation of an area or alternatively, an area that has particular meaning for Aboriginal people, for example, spiritual areas or natural mythological areas. It is important to consider that Aboriginal heritage is not only valuable to Aboriginal people but also to those people who are interested in learning from the early inhabitants of Australia. Proposed developments that alter landscapes can impact on these various types of Aboriginal sites.

Assessment of the cultural values of Aboriginal sites and places to the Aboriginal community is an important part of the assessment process, and the Aboriginal Cultural Heritage Assessment report (discussed below) is required by the NPWS in order for it to consider whether to issue general terms of approval.

2.1.1 Aboriginal Community Group/s Consultation

Applicants should contact (as early as possible) local Aboriginal community groups, including Local Aboriginal Land Councils, any known Tribal Elders Corporations and Native Title Claimants to ensure that proper consultation processes are carried out. Local Aboriginal community groups will require time to consider a proposal and to discuss any issues with its members, and sufficient time must be allowed for this to occur.

The purpose of Aboriginal participation in the assessment process is:

- To notify the local Aboriginal people in sufficient detail and in a timely manner about activities or developments which may impact on Aboriginal heritage, so that their concerns and possible options for action can be identified on a fully informed basis;
- To ensure that Aboriginal people who hold cultural knowledge, including native title holders or applications, are able to contribute to the assessment process in ways that are culturally acceptable to them;
- To identify locations and cultural values of Aboriginal sites and places of significance to the Aboriginal community that may be affected by the proposal so that potential impacts can be avoided wherever possible; and
- To identify whether there are culturally acceptable mitigative measures when impacts are considered to be unavoidable by the applicant.

It is essential that applicants provide NPWS with documentation from the Aboriginal community groups regarding their views and recommendations for actions.

The Environmental Planning and Assessment Amendment Regulation 1998 (Schedule 1, 53AA) allows 46 days (from the date of DA lodgement) for the Director-General of the National Parks and Wildlife to undertake any further Aboriginal community consultation, if the Director-General of the NPW considers that such consultation is required before the Director-General can make a decision concerning the general terms of approval, and consultation commences within 25 days after the date of DA lodgement.

2.1.2 Aboriginal Cultural Heritage Assessment Report

The report should contain:

1. Information on the nature, timing and location of consultation, including the identification of individuals and/or groups consulted and copies of any correspondence from those individuals and/or groups;
2. A statement of the Aboriginal community group/s understanding of the values of the known Aboriginal site/s and/or Aboriginal place located on the development site. This may include social, spiritual, historic, and archaeological values.

3. A statement of the Aboriginal community groups response to the development and their recommendations (if any) for mitigation of impacts and/or conservation of known Aboriginal sites and/or Aboriginal place/s.

The results of this assessment must be integrated with the technical (archaeological) assessment and provide the basis for the final assessment of Aboriginal heritage values and recommendations for management options. The NPWS will also require a clear demonstration in the development application of how the proponent proposes to address any issues which have been raised as part of the Aboriginal cultural assessment, and whether this is acceptable to the Aboriginal community.

To obtain a list of Land Councils and Native Title claimants contact:

NSW State Aboriginal Land Council
PO Box W125
PARRAMATTA NSW 2150
Ph: (02) 9689 4444

Department of Aboriginal Affairs
Level 5, 83 Clarence Street
SYDNEY NSW 2000
Ph: (02) 9290 8700

2.2 Archaeological Assessment

The NPWS requires the information summarised below to evaluate reports on the assessment of Aboriginal sites. Further detail on this is located in the NPWS' *"Aboriginal Cultural Heritage Standards and Guidelines Kit" 1997*, which sets out NPWS requirements for reporting on Aboriginal sites and assessments (refer **Attachment 3** for information on this kit). The assessment of individual Aboriginal sites and the development of management strategies may not require that all of the categories under the following list of information requirements are addressed, however, their relevance needs to be considered for each proposal.

The assessment of Aboriginal sites should be directed towards their conservation and protection. While the *NPW Act* provides for the destruction of sites, this option should always be considered as a last option and must be well supported.

2.2.1 Locational Context:

- description of location of study
- legislative context
- cadastral context (eg: Lot, DP)
- identification of any associated Aboriginal cultural heritage studies undertaken in the study area

2.2.2 Description of Development Impact

- type of development
- extent of direct impacts
- extent of potential indirect impacts (eg: run-off, increased visitation)
- flexibility of project design
- staging and how this might effect present or future management decisions

2.2.3 Assessment Context

- the brief for the work being undertaken for this particular project
- objectives of the assessment

2.2.4 Archaeological Context

- targeted review of known archaeology of region and previous work in the study area to identify range of expected archaeological evidence relative to the project and landscape
- type/s of Aboriginal sites
- **synthesis** and **evaluation** of this information to identify archaeological issues. This will provide the basis for defining the archaeological assessment and management context relevant to this study, and the development of appropriate management options, with protection/conservation being the primary consideration. It should be noted that a summary of previous work is not adequate.

2.2.5 Landscape Context

- description of landscape classification and land units being used for the study (at the different levels of landscape, landscape unit, landform, topographic unit)
- identification of any paleo-features
- assessment of how the landscape context and previous land surface change is relevant to the study
- assessment of how the landscape relates to models of site location and archaeology (as per synthesis above), and development of a framework for assessing the sites and landscapes within the study area
- identification of areas of archaeological sensitivity

The landscape analysis may need to include a geomorphic study to ensure that significant features are identified and considered in the overall assessment (e.g.: paleofeatures with the potential to include older sites).

2.2.6 Condition of Landsurface

- identify previous land surface impacts across the study area, with the view to assessing whether sites may be buried such as campsites, burials, and the integrity of the landsurface in those locations
- description of ground surface conditions and supporting tabulated data (for surveys)
- assessment of how the landsurface conditions have revealed, concealed, destroyed, impacted on or preserved archaeological evidence and how this relates to archaeological potential, the condition of Aboriginal sites and the geomorphology in these contexts

2.2.7 Methodology for Investigation

- description of input from the Aboriginal community to the method proposed for undertaking the study
- the proposed field methodology, such as type of sampling strategies and survey coverage (this should be targeted to the objectives of the study)
- description of the scope and method of recording and analysis by which the objectives of the study will be achieved

- the method whereby a clear and supportable significance assessment will be undertaken a supportable rationale for any proposed test excavations
- the program of work
- rationale for any variation in the methods adopted
- test excavation methodology, if relevant

2.2.8 Survey Coverage Data

- description of survey coverage and the effectiveness of that coverage for detecting potentially buried Aboriginal sites (this needs to be fully described and evaluated within the context of the objectives and the study plan. Specific methods are detailed in the NPWS Standards & Guidelines Kit)

2.2.9 Analysis and Reporting

- detailed Aboriginal site description/s including tabulated data summarising site content and any analysis, as per the NPWS Guidelines
- comprehensive evaluation of the study results (for potentially buried archaeological deposits this includes incorporating the information on archaeological potential and the reliability of survey coverage)
- results of test excavations, if relevant

Diagrams and photos are considered to be an essential component of archaeological reporting.

2.2.10 Archaeological Significance Assessment

- the significance criteria and attributes used for the assessment need to be fully supported by the information presented on the archaeological and landscape context of the site/s (e.g.: representativeness, items and landscape elements considered to be rare, information potential, social/historical values). The criteria for assessment need to be measurable.

2.2.11 Conclusions of the Study

- evaluation of potential impacts on known Aboriginal sites and areas of
- archaeological sensitivity and potential (if relevant)
- establish clear relationship between significance assessment and impacts
- consideration of cumulative impact of development on comparable sites and landscapes at both a local and regional level
- consideration of various management options, **specifically identification of conservation options**, including on-site conservation and compensatory areas (for larger scale projects)
- description of mitigation works required for specific sites to be impact on

2.2.12 Management Options

- recommendations for conservation and other management options based on the results of the archaeological report and discussions with the land owner / manager and the Aboriginal community group/s
- incorporation of management options from Aboriginal community group/s where these relate to the management options being proposed for sites or places

The following maps are required as a minimum (more detailed specifications are set out in the NPWS Guidelines). Mapping should be at the same scale throughout the report.

- location of study area (1:25,000 map series where available, more detailed maps are useful additions)
- development layout if known, flexible components of design if applicable
- locations of previous survey undertaken and sites recorded (referred to in text)
- (for surveys) survey coverage data showing location and extent of different methods used
- land units and topographic information used
- land surface history highlighting the location and boundaries of the disturbed and intact deposits
- Aboriginal site locations

A comprehensive glossary of terms used should also be provided.

Subsequent to the grant of development consent.

Please note that while you may have been granted a development consent, you are still required to apply to the NPWS for a Section 90 consent to destroy an Aboriginal site and/or Aboriginal place. You have up to three (3) years to apply to the NPWS for a consent to destroy an Aboriginal site or an Aboriginal place. This will involve the submission of an application to the NPWS and the payment of a fee to have the application assessed. For more information about how to applying for a consent to destroy, contact the relevant NPWS office (see below).

What happens if an Aboriginal site is found on the land after a development application is lodged or a development consent is granted ?

It is possible that an 'unknown' Aboriginal site could be identified on the land over which a development application has been lodged or development consent has been granted. The NPWS strongly advises that an adequate assessment of Aboriginal heritage values of the land is carried out prior to lodgement of the DA, so that this situation does not arise. However, in the event that this does occur, all works on or adjacent to the Aboriginal site must cease, and you must identify a conservation option to project the Aboriginal site or seek a consent to destroy the Aboriginal site from the Director-General of NPWS. A development consent granted under the *EP&A Act* does not equate to a Section 90 consent issued under the NPW Act. A consent to destroy an Aboriginal site must be granted pursuant to the *NPW Act* before an Aboriginal site or Aboriginal place can be destroyed. Failure to obtain this consent may result in prosecution.

Fees

The NPWS will charge a fee of $250 to process the development application for an integrated approval. This fee should be paid by cheque and attached to the integrated

development application. The cheque should be made out the National Parks and Wildlife Service.

This fee is only for the processing of an integrated development application. You may be required to pay separate fees to the NPWS to obtain a site search from the NPWS Aboriginal Sites Register, and/or a fee if you apply to the NPWS for an application for consent to destroy an Aboriginal site.

Contacts

The National Parks and Wildlife Service has a Cultural Heritage Division which manages Aboriginal heritage. The Division includes 4 geographic units which deal with on- and off-park conservation planning and assessment issues.
These boundaries are shown on **Attachment 5.**

For further information on these requirements, please contact the Aboriginal heritage unit in your area:

Manager, Central Aboriginal Heritage Unit
Cultural Heritage Division
NSW National Parks and Wildlife Service
PO Box 1967
HURSTVILLE NSW 2040

Ph: (02) 9585 6674
Fax: (02) 9595 6442

Manager, Northern Aboriginal Heritage Unit
Cultural Heritage Division
NSW National Parks and Wildlife Service
Locked Bag 914
COFFS HARBOUR NSW 2450

Ph: (02) 6659 8245
Fax: (02) 6651 6187

Manager, Southern Aboriginal Heritage Unit
Cultural Heritage Division
NSW National Parks and Wildlife Service
PO Box 2115
QUEANBEYAN NSW 2620

Ph: (02) 6298 9736
Fax: (02) 6298 4281

Manager, Western Aboriginal Heritage Unit
Cultural Heritage Division
NSW National Parks and Wildlife Service
PO Box 1007
DUBBO NSW 2830

Ph: (02) 6883 5345
Fax: (02) 6884 9382

Our Ref: ERM01/00970

15 February 2002

LAND & WATER CONSERVATION

Project Environmental Scientist
Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Attention: MARK GRIFFITHS

Dear Mr Griffiths,

Re: EIS Requirements and clarification of Part 3A Permit requirements Proposed Sandstone Extraction Project, Lots 1-5 DP 240610 Wisemans Ferry Road, Cattai

Thank you for your letter dated 24 September 2001, seeking this Departments comments and requirements for the above-proposed EIS.

The Department of Land and Water Conservation (DLWC) is responsible for managing the soil, water and vegetation resources in New South Wales. The vision of the Department is to facilitate *clean, healthy and productive catchments for the twenty-first century.* As part of this vision, the Department advocates the principles of ecologically sustainable development, and intra and intergenerational equity.

The Departments comments are broad in nature to cover a variety of circumstances. Some of these comments may not be fully relevant to your proposal.

As part of the preparation of the EIS you will need to demonstrate how this proposal will meet the requirements of the various Acts and Policies within this letter.

Integrated Development

Any development proposal that requires a **3A permit under the *Rivers and Foreshores Improvement Act (1948)*,** or a **water license under the *Water Act (1912*)**, for either surface water or ground water extraction, will be an Integrated Development. In these instances, the Department is an Approval Body for the Consent Authority (either Council or the Minister for Urban Affairs and Planning).

Rivers and Foreshores Improvement Act (1948).

The Department is responsible for administering the Rivers and Foreshores Improvement (R&FI) Act (1948).
If there is any creek, drain, channel (artificial or natural), depression, etc. which conveys water, or there is a foreshore, a Part 3A Permit may be required from the Department under the Act to:

(1) **Excavate** or remove material from the bank, shore or bed of any stream, estuary or lake, or land that is not more than 40 metres from the top of the bank or shore of protected waters (measured horizontally from the top of the bank or shore). "**Protected waters**" as defined under section 22A of the Act means a river, lake into or from which a river flows, coastal lake or lagoon (including any permanent or temporary channel between a coastal lake or lagoon and the sea).

(2) **Build erosion control works** and other **structures** in a river, estuary or lake.

(3) **Place any fill material** in a river, estuary or lake.

When assessing developments that require a Part 3A permit under the R&FI Act, the Department will consider whether the proposal is consistent with State Government policy, including the NSW State Rivers and Estuaries Policy. A condition of consent to a Part 3A permit may include the establishment of a native vegetation riparian zone along a "river". The Department is unlikely to issue a Part 3A Permit for works that degrade watercourses and their environment.

It is the Departments aim that an adequate native vegetation riparian zone be kept or established on either side of any "river" or wetland area. A minimum native vegetation riparian zone of 20 metres, from the top of the bank is generally required, however the exact widths required will depend upon the site and the surrounding area. Further comment on this issue is provided below.

On-line or in-stream water quality structures such as water quality ponds, trash racks and gross pollutant traps (GPT's) are strongly discouraged, as they will affect the continuity and corridor function of streams and result in the loss of riparian vegetation and habitat.

The channelisation, piping and/or relocation of streams and the construction of on-line or in-stream structures and culverts for stream road crossings are also strongly discouraged. Developments that propose such actions must have the necessary approval of DLWC and are unlikely to receive support.

Works that are undertaken by Public Authorities (not including business ventures such as state-owned corporations or commercial undertakings), or works on Crown Land, do not require a 3A permit prior to commencing works. However, all works undertaken still need to comply with Government policy, and if it is deemed that they could degrade the protected lands of the watercourse, the Department can require works to cease and issue a remedial notice to repair any damage.

Please note that the definition of a "river" in the Rivers and Foreshores Improvement Act is different to the definition in the Water Act and must be considered separately.

Following an inspection of the site and assessment of the submitted plans, the Department has determined which watercourses, including, and south of, the main drainage line, are 'rivers' for the purposes of the Rivers and Foreshores Improvement Act, 1948. Please see attached plan for details. Any excavations that are located in, or within 40 metres from the top of the bank of, these 'rivers' (measured horizontally from the top of the bank), or works likely to affect the flow of waters, will require a Part 3A permit. In addition to the extractive operation, such works may include discharge or outlet structures for stormwater runoff, access roads, sediment and erosion controls, sediment basins etc.

It is critical that any extractive operation incorporate adequate protection of the watercourses and their riparian zones and progressive rehabilitation by the planting of native species propagated from local seed stock as each area or stage is completed.

The 5m setback from the main drainage line and dams as shown on the submitted Plan A, dated 20 September 2001, is not considered adequate. As a large portion of the proposed extraction area consists of native bushland, the specific details of required widths must be determined in conjunction with the review of a comprehensive flora and fauna study (a pre-requisite of further assessment). DLWC would be happy to clarify minimum riparian zone widths and minimum extraction buffers following receipt and review of this information.

DLWC will require the preparation of a *Vegetation Management Plan* for the length of the 'rivers', to be prepared by suitably qualified persons, with knowledge and experience in preparing such plans, in consultation with, and with the approval of DLWC prior to the issue of any Part 3A permit. The plan is to describe in detail the vegetation proposed to be retained and protected, the rehabilitation of any riparian zones affected by works using local native vegetation, vegetation maintenance, monitoring and

performance criteria and who is to undertake the tasks. Refer to the Department's draft guidelines on "How to Prepare a Vegetation Management Plan" (attached) which may be of assistance to you.

While a Part 3A permit is not required for works that may affect the remaining minor watercourses, it is recognised that they and their catchments have an important water quality polishing and improvement function and the watercourses currently provide a vital corridor linkage to native vegetation remnants up and downstream.

For these reasons, the Department strongly recommends these existing natural watercourses and native vegetation riparian zones be protected from any disturbance. However, if this is not possible, it is essential that any proposal incorporate the restoration of an open natural waterway and the re-establishment of an adequate native vegetation riparian zone. Where watercourses are disturbed, the EIS must consider concept stream restoration options. Concept details must address the proposed restoration of the watercourses, staging of works and methods to stabilise the bed and banks of the watercourses. The restoration of the watercourses should adopt an environmentally sympathetic, soft-engineering approach.

The concept design options will provide the basis for a *Stream Restoration Plan* prepared for the length of disturbed watercourses. This plan should be prepared by suitably qualified persons, with knowledge and experience in preparing such plans, in consultation with, and with the approval of, the consent authority prior to the commencement of works.

It was noted during the site inspection that the existing sediment basin No. 2 is severely eroding at the spillway and is in urgent need of stabilisation works. The EIS must address the rehabilitation, and where necessary decommissioning, of existing, or defunct, soil and water management structures.

It is also important that the quarry operations are designed and implemented to ensure that the hydrology of these catchments is not altered. The EIS must be demonstrated how this will occur.

While the above general considerations should be addressed within the EIS, further details and plans as mentioned, will be required to allow detailed assessment of the proposal by DLWC and the preparation of any General Terms of Approval or any Part 3A permit. The proponent is advised to contact a 3A permit Natural Resource Officer, at the Penrith Office, to further discuss any Part 3A matters.

NSW State Rivers and Estuaries Policy - General.

The NSW Government has a policy to encourage sustainable development of the natural resources of the State's rivers, estuaries, wetlands and adjacent riverine plains. This is to reduce and where possible halt;

- declining water quality,
- loss of riparian vegetation,
- damage to river banks and channels,
- loss of biodiversity, and
- declining natural flood mitigation;

and to encourage projects and activities which will restore the quality of the river and estuarine systems such as;

- rehabilitating remnant habitats,
- re-establishing vegetation buffer zones adjacent to streams and wetlands,
- restoring wetland areas,
- rehabilitating of estuarine foreshores, and
- ensuring adequate streamflows to maintain aquatic and wetland habitats.

This includes ensuring the construction of any wetland or detention structure off-line, so as not to degrade the functions of that natural resource.

NSW Wetlands Policy - General

The NSW Government has a policy to encourage projects and activities, which will restore the quality of the States wetlands. The following principles will be applied in reviewing any proposal,

- Water regimes needed to maintain or restore the physical, chemical and biological processes of wetlands will have formal recognition in water allocation and management plans.
- Land use and management practices that maintain or rehabilitate wetland habitats and processes will be encouraged.
- New developments will require allowances for suitable water distribution to and from wetlands.
- Water entering natural wetlands will be of sufficient quality so as not to degrade the wetlands.
- The construction of purpose-built wetlands on the site of viable natural ones will be discouraged.
- Natural wetlands should not be destroyed, but when social or economic imperatives require it, compensation through the rehabilitation or construction of a wetland will be required.
- Degraded wetlands and their habitats and processes will be actively rehabilitated as far as is practical.
- Wetlands of regional or national significance will be conserved, and
- The adoption of a stewardship ethos and co-operative action between land and water owners and managers, government authorities, non-government agencies and the general community is necessary for effective wetland management.

NSW Weirs Policy - General

The goal of the NSW Weirs Policy is to halt and, where possible, reduce and remediate the environmental impacts of weirs. The following principles will be applied in reviewing any proposal.

- The construction of new weirs, or enlargement of existing weirs, shall be discouraged.
- Weirs that are no longer providing significant benefits to the owner or user shall be removed, taken into consideration the environmental impact of removal.
- Where retained, owners shall be encouraged to undertake structural changes to weirs to reduce their environmental impact.
- Where retained, owners of weirs with regulatory works shall prepare and adhere to operational plans to reduce the environmental impact of those weirs.
- Where retained, gates, offtake structures and fishways on all weirs shall be maintained in good working order.
- Wetlands and riparian vegetation adjacent to weirs should be protected from permanent inundation.
- Ares of environmental degradation caused by the impact of weirs upstream and downstream of weir pools, should where possible be rehabilitated.
- A respect for the environmental impact of weirs should be encouraged in all agencies and individuals who own, manage or derive benefits from weirs.

