EIS 1756

AA066831

Environmental impact statement : existing sandstone quarry,

Lot 23, DP 1002468, 172 Smallwood Road, Glenorie

Don Fox Planning

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ENVIRONMENTAL IMPACT STATEMENT

EXISTING SANDSTONE QUARRY, LOT 23, DP 1002468, 172 SMALLWOOD ROAD, GLENORIE

Prepared for
M. Petith
POSITIVE EARTHMOVING

PROJECT NO: 4311

November 2001

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DON FOX PLANNING PTY LTD

Environmental Planning and Assessment Regulation 1994

Submission of
environmental impact statement (EIS)
prepared under the *Environmental Planning and Assessment Act 1979*
Section 78A (8)

EIS prepared by

name
qualifications

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address

PO Box 230
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in respect of

development application

applicant name
applicant address

Positive Earth Moving Pty Ltd
172 Smallwood Road
Glenorie

land to be developed

Lot 23 DP 1002468, Smallwood Road, Glenorie

lot no, DP/MPS, vol/fol etc
proposed development

Lot 23 DP 1002468

environmental impact statement

√ an environmental impact statement (EIS) is attached

Certificate

I 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
name
date

Roger Gain
8/11/01

Robert Player
8/11/01

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1.0 INTRODUCTION

1.1 Commission

Don Fox Planning Pty Ltd has been engaged by Michael Petith of Positive Earthmoving to prepare an Environmental Impact Statement (EIS) for the continuation of use of an existing sandstone quarry at 172 Smallwood Road, Glenorie. Positive Earthmoving is the quarry operator of the site.

1.2 Background

Excavation activity has apparently occurred on the subject site since the 1940's. The property was purchased in 1975 by Dennis (Peter) and Carol Petith for the purpose of enabling the Petiths to continue to extract sandstone and to produce sandstone products similar to those they produced on a property at Benbullen Road, Glenorie. Since 1975, the property has been quarried by D & C Petith and their three sons.

In June 1997, Baulkham Hills Shire Council advised that unauthorised extraction of sandstone was occurring on the subject property. Since that time, Council has sought the submission of a development application, seeking approval for the extraction of sandstone. Council has threatened legal action to ensure that unauthorised use of the land ceases.

Michael Petith, son of D & C Petith now operates Positive Earthmoving from the site and intends to continue extraction of sandstone from the site with Council's approval in a manner which is environmentally sound and which follows a logical extraction and rehabilitation program.

In January 2000, Don Fox Planning prepared a Statement of Environmental Effects (SEE) which accompanied a development application for the continuation of use. That application was withdrawn when, despite advice from the Department of Land & Water Conservation to the contrary, Council advised that because the quarry face was steeper than 18 degrees, the land could be regarded as protected lands and, in that case, the extractive industry could be regarded as designated development.

This EIS is to accompany a designated development application and has been prepared in accordance with a specification issued by the Department of Urban Affairs &

Planning, a copy of which is attached at **Appendix B**. A copy of the designated development application is included at **Appendix A**.

The application also addresses some relatively minor issues, being the erection of a shelter over part of the working area and the relocation of a small dam which is partly located on Smallwood Road.

1.3 Consultations

The following authorities have been consulted during the preparation of the EIS:

(a) Baulkham Hills Shire Council (BHSC);
(b) Department of Urban Affairs & Planning (DUAP);
(c) NSW Department of Land & Water Conservation (DLWC);
(d) NSW National Parks & Wildlife Service (NPWS);
(e) NSW Department of Mineral Resources (DMR);
(f) State Forests of NSW;
(g) Roads and Traffic Authority (RTA); and
(h) Environment Protection Authority (EPA).

BHSC was requested by letter dated 9 November 2000, to advise the specific details of those matters which Council considers should be addressed in the EIS. Council has advised that the issues which arose from the Conciliation Conference held in May 2000 in relation to the earlier development application are those which need to be taken into account in the EIS. Subsequent correspondence between BHSC and Don Fox Planning identified several further issues which have been addressed in the EIS.