Any proposal to build a new weir or enlarge or modify an existing weir may not be approved unless it can be demonstrated that the primary component of the proposal is necessary to the maintaining the essential social and economic needs of the affected community.

Surface Water License Issues

The Department is responsible for administering the Water Act (1912), which is for the managing and regulating the use of surface water resources. Water extraction is governed by the Water Administration Act (1986). The new Water Management Bill, will consolidate these and other existing Acts. The new legislation is designed to provide better ways for the equitable distribution of water with an emphasis on environmental protection. Therefore any proposal that may take several years to be implemented may be impacted by changes to the new legislation.

Surface water Licences are issued for authorised works which:-

- Are connected with or which affect the quantity or use of water in a "river" or "lake". A "river" is defined as:- any 3rd or higher order watercourse, as shown on topographic maps.
  any "permanent" flowing stream irrespective of stream order.

Please note that the definition of a "river" in the Water Act is different to the definition in the Rivers and Foreshores Improvement Act and must be considered separately.

- Capture rainfall runoff, and are located on hillsides, gullies or minor non-permanent watercourses. (refer to the Farm Dams Policy below).

Authorised works can include one or a number (or variations on these structures) of the following:-

*	Pumps	*	Regulators	*	Off river storage
*	Pipes	*	Channels	*	Turkeys nest storage
*	Dams	*	Drains	*	Floodplain harvesting storages
*	Weirs	*	Cuttings	*	Tailwater storages
*	Locks	*	Excavations	*	Retentions basins
*	Barrages	*	Training banks		

A licence is issued for a particular purpose and can include one or a combination of the following:

a. General

*	Irrigation	*	Augmentation of a watercourse
*	Stock supply	*	Prevention of inundation
*	Domestic supply	*	Experimental/research purposes
*	Town water supply	*	Drainage
*	Conservation of water	*	Changing the course of a watercourse
*	Recreation	*	Recirculation
*	Horticulture (*citrus, nuts, grapes)*	*	Farming purposes (*dairy, washing/preparing produce for market etc. See also processing produce under Industrial*).
*	Pisciculture (*fish farming)*	*	Firefighting
*	Aquaculture *(crustaceans)*	*	Regulation of flow
*	Soil conservation		

* The capacity of the dam is greater than 7.0 megalitres. Dams less than 7.0 megalitres and for stock and domestic purposes only, form part of a riparian right and are not required to be licensed. However these dams will require a Part 3A Permit under the R&FI Act.

b. Industrial/Commercial

*	Power generation	*	Industrial
*	Mining	*	Abattoir
*	Industrial-sand and gravel	*	Cannery
*	Hotel	*	Motel
*	Caravan park	*	Boarding house
*	Intensive breeding (feedlot)	*	Dust suppression

* Processing produce *(eg. poultry, fruit vegetables etc).*

Details of the proposal are required, including design, layout, pumping and storage capacities, volumes of water to be used, all associated earthworks and infrastructure works etc. Also to be included are environmental impact management reports such as fauna and flora reports, geotechnical reports for salinity or acid sulfate soils etc. The EIS will need to demonstrate the commercial, environmental benefits and sustainability of the proposal.

The licensing process includes advertising which the consent body must undertake. Licenses are generally issued for 5 years.

There will be separate fees, including an application fee and other charges based on the capacity of the work, the purpose, the volumetric allocation or the area to be irrigated. Surface water licenses are also subject to annual charges as determined by IPART. The license must be obtained before any licensable works can be constructed.

Farm Dams Policy

The NSW Government has a policy to give landholders the right to capture and use for any purpose some of the runoff from their property. This is known as the Harvestable Right and for management purposes will be implemented as a corresponding total dam capacity for the property. The Harvestable Right does not need to have a water licence.
Harvestable Right Dams can be located on hillsides, gullies and minor watercourses that do not have permanently flowing waters. In order to provide a practical and objective way of deciding what are gullies and minor watercourses the Department has adopted a method based on stream ordering of watercourses on topographic maps. It is recommended that you contact your local DLWC office to determine the status of any watercourses on the property.

The Farm Dam Policy does not apply to "Rivers" as defined above. The term "Farm" dam is generic and can apply to any dam whether or not it is on a farm.

The Harvestable Right entitles landholders to capture and use for any purpose 10% of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC).

The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. The location and estimated capacity of every dam must be shown. A self assessment kit is available from the Department to help understand and calculate the Harvestable Right. This can be obtained by phoning 1800 353 104 for a copy. For more information please contact your local licensing officer. Any capacity of the total of all the dams on the property greater than the MHRDC may require a licence.

There are exemptions for dams related to the Harvestable Right. These include:-

- Dams to control or prevent soil erosion.
- Dams to contain effluent and sediment.
- Flood detention basins.
- Dams built for environmental reasons (eg aesthetics, nutrient control, wildlife etc).
- Dams which don't harvest runoff (eg. turkeys nest dams, ring tanks).

These exemptions are only applicable to the end use of the dam, even if the initial use is one of the above.

Embargoed Catchments.

The Department has proclaimed an embargo on application for new or additional entitlements from surface water sources within the Hawkesbury/Nepean catchment and the Bega/ Brogo River catchment. This also applies to the construction of dams that require a water licence and are on a 3rd order stream or larger watercourse.
Any landholder wishing to lodge an application for a surface water licence should firstly contact an appropriate Licensing Officer within the Department to seek advice. The Department cannot accept licence applications in embargoed catchments.

Ground Water License Issues.

The Water Act states that all works connected to a source of underground water and used for water supply, waste disposal, or any other commercial or industrial purpose, must be licensed. A work includes any of the following: bore, well, excavation, shaft trench, collector system, spearpoint, artesian bore temporary dewatering of construction sites, or variations on these basic structures. The term bore is used throughout this section to describe any of the above works.

When there has been an artificial improvement work carried out on a natural spring and it is used for water supply, a licence is also required. A natural spring where there has been no improvement of the original feature does not require a licence.

Licences are issued for a commercial, industrial etc purposes. There is a requirement to fit a meter and report water usage to the Department.. Licences are subject to distance conditions as follows:

a) At least 200 metres from a property boundary.
b) At least 400 metres from the nearest irrigation bore.
c) At least 500 metres from a town water supply bore.
d) At least 40 metres from the bank of a river or defined creek.

Exemptions are sometimes possible for small properties and where practical considerations lead neighbours to agree on more closely spaced bores.
In assessing the groundwater license, the Department will consider if the proposal is consistent with The NSW Groundwater Policy Framework Document.

Any dewatering a development site in order to lower the local water table to permit the construction of subsurface areas eg. a basement level underground carpark etc. is also a licensable work under Part V of the Water Act.. Temporary dewatering may be authorised provided there are no adverse environmental or resource management impacts associated with the proposal.. Permanent dewatering, however, is considered to be unsustainable and accordingly will Not be APPROVED.

Details of the proposal are required, including design, layout, pumping and storage capacities, volumes of water to be extracted all associated earthworks and infrastructure works etc. Also to be included are environmental management reports such as water quality assessments (particularly in urban areas, and areas of known or suspected contaminated groundwater locations), a hydrogeological report showing the impacts on the groundwater and other users of the water, a fauna and flora report, a geotechnical report for salinity or acid sulfate soils etc. The EIS will need to demonstrate the commercial, environmental benefits and sustainability of the proposal.

There will be separate fees, including an application fee and other charges based on the capacity of the work, the purpose, or the area to be irrigated. The water license is also subject to annual charges as determined by IPART
The bore licence must be obtained prior to construction of the any licensable works you must supply the name of the licensed driller before work commences.

For further information contact, Mr Dan McKibbin, Regional Hydrogeologist, phone number 9895 7875.

The NSW Groundwater Policy Framework Document - General

The NSW Government recognises the need to manage the State's groundwater resources so that they can sustain environmental, social and economic uses for the people of NSW.
It is to encourage the ecological sustainable management of the groundwater resources so as to:

- Slow and halt, or reverse any degradation of groundwater resources.

- Ensure long term sustainability of the systems ecological support characteristics.
- Maintain the full range of beneficial uses of these resources.
- Maximise economic benefit to the Region, State and nation.

The following principles will be applied to any proposal:

- An ethos for the ecologically sustainable management of groundwater resources to be encouraged in all agencies, communities and individuals that own, manage or use these resources, and its practical application facilitated.
- Non-sustainable resource uses to be phases out.
- Significant environmental and/or social values dependent on groundwater to be accorded special protection.
- Environmentally degrading processes and practices to be replaced with more efficient and ecologically sustainable alternatives.
- Where possible, environmentally degraded areas to be rehabilitated and their ecosystem support functions restored.
- Where appropriate, the management of surface and groundwater resources should be integrated.
- Groundwater management should be adaptive, to account for both increasing understanding of resource dynamics and changing community attitudes and needs.
- Groundwater management should be integrated with the wider environmental and resource management framework, and also with other policies, dealing with human activities and land use, such as urban development, agriculture, industry, mining, energy, transport and tourism.

The proponent will need to demonstrate how this strategy will be met.

Floodplain Management - General

Any development on flood prone land should be considered in accordance with the NSW Government's Flood Policy (1984). These principles are further explained in the Government's Floodplain Management Manual (2001). The primary objective of the State Government's Flood Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers, and to reduce the private and public losses resulting from all levels of potential flooding. As outlined in the Manual the Policy is merits based, in which the impacts of flooding are balanced against planning, social, environmental and economic issues. The consent authority needs to check that all considerations in the Manual are adequately addressed in making decisions.

The management of flood prone land is primarily the responsibility of local government. The State Government provides technical assistance and, in association with the Federal Government, financial assistance for flood related studies, mitigation works etc.

In assessing any development proposal, consideration needs to be given, where appropriate, to the potential impacts of flooding on the proposed development; the impact of the proposed development on flood behaviour both upstream and downstream of the site; and the possible impacts of flooding on residents and other users of the floodplain. Particular attention should also be given to availability of safe access and egress from the site in times of flood. In this regard, the full range of potential flood events, up to the probable maximum flood (PMF) should be considered.

Impacts from development in isolation can be small. However, when considered in combination with other future development the impact might be significant. It is therefore prudent to assess the cumulative impacts of all likely development. A floodplain management study is an effective way of assessing these cumulative impacts.

Under the Government's Flood Policy, the determination of the acceptability of any afflux arising from proposed development should be merits based and would normally be a matter for the relevant consent authority. However, it should be noted that in some communities an afflux as small as 10 mm has needed to be addressed by way of providing some compensatory flood mitigation.

Should you wish to discuss any Floodplain Management matters further with the Department, please do not hesitate to contact David Avery on phone number 9895 6242.

NSW Biodiversity Strategy

The NSW Government has a strategy for protecting the native biodiversity of NSW and for maintaining ecological processes and systems. The following principles will be applied in reviewing any proposal;

- Ensuring that the proposal does not decrease native biodiversity of either individual species or communities of the site or area.
- Ensuring that the proposal is not part of any threatening process to the native biodiversity of the site or area.
- Determining if the proponent has been guided by the precautionary principle to show careful evaluation to avoid, wherever possible, serious or irreversible damage to native biodiversity, through an assessment of risk-weighted consequences of various options.

The proponent will need to demonstrate how this strategy will be met.

Crown Land Matters - General

Matters the proponent needs to consider when undertaking development adjoining Crown land include;

- Overland flows, including stormwater should not be concentrated or diverted from their natural flowline.
- Roofwater shall not be discharged directly onto Crown land.
- The velocity and volume of stormwater flows to Crown land must be no greater than those before the proposed development.
- Any stormwater control structure must be designed and constructed in accordance with, *Managing urban Stormwater, Soils and Construction*. NSW Dept of Housing, 3 Ed. (1998).
- Any excavation or fill is to be contained entirely on the proponents' property and shall not jeopardise the longevity of any vegetation on Crown land. Where fill is proposed adjoining the common boundary it shall be properly drained and retained or battered back and revegetated to prevent the escape of any material onto Crown land.
- Access to any part of the proponents property is not to be over Crown Land. Should the proponent wish to construct a Crown road, permission in writing must first be obtained from the Department.
- Any fire reduction zone that is required by a development, that adjoins Crown land is to be completely within that development boundary.
- Any other matters that may adversely impact upon the Crown land.

Soil Conservation Act (1938)

The Soil Conservation Act (1938) and amendments provides for the conservation of soil and farm water resources and for the mitigation of erosion within NSW. Any land use activity that disturbs a vegetative ground cover creates an erosion hazard, which requires measures to minimise environmental degradation.

In relation to soil erosion, sedimentation and land degradation in general the Department advises that the EIS should address at least, but not be limited to the following issues:-

⇒ topography
⇒ landform
⇒ soil type
⇒ soil erodibility
⇒ site capability

- ⇒ potential for salinity problems.
- ⇒ acid sulfate and potential acid sulfate soils
- ⇒ vegetation management
- ⇒ erosion and sediment control strategy including techniques

Saline Soils

All developments occurring on the soils derived from the shales on the Cumberland Plain and other known areas of saline soil risk, have a high potential to be adversely impacted upon be a rising saline ground water table. Any development which clears vegetation, (particularly trees), and developments that are in the lower parts of the local landscape could cause a salinity impact, either on the site or off the site, and may not occur for several years after the development.

There are three factors to the development of salinity in an area. These are the salts that are contained within the vertical profile (whether topsoil, subsoil or bedrock); a shallow groundwater table (that will allow mobilisation of salts within the soil or bedrock) or, a shallow saline groundwater table.
In order to ascertain the presence of these factors it is recommended as a minimum:

1. Soil testing be undertaken at least every 500-1000m^2 and samples should be taken of the top 15cm, 15-30cm, 30-50cm, 50 -75cm and 75cm to 1m. If there is a salt crust anywhere on the site, a separate sample of the top 2cm should be undertaken. The location of sampling should ensure that the site is adequately represented in the results.

   Note that when electrical conductivity is tested for the soil samples, the results should ensure that conversion factors allowing for the texture of the soil have been taken into account. A raw reading for electrical conductivity with no corrections for texture will give an incorrect and misleading result.

2. Water samples should be taken from piezometers and measure for electrical conductivity. Note that the position of groundwater relative to the ground surface is very important as a shallow watertable (<3m) will affect surface conditions. This may change over time (especially during and after rainfall events) so that a data recorder may be necessary unless frequent recordings can be taken manually.

It is strongly recommended that an electromagnetic induction survey be undertaken of the entire site to determine areas at risk. Proposed development(s) can then be undertaken with reference to this information especially in terms of future drainage, stormwater retention, open space and zoning requirements.

Please note that conditions are subject to change over time whether or not development is undertaken, and that the results of the above tests do not provide any guarantee that salinity will not become a land management issue in the future.
These impacts need to be considered, and remediation strategies developed to minimise the potential impacts. If your site occurs in these soils or locations, then you are advised to seek more site specific advice from Ms Susan Hayward, Regional Salinity Awareness Officer, phone contact 4722 1188

Erosion and Sediment control Plan

An integrated site development plan needs to be prepared, incorporating an Erosion and Sediment Control Plan, for the EIS. This plan shall cover the life of the proposed site extension, rehabilitation and closure, and ensure that the site land is stabilised to standards of the *Managing Urban Stormwater, Soils and Construction*. NSW Dept of Housing,, 1998, 3 Ed, and Consent Authority (which ever is the greater). The plan at the EIS stage should be detailed enough to enable any reviewer to determine that the concepts for control are sound and practical. The sizes and location of control works should be according to design and the accepted policies, and the revegetation/ landscape plan will enhance the native vegetation biodiversity of the site. It is expected that the following detail will be made available

upon request, if required. This same detail is what will be required before the Construction Certificate stage.

- ⇒ Soils investigation to determine erosion and sediment control design
- ⇒ Details on proposed erosion control practices
- ⇒ Details on proposed sediment and pollution control practices
- ⇒ Discharge calculations for diversionary works
- ⇒ Design specifications for banks and sediment basins
- ⇒ Detailed rehabilitation practices including selection of tree, shrub and cover crop species and implementation method
- ⇒ Maintenance and monitoring program for sediment and pollution control structures
- ⇒ Assessment of off-site impacts for surface flow from the development
- ⇒ Rehabilitation proposal for existing erosion on or adjacent to the site
- ⇒ Plans at suitable scale and with diagrams and notation clearly displayed
- ⇒ Details of development works for sequence and staging
- ⇒ Location of critical areas (water bodies, drainage lines, unstable slopes, rock outcrops, hard cover areas, flood plains and wet areas).
- ⇒ Location of all earthworks including roads, areas of cut and fill or land regrading
- ⇒ Diversion of uncontaminated up-site runoff areas to be disturbed
- ⇒ Existing and final contours
- ⇒ Revegetation program

Native Vegetation Conservation Strategy.

The Commonwealth and NSW Governments have a strategy for protecting native vegetation. The performance indicator for this strategy is the concept of no net loss.
No net loss is the enhancement of both the quality and extent of native vegetation in the long term as a result of retention and adequate offsets for losses across a specified area.
To offset an activity means to compensate for the negative impacts of that activity, by taking a separate action with equal or greater positive impacts.

The proponent will need to demonstrate how this strategy will be met.

Vegetation - Endangered Ecological Communities

If there is any native vegetation upon the proposed development site\s, the proponent must check that there is no other Endangered Ecological Communities. There have been several recently listed, and an up to date listing, details of potential location, and description should be obtained from National Parks and Wildlife.

Vegetation - Native vegetation establishment near native vegetation areas.

The Department recommends that developments integrate an endemic native revegetation program. This is to minimise or prevent potential environmental weeds spreading into any existing nearby native vegetation areas and to minimise the fragmentation of any native vegetation by the development.

Vegetation - Native plant enhancement.

The Department recommends that developments, where applicable, integrate a bush regeneration program within the development. This is to minimise the on and off-site environmental weed invasion potential and enhance any native vegetation.

I trust the above comments will be useful in the preparation of the EIS. The Department will require three full copies of the EIS to be sent to Greg Brady, Environmental Review Co-ordinator, at the address supplied. Should you have any questions please contact Greg Brady on (02) 9895 7441.

Yours sincerely,

for
Marwan El-Chamy
Resource Access Manager
Sydney/South Coast Region

ATTACHMENT A

How to Prepare a Vegetation Management Plan
(Draft)

1. **Assess the site and determine constraints:** flora and fauna (previous studies, endangered species & ecological communities/existing vegetation communities, etc.); habitat and corridor values; topsoil/litter layer quality; hydrology/hydraulics (flooding, surface water runoff/drainage, velocities, water table, etc.); frost areas; fire issues; contaminants; acid sulphate soils; salinity, roads and pathways, railways, airfields, service infrastructure (water, sewerage, gas, electricity, communications); stock and herbivore access (rabbits, hares, ducks, etc.); shadow zones; drainage; topography (slope, aspect, soils, geology, erosion, deposition); weeds and weed sources, risk of vandalism, public safety issues, etc..

2. **Define project tasks:** describe each task necessary for the implementation of the plan, how each task will be done, the duration of each task, the priority order for each task and who will be responsible for undertaking each task.

3. **Prepare a time frame (eg Gannt chart):** address all tasks in the project.

4. **Liaise:** contact council Bushcare Officer, landcare or bushcare groups.

5. **Provide details on seed collection and propagation:** local native species only to be used - identify local native seed sources, check on any licences required - identify who will propagate.

6. **Prepare maps/diagrams and plant species lists:** describe existing vegetation, constraints, vegetation and natural features to be retained, proposed vegetation (species/communities, zonation from water to land, corridors/linkages, spacings, tubestock/virocells/long stems/direct seeding, etc.), sediment and erosion control, stabilisation works, etc..

7. **Provide details on site preparation:**

   - protection of plants to be retained
   - installation of sediment and erosion control devices
   - completion of any site works (if any)
   - weed control (techniques and sequences of removal)
   - application of herbicides
   - topsoil/litter layer storage
   - soil remediation
   - surface preparation (levelling, deep ripping, scarifying, mulching etc.)
   - surface stabilisation - (needs to be suitable for the site/vegetation - erosion matting, mulch, brushmatting, sterile cover crops, binding sprays, etc.)
   - site drainage

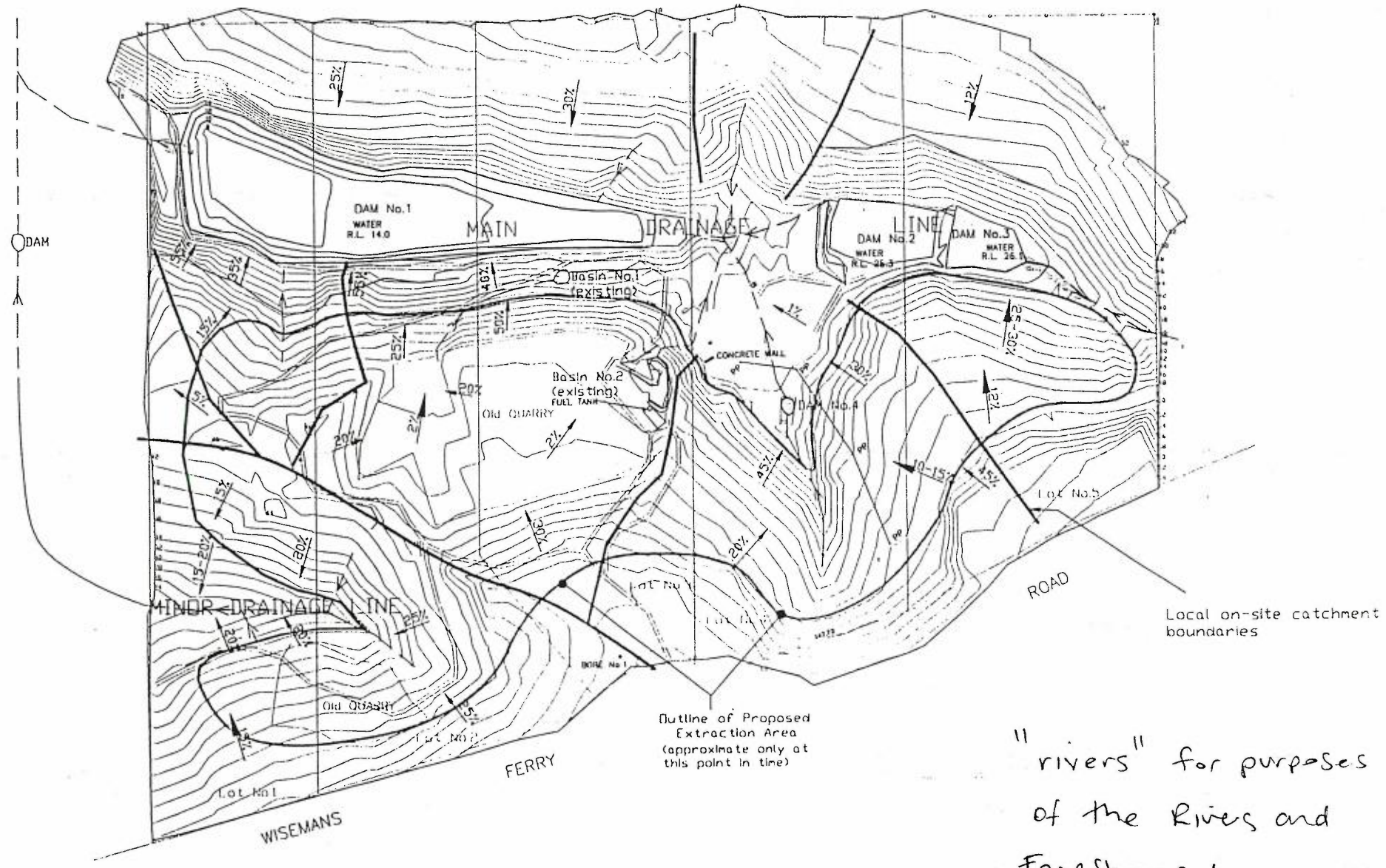
8. **Describe the planting program and method:** detail how it will be done, staging and also consider the installation of weed mats, mulch, stakes & ties, tree guards and the use of fertilizer types (justify their need), water-retaining crystals, etc..

9. **Describe site and vegetation maintenance:** sediment and erosion control, watering, replacement of plant losses, weed control, disease and insect control, mulch, etc.. (Note: DLWC requires a minimum of **two** years maintenance after last plantings completed).

10. **Describe the monitoring and review process:** include a method of performance evaluation, assessing the need for replacing plant losses, addressing deficiencies and six-monthly reporting.

11. **Address other issues:** signage, relevant legislation, planning instruments/guidelines, OH&S, community involvement, liaison with DLWC and others, how other parts of the site and adjacent areas can be managed to compliment the vegetation strategy (weed control, drainage, etc.), etc..

12. **Prepare a costing:** for the implementation of all stages and all components of the work - show details on unit cost, materials, labour, monitoring/maintenance/reporting, etc..



"rivers" for purposes of the Rivers and Foreshores Improvement Act, 1948.

PLAN A - Cattai Sandstone Quarry Proposal

Date: 20/9/01

N

Scale 1:5000

Surveying by McElwee Associates Pty Ltd

INTEGRAL energy

Australian Quality Award Winner 1995 Large Organisation

24 September 2001

Mr Mark Griffiths
Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

QEC Lic 3351 Integral Energy Networks AS NZS ISO 9001

Dear Mark

RE: Proposed Sandstone Extraction Project - Lots 1-5 (DP240610) Wisemans Ferry Road, Cattai

I refer to your letter dated 7 September 2001 regarding a proposed sandstone extraction project at Wisemans Ferry Rd, Cattai. A search of our records has confirmed that the existing 11kV distribution line located on Lot 5 DP 240610 is owned by Integral Energy.

Should the proposed sandstone extraction works require the relocation of this line, an application is to be made to Integral Energy for the relocation. Upon receipt of this application, you will be advised of the appropriate procedure to follow and advised of costing requirements. It is usual for the full cost of the relocation to be borne by the proponent of the project.

In the event that this line needs to be relocated, an appropriate level of environmental assessment is required. Since the relocation of the line is required for the proposed sandstone extraction works, assessment of the effects of this relocation should be adequately covered in the Environmental Impact Assessment document for this project.

This should be in accordance with Integral Energy's Environmental Management Standard (EMS 0003) which is designed to ensure compliance with statutory obligations under Section 111(1) of the Environmental Planning and Assessment Act 1979. This provides that Integral Energy, as a determining authority must, in its consideration of any works "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity".

Should the existing line require relocation, the following issues should be addressed within the environmental impact statement:

- The visual impact of electrical infrastructure should be adequately assessed within the Environmental Impact Statement. This is particularly important when siting structures such as pole mounted substations and overhead conductors within the vicinity of any residences where previously no electrical infrastructure was visible. These structures should be sited where they impact least on the residents involved.

- Appropriate application is to be made to the relevant local council for any removal of trees under their Tree Preservation Regulations. Negotiations should take place with any affected residents or other stakeholders

- Adequate clearance is to be maintained between the electrical infrastructure and trees. The relocation of assets may require the trimming of trees, which have not previously required trimming. Appropriate consultation is to take place with affected residents and other stakeholders prior to any trimming occurring.

- Residents and other stakeholders affected by electricity outages are to be notified in writing prior to any anticipated outages. Interruption to supply is to be organised so that minimum inconvenience is caused to the customers.

- Appropriate searches must be conducted prior to works commencing to ensure the works affect no other services.

Integral Energy has developed an Environmental Management Standard (EMS 0001) to address the need for Environmental Due Diligence and Environmental Management Plans to be produced and adhered to for works being undertaken on our electrical network. A generic Environmental Management Plan is included to address minor works which may be adopted, and adapted to address the needs of each site.

Copies of EMS 0001 and EMS 0003 are attached for your information. Also attached is a GIS map indicating the location of the powerline on the above-mentioned land. Should you wish to discuss this further, please do not hesitate to contact me on 9853 6549.

Yours faithfully

Lisabeth Chick
Environmental Specialist
Asset Management Services

Your contact: Lisabeth Chick ☎ Direct 9853 6549 Fax: 9853 5169
In Reply Quote: 2001/00342/001
Huntingwood Drive, Huntingwood NSW 2148
Telephone: 131 081 Facsimile: (02) 9853 6000
Postal Address: PO Box 6366, Blacktown NSW 2148. DX 8148 Blacktown
integral@integral.com.au

Our Reference: 31.5314
Contact: Tricia Zapanta-Mostyn
Telephone: 9672 2577
Monday 17 September 2001

Roads and Traffic Authority
www.rta.nsw.gov.au
ABN 64 480 155 255
Sydney Client Services
83 Flushcombe Road
Blacktown NSW 2148
Telephone 131 782
Facsimile (02) 9831 0155
PO Box 558
Blacktown NSW 2148
DX 8120 Blacktown

Harvest Scientific Services
P.O. Box 1000
PICTON NSW 2571

Attention: Mark Griffiths

Dear Mark

PROPOSED SANDSTONE EXTRACTION PROJECT - LOTS 1-5 DP 240610, WISEMANS FERRY ROAD, CATTAI

Further to your letter of 7 September 2001 in relation to the above matter, the following information is submitted for your consideration.

The RTA would like to see the following matters addressed in an impact assessment for the subject site:

1. The proposed means of vehicular access to/from the site during the development;
2. Likely daily traffic movements generated by the development and the potential increase in the level and type of traffic associated with the proposal,
3. Consideration of the need for the preparation of a local area traffic management plan,
4. An assessment of the likely impact of truck traffic upon nearby residential areas;
5. Details of the anticipated route of trucks through the metropolitan and local road network,
6. An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads and consequently, the preparation of an incident management strategy for accidents.

Please refer further queries to Tricia Zapanta-Mostyn on 9672 2577.

Yours faithfully

Charles Wiafe
Manager, Landuse Development
Transport Planning Group, Sydney Client Services Branch

g:\reg_dev\landuse\consult\2001\harvest2.doc

Hawkesbury City Council

Our Ref: GT192/002

26 October 2001

366 George Street
(PO Box 146)
Windsor NSW 2756
Phone: 02 4560 4444
Facsimile: 02 4560 4400
DX: 8601 Windsor

The Manager
Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Dear Sir/Madam

Proposed Sandstone Extraction - Lots 1-5 DP240610 Wisemans Ferry Road, Cattai

I refer to your letter concerning the above matter and wish to advise the following:

- The proposed quarry will be located within 2kms of the residential area of Ebenezer.
- Access to the quarry is likely to be through McGraths Hill and Windsor Road.

The potential impacts that must be considered are:

1. Noise generated by the operation and its impact on the residents in Ebenezer.
2. Visual impact if the quarry operation is exposed to the Hawkesbury River and Ebenezer.
3. Emissions from runoff (erosion and sediment) and wind. Suitable measures and management practices should be installed and developed to reduce the potential impact.
4. Traffic generation and impact on the wider road network (Windsor Road).

If you require any further information, please ring me on the number below.

Yours faithfully

Greg Hall
Town Planning Co-Ordinator

Direct Line : 4560 4548

Sydney and South Coast
NSW Agriculture

299 George Street Windsor 2756
(Locked Bag 11)

Telephone: (02) 4577 0600
Facsimile: (02) 4577 0650
http://www.agric.nsw.gov.au

Your Ref:
Our Ref: EIS_Issues-Cattai

Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Attention: Mark Griffiths

15 November 2001

Dear Mr Griffiths

Proposed Sandstone Extraction
Wisemans Ferry Road, Cattai

I have no record of any correspondence dated 7/9/01. NSW Agriculture notes the following issues that should be addressed in the Environmental Impact Statement (EIS).

1. The agricultural quality of land being disturbed noting the Agricultural land classification as described in the Sydney Agricultural Land Classification Atlas, 1995).

2. Proposed rehabilitation of the site to at least the existing level of agricultural potential.

   - Final landscape and potential utilisation of the site post extraction include any sub-surface drainage requirements.
   - An assessment of any decline in future agricultural productivity or potential opportunities for the site.
   - The storage of overburden/top soil for rehabilitation purposes.
   - Demonstration of the proponent's previous performance and success for rehabilitating extraction land back to land suitable for agriculture.

3. Potential impacts on existing agricultural developments in the area, taking into account the strategy of the Sydney Regional Environmental Plan No. 20 regarding the protection of agriculture from adverse impacts of other forms of development.

   - Any mitigation proposed to reduce potential impacts. This should include proposed access, hours of operation and landholders agreements. It should also consider potential cumulative effects related to nearby quarrying operations.
   - Impact upon the local water resources, surface and ground water.

- Monitoring proposed of the quality and volumes of any discharged water to ensure no reduction in quality and quantity to down stream agricultural users of the water.

- The effect of windborne dust from the site on agricultural crops.

4. Weed management proposed in line with existing State, regional or local weed management plans or strategies.

5. Fencing proposed of the site to ensure animals do not fall into the extracted area.

NSW Agriculture looks forward to reviewing the draft EIS when it is completed.

Yours sincerely

ADocking

Andrew Docking
Agricultural Environment Officer

APPENDIX 3

ISSUES ADDRESSED – Catai Sandstone Quarry EIS 2002

A number of Government departments and organisations have been consulted in the preparation of this EIS. A range of issues that required addressing are presented below.

Government Department or organisation	Specific Issue	Section of EIS in which Issue is Addressed
NSW Department of Urban Affairs and Planning	- Existing ambient air	12.3
	- Existing ambient noise	16.4
	- Existing ambient water	10.2
	- Existing waste management	6.8
	- Predicted ambient air	12.5-12.6
	- Predicted ambient noise	16.4-16.5
	- Predicted waste management	6.8
	- Impact on surface water	10.5
	- Impact on groundwater	11.5
	- Surface water mitigation measures	10.4
	- Groundwater mitigation measures	11.6
	- Acid sulphate soils	8.2
	- Pollution control/environmental mgt of air	12.5-12.6
	- Pollution control/environmental mgt of noise	16.4-16.5
	- Pollution control/environmental mgt of water	11.5-11.6
	- Contingency plans	6.7-6.8
	- Details of development	6.2
	- Use of extracted sandstone	4.1-4.4
	- Impacts from road transportation	17.8
	- Impacts on Aboriginal heritage	14.4
	- Management of wet weather run-off	10.5
	- Impact on flora and fauna	13.5
	- Address requirements of EPA & DLWC	7.2-7.7
	- Consultation with Wollondilly Shire Council	23.1-23.4
	- Consultation with relevant local, State, Commonwealth Authorities, service providers, community groups	7.2-7.7, 23.1-23.4
	- EPBC Act 1999	7.2-7.7, 23.1-23.4 7.7
NSW Environment Protection Authority	- Objectives of the proposal	3.2-3.3, 6.2
	- Description of the proposal	6.6
	- Ecologically Sustainable Development	20.1
	- Rehabilitation	6.6-6.7
	- Alternatives for the proposal	5.3
	- Justification of the proposal	25.1-25.3
	- Location	1.1
	- Identification & prioritisation of issues	1.7, 6.4
	- Environmental Issues	
	- Existing air conditions	12.3
	- Existing noise & vibration	16.4
	- Existing water conditions	10.2
	- Soil contamination issues	8.2

	- Impacts on air	12.4
	- Impacts on noise & vibration	16.5
	- Impacts on water	10.5
	- Impacts on soil	8.5
	- Waste and chemical impacts	n/a
	- Ecological Sustainable Development	
	- Cumulative Impacts	20.7
	- Mitigation of impacts on air	12.5
	- Mitigation of impacts on noise & vibration	16.5
	- Mitigation of impacts on water	10.5
	- Mitigation of waste & chemical impacts	n/a
	- Mitigation of impacts on soil	8.6
	- List of approvals and licences	1.6, 7.2-7.7
	- Compilation of mitigation measures (EMP)	24.1-24.12
	- Justification for the proposal	25.1-25.3
NSW Department of Mineral Resources	- Regional & local geology	8.3-8.4
	- Amount of material available for extraction	4.2
	- Method used to determine quantities available	4.2
	- Characteristics of material to be extracted	4.3
	- Assessment of material quality	4.3
	- Anticipated annual production	1.2
	- Life of operation	6.7
	- Past annual production data	n/a
	- Alternative sandstone sources	5.3
	- Impact of not proceeding with proposal	25.6
	- Justification of the proposal	25.1-25.3
	- Relevance to regional environmental plans	7.2-7.7
	- Markets	25.1-25.2
	- Transport routes	17.4
	- Stockpiles	6.2-6.6
Department of Land and Water Conservation	- Rivers and Foreshores Improvement Act Part 3A permit	7.6
	- Surface Water licence under the Water Act (1912)	7.6
	- Hawkesbury Nepean catchment – Embargo	
	- Farm Dam Policy	7.6
	- Groundwater licence under the Water Act (1912)	7.6
	NSW State Rivers and Estuaries Policy – General	
	- water quality	10.6
	- riparian vegetation	13.2
	- river banks & channels	13.2
	- loss of biodiversity	13.3
	- declining natural flood mitigation	n/a
	- NSW Wetlands Policy - General	n/a
	- Floodplain Management	n/a
	- NSW Biodiversity Strategy	
	- native biodiversity	13.4
	- precautionary principle	20.6
	- Crown Land Matters	6.2

	Soil Conservation Act (1938)	
	- topography	8.1
	- landform	8.1
	- soil type	8.2
	- soil erodibility	8.2,10.3
	- site capability	8.5
	- potential for salinity problems	8.2
	- acid sulphate and potential acid sulphate soils	8.2
	- vegetation management	13.7, 13.9
	- erosion & sediment control.	10.4
	- Acid Sulphate Soils	8.2
	- Saline Soils	8.2
	- Erosion and Sediment Control Plan	10.4
	Native Vegetation Conservation Act 1997	
	- Vegetation other Endangered Ecological communities	13.4
	- Vegetation - Native vegetation establishment near native vegetation areas	13.9
	- Vegetation - Native plant enhancement	13.9
Baulkam Hills Shire Council	1 EIS to be in accordance with Guidelines for Extractive Industries	7.6
	2 Review of proposal wrt Designated Development	7.6
	3 Proposal is likely to be Intergrated Development	7.6
	4 Extraction rate and project life	1.2, 6.7
	5 relationship with REP 20	7.6
	6 Compliance with DCP 500	7.3
	7 Flora and Fauna Assessment	13.2
	8 EPBC Act	13.8
	9 Impact on Wetlands, Hawkesbury River	13.2
	10 Noise Impact	16.3
	11Traffic Assessmenet	17.3
	12 Site Plan	Figure 7
	13 Staging Plan	Figure 8
	14 Final Landuse	18.3
	15 Visual Impact	15.4
	16 Groundwater Impacts	11.5
	17 Copies of written advice from DLWC, NSW EPA, NPWS, DMR, RTA, DUAP & Hawkesbury City Council	Appendices 1 & 2
	18 State Significant Development	7.4
Roads and Traffic Authority	- Access to and from the site	17.6
	- Daily traffic movements generated	17.2
	- Potential increase in level & type of traffic	17.3
	- Need for a Local area traffic management plan	17.5
	- Impact of traffic on nearby residential areas	17.5
	- Anticipated truck routes	17.4
	- Likely road upgrades	17.8
	- Increase in toxicity levels	17.9

	- Incident management strategy	17.9
NSW National Parks & Wildlife Service	General information	
	- Description of proposal	6.2-6.6
	- Regional & local setting	1.2
	- LEP's, REP's, & SEPP's	7.2-7.7
	- Current land use	18.1
	- Past land use	18.1
	- Maps showing vegetation	Figures 25,26
	- Maps showing fauna habitat	Figure 26
	- Maps showing Aboriginal culture	Figure 7
	Impacts	
	- Impact on land under NP&W Act	8.2-8.6
	- Impact on vegetation	13.5
	- Impact on fauna habitats	13.5
	- Impact on Aboriginal heritage	14.4
	- Measures to minimise impacts	14.4
	- Alternative development options	25.5
	- Monitoring programmes	21
	Native flora, fauna and threatened species	
	- Description & mapping of vegetation communities	13.2
	- Identification of significant vegetation communities or plant species	13.2
	- Description of fauna assemblages	13.2
	- Identification of significant Fauna habitat	13.2
	- Habitat corridors	13.3
	- Impact of development on flora/fauna	13.5
	Aboriginal Heritage assessment	14.3
Integral Energy	Relocation of existing power lines	6.8
Hawkesbury City Council	-Noise assessment	16
	-Visual Impacts	15
	-Emissions from runoff	10
	-Traffic generation and general impact	17
NSW Agriculture	Agricultural quality of land	8.2
	Proposed rehabilitation of land	6.6 &8.6
	Final landscape	6.6
	Assessment of Agricultural productivity	8.2
	Storage of overburden/top soil	6.6
	Proponents previous performance on rehab.	1.4
	Potential Impacts of existing agricultural developments	n/a
	Mitigation proposals	8 – 19
	Impact on local water resources	10
	Monitoring of water quality	10.6
	Windborne dust	12
	Weed Management	13
	Fencing	n/a

APPENDIX 4

GEOLOGICAL LOG					Total Depth:		25.36m
Core Hole					Hole No.		CS-3
Project	EIS - Cattai Sandstone Quarry				RL Surface:		unknown
Location	Wisemans Ferry Road, Cattai						
Metres	Graph	Description	C	M	L	R	Comments
0.00							
0.25		White, medium grained quartzoze					
0.50		sandstone					
0.75							
1.00							
1.25							
1.50		medium-coarse grained, iron staining					
1.75		in bands					
2.00							
2.25							
2.50							
2.75							
3.00							
3.25		Minor clay bands: 7cm, 4cm.					
3.50							
3.75		medium grained, white sandstone					
4.00							
4.25							
4.50							
4.75							
5.00		coarse-grained, white sandstone					
5.25							
5.50		medium grained, white					
5.75							
6.00		coarse grained, conglomeratic					
6.25							
6.50		medium grained sandstone					
6.75		2cm shale band					
7.00							
7.25							
7.50							
7.75							
8.00		Coarse grained, quartzose pebbly					
8.25		sandstone (minor feldspar)					
8.50							
8.75							
9.00							
9.25							
9.50							
9.75							
10.00							

C: Colour
M: Moisture
R: Recovery (%)