Comments had previously been received from some of the other authorities in relation to the SEE and those comments have been taken into within the EIS as appropriate. Copies of those comments as well as more recent referrals from all of the authorities relating to the EIS are attached in **Appendix C.**

It is understood that Council may refer the EIS to the authorities which have already been contacted and any other authorities prior to determination of the application.

1.4 Major Issues

The following are considered to be the major issues relevant to the proposal. These issues have been compiled based on our assessment of the proposal and the comments received during the consultation process:

(a) Soil and water management - particularly related to the discharge of silt-laden stormwater from the site;

(b) Impact on the surrounding bushland and nearby habitat areas, particularly on the Broadwater Swamp Wetland (Wetland No. 128 under REP 20);

(c) Truck movements to and from the site; and

(d) Rehabilitation of the site following completion of extraction.

Matters required to be addressed and particularly the above issues, are detailed within later sections of this report.

1.5 Project Team

In order to undertake the required assessment and to provide the relevant information, a project team consisting of relevant specialist consultants has been formed. The project team comprises the following:

• Don Fox Planning Pty Ltd	Town planning, environmental issues and project management;
• Morse McVey & Associates Pty Ltd	Soil, water and rehabilitation strategies and assessment of the impact of the proposed quarry on the downstream watercourses;
• Ecotone Ecological Consultants	Flora and fauna assessment;
• Mepstead & Associates	Surveying; and
• Atkins Acoustics	Noise audit and assessment.

Conacher Travers had prepared a report covering their investigation of flora and fauna issues for the SEE. A copy of their report is also attached to this EIS.

The assessments and recommendations of these specialist subconsultants are outlined and discussed within the body of this report. Copies of the reports of the specialist consultants are appended.

2.0 INFORMATION ABOUT THE LOCATION

2.1 Site Location

The subject site is located at Glenorie, approximately 35 kilometres north-west of the Sydney Central Business district. The specific location of the subject site is depicted on **Illustration 1**. The site has a frontage to Smallwood Road which in turn intersects with Halcrows Road, then Cattai Ridge Road and ultimately, Old Northern Road.

2.2 Subject Site

The subject site comprises Lot 23, DP 1002468 Smallwood Road, Glenorie. The subject allotment comprises part of the larger landholding of D & C Petith. The total landholding is in the order of 64 hectares, while the allotment being the subject of this application comprise an area of 9.018 hectares. The area covered by this application, being the area comprising the quarry, the sandstone cutting and shaping area and the site of the small dam is approximately 5.8 hectares and is referred to in this document as the subject site. This site is larger than the site discussed in the SEE, since it now includes the site of the small dam as well as being a more rational shape than previous. The area of the quarry and work areas have not increased.

Illustration 2 depicts the subject allotment and the location of the subject site. **Illustration 3** shows a topographic plan of the subject site with the existing quarry and machinery area.

2.3 Tenure

The whole of the subject lands are owned by Mr and Mrs D C Petith, who are the parents of Michael Petith, the current operator of the quarry.

2.4 Existing and Previous Use

As outlined in the introduction, sandstone has been extracted from the site since the 1940's and by the Petith family since they purchased the site in 1975. As far as can be determined, this use has continued without significant interruption since the mid-1970's.

Council has never granted development consent for the use to which the site is being put, and has not agreed that the use is "an existing use".

In addition to sandstone extraction, the Petith's also cut sandstone into a range of building products, using large diamond-tipped circular saws. This process is described in more detail in later sections of this report. There are presently three fixed saws on the site.

Some sandstone is brought onto the site for cutting, but this is a small percentage of the total material processed on the site.

2.5 Existing Site Characteristics

The existing site features and improvements are depicted on the survey plan included as **Illustration 3**. It can be seen that the site falls from Smallwood Road through the sandstone processing area to the quarry itself. The processing site is on a plateau surface at around RL 108 metres, while the quarry is approximately 150 metres to the north-east and on the side slopes of a ridge. The floor of the quarry is presently at approximately RL 76 metres, while the top of the quarry cutting is presently at approximately RL 90 metres.

Although the site itself has generally been cleared as a result of the existing quarry operations, the surrounding area is relatively undisturbed natural bushland, except for a small area to the east of the site where, at some time in the past, the operation encroached on the adjoining property. This area has not been disturbed for some time and is slowly regenerating. It is not proposed to carry out any future work in this area and rather than create further disturbance, it is proposed that the area be left to regenerate naturally.