L = Lithology

Date logged:	12/10/01	Author:	GM
			800211

GEOLOGICAL LOG		Total Depth:	25.36m
Core Hole		Hole No.	CS-3
Project	EIS - Cattai Sandstone Quarry	RL Surface:	unknown
Location	Wisemans Ferry Road, Cattai		

Metres	Graph	Description	C	M	L	R	Comments
10.00							
10.25							
10.50		coarse grained, quartzose sandstone					
10.75							
11.00		Minor shale band (2-3cm)					
11.25							
11.50							
11.75		coarse grained, banded sandstone					
12.00							
12.25							
12.50							
12.75							
13.00							
13.25							
13.50							
13.75		medium-coarse grained quartzose					
14.00		sandstone					
14.25							
14.50							
14.75							
15.00		coarse-grained, white sandstone					
15.25							
15.50							
15.75		5cm shale band					
16.00							
16.25							
16.50							
16.75							
17.00							
17.25							
17.50							
17.75							
18.00		Coarse grained, quartzose sandstone					
18.25							
18.50							
18.75							
19.00							
19.25							
19.50							
19.75							
20.00							

C: Colour
M: Moisture
R: Recovery (%)
L = Lithology

Date logged:	12/10/01	Author:	GM
			800211

GEOLOGICAL LOG		Total Depth:	25.36m
Core Hole		Hole No.	CS-3
Project	EIS - Cattai Sandstone Quarry	RL Surface:	unknown
Location	Wisemans Ferry Road, Cattai		

Metres	Graph	Description	C	M	L	R	Comments
20.00							
20.25							
20.50							
20.75							
21.00							
21.25							
21.50		coarse grained, quartzose sandstone					
21.75							
22.00							
22.25							
22.50							
22.75							
23.00							
23.25							
23.50							
23.75		medium-coarse grained quartzose					
24.00		sandstone					
24.25							
24.50							
24.75							
25.00							
25.25		End of Hole (25.36m)					
25.50							
25.75							
26.00							
26.25							
26.50							
26.75							
27.00							
27.25							
27.50							
27.75							
28.00							
28.25							
28.50							
28.75							
29.00							
29.25							
29.50							
29.75							
30.00							

C: Colour
M: Moisture
R: Recovery (%)

L = Lithology

Date logged:	12/10/01	Author:	GM
			800211

GEOLOGICAL TRAVERSE 2

Project	EIS - Cattai Sandstone Quarry	Traverse Length: 280m
Location	Wisemans Ferry Road, Cattai	Traverse Orientation: N-S

Metres	Graph	Geology	Other Features
280.00			Wisemans Ferry Rd
275.00			
270.00		soil/clay cover	
265.00			Access track, dirt, on crown land
260.00			
255.00			
250.00		Sub-outcrop of sandstone	
245.00			
240.00		Slab outcrop of sandstone	Sharp embankment (up to ~5m high)
235.00		coarse grained pebbly sandstone	
230.00			
225.00			
220.00			
215.00		sub outcrop, embankment to	
210.00		the west	
205.00			
200.00			
195.00			
190.00			
185.00			
180.00			Access track from the west (facing north)
175.00			
170.00			Drainage line located on eastern side
165.00			
160.00			
155.00		Feldspar, iron-rich medium-coarse	
150.00		grained pebbly sandstone	
145.00			
140.00			
135.00			
130.00		slab outcrop of massive sandstone	
125.00			
120.00			
115.00			
110.00			
105.00			
100.00			

LEGEND

- Soil cover
- Sub-outcrop of massive sandstone
- Massive sandstone
- Location of access track
- Embankment (dip direction shown)

Date logged: 12/07/01

800211

GEOLOGICAL TRAVERSE 2 (ii)

Project	EIS - Cattai Sandstone Quarry	Traverse Length: 280m
Location	Wisemans Ferry Road, Cattai	Traverse Orientation: N-S

Metres	Graph	Geology	Other Features
100.00			Embankment
95.00		outcrop of massive sandstone	
90.00			
85.00			
80.00		medium-coarse grained quartzose sst.	Minor embankment on the western side
75.00			Drainage line crossed at 75m
70.00			
65.00			
60.00			
55.00			
50.00		Clay mounds	residual from previous sand-extraction
45.00		Outcrop visible to the east	activities
40.00			
35.00			
30.00			
25.00			Sediment pond on the western side of creek
20.00			
15.00			
10.00		clay and sand mixture	
5.00			
0.00			traverse terminated at powerpole

LEGEND

- Soil cover
- Sub-outcrop of massive sandstone
- Massive sandstone
- Location of access track
- Embankment (dip direction shown)

Date logged: 12/07/01

800211

GEOLOGICAL TRAVERSE 1a

Project	EIS - Cattai Sandstone Quarry	Traverse Length: 400m
Location	Wisemans Ferry Road, Cattai	Traverse Orientation: N-S

Metres	Graph	Geology	Other Features
400.00		soil cover	Travelling south from residence
395.00			
390.00		Sub-outcrop of sandstone	
385.00		soil covered	
380.00		Medium-coarse grained sandstone	
375.00		outcrop (~2m)	
370.00			
365.00		Sub-outcrop of sandstone	
360.00		Embankment (~2m high)	Embankment (~2m high)
355.00			
350.00			Access Rd located at 350m.
345.00		Coarse grained sandstone, white-orange	
340.00		with iron staining (1-2m)	
335.00			Location of old quarry area (east)
330.00			
325.00			
320.00			Quarry edge', artificial embankment
315.00			
310.00		Pebbly sandstone, moderately weathered	
305.00		feldspar/quartz with quartz pebbles	
300.00			Drainage line (295m)
295.00			
290.00			
285.00		outcrop- medium/coarse-grained	
280.00		quartzose sandstone	
275.00		sub-outcrop	
270.00			
265.00			
260.00			
255.00		Primarily outcrop of massive sandstone	
250.00			Artificial rock wall (treatment train)
245.00			
240.00			Access track (~240m)
235.00		medium-coarse grained quartzose	
230.00		(orange-white) sandstone	Old blast face (230m) in previous extraction area
225.00			
220.00		weathered coarse-grained sandstone	
215.00			Access track (213m), N-S
210.00			
205.00			Old Blast pit located to the west

LEGEND

- Soil cover
- Sub-outcrop of massive sandstone
- Massive sandstone
- Location of access track
- Embankment (dip direction shown)

Date logged: 12/07/01

800211

GEOLOGICAL TRAVERSE 1a (ii)

Project	EIS - Cattai Sandstone Quarry	Traverse Length: 400m
Location	Wisemans Ferry Road, Cattai	Traverse Orientation: N-S

Metres	Graph	Geology	Other Features
200.00			
195.00		Soil cover	
190.00		some boulders	
185.00			
180.00			
175.00		White, medium grained quartzose sst.	Access Rd (175m)
170.00			
165.00			
160.00			
155.00			
150.00			
145.00		Outcrop, orange/white medium grained	Access Rd (145m), pit located to the east
140.00		quartzose sandstone	
135.00			
130.00		Sandy soil, sub-outcrop	
125.00			Artificial rock wall, up to 5m high
120.00			
115.00			
110.00		clayey/sandy soil	
105.00			
100.00			
95.00			Embankment of access rd (93m)
90.00			
85.00			
80.00		Outcropping sandstone boulders, steep	
75.00		embankment	
70.00			
65.00			
60.00			
55.00		primarily outcropping, 'slab-style'	
50.00		massive sandstone	
45.00		Thin, sandy soil.	
40.00			
35.00			cliff' embankment, averages 2-3m, up to 5m
30.00			
25.00			
20.00			
15.00		Scree slump, sandy soil and rocks	
10.00			
5.00			
0.00			Location of main dam on property (north)

LEGEND

- Soil cover
- Sub-outcrop of massive sandstone
- Massive sandstone
- Location of access track
- Embankment (dip direction shown)

Date logged: 12/07/01

800211

APPENDIX 9 6

PRINCE GEOTECHNIQUE PTY. LTD.

Mulgoa Road
SOUTH PENRITH NSW 2750
P.O. Box 795, PENRITH 2750

Telephone: (047) 33 3636
Fax: (047) 33 1628

california bearing ratio test - results

Client: Western Earthmoving Pty Ltd
Project: Sandstone Evaluation
Location: Ex Cattai Quarry

Date of Test: 10/09/90
Tested By: DMC
Checked By: A O'B

Test Procedure: AS1289 F1.1-1977
Laboratory Compaction method: AS1289 E1.1-1977

Job No. 15133/1

sample no.		1	2		
location/depth		Bulk Sample Ex Cattai Quarry			
date sampled					
description of sample					
max. dry density t/m³		1.92			
optimum moisture content %		12.5			
field moisture content %					
C.B.R. test: dry density t/m³	before soaking	1.92	1.93		
	after soaking	1.92	1.93		
C.B.R. test: density ratio %	before soaking	100	100.5		
	after soaking	100	100.5		
C.B.R. test: moisture content %	before soaking	12.6	12.2		
	after soaking	13.0	13.0		
C.B.R. test: number of days soaked		4	4		
C.B.R. test: surcharge kg		4.5	4.5		
C.B.R. test: moisture content after test %	top 30 mm	13.3	13.0		
	whole sample	12.9	13.0		
C.B.R. test: swell after soaking %		nil	nil		
C.B.R. value % 2.5 mm		50	40		
C.B.R. value % 5.0 mm		60	50		

Date 20/9/90 A. P. O'Brien

PRINCE GEOTECHNIQUE PTY. LTD.

APPENDIX 9C

test results

JOB NO. 15163/1

Client: Department of Housing NSW
Project: Pavement Material Evaluation
Location:

Date: September 1990
Tested by: DMC
Checked by: A O'B

test procedure: AS1289 C6.1-1977

Sieve Size	Nolan	Awanaki	Cleary Bros	
	Percentage Passing			Cattai
13.2mm	100	100	100	100
9.5mm	97	97	94	97
6.75mm	94	95	90	94
4.75mm	93	92	87	93
2.36mm	91	88	83	91
1.18mm	89	84	79	89
600 µm	80	72	72	80
455 µm	55	46	56	55
300 µm	35	32	41	35
150 µm	20	20	23	20
75 µm	16	15	18	16

Date 19/9/90 A. P. O'Brien

Authorised Signatory

Geotechnical | Resources | Environmental | Technical | Project Management

13 Mangrove Road, Sandgate, NSW, 2304
Ph:[02] 4967 6377 Fax:[02] 4967

california bearing ratio test results

client : *DARACON QUARRIES PTY LTD*
principal :
project : *MATERIAL TESTING*
location : *SYDNEY*

job no : *NL2077/1*
laboratory : *NEWCASTLE*
report date : *March 13, 2000*
test report : *MAR13-01/1*

test procedure : *AS1289 6.1.1 1998*
laboratory compaction method : *AS1289 5.1.1*

sample number :			5	6	7
depth:		m			
location:			*Sydney Sandstone #1*	*Sydney Sandstone #2*	*Sydney Sandstone #3*
date sampled:			*2-3-00*	*2-3-00*	*2-3-00*
date tested:			*6-3-00*	*6-3-00*	*6-3-00*
material description:			*(SP) Gravelly SAND, fine to coarse grained sand, orange-brown.*	*(SP) Gravelly SAND, fine to coarse grained sand, orange-brown.*	*(SP) Gravelly SAND, fine to coarse grained sand, orange-brown.*
maximum dry density:		t/m^3	*1.956*	*2.005*	*1.892*
optimum moisture content:		%	*11.2*	*9.7*	*11.9*
retained on 19mm AS sieve:		%	*22.0*	*35.0*	*Nil*
+19mm material included:			*Nil*	*Nil*	*Nil*
C.B.R. test	before soaking: dry density	t/m^3	*1.995*	*2.045*	*1.948*
	before soaking: density ratio	%	*102.0*	*102.0*	*103.0*
	before soaking: moisture content	%	*10.4*	*9.1*	*10.9*
	before soaking: moisture ratio	%	*93.0*	*93.8*	*91.6*
	after soaking: dry density	t/m^3	*1.993*	*2.045*	*1.936*
	after soaking: density ratio	%	*101.9*	*102.0*	*102.3*
	after soaking: moisture content	%	*11.5*	*10.4*	*11.7*
	number of days soaked:		*4*	*4*	*4*
	surcharge:	kg	*9*	*9*	*9*
	moisture content after test: top 30 mm	%	*11.4*	*9.8*	*11.9*
	moisture content after test: remaining sample	%	*11.2*	*10.1*	*11.6*
	swell after soaking:	%	*0.12*	*0*	*0.62*
	penetration:	mm	*2.5/5.0*	*2.5/5.0*	*2.5/5.0*
	C.B.R. value:	%	*45/60*	*60/70*	*60/60*

remarks :
field moisture content % — *5.3* | *5.0* | *1.4*

Authorised Signature 13.3.00
NATA No 1503

Geosciences Pty Ltd A.C.N. 056 335 516 MAR13-03

Geotechnical | Resources | Environmental | Technical | Project Management

13 Mangrove Road, Sandgate, NSW, 2304
Ph:[02] 4967 6377 Fax:[02] 4967 5402

Coffey

test results

client : *DARACON QUARRIES PTY LTD*
principal :
project : *MATERIAL TESTING*
location : *SYDNEY*

job no : *NL2077/1*
laboratory : *NEWCASTLE*
report date : *March 13, 2000*
test report : *MAR13-03/1*

test procedure : *AS1289 3.6.1*
test date : *6-3-00*

LABORATORY REFERENCE	#5	
CLIENT REFERENCE	Sydney Sandstone #1	
% Passing AS1289 Test Sieve *mm*		
63	*100*	
53	*94*	
37.5	*88*	
26.5	*80*	
19	*78*	
13.2	*75*	
9.5	*72*	
6.7	*70*	
4.75	*69*	
2.36	*67*	
1.18	*65*	
0.600	*58*	
0.425	*47*	
0.300	*33*	
0.150	*16*	
0.75	*11*	

remarks : *NOTE: Sampled and delivered to laboratory by client.*

Authorised Signature
NATA No 1503

13.3.00

Geosciences Pty Ltd A.C.N. 056 335 516 MAR13-03

Geotechnical | Resources | Environmental | Technical | Project Management

13 Mangrove Road, Sandgate, NSW, 2304
Ph:[02] 4967 6377 Fax:[02] 4967 5402

Coffey

test results

client : *DARACON QUARRIES PTY LTD*
principal :
project : *MATERIAL TESTING*
location : *SYDNEY*

job no : *NL2077/1*
laboratory : *NEWCASTLE*
report date : *March 13, 2000*
test report : *MAR13-03/2*

test procedure. : *AS1289 3.6.1*
test date : *6-3-00*

LABORATORY REFERENCE	#6
CLIENT REFERENCE	Sydney Sandstone #2
% Passing AS1289 Test Sieve *mm*	
75	*100*
63	*97*
53	*89*
37.5	*77*
26.5	*70*
19	*65*
13.2	*59*
9.5	*55*
6.7	*51*
4.75	*48*
2.36	*44*
1.18	*41*
0.600	*35*
0.425	*29*
0.300	*21*
0.150	*11*
0.075	*8*

remarks : *NOTE: Sampled and delivered to laboratory by client.*

Form Number 11.01 Version 3.0

Authorised Signature
NATA No 1503

13.3.00

Geosciences Pty Ltd A.C.N. 056 335 516 MAR13-03
Geotechnical | Resources | Environmental | Technical | Project Management
13 Mangrove Road, Sandgate, NSW, 2304
Ph:[02] 4967 6377 Fax:[02] 4967 5402
Coffey

test results

client : DARACON QUARRIES PTY LTD
principal :
project : MATERIAL TESTING
location : SYDNEY

job no : NL2077/1
laboratory : NEWCASTLE
report date : March 13, 2000
test report : MAR13-03/3

test procedure : AS1289 3.6.1
test date : 6-3-00

LABORATORY REFERENCE	#7
CLIENT REFERENCE	#3 Crushed Sandstone
% Passing AS1289 Test Sieve mm	
19	100
13.2	99
9.5	91
6.7	69
4.75	60
2.36	52
1.18	45
0.600	35
0.425	27
0.300	18
0.150	7
0.075	5

remarks : NOTE: Sampled and delivered to laboratory by client.

Authorised Signature 13.3.00
NATA No 1503

Geosciences Pty Ltd A.C.N. 056 335 516 MAR13-03

Geotechnical | Resources | Environmental | Technical | Project Management

13 Mangrove Road, Sandgate, NSW, 2304
Ph:[02] 4967 6377 Fax:[02] 4967 5402

Coffey

test results

client : *DARACON QUARRIES PTY LTD*

principal :

project : *MATERIAL TESTING*

location : *SYDNEY*

job no : *NL2077/1*

laboratory : *NEWCASTLE*

report date : *March 13, 2000*

test report : *MAR13-03/4*

test procedure. : *AS1289 3.6.1*

test date : *6-3-00.*

LABORATORY REFERENCE	#8
CLIENT REFERENCE	#4 Sandstone Sand S/P
% Passing AS1289 Test Sieve *mm*	
13.2	*100*
9.5	*99*
6.7	*99*
4.75	*98*
2.36	*96*
1.18	*92*
0.600	*71*
0.425	*44*
0.300	*23*
0.150	*4*
0.075	*2*

remarks : *NOTE: Sampled and delivered to laboratory by client.*

Authorised Signature
NATA No 1503

13.3.00

APPENDIX 5

GEOTECHNICAL LOG

Auger		Dimensions	100mm hand auger
Project	EIS - Cattai Sandstone Quarry	Auger Hole	AH1
Location	Wisemans Ferry Road, Cattai	RL Surface	

Metres	Graph	Description	C	M	N	P	CDI	Comments
0.10		Light brown to yellow sandy loam.						Sample CQ1A
0.20		Slightly fatty. Sandstone fragments to 20mm.						taken.
0.30		Clay. Yellow. Moderate plasticity.						
0.40		High pedality.						Sample CQ1B
0.50		Some ferruginous zones.						taken.
0.60		Hole terminated on refusal on well-weathered						
0.70		fragmented sandstone with yellow clay matrix.						
0.80								
0.90								
1.00								
1.10								
1.20								
1.30								
1.40								
1.50								
1.60								
1.70								
1.80								
1.90								
2.00								
2.10								
2.20								
2.30								
2.40								
2.50								
2.60								
2.70								
2.80								
2.90								
3.00								
3.10								
3.20								
3.30								
3.40								
3.50								
3.60								
3.70								
3.80								
3.90								
4.00								

C: Soil classification
M: Moisture
N: SPT Values (blows per 300mm)

P = Penetration of Excavator
(1 to 3 = no resistance to Refusal)
CDI = Consistency/Density Index

Pen. = Penetrometer Test Readings

Date logged: 12/07/01

Author: MG

800211

GEOTECHNICAL LOG

Auger		Dimensions	100mm hand auger
Project	EIS - Cattai Sandstone Quarry	Auger Hole	AH2
Location	Wisemans Ferry Road, Cattai	RL Surface	

Metres	Graph	Description	C	M	N	P	CDI	Comments
0.10		Light yeilow to white very sandy loam.						Sample CQ2
0.20		Loose consistency.						taken
0.30		Minor sandstone fragments to 30mm.						
0.40								
0.50		Hole terminated on refusal on fragmented						
0.60		sandstone with sandy matrix.						
0.70								
0.80								
0.90								
1.00								
1.10								
1.20								
1.30								
1.40								
1.50								
1.60								
1.70								
1.80								
1.90								
2.00								
2.10								
2.20								
2.30								
2.40								
2.50								
2.60								
2.70								
2.80								
2.90								
3.00								
3.10								
3.20								
3.30								
3.40								
3.50								
3.60								
3.70								
3.80								
3.90								
4.00								

C: Soil classification
M: Moisture
N: SPT Values (blows per 300mm)

P = Penetration of Excavator
(1 to 3 = no resistance to Refusal)
CDI = Consistency/Density Index

Pen. = Penetrometer Test Readings

Date logged: 12/07/01

Author: MG

800211

GEOTECHNICAL LOG

Auger		Dimensions	100mm hand auger
Project	EIS - Cattai Sandstone Quarry	Auger Hole	AH3
Location	Wisemans Ferry Road, Cattai	RL Surface	

Metres	Graph	Description	C	M	N	P	CDI	Comments
0.10		Sandy loam. Yellow.						Sample CQ3 taken.
0.20		Slightly fatty.						
0.30								
0.40		Hole terminated on weathered sandstone.						
0.50								
0.60								
0.70								
0.80								
0.90								
1.00								
1.10								
1.20								
1.30								
1.40								
1.50								
1.60								
1.70								
1.80								
1.90								
2.00								
2.10								
2.20								
2.30								
2.40								
2.50								
2.60								
2.70								
2.80								
2.90								
3.00								
3.10								
3.20								
3.30								
3.40								
3.50								
3.60								
3.70								
3.80								
3.90								
4.00								

C: Soil classification
M: Moisture
N: SPT Values (blows per 300mm)

P = Penetration of Excavator (1 to 3 = no resistance to Refusal)
CDI = Consistency/Density Index

Pen. = Penetrometer Test Readings

Date logged: 12/07/01

Author: MG

800211

GEOTECHNICAL LOG

Auger		Dimensions	100mm hand auger
Project	EIS - Cattai Sandstone Quarry	Auger Hole	AH4
Location	Wisemans Ferry Road, Cattai	RL Surface	

Metres	Graph	Description	C	M	N	P	CDI	Comments
0.10		Sandy loam. Light brown/yellow.						
0.20		Loose consistency.						
0.30		Sandstone fragments to 40mm.						
0.40		Hole terminated on refusal on well-weathered						
0.50		fragmented sandstone with sandy matrix.						
0.60								
0.70								
0.80								
0.90								
1.00								
1.10								
1.20								
1.30								
1.40								
1.50								
1.60								
1.70								
1.80								
1.90								
2.00								
2.10								
2.20								
2.30								
2.40								
2.50								
2.60								
2.70								
2.80								
2.90								
3.00								
3.10								
3.20								
3.30								
3.40								
3.50								
3.60								
3.70								
3.80								
3.90								
4.00								

C: Soil classification
M: Moisture
N: SPT Values (blows per 300mm)

P = Penetration of Excavator
(1 to 3 = no resistance to Refusal)
CDI = Consistency/Density Index

Pen. = Penetrometer Test Readings

Date logged: 12/07/01 Author: MG

800211

GEOTECHNICAL LOG

Auger		Dimensions	100mm hand auger
Project	EIS - Cattai Sandstone Quarry	Auger Hole	AH5
Location	Wisemans Ferry Road, Cattai	RL Surface	

Metres	Graph	Description	C	M	N	P	CDI	Comments
0.10		Sandy loam. Light brown to white.						Sample CQ5 taken.
0.20		Loose consistency. Minor organic matter.						
0.30		Sandstone fragments to 30mm.						
0.40		Hole terminated on refusal on well-weathered						
0.50		fragmented sandstone with sandy matrix.						
0.60								
0.70								
0.80								
0.90								
1.00								
1.10								
1.20								
1.30								
1.40								
1.50								
1.60								
1.70								
1.80								
1.90								
2.00								
2.10								
2.20								
2.30								
2.40								
2.50								
2.60								
2.70								
2.80								
2.90								
3.00								
3.10								
3.20								
3.30								
3.40								
3.50								
3.60								
3.70								
3.80								
3.90								
4.00								

C: Soil classification
M: Moisture
N: SPT Values (blows per 300mm)

P = Penetration of Excavator (1 to 3 = no resistance to Refusal)
CDI = Consistency/Density Index

Pen. = Penetrometer Test Readings

Date logged: 12/07/01

Author: MG

800211

Soil Chemistry Profile

Test Type: FS,OM,PSA, Disp%
Order No: Job No: 800211
Reference
Sample Name: CQ1A
Sample No: 62284
Date Received 18/07/2001 Total No Pages: 10
CLIENT: Harvest Scientific Services
Mark Griffiths
PO Box 1000
PICTON NSW 2571

Certified Laboratory Practice

Sydney Environmental and Soil Laboratory

Sydney Environmental and Soil Laboratory Pty Ltd
(inc in NSW)
ACN 002 825 569
ABN 23 002 825 569
16 Chilvers Road
Thornleigh NSW 2120
Australia
Address Mail to
PO Box 357
Pennant Hills NSW 2120
Telephone (02) 9980 6554
Facsimile (02) 9484 2427
Email sesl@sesl.com.au

TEST	RESULT	COMMENTS
pH in water 1:2	5.2	
pH in $CaCl_2$ 1:2	4.2	very acidic
EC mS/cm 1:2	.04	low salinity level
Chlorides mg/kg		

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
Unit	meq%	Comment	meq%	% of ECEC	Comment
Sodium			.14	4.70	low - not sodic
Potassium			.12	4.10	low
Calcium			.51	17.20	low
Magnesium			.84	28.40	OK
Aluminium			1.35	45.60	high - toxic
		ECEC	2.96		
		Ca/Mg	0.60		unbalanced ratio

	mg/kg	
Phosphate as P	1.1	low
Ammonium as N	3.6	low
Nitrate as N	<2.50	low
Sulphate as S	21.1	OK
Iron	106.6	OK
Zinc	.8	low
Copper	1.5	low
Manganese	4.4	low
Boron		

Recommendations

Organic Matter = 3.87%
The pH of this material is very acidic resulting in the availability of aluminium which is toxic to plant roots. To raise the pH and reduce aluminium, apply lime at 700-800g/sqm and incorporate into the surface 100-150mm of soil. The calcium will also raise the low calcium level and improve the balance of the Ca:Mg ratio. The salinity and sodium levels are low and pose no limitations, however general nutrient levels are also low. The addition of effluent water will suitably raise these levels for general plant growth.
The particle size analysis shows this material is quite evenly graded, however there is a higher proportion of coarse and fine sand, compared to the gravel silt and clay contents. Evenly graded materials tend to be prone to compaction, so precautions should be taken to ensure this does not occur. Although the sodium level is low, the dispersion percentage indicates a significant proportion of the material will disperse in water.

Explanation of the Methods:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). **Exchangeable Cations, ECEC:** Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). **Aluminium:** Method 3500 APHA (1992). **Phosphate:** Method 9E1 Rayment & Higginson (1992). **Ammonium, Sulphate, Iron, Copper, Manganese + Zinc:** Method 83-1 to 83-5 Black (1983). **Boron:** Method 12C2 Rayment & Higginson (1992).

Checked by Principal..... Consultant.....
Simon Leake Date of Report 01/08/2001 N.Burrows

Soil Physics Profile No. 1

Test Type I FS,OM,PSA, Disp%
Order No Job No: 800211
Reference
Sample Name CQ1A
Sample No. 62284
Date Received 18/07/2001 Total No Pages: 10
Client: Harvest Scientific Services
Mark Griffiths
PO Box 1000
PICTON NSW

Certified Laboratory Practice

2571

Sydney Environmental and Soil Laboratory

Sydney Environmental and Soil Laboratory Pty Ltd
(Inc in NSW)
ACN 002 825 569
ABN 23 002 825 569
16 Chilvers Road
Thornleigh NSW 2120
Australia
Address Mail to
PO Box 357
Pennant Hills NSW 2120
Telephone (02) 9980 6554
Facsimile (02) 9484 2427
Email sesl@sesl.com.au

CHARACTERISTIC		RESULT	COMMENTS
Texture			
Emerson Stability Class			
Dispersion %		40.0	
Particle Size Analysis (PSA)			
> 2mm	Gravel	10.9	
2 - 0.2 mm	Coarse Sand	32.8	
0.2 - 0.02 mm	Fine Sand	28.0	
0.02 - 0.002 mm	Silt	13.6	
< 0.002 mm	Clay	14.6	
Sieve Analysis			
> 4 mm	Gravel		
2-4 mm	Coarse Sand		
1-2 mm			
0.5-1 mm	Medium Sand		
0.25-0.5 mm			
0.1-0.25 mm	Fine Sand		
< 0.1 mm	Very Fine Sand		

Recommendations

Organic Matter = 3.87%
The pH of this material is very acidic resulting in the availability of aluminium which is toxic to plant roots. To raise the pH and reduce aluminium, apply lime at 700-800g/sqm and incorporate into the surface 100-150mm of soil. The calcium will also raise the low calcium level and improve the balance of the Ca:Mg ratio. The salinity and sodium levels are low and pose no limitations, however general nutrient levels are also low. The addition of effluent water will suitably raise these levels for general plant growth.
The particle size analysis shows this material is quite evenly graded, however there is a higher proportion of coarse and fine sand, compared to the gravel silt and clay contents. Evenly graded materials tend to be prone to compaction, so precautions should be taken to ensure this does not occur. Although the sodium level is low, the dispersion percentage indicates a significant proportion of the material will disperse in water.

Explanation of the Methods:
Texture:- Charman & Murphy (1991). **Emerson's Aggregate Test:-** Charman & Murphy (1991). **Dispersion %:-** Ritchie (1963). **Particle Size Analysis & Sieve Analysis:-** Modified Black (1983) Method 43-1 to 43-6.

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

Soil Chemistry Profile

Test Type: pH EC,PSA,Disp%
Order No: Job No: 800211
Reference
Sample Name: CQ1B
Sample No: 62288
Date Received 18/07/2001 Total No Pages: 10
CLIENT: Harvest Scientific Services
Mark Griffiths
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PICTON NSW 2571

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TEST	RESULT	COMMENTS
pH in water 1:2	5.4	
pH in $CaCl_2$ 1:2	4.2	very acidic
EC mS/cm 1:2	.07	low salinity level
Chlorides mg/kg		

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
Unit	meq%	Comment	meq%	% of ECEC	Comment
Sodium					
Potassium					
Calcium					
Magnesium					
Aluminium					
		ECEC			
		Ca/Mg			

mg/kg

Phosphate as P
Ammonium as N
Nitrate as N
Sulphate as S
Iron
Zinc
Copper
Manganese
Boron

Recommendations

This material is very acidic with a low salinity level. To raise the pH to within a more appropriate range, apply lime at 600-700g/sqm and incorporate into the surface 100-150mm.

The main component of this material is clay, with some fine sand, silt and coarse sand, and a smaller fraction of gravel. The dispersion percentage indicates some dispersion of this material in water, so minor erosion problems may be expected.

Explanation of the Methods:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). **Exchangeable Cations, ECEC:** Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). **Aluminium:** Method 3500 APHA (1992). **Phosphate:** Method 9E1 Rayment & Higginson (1992). **Ammonium, Sulphate, Iron, Copper, Mengenese + Zinc:** Method 83-1 to 83-5 Black (1983). **Boron:** Method 12C2 Rayment & Higginson (1992).

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

Soil Physics Profile No. 1

Test Type I pH EC,PSA,Disp%
Order No Job No: 800211
Reference
Sample Name CQ1B
Sample No. 62288
Date Received 18/07/2001 Total No Pages: 10
Client: Harvest Scientific Services
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CHARACTERISTIC	RESULT	COMMENTS
Texture		
Emerson Stability Class		
Dispersion %	31.7	

Particle Size Analysis (PSA)

> 2mm	Gravel	0.4
2 - 0.2 mm	Coarse Sand	10.2
0.2 - 0.02 mm	Fine Sand	20.1
0.02 - 0.002 mm	Silt	12.8
< 0.002 mm	Clay	56.3

Sieve Analysis

> 4 mm	Gravel
2-4 mm, 1-2 mm	Coarse Sand
0.5-1 mm, 0.25-0.5 mm	Medium Sand
0.1-0.25 mm	Fine Sand
< 0.1 mm	Very Fine Sand

Recommendations

This material is very acidic with a low salinity level. To raise the pH to within a more appropriate range, apply lime at 600-700g/sqm and incorporate into the surface 100-150mm.

The main component of this material is clay, with some fine sand, silt and coarse sand, and a smaller fraction of gravel. The dispersion percentage indicates some dispersion of this material in water, so minor erosion problems may be expected.

Explanation of the Methods:
Texture:- Charman & Murphy (1991). **Emerson's Aggregate Test:-** Charman & Murphy (1991) . **Dispersion %:-** Ritchie (1963). **Particle Size Analysis & Sieve Analysis:-** Modified Black (1983) Method 43-1 to 43-6.

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

Soil Chemistry Profile

Test Type: FS,OM,PSA, Disp%
Order No: Job No: 800211
Reference
Sample Name: CQ2
Sample No: 62285
Date Received 18/07/2001 Total No Pages: 10
CLIENT: Harvest Scientific Services
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TEST	RESULT	COMMENTS
pH in water 1:2	5.1	
pH in $CaCl_2$ 1:2	4.2	very acidic
EC mS/cm 1:2	.03	low salinity level
Chlorides mg/kg		

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
Unit	meq%	Comment	meq%	% of ECEC	Comment
Sodium			.07	4.50	low - not sodic
Potassium			.05	3.20	low
Calcium			.36	23.20	low
Magnesium			.33	21.30	OK
Aluminium			.74	47.70	high - toxic
		ECEC	1.55		
		Ca/Mg	1.10		unbalanced ratio

	mg/kg	
Phosphate as P	<0.80	low
Ammonium as N	3.6	low
Nitrate as N	<2.50	low
Sulphate as S	15.4	slightly low
Iron	91.9	OK
Zinc	.8	low
Copper	1.7	low
Manganese	1.9	low
Boron		

Recommendations

Organic Matter = 2.03%
The pH of this material is very acidic resulting in the availability of toxic levels of aluminium. To raise the pH and reduce aluminium apply lime at 600-700g/sqm and incorporate into the surface 100-150mm. Calcium is low relative to magnesium but the lime will improve this ratio. Salinity and sodium levels are suitably low and pose no limitations for effluent disposal. General nutrient levels are low for optimum plant growth.

The particle size analysis shows this material is mainly coarse sand with some fine sand and smaller fractions of silt, clay and gravel. Although the sodium level is low, the dispersion percentage result indicates the material is very dispersive and is therefore likely to be prone to erosion problems.

Explanation of the Methods:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). **Exchangeable Cations, ECEC:** Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). **Aluminium:** Method 3500 APHA (1992). **Phosphate:** Method 9E1 Rayment & Higginson (1992). **Ammonium, Sulphate, Iron, Copper, Manganese + Zinc:** Method 83-1 to 83-5 Black (1983). **Boron:** Method 12C2 Rayment & Higginson (1992).

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

Soil Physics Profile No. 1

Test Type I FS,OM,PSA, Disp%
Order No Job No: 800211
Reference
Sample Name CQ2
Sample No. 62285
Date Received 18/07/2001 Total No Pages: 10
Client: Harvest Scientific Services
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CHARACTERISTIC		RESULT	COMMENTS
Texture			
Emerson Stability Class			
Dispersion %		100.0	
Particle Size Analysis (PSA)			
> 2mm	Gravel	2.3	
2 - 0.2 mm	Coarse Sand	72.5	
0.2 - 0.02 mm	Fine Sand	17.3	
0.02 - 0.002 mm	Silt	4.0	
< 0.002 mm	Clay	4.0	
Sieve Analysis			
> 4 mm	Gravel		
2-4 mm	Coarse Sand		
1-2 mm			
0.5-1 mm	Medium Sand		
0.25-0.5 mm			
0.1-0.25 mm	Fine Sand		
< 0.1 mm	Very Fine Sand		

Recommendations

Organic Matter = 2.03%
The pH of this material is very acidic resulting in the availability of toxic levels of aluminium. To raise the pH and reduce aluminium apply lime at 600-700g/sqm and incorporate into the surface 100-150mm. Calcium is low relative to magnesium but the lime will improve this ratio. Salinity and sodium levels are suitably low and pose no limitations for effluent disposal. General nutrient levels are low for optimum plant growth.

The particle size analysis shows this material is mainly coarse sand with some fine sand and smaller fractions of silt, clay and gravel. Although the sodium level is low, the dispersion percentage result indicates the material is very dispersive and is therefore likely to be prone to erosion problems.

Explanation of the Methods:
Texture:- Charman & Murphy (1991). **Emerson's Aggregate Test:-** Charman & Murphy (1991). **Dispersion %:-** Ritchie (1963). **Particle Size Analysis & Sieve Analysis:-** Modified Black (1983) Method 43-1 to 43-6.

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

Soil Chemistry Profile

Test Type: FS,OM,PSA, Disp%
Order No: Job No: 800211
Reference
Sample Name: CQ3
Sample No: 62286
Date Received 18/07/2001 Total No Pages: 10
CLIENT: Harvest Scientific Services
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TEST	RESULT	COMMENTS
pH in water 1:2	5.3	
pH in $CaCl_2$ 1:2	4.2	very acidic
EC mS/cm 1:2	.03	low salinity level
Chlorides mg/kg		

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
Unit	meq%	Comment	meq%	% of ECEC	Comment
Sodium			.1	4.40	low - not sodic
Potassium			.07	3.10	low
Calcium			.25	11.00	low
Magnesium			.71	31.30	elevated
Aluminium			1.14	50.20	high - toxic
		ECEC	2.27		
		Ca/Mg	0.40		unbalanced ratio

	mg/kg	
Phosphate as P	1.1	low
Ammonium as N	3.6	low
Nitrate as N	2.8	low
Sulphate as S	25.6	OK
Iron	77.7	OK
Zinc	6.5	OK
Copper	1.5	low
Manganese	.7	low
Boron		

Recommendations

Organic Matter = 0.53%
The pH of this material is very acidic resulting in the availability of toxic levels of aluminum. In order to raise the pH and render aluminium unavailable, apply lime at 600-700g/sqm and incorporate into the surface 100-150mm of soil. Calcium is low relative to magnesium but the added lime will improve this ratio. Salinity and sodium levels are appropriately low and pose no limitations. General nutrient levels are also low, but would be improved by the addition of effluent water.

This material is mainly coarse sand with some fine sand and clay, and smaller fractions of gravel and silt. Although the sodium level is low, the dispersion percentage indicates a significant proportion of the material will disperse in water.

Explanation of the Methods:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). **Exchangeable Cations, ECEC:** Method 15A1 Rayment & Higginson (1992) **Chloride:** Vogel (1961). **Aluminium:** Method 3500 APHA (1992). **Phosphate:** Method 9E1 Rayment & Higginson (1992). **Ammonium, Sulphate, Iron, Copper, Manganese + Zinc:** Method 83-1 to 83-5 Black (1983). **Boron:** Method 12C2 Rayment & Higginson (1992).

Checked by Principal..... Consultant.....
Simon Leake Date of Report 01/08/2001 N.Burrows

Soil Physics Profile No. 1

Test Type I FS,OM,PSA, Disp%
Order No Job No: 800211
Reference
Sample Name CQ3
Sample No. 62286
Date Received 18/07/2001 Total No Pages: 10
Client: Harvest Scientific Services
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CHARACTERISTIC		RESULT	COMMENTS
Texture			
Emerson Stability Class			
Dispersion %		50.0	
Particle Size Analysis (PSA)			
> 2mm	Gravel	2.4	
2 - 0.2 mm	Coarse Sand	63.2	
0.2 - 0.02 mm	Fine Sand	17.7	
0.02 - 0.002 mm	Silt	4.9	
< 0.002 mm	Clay	11.7	
Sieve Analysis			
> 4 mm	Gravel		
2-4 mm	Coarse Sand		
1-2 mm			
0.5-1 mm	Medium Sand		
0.25-0.5 mm			
0.1-0.25 mm	Fine Sand		
< 0.1 mm	Very Fine Sand		

Recommendations

Organic Matter = 0.53%
The pH of this material is very acidic resulting in the availability of toxic levels of aluminum. In order to raise the pH and render aluminium unavailable, apply lime at 600-700g/sqm and incorporate into the surface 100-150mm of soil. Calcium is low relative to magnesium but the added lime will improve this ratio. Salinity and sodium levels are appropriately low and pose no limitations. General nutrient levels are also low, but would be improved by the addition of effluent water.

This material is mainly coarse sand with some fine sand and clay, and smaller fractions of gravel and silt. Although the sodium level is low, the dispersion percentage indicates a significant proportion of the material will disperse in water.

Explanation of the Methods:
Texture:- Charman & Murphy (1991). **Emerson's Aggregate Test:-** Charman & Murphy (1991). **Dispersion %:-** Ritchie (1963). **Particle Size Analysis & Sieve Analysis:-** Modified Black (1983) Method 43-1 to 43-6.

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

Soil Chemistry Profile

Test Type: FS,OM,PSA, Disp%
Order No: Job No: 800211
Reference
Sample Name: CQ5
Sample No: 62287
Date Received 18/07/2001 Total No Pages: 10
CLIENT: Harvest Scientific Services
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TEST	RESULT	COMMENTS
pH in water 1:2	5.1	
pH in $CaCl_2$ 1:2	4.0	very acidic
EC mS/cm 1:2	.03	low salinity level
Chlorides mg/kg		

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
Unit	meq%	Comment	meq%	% of ECEC	Comment
Sodium			.09	5.20	slightly elevated
Potassium			.06	3.50	low
Calcium			.46	26.70	low
Magnesium			.54	31.40	elevated
Aluminium			.57	33.10	high - toxic
		ECEC	1.72		
		Ca/Mg	0.90		unbalanced ratio

	mg/kg	
Phosphate as P	<0.80	low
Ammonium as N	4.5	low
Nitrate as N	<2.50	low
Sulphate as S	19.2	OK
Iron	96.6	OK
Zinc	1.8	low
Copper	1.7	low
Manganese	5.2	low
Boron		

Recommendations

Organic Matter = 2.50%
The pH of this material is very acidic resulting in the availability of aluminium which is toxic to plant roots. To raise the pH and render aluminium unavailable, apply lime at 700-800g/sqm and incorporate into the surface 100-150mm. Calcium is low relative to aluminium but the lime application will improve this ratio. Salinity is suitably low and although sodium is slightly elevated this is not a serious concern. General nutrient levels are low but would be improved by the application of effluent water.

This material is mainly coarse sand with some gravel and fine sand and smaller fractions of silt and clay. Although the sodium level is low, the dispersion percentage result indicates the material is very dispersive and is therefore likely to be prone to erosion problems.

Explanation of the Methods:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). **Exchangeable Cations, ECEC:** Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). **Aluminium:** Method 3500 APHA (1992). **Phosphate:** Method 9E1 Rayment & Higginson (1992). **Ammonium, Sulphate, Iron, Copper, Manganese + Zinc:** Method 83-1 to 83-5 Black (1983). **Boron:** Method 12C2 Rayment & Higginson (1992).

Checked by Principal..... Consultant.....
Simon Leake Date of Report 01/08/2001 N.Burrows

Soil Physics Profile No. 1

Test Type I FS,OM,PSA, Disp%
Order No Job No: 800211
Reference
Sample Name CQ5
Sample No. 62287
Date Received 18/07/2001 Total No Pages: 10
Client: Harvest Scientific Services
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CHARACTERISTIC		RESULT	COMMENTS
Texture			
Emerson Stability Class			
Dispersion %		100.0	

Particle Size Analysis (PSA)

> 2mm	Gravel	12.0
2 - 0.2 mm	Coarse Sand	62.4
0.2 - 0.02 mm	Fine Sand	17.7
0.02 - 0.002 mm	Silt	3.9
< 0.002 mm	Clay	3.9

Sieve Analysis

> 4 mm	Gravel
2-4 mm, 1-2 mm	Coarse Sand
0.5-1 mm, 0.25-0.5 mm	Medium Sand
0.1-0.25 mm	Fine Sand
< 0.1 mm	Very Fine Sand

Recommendations

Organic Matter = 2.50%
The pH of this material is very acidic resulting in the availability of aluminium which is toxic to plant roots. To raise the pH and render aluminium unavailable, apply lime at 700-800g/sqm and incorporate into the surface 100-150mm. Calcium is low relative to aluminium but the lime application will improve this ratio. Salinity is suitably low and although sodium is slightly elevated this is not a serious concern. General nutrient levels are low but would be improved by the application of effluent water.

This material is mainly coarse sand with some gravel and fine sand and smaller fractions of silt and clay. Although the sodium level is low, the dispersion percentage result indicates the material is very dispersive and is therefore likely to be prone to erosion problems.

Explanation of the Methods:
Texture:- Charman & Murphy (1991). **Emerson's Aggregate Test:-** Charman & Murphy (1991). **Dispersion %:-** Ritchie (1963). **Particle Size Analysis & Sieve Analysis:-** Modified Black (1983) Method 43-1 to 43-6.

Checked by Principal.....
Simon Leake Date of Report 01/08/2001

Consultant.....
N.Burrows

APPENDIX 6

SOIL LOSS CALCULATION FOR CATTAI QUARRY

Based on:

UNIVERSAL SOIL LOSS EQUATION*

A = R x K x LS x P x C

where:

A = computed soil loss (tonnes/ha/yr)
R = rainfall erosivity factor
K = soil erodibility factor
LS = slope length/gradient factor
P = erosion control practive factor
C = ground cover and management factor

	R	K	LS	P	C
	2500	0.022	2.18	1.3	1
A =	155.87				
	2500	0.043	2.18	1.3	1
A =	304.655				

*From: Appendix A Revised Universal Soil Loss Equation
Managing Urban Stormwater Soils and Construction
NSW Department of Housing, 1998

Notes:

1. Two outcomes have been calculated, based on the variability of the soil erodibility factor.
2. The quarry falls within Rainfall Distribution Zone 4
3. The resultant soil loss range falls within Soil Loss Class 1 - 2. The corresponding erosion hazard is thus considered to be very low to moderate.

APPENDIX 7

CATTAI QUARRY PROJECT

Nepean Quarries Pty Ltd: Water Testing Results - 5/12/01

Sample	Location Description	Conductivity (uS/cm)	TDS (mg/L)	Salinity %	Temp (C)	pH	Comments
12/5/2001	SW-1, eastern top dam	106	74	0	25.1	n/a	normal level
	SW-2, between dams	271	193	0	21.6	"	slight flow
	SW-3 flow from main dam	153	108	0	24.2	"	low level
	SW-4, Eastern Dam	138	98	0	24.7	"	low level
	SW-5, small dam BW-1	88	63	0	22.2	"	clear
	SW-6, main dam, w.end	111	78	0	25	"	clear
	SW-7, Cheesmans Rd	67	97	0	21.6	"	low level
	SW-8, small basin	97	33	0	24.6	"	silty
	BW-2, windmill, Wise. Rd	393	281	0	20.3	"	Water Depth = 45m
	Standard						

OFL = Off Limits of measuring instrument

High Salinity	>2000
Extremely High Salinity	>5500

(Note: NSW Agriculture recommended irrigation limit 2500 uS/cm, World Health Organisation Drinking Water Standard is 800uS/cm)

Nepean Quarries Pty Ltd: Water Testing Results - 9/11/01

Sample	Location Description	Conductivity (uS/cm)	TDS (mg/L)	Salinity %	Temp (C)	pH	Comments
11/9/2001	SW-1, eastern top dam	98.5	70	0	24.7	n/a	clear
	SW-2, between dams	262	187	0	23.2	"	flowing
	SW-3 flow from main dam	118	84	0	28.3	"	flowing
	SW-4, Eastern Dam	125	89	0	25.7	"	clear
	SW-5, small dam BW-1	83	60	0	23.1	"	tea colour
	SW-6, main dam, w.end	106	76	0	24	"	clear
	SW-7, Cheesmans Rd	62	44	0	23.5	"	clear-turbid
	SW-8, small basin	33	24	0	27.2	"	turbid
	BW-2, windmill, Wise. Rd	355	255	0	21.7	"	Water Depth = 45m
	Standard						

OFL = Off Limits of measuring instrument

High Salinity	>2000
Extremely High Salinity	>5500

(Note: NSW Agriculture recommended irrigation limit 2500 uS/cm, World Health Organisation Drinking Water Standard is 800uS/cm)

CATTAI QUARRY PROJECT

Nepean Quarries Pty Ltd: Water Testing Results - 12/10/01

Sample	Location Description	Conductivity (uS/cm)	TDS (mg/L)	Salinity %	Temp (C)	pH	Comments
12/10/01	SW-1, eastern top dam	95.5	68	0	22	7.6	clear
	SW-2, between dams	265	190	0	25.2		flowing
	SW-3 flow from main dam	100	71	0	28.7		slow flow (seepage)
	SW-4, Eastern Dam	117	84	0	27.3		clear
	SW-5, small dam BW-1	77	55	0	20.9		
	SW-6, main dam, w.end	98	70	0	21.8		clear blue
	SW-7, Cheesmans Rd	53.6	37	0	24		
	SW-8, small basin	32	23	0	27.7		
	BW-2, windmill, Wise. Rd	369	263	0	20.2		Water Depth = 46m
						Note:	pH meter faulty, needs calibrating?
	Standard						

OFL = Off Limits of measuring instrument

High Salinity	>2000
Extremely High Salinity	>5500

(Note: NSW Agriculture recommended irrigation limit 2500 uS/cm, World Health Organisation Drinking Water Standard is 800uS/cm)

CATTAI QUARRY PROJECT

Nepean Quarries Pty Ltd: Water Testing Results - 14/9/01

Sample	Location Description	Conductivity (uS/cm)	TDS (mg/L)	Salinity %	Temp (C)	pH	Comments
14/09/01	SW-1, eastern top dam	94	67	0	19.5	7	clear, fairly full
	SW-2, between dams	242	175	0	20.4	4.3	red algae in stream, clear water
	SW-3 flow from main dam	98.7	70	0	19.4	5.6	flowing from seep just below dam
	SW-4, Eastern Dam	109	78	0	20.1	6.4	fairly low level, clear
	SW-5, small dam BW-1	77	55	0	20.1	7.8	clear
	SW-6, main dam, w.end	98	70	0	19	5.4	clear
	SW-7, Cheesmans Rd	52	37	0	17.2	6.3	slightly muddy
	SW-8, small basin	36	26	0	21	6.4	silty
	BW-2, windmill, Wise. Rd	385	275	0	20.9	4.5	Water Depth = 49m (161ft), clear & odourless
	Standard						

OFL = Off Limits of measuring instrument

High Salinity	>2000
Extremely High Salinity	>5500

(Note: NSW Agriculture recommended irrigation limit 2500 uS/cm, World Health Organisation Drinking Water Standard is 800uS/cm)

Nepean Quarries Pty Ltd: Water Testing Results - 10/8/01

Sample	Location Description	Conductivity (uS/cm)	TDS (mg/L)	Salinity %	Temp (C)	pH	Comments
10/08/01	SW-1, eastern top dam	91.6	66	0	15.3	8.3	pH meter faulty?
	SW-2, between dams	310	221	0	19.6		
	SW-3 flow from main dam	94.6	68	0	17.3		
	SW-4, Eastern Dam	106	76	0	19.3	7.6	
	SW-5, small dam BW-1	75.6	54	0	16.7		
	SW-6, main dam, w.end	95	68	0	16.2		
	SW-7, Cheesmans Rd	43.9	31	0	16.3		
	SW-8, small basin	30.5	22	0	20		
	BW-2, windmill, Wise. Rd	400	286	0	20.6		Iron colouring from pipe, water depth ~115ft (35m)
	Standard	1538	1099	0.7	23.6		

OFL = Off Limits of measuring instrument

High Salinity	>2000
Extremely High Salinity	>5500

(Note: NSW Agriculture recommended irrigation limit 2500 uS/cm, World Health Organisation Drinking Water Standard is 800uS/cm)

CATTAI QUARRY PROJECT

Nepean Quarries Pty Ltd: Water Testing Results - 12/7/01

Sample	Location Description	Conductivity (uS/cm)	TDS (mg/L)	Salinity %	Temp (C)	pH	Comments
12/07/01	SW-1, eastern top dam	221	158	0	19.9	?	pH meter may be faulty, registered 5
	SW-2, between dams	244	174	0	19.8	?	" "
	SW-3 flow from main dam	93	67	0	20.1	8.2	trickle, discoloured by algae
	SW-4, Eastern Dam	103	74	0	19.6	8	
	SW-5, small dam BW-1	70	50	0	19.1	?	pH meter may be faulty, registered 5
	SW-6, main dam, w.end	96	68	0	14.7	9.1	clear, blue tinge, full
	High Salinity	>2000					
	Extremely High Salinity	>5500					
	Standard						

OFL = Off Limits of measuring instrument

(Note: NSW Agriculture recommended irrigation limit 2500 uS/cm, World Health Organisation Drinking Water Standard is 800uS/cm)

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR MARK GRIFFITHS	BATCH:	ES29440
CLIENT:	HARVEST EXPLORATION	SUB BATCH:	0
ADDRESS:	C/-HARVEST SCIENTIFIC SERVICES PO BOX 204 CAMDEN NSW 2570	LABORATORY:	SYDNEY
		DATE RECEIVED:	10/08/2001
		DATE COMPLETED:	23/08/2001
		SAMPLE TYPE:	WATER
ORDER No.:		No. of SAMPLES:	4
PROJECT:			

COMMENTS

Oil and Grease determined as per APHA 20th edition method 5520 A and B.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: SYDNEY

Address
277-289 Woodpark Road
SMITHFIELD NSW 2164

Phone: 61-2-8784 8555
Fax: 61-2-8784 8500
Email: brianw@als.com.au

Signatory Greg Vogel

LABORATORIES

AUSTRALASIA

Brisbane
Melbourne
Sydney
Newcastle
Auckland
Hong Kong
Singapore
Kuala Lumpur
Bogor

AMERICAS

Vancouver
Santiago
Antofagasta
Lima

Batch: ES29440
Sub Batch: 0
Date of Issue: 23/08/2001
Client: HARVEST EXPLORATION
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4						
		Date Sampled											
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	BW-2	SW-2	SW-3	SW-7						
EA-005-P	pH Value		0.01	4.86	4.08	6.59	6.14						
EA-010-P	Conductivity @ 25'c	uS/cm	1	379	237	108	56						
EA-025	Suspended Solids (SS)	mg/L	1	236	<1	5	6						
EA-045	Turbidity	NTU	0.1	320	0.1	1.6	51.0						
EG-020F	Silver - Filtered	mg/L	0.001	<0.001	<0.001	<0.001	<0.001						
EG-020F	Arsenic - Filtered	mg/L	0.01	<0.01	<0.01	<0.01	<0.01						
EG-020F	Cadmium - Filtered	mg/L	0.001	<0.001	<0.001	<0.001	<0.001						
EG-020F	Copper - Filtered	mg/L	0.001	0.003	0.001	<0.001	0.001						
EG-020F	Lead - Filtered	mg/L	0.001	0.009	<0.001	<0.001	<0.001						
EG-020F	Zinc - Filtered	mg/L	0.001	0.782	0.015	0.003	0.004						
EG-035F	Mercury - Filtered	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
EK-059A	Nitrite and Nitrate as N	mg/L	0.01	0.49	0.05	0.02	0.02						
EK-061A	Total Kjeldahl Nitrogen as N	mg/L	0.1	0.8	0.2	1.0	0.7						
EK-067A	Phosphorus as P - Total	mg/L	0.01	0.02	<0.01	0.02	<0.01						
EP-008	Chlorophyll a	mg/m3	1	<1	1	2	10						
EP-020	Oil & Grease	mg/L	5	<5	<5	<5	<5						
EP-030	Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2						

EML CONSULTING SERVICES PTY LTD
A.B.N 71 006 308 774
Unit 6, 1 River Road West, Parramatta, NSW, 2150
Telephone (02)9893 9366 • Facsimile (02)9893 8717

EML Ref No: 21369

Client Ref No: 95714

Report Date: 16 August, 2001

Australian Laboratory Services Pty Ltd
Locked Bag 106
WETHERILL PARK BC NSW 1851

Attention Mr Heery

Certificate of Analysis

Sample description: ES 29440 10/08/01
Samples received: 13 August 2001 at 13:40 hrs. Testing commenced: 13 August 2001 at 15:00 hrs.

EML S/No 021369	Sample Marking: Samples tested as received into the laboratory	Faecal Coliforms /100mL
1	BW-2	0
2	SW-2	0
3	SW-3	1
4	SW-7	11
Method:		3.3.3.4

> greater than, < less than, ~ approximately, est estimated, N/D not detected, cfu colony forming units, SPC Standard (bacterial) plate count, NR Not required

Yours faithfully
EML CONSULTING SERVICES PTY LTD

Carmen Gurney B.Sc MASM AAIFST
Microbiologist

APPENDIX 8

BAULKHAM HILLS SHIRE COUNCIL

14 September 2001

Harvest Scientific Services
PO Box 1000
PICTON NSW 2571

Your Ref:
Our Ref: 599767

Attention: Mr G Muers

Dear Mr Muers

Please find attached details of the recent traffic count undertaken by Council at your request on Wisemans Ferry Road, north of O'Briens Road outside No. 572 Wisemans Ferry Road.

The traffic speed and volume count was undertaken using MetroCount vehicle classifiers with Austroads 94 classification system.

Please find attached the following:

- Virtual Week – Counts for all classifications
- Virtual Week – Counts for all classifications except Class 1 and 2
- Vehicle counts on 15 minute intervals
- Daily Classes as percentages
- Class Bin Chart
- Speed Histogram and Details

I trust that you find this information to be satisfactory and should you require any further information regarding this matter, please contact me on 9843 0243. An invoice will be issued for this work shortly.

Yours faithfully

$550.00

Michael Doyle
TRAFFIC ENGINEER

Encl.

P.O. Box 75 Castle Hill, NSW 1765 • 129 Showground Road Castle Hill, NSW 2154
Telephone **(02) 9843 0555** • Facsimile (02) 9843 0409 • DX 8455 Castle Hill
A.B.N. No. 25 034 494 656

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-626

DATASETS:

Site:	[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Direction:	6 - West bound A>B, East bound B>A., Lane: 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	12469 Vehicles

Weekly Vehicle Counts (Virtual Week)

Report Id: VirtWeeklyVehicle-626
Site ID: 50844.0EW
Location: Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Filter time: 08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
Scheme: AustRoads94
Filter: CL(1 2 3 4 5 6 7 8 9 10 11 12) DR(NESW) SP(15,160) HW(all)

	MON	TUE	WED	THU	FRI	SAT	SUN	AVERAGES 5-DAY	AVERAGES 7-DAY
Hour period									
0000-0100	4.0	2.0	4.0	7.0	10.0	6.0	13.0	5.4	6.6
0100-0200	1.0	2.0	5.0	2.5	4.0	4.0	8.0	2.9	3.8
0200-0300	1.0	0.0	4.0	1.5	8.0	1.0	3.0	2.9	2.6
0300-0400	0.0	7.0	6.0	4.5	2.0	4.0	7.0	3.9	4.4
0400-0500	5.0	4.0	4.0	5.0	9.0	2.0	7.0	5.4	5.1
0500-0600	50.0	45.0	43.0	45.5	45.0	26.0	9.0	45.7	37.6
0600-0700	73.0	72.0	79.0	80.0	77.0	42.0	17.0	76.2	62.9
0700-0800	112.0	**119.0<**	106.0	**116.5<**	94.0	78.0	35.0	109.5	94.4
0800-0900	**121.0<**	94.0	**118.0<**	115.0	**144.0<**	91.0	104.0	**118.4<**	**112.4<**
0900-1000	95.0	113.0	37.5	83.5	95.0	125.0	138.0	84.8	98.1
1000-1100	96.0	87.0	64.5	77.5	87.0	124.0	177.0	82.4	101.9
1100-1200	94.0	92.0	78.5	78.0	81.0	**140.0<**	**191.0<**	84.7	107.8
1200-1300	81.0	90.0	79.0	77.0	91.0	**129.0<**	**191.0<**	83.6	105.4
1300-1400	105.0	86.0	89.0	73.0	91.0	107.0	190.0	88.8	105.9
1400-1500	**123.0<**	91.0	102.5	98.0	117.0	116.0	146.0	106.3	113.4
1500-1600	110.0	112.0	97.5	115.0	124.0	106.0	179.0	111.7	120.5
1600-1700	114.0	**123.0<**	**117.5<**	**142.0<**	**141.0<**	112.0	162.0	**127.5<**	**130.2<**
1700-1800	117.0	103.0	93.5	89.0	134.0	120.0	128.0	107.3	112.1
1800-1900	82.0	92.0	95.0	85.0	112.0	74.0	75.0	93.2	87.9
1900-2000	58.0	42.0	49.5	46.0	63.0	46.0	40.0	51.7	49.2
2000-2100	30.0	43.0	31.5	50.0	28.0	32.0	25.0	36.5	34.2
2100-2200	27.0	25.0	25.0	34.0	36.0	30.0	22.0	29.4	28.4
2200-2300	13.0	27.0	21.0	24.0	24.0	23.0	21.0	21.8	21.9
2300-2400	10.0	7.0	13.5	12.0	26.0	33.0	8.0	13.7	15.6
TOTALS									
12Hr 7-19	1250	1202	1078	1149	1311	1322	1716	1198.2	1289.9
16Hr 6-22	1438	1384	1263	1359	1515	1472	1820	1392.0	1464.6
18Hr 6-24	1461	1418	1298	1395	1565	1528	1849	1427.5	1502.1
24Hr 0-24	1522	1478	1364	1461	1643	1571	1896	1493.7	1562.2
AM HR	8	7	8	7	8	11	11		
PEAK	121	119	118	116	144	140	191		
PM HR	14	16	16	16	16	12	12		
PEAK	123	123	117	142	141	129	191		

* - Not in logging period.

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-631

DATASETS:

Site:	[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Direction:	6 - West bound A>B, East bound B>A., Lane: 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
Included classes:	3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	1436 Vehicles

Weekly Vehicle Counts (Virtual Week)

Report Id: VirtWeeklyVehicle-631
Site ID: 50844.0EW
Location: **Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai**
Filter time: **08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001**
Scheme: AustRoads94
Filter: CL(3 4 5 6 7 8 9 10 11 12) DR(NESW) SP(15,160) HW(all)

	MON	TUE	WED	THU	FRI	SAT	SUN	AVERAGES 5-DAY	AVERAGES 7-DAY
Hour period									
0000-0100	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.4	0.3
0100-0200	0.0	2.0	1.0	0.5	1.0	0.0	1.0	0.9	0.8
0200-0300	0.0	0.0	3.0	0.5	1.0	0.0	0.0	0.9	0.6
0300-0400	0.0	3.0	3.0	1.5	2.0	1.0	0.0	1.9	1.5
0400-0500	0.0	1.0	1.0	1.5	3.0	0.0	0.0	1.3	0.9
0500-0600	12.0	10.0	8.0	15.0	14.0	10.0	0.0	11.8	9.9
0600-0700	19.0	13.0	16.0	15.5	18.0	**16.0<**	1.0	16.3	**14.1<**
0700-0800	17.0	12.0	16.0	**17.0<**	12.0	9.0	1.0	14.8	12.0
0800-0900	11.0	7.0	**16.0<**	12.0	19.0	13.0	1.0	13.0	11.3
0900-1000	17.0	**21.0<**	7.0	16.0	7.0	11.0	**7.0<**	13.6	12.3
1000-1100	**20.0<**	20.0	14.5	11.5	**19.0<**	7.0	5.0	**17.0<**	13.9
1100-1200	19.0	16.0	10.0	13.0	8.0	13.0	6.0	13.2	12.1
1200-1300	9.0	**24.0<**	15.5	13.0	15.0	**8.0<**	**5.0<**	15.3	12.8
1300-1400	20.0	11.0	17.5	15.0	13.0	1.0	3.0	15.3	11.5
1400-1500	**21.0<**	17.0	**20.5<**	17.0	**24.0<**	3.0	2.0	**19.9<**	**14.9<**
1500-1600	18.0	14.0	19.5	12.0	10.0	3.0	3.0	14.7	11.4
1600-1700	10.0	11.0	13.5	**20.0<**	16.0	7.0	3.0	14.1	11.5
1700-1800	10.0	11.0	6.0	7.0	6.0	6.0	2.0	8.0	6.9
1800-1900	4.0	8.0	6.0	1.0	6.0	2.0	2.0	5.0	4.1
1900-2000	2.0	6.0	2.5	5.0	4.0	0.0	1.0	3.9	2.9
2000-2100	1.0	5.0	1.5	4.0	4.0	0.0	2.0	3.1	2.5
2100-2200	3.0	3.0	2.0	3.0	1.0	1.0	0.0	2.4	1.9
2200-2300	2.0	6.0	1.0	1.0	0.0	0.0	1.0	2.0	1.6
2300-2400	0.0	1.0	1.5	2.0	1.0	0.0	0.0	1.1	0.8
TOTALS									
12Hr 7-19	176	172	162	154	155	83	40	163.9	134.6
16Hr 6-22	201	199	184	182	182	100	44	189.6	156.0
18Hr 6-24	203	206	186	185	183	100	45	192.7	158.4
24Hr 0-24	215	222	202	204	206	111	46	209.9	172.4
AM HR PEAK	10 20	9 21	8 16	7 17	10 19	6 16	9 7		
PM HR PEAK	14 21	12 24	14 20	16 20	14 24	12 8	12 5		

* - Not in logging period.

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-627

DATASETS:

Site:	**[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai**
Direction:	6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	**08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	12469 Vehicles

• Wed 05 Sep 2001 - Total=894(incomplete) , 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
-	-	-	-	-	-	-	-	-	0	36	63	81	99	99	76	117	91	88	50	34	26	19	15
-	-	-	-	-	-	-	-	-	0	0	18	19	25	22	20	27	21	21	19	8	9	2	4
1																							
-	-	-	-	-	-	-	-	-	0	0	15	18	25	27	12	31	21	26	13	9	6	9	1
2																							
-	-	-	-	-	-	-	-	-	0	15	18	26	24	26	23	22	23	24	12	9	2	5	6
2																							
-	-	-	-	-	-	-	-	-	0	0	21	12	18	25	24	21	37	26	17	6	8	9	3	4
1																							

PM PkHr 16:00 to 17:00 (n=117), PM PHF=0.79

• Thu 06 Sep 2001 - Total=1462, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
6	4	3	4	5	45	80	114	114	83	81	78	77	73	98	115	142	89	85	46	50	34	24	12
1	2	2	1	1	5	10	25	31	21	15	21	20	17	20	26	35	18	22	14	18	10	7	3
1																							
2	1	0	2	2	6	19	23	29	32	28	16	23	21	26	24	27	26	24	11	12	13	4	5
4																							
2	1	0	1	2	16	25	31	24	14	19	13	17	10	24	34	35	25	24	12	11	3	8	3
1																							
1	0	1	0	0	18	26	35	30	16	19	28	17	25	28	31	45	20	15	9	9	8	5	1
4																							

AM PkHr 07:30 to 08:30 (n=126), AM PHF=0.90 PM PkHr 16:00 to 17:00 (n=142), PM PHF=0.79

• Fri 07 Sep 2001 - Total=1643, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
10	4	8	2	9	45	77	94	144	95	87	81	91	91	117	124	141	134	112	63	28	36	24	26
1	2	2	1	2	4	8	15	37	26	25	17	34	13	18	42	44	35	37	12	8	14	6	6
1																							
4	0	3	0	1	6	16	24	44	21	20	23	16	24	29	26	26	34	32	23	7	12	7	7
1																							
1	1	2	1	1	15	31	27	38	28	26	24	14	27	36	26	39	37	25	19	9	7	5	8
2																							
4	1	1	0	5	20	22	28	25	20	16	17	27	27	34	30	32	28	18	9	4	3	6	5
2																							

AM PkHr 07:45 to 08:45 (n=147), AM PHF=0.84 PM PkHr 14:15 to 15:15 (n=141), PM PHF=0.84

• Sat 08 Sep 2001 - Total=1571, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
6	4	1	4	2	26	42	78	91	125	124	140	129	107	116	106	112	120	74	46	32	30	23	33
1	0	1	3	0	5	9	13	19	31	31	34	36	27	25	30	32	33	27	7	8	10	4	7
1																							
1	2	0	0	0	7	15	23	30	30	25	30	25	26	34	23	31	31	15	14	7	5	8	8
5																							
2	1	0	1	0	8	7	20	25	32	26	41	36	24	29	28	25	22	17	11	8	7	7	11
7																							
2	1	0	0	2	6	11	22	17	32	42	35	32	30	28	25	24	34	15	14	9	8	4	7
0																							

AM PkHr 10:45 to 11:45 (n=147), AM PHF=0.88 PM PkHr 12:00 to 13:00 (n=129), PM PHF=0.90

• Sun 09 Sep 2001 - Total=1896, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
13	8	3	7	7	9	17	35	104	138	177	191	191	190	146	179	162	128	75	40	25	22	21	8
1	1	1	4	0	2	4	8	16	26	33	46	48	56	26	33	51	35	22	12	8	9	10	2
3																							
5	2	1	0	2	3	5	7	29	36	58	44	48	44	33	48	29	29	20	11	8	5	3	3
0																							
7	4	1	3	2	2	4	11	26	39	36	51	53	45	54	52	40	29	15	12	5	5	4	3
1																							
0	1	0	0	3	2	4	9	33	37	50	50	42	45	33	46	42	35	18	5	4	3	4	0
0																							

AM PkHr 11:45 to 12:45 (n=199), AM PHF=0.94 PM PkHr 12:15 to 13:15 (n=199), PM PHF=0.89

• Mon 10 Sep 2001 - Total=1522, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
4	1	1	0	5	50	73	112	121	95	96	94	81	105	123	110	114	117	82	58	30	27	13	10
3	0	0	0	1	6	13	22	45	26	29	22	22	35	24	26	28	23	24	20	11	13	3	1
1																							
0	1	1	0	1	15	23	33	28	24	19	22	20	32	36	20	28	29	26	14	10	3	0	3
0																							
1	0	0	0	1	16	25	23	27	21	17	30	19	19	31	36	28	29	19	12	3	6	6	2
1																							
0	0	0	0	2	13	12	34	21	24	31	20	20	19	32	28	30	36	13	12	6	5	4	4
0																							

AM PkHr 07:15 to 08:15 (n=135), AM PHF=0.75 PM PkHr 14:15 to 15:15 (n=125), PM PHF=0.87

• Tue 11 Sep 2001 - Total=1478, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	2	0	7	4	45	72	119	94	113	87	92	90	86	91	112	123	103	92	42	43	25	27	7
1	1	0	4	0	3	15	33	27	29	18	17	22	16	16	24	24	31	19	16	11	6	2	3
0																							
0	1	0	1	0	8	12	24	26	25	31	26	23	22	21	30	37	22	23	9	15	13	6	2
2																							
1	0	0	2	1	23	29	29	14	28	17	24	17	28	27	29	33	27	23	13	8	3	8	1
2																							
0	0	0	0	3	12	16	33	27	31	21	25	28	20	27	29	29	23	27	4	9	3	11	1
0																							

AM PkHr 07:00 to 08:00 (n=119), AM PHF=0.90 PM PkHr 16:15 to 17:15 (n=130), PM PHF=0.88

Wed 12 Sep 2001 - Total=1465, 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
4	5	4	6	4	43	79	106	118	75	93	94	77	79	106	119	118	96	102	49	29	24	23	12
0	2	3	0	1	5	11	21	35	12	25	26	36	18	32	32	28	19	34	20	8	11	7	4
2	2	0	1	1	8	20	28	22	25	19	17	14	26	24	21	27	27	23	9	7	7	6	3
2	1	0	3	0	16	22	30	35	20	18	18	17	21	30	33	29	23	30	8	9	4	2	4
0	0	1	2	2	14	26	27	26	18	31	33	10	14	20	33	34	27	15	12	5	2	8	1

AM PkHr 07:15 to 08:15 (n=120), AM PHF=0.86 PM PkHr 15:30 to 16:30 (n=121), PM PHF=0.92

Thu 13 Sep 2001 - Total=538(incomplete) , 15 minute drops,

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
8	1	0	5	5	46	80	119	116	84	74	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0	0	0	1	8	8	22	31	18	21	-	-	-	-	-	-	-	-	-	-	-	-	-
3	0	0	3	0	8	23	33	26	19	18	-	-	-	-	-	-	-	-	-	-	-	-	-
3	0	0	0	1	13	26	32	33	18	22	-	-	-	-	-	-	-	-	-	-	-	-	-
0	1	0	2	3	17	23	32	26	29	13	-	-	-	-	-	-	-	-	-	-	-	-	-

MetroCount Traffic Executive
Daily Classes

DailyClass-628

DATASETS:

Site:	**[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai**
Direction:	6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	**08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	12469 Vehicles

Daily Classes

Report Id: DailyClass-628
Site ID: 50844.0EW
Location: Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Filter time: 08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
Scheme: AustRoads94
Filter: CL(1 2 3 4 5 6 7 8 9 10 11 12) DR(NESW) SP(15,160) HW(all)

CLASS

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Mon 03 Sep 2001 : Volume = 0 (incomplete data)											
0	0	0	0	0	0	0	0	0	0	0	0
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tue 04 Sep 2001 : Volume = 0 (incomplete data)											
0	0	0	0	0	0	0	0	0	0	0	0
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Wed 05 Sep 2001 : Volume = 894 (incomplete data)											
744	24	50	26	1	5	1	8	33	1	1	0
83.2%	2.7%	5.6%	2.9%	0.1%	0.6%	0.1%	0.9%	3.7%	0.1%	0.1%	0.0%
Thu 06 Sep 2001 : Volume = 1462											
1234	27	97	15	6	6	3	8	65	0	1	0
84.4%	1.8%	6.6%	1.0%	0.4%	0.4%	0.2%	0.5%	4.4%	0.0%	0.1%	0.0%
Fri 07 Sep 2001 : Volume = 1643											
1389	48	118	12	4	5	0	8	55	3	1	0
84.5%	2.9%	7.2%	0.7%	0.2%	0.3%	0.0%	0.5%	3.3%	0.2%	0.1%	0.0%
Sat 08 Sep 2001 : Volume = 1571											
1359	101	41	13	4	3	0	7	43	0	0	0
86.5%	6.4%	2.6%	0.8%	0.3%	0.2%	0.0%	0.4%	2.7%	0.0%	0.0%	0.0%
Sun 09 Sep 2001 : Volume = 1896											
1707	143	33	6	5	0	2	0	0	0	0	0
90.0%	7.5%	1.7%	0.3%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%

AVERAGES

Monday to Friday: Average daily volume = 1552											
1311	37	107	13	5	5	1	8	60	1	1	0
84.5%	2.4%	6.9%	0.9%	0.3%	0.4%	0.1%	0.5%	3.9%	0.1%	0.1%	0.0%
Monday to Sunday: Average daily volume = 1643											
1422	79	72	11	4	3	1	5	40	0	0	0
86.6%	4.9%	4.4%	0.7%	0.3%	0.2%	0.1%	0.3%	2.5%	0.0%	0.0%	0.0%

Daily Classes

Report Id: DailyClass-628
Site ID: 50844.0EW
Location: Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Filter time: 08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
Scheme: AustRoads94
Filter: CL(1 2 3 4 5 6 7 8 9 10 11 12) DR(NESW) SP(15,160) HW(all)

CLASS

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Mon 10 Sep 2001 : Volume = 1522											
1266	41	93	27	4	0	0	19	70	2	0	0
83.2%	2.7%	6.1%	1.8%	0.3%	0.0%	0.0%	1.2%	4.6%	0.1%	0.0%	0.0%
Tue 11 Sep 2001 : Volume = 1478											
1229	27	107	20	5	0	3	21	64	2	0	0
83.2%	1.8%	7.2%	1.4%	0.3%	0.0%	0.2%	1.4%	4.3%	0.1%	0.0%	0.0%
Wed 12 Sep 2001 : Volume = 1465											
1228	22	107	17	3	0	2	19	66	1	0	0
83.8%	1.5%	7.3%	1.2%	0.2%	0.0%	0.1%	1.3%	4.5%	0.1%	0.0%	0.0%
Thu 13 Sep 2001 : Volume = 538 (incomplete data)											
435	9	31	11	2	0	4	3	41	1	1	0
80.9%	1.7%	5.8%	2.0%	0.4%	0.0%	0.7%	0.6%	7.6%	0.2%	0.2%	0.0%
Fri 14 Sep 2001 : Volume = 0 (incomplete data)											
0	0	0	0	0	0	0	0	0	0	0	0
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sat 15 Sep 2001 : Volume = 0 (incomplete data)											
0	0	0	0	0	0	0	0	0	0	0	0
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sun 16 Sep 2001 : Volume = 0 (incomplete data)											
0	0	0	0	0	0	0	0	0	0	0	0
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

AVERAGES

Monday to Friday: Average daily volume = 1488											
1241	30	102	21	4	0	1	19	66	1	0	0
83.4%	2.0%	6.9%	1.4%	0.3%	0.0%	0.1%	1.3%	4.5%	0.1%	0.0%	0.0%
Monday to Sunday: Average daily volume = 1488											
1241	30	102	21	4	0	1	19	66	1	0	0
83.4%	2.0%	6.9%	1.4%	0.3%	0.0%	0.1%	1.3%	4.5%	0.1%	0.0%	0.0%

MetroCount Traffic Executive
Class Bin Chart

ClassBin-629

DATASETS:

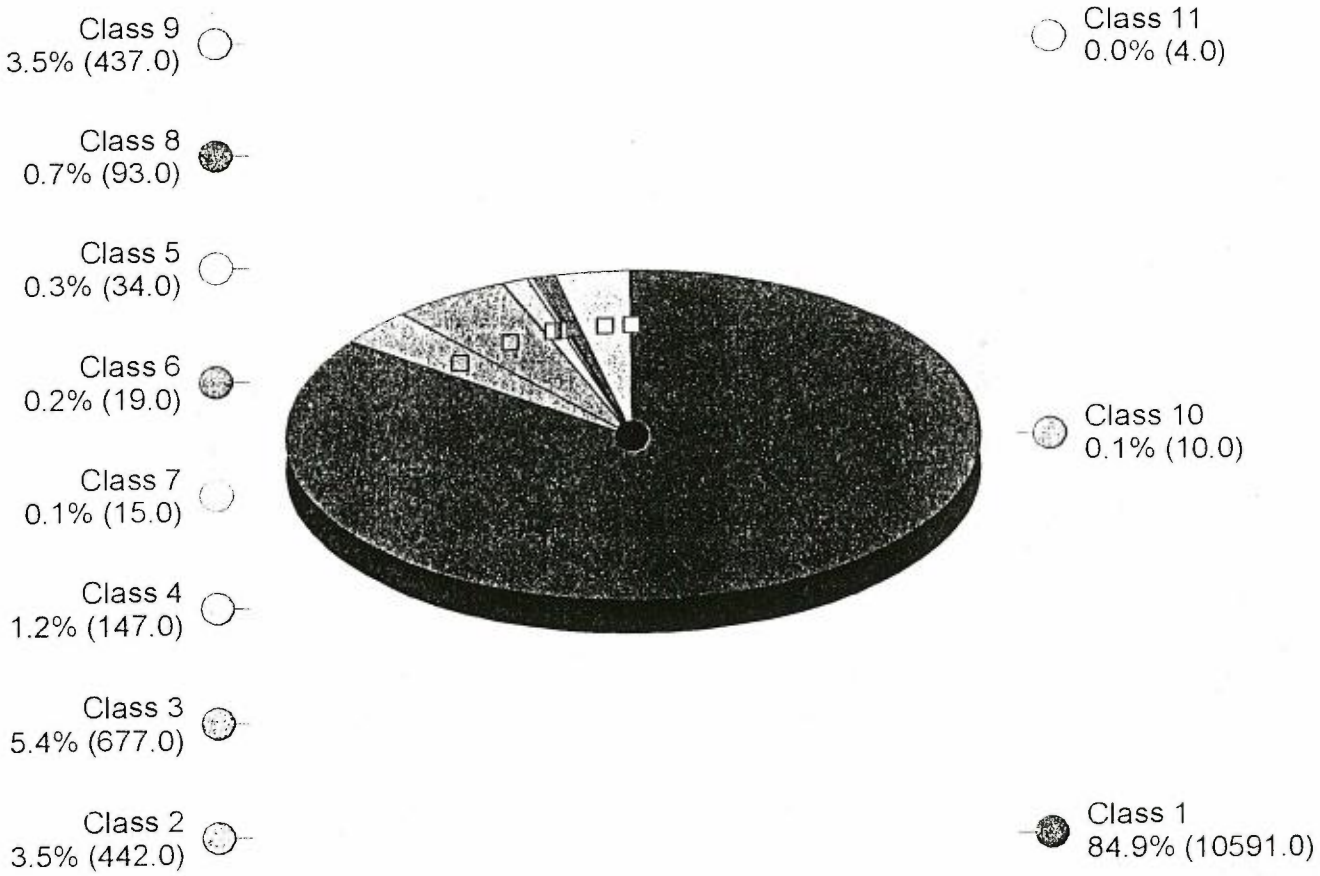
Site:	**[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai**
Direction:	6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	**08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	12469 Vehicles

Class Bin Chart

Report Id : ClassBin-629 (Units: Metric (m, km, m/s, km/hr, kg, tonne))
Site ID: 50844.0EW
Location: Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Time range : [08:43 Wed 05 Sep 2001] to [13:59 Thu 13 Sep 2001]
Scheme : AustRoads94
Profile : CL(1 2 3 4 5 6 7 8 9 10 11 12) DR(NESW) SP(15,160) HW(all)
Method : Classified vehicles
Total=12469



Pie Slices (Vehicles in profile = 12469)

Class 1 - 10591 (84.94%)
Class 2 - 442 (3.54%)
Class 3 - 677 (5.43%)
Class 4 - 147 (1.18%)
Class 5 - 34 (0.27%)
Class 6 - 19 (0.15%)
Class 7 - 15 (0.12%)
Class 8 - 93 (0.75%)
Class 9 - 437 (3.50%)
Class 10 - 10 (0.08%)
Class 11 - 4 (0.03%)
Class 12 - 0 (0.00%)

MetroCount Traffic Executive
Speed Histogram

SpeedHist-630

DATASETS:

Site:	[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai
Direction:	6 - West bound A>B, East bound B>A., Lane: 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	12469 Vehicles

Speed Statistics

Total vehicles in profile= 12469
Posted speed limit = 80 km/hr
Number speeding = 2992 (24.00%)
Maximum speed = 119 km/hr
Minimum speed = 19 km/hr
Mean speed = 74.17 km/hr
85% speed = 82 km/hr
20 km/hr pace = 64 to 84
Number in 20 km/hr pace = 9388 (75.29%)
Variance = 84.35
Standard deviation = 9.18 km/hr

MetroCount Traffic Executive
Speed Histogram

SpeedHist-630

DATASETS:

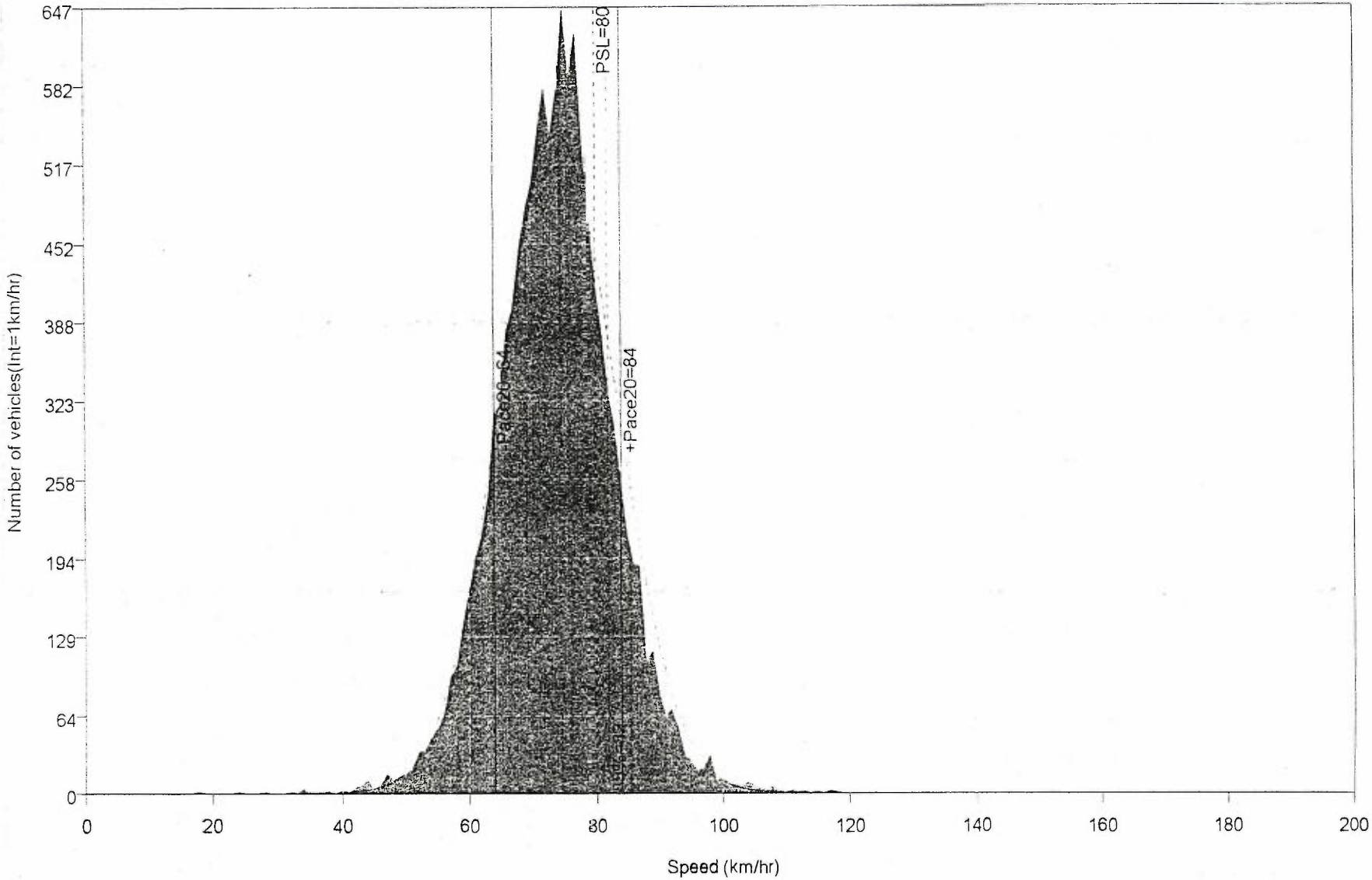
Site:	**[50844] Wisemans Ferry Rd, Mid between O'briens Rd and Wheeny St, Cattai**
Direction:	6 - West bound A>B, East bound B>A., **Lane:** 0
Survey Duration:	08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001
File:	N:\data\SERVDELI\traffic&park\MetroCount Data\Data\5084413SEP2001.EC0 (Plus)
Identifier:	B244A7BS MC56-1 [MC55] (c)Microcom 07/06/99
Algorithm:	Advanced

PROFILE:

Filter time:	**08:43 Wed 05 Sep 2001 to 13:59 Thu 13 Sep 2001**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	15 - 160 km/hr.
Direction:	North, East, South, West (bound)
Headway:	All
Scheme:	AustRoads94
Name:	Factory default profile
Method:	Vehicle classification
Units:	Metric (m, km, m/s, km/hr, kg, tonne)
In profile:	12469 Vehicles

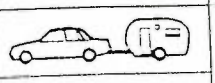
Speed Histogram

Report Id : SpeedHist-630 (Units: Metric (m, km, m/s, km/hr, kg, tonne))
Site ID: 50844.0EW
Location: Wisemans Ferry Rd, Mid between O briens Rd and Wheeny St, Cattai
Time range : [08:43 Wed 05 Sep 2001] to [13:59 Thu 13 Sep 2001]
Scheme : AustRoads94
Profile : CL(1 2 3 4 5 6 7 8 9 10 11 12) DR(NESW) SP(15,160) HV(all)
Method : Classified vehicles



AustRoads94 Classification Scheme

AustRoads94 replaced NAASRA in Australia in 1994. It is an improved system using information from the spacing of the first three axles, the total number of axles and the number of axle groups. There are 13 classes.

Level 1	Level 2		Level 3	Austroads Classification			
Length (indicative)	Axles and Groups		Vehicle Type				
Type	Axles	Groups	Description	Class		Parameters	Dominant Vehicle
	Light Vehicles						
Short Up to 5.5m	2	1 or 2	Short Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc.	SV	1	d(1) <= 3.2m and axles = 2	
	3, 4 or 5	3	Short – Towing Trailer, Caravan, Boat, etc.	SVT	2	groups = 3, d(1) >= 2.1m, d(1) <= 3.2m, d(2) >= 2.1m and axles = 3,4,5	
	Heavy Vehicles						
Medium 5.5m to 14.5m	2	2	Two Axle Truck or Bus	TB2	3	d(1) > 3.2m and axles = 2	
	3	2	Three Axle Truck or Bus	TB3	4	axles = 3 and groups = 2	
	> 3	2	Four Axle Truck	T4	5	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	Three Axle Articulated Three axle articulated vehicle or Rigid vehicle and trailer	ART3	6	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	Four Axle Articulated Four axle articulated vehicle or Rigid vehicle and trailer	ART4	7	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	Five Axle Articulated Five axle articulated vehicle or Rigid vehicle and trailer	ART5	8	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	>= 6	> 2	Six Axle Articulated Six (or more) axle articulated vehicle or Rigid vehicle and trailer	ART6	9	axles = 6 and groups > 2 or axles > 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	B Double B Double or Heavy truck and trailer	BD	10	groups = 4 and axles > 6	
	> 6	5 or 6	Double Road Train Double road train or Heavy truck and two trailers	DRT	11	groups = 5 or 6 and axles > 6	
Long Combination Over 33.0m	> 6	> 6	Triple Road Train Triple road train or Heavy truck with three trailers	TRT	12	groups > 6 and axles > 6	
	Ungrouped Classes						
			Unclassifiable Axle Event	N/A	0		
			Unclassifiable Vehicle	???	13		

Definitions

Group: Axle group, where adjacent axles are less than 2.1 m apart
Groups: Number of axle groups
Axles: Number of axles (maximum axle spacing of 10.0m)
d(1): Distance between first and second axle
d(2): Distance between second and third axle

APPENDIX 9

DRAFT WASTE MANAGEMENT PLAN

NEPEAN QUARRIES PTY LTD

CATTAI SANDSTONE QUARRY

Prepared by

HARVEST SCIENTIFIC SERVICES

DRAFT WASTE MANAGEMENT PLAN

NEPEAN QUARRIES PTY LTD

CATTAI SANDSTONE QUARRY

OUTLINE OF PROPOSAL

Site Address: (518) Wisemans Ferry Rd Cattai NSW 2756

Applicant's Name: Nepean Quarries Pty Ltd

Applicant's Address: 8 Araluen Street

Camden NSW 2570

Phone: 0418 442 253 Fax: 4655 1173

Buildings and Structures currently on the site:

Minor concrete and brick retention works, powerline

From previous operations

Brief Description of Proposal:

Extraction of sandstone for crushed aggregate and dimension stone

The Details provided in this plan are the intentions for managing waste relating to this project:

Signature of Proponent: Date:

DRAFT WASTE MANAGEMENT PLAN

NEPEAN QUARRIES PTY LTD

CATTAI SANDSTONE QUARRY

Table of Contents: **Page No:**

Appendix 1

Worksheets:

1) Demolition and Clearing Stage
2) Extraction Stage
3) On-going Management

WASTE MANAGEMENT PLAN

NEPEAN QUARRIES PTY LTD

CATTAI SANDSTONE QUARRY

1 Definition of Waste Management

Waste Management refers to the effective disposal, reuse and recycling of unwanted materials. One of the primary objectives of Waste Management is to reduce the amount of material being disposed of in landfills.

2 Need for a Plan

The need for a Waste Management Plan is based on the following:

- A lack of waste management can cause economic loss and be detrimental to the natural environment;
- Potential exists for pollution from waste in the form of soil, water, air and visual pollution;
- Potentially hazardous wastes need to be managed appropriately to prevent possible spills and future contamination;

3 Objectives of Waste Management

Waste management is an essential part of any environmental management program, the control of wastes being fundamental in protection of the environment.
Effective waste management can not only be beneficial to the environment, but can also provide considerable cost savings to those implementing it.

Objectives Include:

- The reduction in use of new materials;
- The reuse of materials where possible;
- The recycling of old materials;
- The prevention of site contamination from fuels and chemicals;
- The proper design of storage facilities to handle wastes; and
- Adequate labelling of all fuels, chemicals, container and storage areas.

4 Appropriate Waste Management Strategy

The development of an appropriate waste management strategy involves input from all involved in a project, from suppliers to operators and waste removal contractors.

Nepean Quarries Pty Ltd has adopted the following strategy which is based on the *Environmental Audit Guidebook* (Brown, G.A. 1999). Other sources utilised include guidelines issues by the local wasteboard (NSW Government, 1995)

OBJECTIVE	STRATEGY	INDICATOR
To effectively and economically minimise the generation of waste	Determine opportunities for waste minimisation	A formal study/report documenting areas where waste is reduced, reused or recycled
	Implement waste minimisation procedures	Quantities of waste for disposal have been reduced over time
	Evaluate effectiveness of waste minimisation program	The cost of waste disposal has been reduced
To Recycle waste that cannot be avoided	Evaluate opportunities to recycle waste	A waste recycling report is available
	Implement waste recycling initiatives	The installation of waste recycling facilities on site, or agreement for outside contractors to handle recyclables
Waste Treatment	Assess whether the treatment of waste will reduce quantity of waste generated or environmental risk	A formal study has been completed into the needs and opportunities for waste treatment facilities
Waste management Documentation	Document all waste types generated on site	Continued record of all wastes, types, quantities and disposal methods
	Ensure waste disposal records meet legal requirements	Requirements under legislation have been assessed and reported to relevant authorities
	Ensure that wastes removed from the site are properly handled	Written procedures covering handling of wastes by outside organisations have been obtained
	Obtain permits where required for the transportation of wastes from the site	Appropriate permits are held by the Company or contractor

Licensing	Ensure wastes disposed of onsite are covered by appropriate permits	Permits are held by the Company
Waste Removal	Ensure wastes removed from site are properly packaged and labelled	Written instructions available for handling of dangerous wastes
	Ensure that wastes are disposed of according to legal requirements	Wastes disposed of offsite are covered by a letter regarding liability

Nepean Quarries Pty Ltd Activities at Cattai

Activities conducted by Nepean Quarries Pty Ltd have the potential to generate various types of waste including:

- Cardboard and plastics from packaging;
- Green Waste, including vegetation and timber from clearing;
- Overburden, clay and waste rock materials;
- Bricks, concrete and similar waste from prior infrastructure items;
- Metallic refuse including steel wire, fence posts and previous infrastructure refuse;
- Empty fuel, oil or chemical containers (may be metal or plastic); and
- Domestic-type wastes from the site office/weighbridge.

5 Waste Management Plan for Nepean Quarries Pty Ltd

The most appropriate action for Nepean Quarries to take relates to the reuse and recycling of materials, rather than the treatment or disposal of wastes, as these types of waste are not a common component of company activities. Despite this, a management plan needs to be in place to deal with disposal of potential hazardous wastes and contaminated materials. Responsibility for implementation of the Waste management Protocol lies with the Site (Environmental) Manager or his/her nominee.

Specific Actions for Nepean Quarries Pty Ltd:

A) Reduction in the amount of waste generated:

Consultation with suppliers regarding packaging of supplies, can they take back cardboard boxes and packaging materials? If not, can they be recycled?
Waste may also include those items that are on site and no longer required - can they be sold? or alternate uses found for them?
Ensure earthworks and vegetation clearing are kept to a minimum.

B) Reuse of materials:

Involves the reuse of boxes and packaging material, fuel, oil and chemical containers where appropriate, boxes, fencing materials, gates, wire and other items. Requires liaison with staff and contractors, what procedures do they have in place for waste management, is a written copy available?
Reuse topsoil and overburden in rehabilitation activities.

C) Recycling of materials:

Involves the recycling of materials such as paper, plastics and cardboard and some metal products. Set up a recycling area on site, or arrange with waste contractors for external processing. Concrete and bricks may also be recycled, with green waste processed into woodchip to be used in rehabilitation program.

D) Proper disposal of Rubbish

The site must have bins available for the disposal of rubbish. No material (other than natural materials) must be disposed of in drill sumps or trenches.

E) Hazardous Waste Management Plan:

Prepare a written procedure to deal with the disposal of potentially hazardous wastes such as fuels, oils and chemicals. Such materials must be stored on site in a contained area before being disposed of in an appropriate manner by a licensed contractor to a licensed landfill.

6 Responsibility

It is ultimately the responsibility of all employees and contractors to effectively manage waste generated from the operations. Waste Management is to be applied to all operations located on the site. Specific actions for various stages of the quarry are detailed in Annexure 1.

7 References

Brown, G.A., 1999. *Environmental Audit Guidebook*, Centre for Professional Development.

NSW Government, 1995. *Waste Management Act*, http://www.wasteboards.nsw.gov.au

ANNEXURE 1

Worksheet 1) **WASTE MANAGEMENT – DEMOLITION AND CLEARING STAGE**

MATERIALS ON SITE		DESTINATION		
		Re-use and Recycling		Disposal
Type of Material	Estimated Volume (m^2)	**ON-SITE** (Specify proposed re-use or on-site recycling method)	**OFF-SITE** (Specify contractor and recycling outfit)	(Specify contractor and landfill site)
Topsoil	To be Determined (TBD)	Use in rehabilitation		
Overburden	To be Determined in the EMP	Use in rehabilitation and for bunding		
Green Waste (inc. Timber)	TBD	Mulch and use in rehabilitation	Timber may be taken off site. Contractor TBD	
Bricks	N/A			
Concrete	TBD		Recycled into construction materials. Contractor and site TBD	
Clay	TBD	To be used in landscaping and rehabilitation works		
Oil. Fuel and other containers	TBD	To be re-used where practicable		Disposal to a licensed landfill, contractor TBD

Worksheet 2) **WASTE MANAGEMENT – EXTRACTION STAGE**

TYPE OF WASTE TO BE GENERATED (For example: Food waste, offcuts, sludge, clay, sand, boulders)	**EXPECTED VOLUME PER WEEK (Litres or m^3)**	**PROPOSED ON-SITE STORAGE AND TREATMENT FACILITIES (For example: waste storage, recycling area, composting area, rehabilitation area)**	**DESTINATION (recycling, disposal, specify contractor)**
Topsoil	To be determined (TBD)	Use in rehabilitation	Recycling
Overburden	TBD	Use in rehabilitation and for bunding	Recycling
Green Waste (inc. Timber)	TBD	Mulch and use in rehabilitation	Recycling
Oil. Fuel and other containers	TBD	To be re-used where practicable	Re-use and disposal (contractor TBD)
Household type waste from office/weighbridge area	$<1m^3$	Standard size rubbish bin	Disposal by contractor (TBD)
Waste Rock	TBD	To be used in landscaping and rehabilitation works	

Worksheet 3) **WASTE MANAGEMENT – ONGOING MANAGEMENT**

Describe how you intend to ensure on-going management of waste on-site (e.g. contracting conditions. caretaker/manager on-site). Details should include any rehabilitation works proposed.
Details regarding the on-going management of the site with respect to waste will be further detailed in the EMP. The EMP will outline measures to be taken with regard to ensuring that the site meets all approval conditions, does not represent a hazard to the environment and is managed in an environmentally responsible manner. The majority of waste generated in this proposal consists of natural products such as topsoil, clay and rock, which if managed successfully, will result in no actual 'waste' being generated as all material will be utilised in the landscaping and rehabilitation program. Minor amounts of other non-useable waste will be recycled by appropriate contractors and non-recyclables disposed of by licensed contractors. The on-going compliance of waste management of the site will be monitored by a weekly/monthly waste manual to be completed by the site manager.

APPENDIX 10

HARVEST SCIENTIFIC SERVICES

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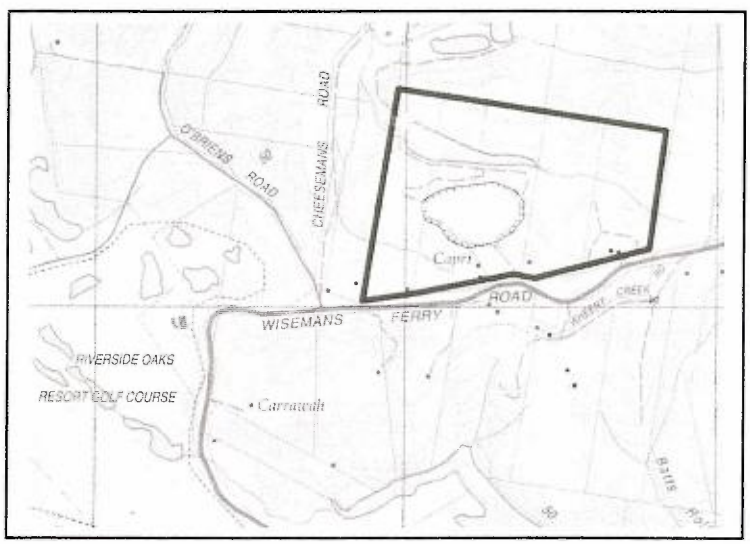
CATTAI SANDSTONE QUARRY PROPOSAL:
Update on Activities

14th March, 2002

- Nepean Quarries Pty Ltd is proposing to re-commence a sandstone extraction program on Lots 1-5, DP 240610, Wisemans Ferry Road, Cattai. The proposal covers both crushed sandstone and dimension stone. Harvest Scientific Services is managing the Approval Process, including the preparation of an Environmental Impact Statement.

- The location of the project is illustrated in the figure below.



- The Environmental Impact Statement is now nearing completion, and is due to be lodged with Baulkham Hills Shire Council before the end of April, 2002.

- A number of studies have been completed including the assessment of traffic, noise, dust, surface and groundwater, flora and fauna and archaeology. Most of these have now been completed. The flora and fauna study has been extensive and incorporates a Species Impact Statement for several flora and fauna species.

- Once the EIS has been completed it will, together with the Development Application, be lodged with Baulkham Hills Shire Council. The EIS will then be placed on public exhibition at a number of localities. Notification that the EIS is on exhibition will be advertised in the local newspapers. Should you then wish to comment on the EIS, submissions must be made in writing to the Council.

- In the meantime, for those of you who have missed the previous mail-outs and the public meeting, and you would like some further information, please call Mart Rampe at Harvest Scientific Services on 4677 3127, by fax on 4677 3108, or by e-mail at harvest@ispdr.net.au

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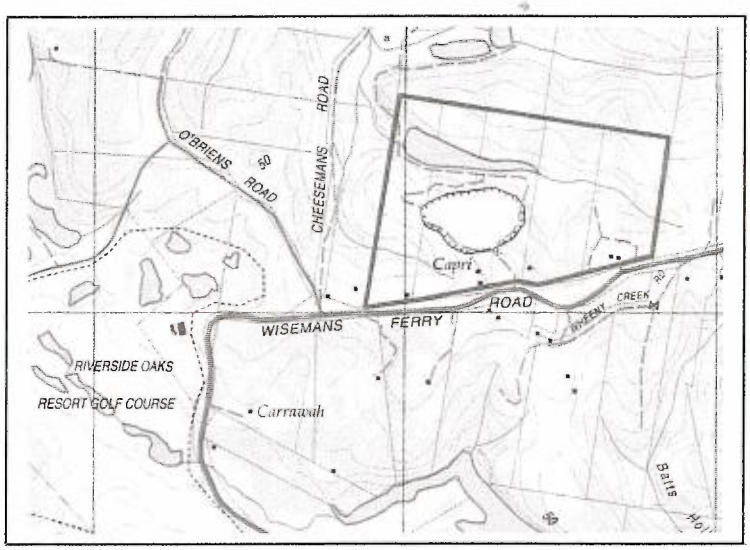
CATTAI SANDSTONE QUARRY PROPOSAL:
Recommencement of Operations

8th October, 2001

- Nepean Quarries Pty Ltd is proposing to re-commence a sandstone extraction program on Lots 1-5, DP 240610, Wisemans Ferry Road, Cattai (see Figure 1). The proposal is to cover crushed sandstone as well as dimension stone.



- Extraction of sandstone products at this site occurred over 4-5 years and ceased approximately 3 years ago.
- Approvals for previous activities have lapsed and this proposal is subject to a fresh development application and assessment.
- It is planned to extract between 10 000 and 15 000 tonnes of sandstone products per month.
- The project is considered a Designated Development and requires an Environmental Impact Statement to be lodged with Baulkham Hills Shire Council. Harvest Scientific Services has been commissioned to prepare this application and supporting documentation.
- Preparation of the Environmental Impact Statement is underway, with completion estimated for December 2001. Aspects of the proposal to be addressed include noise, dust, flora and fauna, water resources, archaeology, visual amenity, traffic, soils and rehabilitation.
- **An Information Night is planned for 6pm, Wednesday 17th October 2001** at the Cattai Public School (487 Cattai Rd, Cattai) and we are seeking input from residents who may be interested in certain aspects of the proposal, or would like further information. Please advise us of your interest in attending the information night by calling Mart Rampe at Harvest Scientific Services on 4677 3127, by fax on 4677 3108, or by e-mail at harvest@ispdr.net.au
- Details of the proposal will be posted on our webpage at regular intervals.