Existing improvements on the site include 2 fibro cottages, a small metal shed, a large metal shed, power lines and various pieces of equipment used in the extraction and machining of the sandstone.

2.6 Surrounding Land Uses

The subject site is adjoined by private land to the north (owned by the Petith family) and former State Forest to the east. The land to the east was formally the Maroota State Forest 978, but the forest status was revoked in 1976 and control handed to an Aboriginal Land Group.

To the south, there are two properties, one used for rural/residential purposes and the other as a nursery. The nearest dwelling on these properties is approximately 500 metres from the cutting saw and even further from the quarry.

The property to the west, on the opposite side of Smallwood Road is owned by D & C Petith and includes a dwelling which is approximately 250 metres from the quarry. The Petiths have applied for, and are likely to receive, a lease over the Crown Land to the west and north of their property.

The Glenorie Wildlife Refuge was proclaimed in 1987 under the National Parks and Wildlife Act 1974 on a number of land parcels in the area surrounding the subject site. The Refuge mostly comprises private land, but does include one section of Crown Land which is under permissive occupancy. The owners and occupants of the Refuge participated in the Conciliation Conference in May 2000 and were concerned that the quarry operation could result in impacts on the wildlife using the refuge.

Illustration 4 comprises an aerial photograph of the site, with cadastral boundaries superimposed. 1 and 2 kilometre circles have been drawn on this plan to give an indication of scale. The Glenorie Wildlife Refuge is identified on the photograph.

3.0 DESCRIPTION OF THE PROPOSAL

3.1 General

3.1.1 Objectives of the Proposal

The primary objective of the proposal is to allow for the continuation of an existing sandstone extraction operation and to provide a means to rehabilitate the site once extraction is complete.

The specific objectives of the proposal are as follows:

(a) To allow for the continuation of a current sandstone extraction operation which provides a valuable, scarce resource to the surrounding regions and to the Shire of Baulkham Hills in a location which is convenient to current and future land and building developments;

(b) To rehabilitate the area which has been used for extractive industry purposes over numerous years;

(c) To rehabilitate the subject site to a land form suitable for future uses in accordance with the current and envisaged long-term zonings of the land;

(d) To provide for continued employment for those associated with the current operations and then the landscaping and development industries;

(e) To provide a service to the local community and building industry by way of a conveniently located resource of various sandstone products associated with land development, building and landscaping, including heritage sites and building restorations;

(f) To provide a site development which satisfies all environmental concerns and which is managed in a responsible manner; and

(g) To provide a continued source of export income from products which are sold overseas.

The proposed development has been designed to achieve the above objectives in a manner which will ensure negligible impact upon the surrounding environment.

3.1.2 Development Plans

The proposed development comprises:

(a) Extension of the existing quarry to the west and including deepening the quarry to approximately RL 70;

(b) Upgrading of the soil and water management of the site to ensure that uncontrolled run-off from the site is minimised and any discharges comply with the appropriate guidelines

(c) To relocate an existing small dam which presently encroaches onto Smallwood Road; and

(d) To erect an open sided shed over the sandstone processing area.

Illustration 5 depicts the proposed sandstone quarry extension in relation to the existing quarry and to the other improvements on the site as well as showing the location of the small dam and the open sided shed. **Illustration 6** contains cross-sections of the proposed quarry extensions. **Illustration 7** shows the proposed open sided shed.

The cross sections show that the finished floor will slope to ensure that it remains free draining. In addition, it will be impractical to complete the excavation as a perfect plane, given the method of removal. The finished floor level is therefore described as being approximately RL 70. The rehabilitation works include spreading 300mm of crushed sandstone and stockpiled topsoil on the floor of the quarry. This material will generally follow the slope of the finished excavation.

3.1.3 Construction Program

Construction of the quarry will proceed over the next 1 to 2 decades, with extraction of sandstone.

Construction of the soil and water management facilities will proceed immediately consent is granted for the works.

Because of the small area occupied by the quarry, rehabilitation cannot proceed until extraction has been completed, although some planting will take place immediately to stabilise disturbed areas of the site.

3.1.4 Number of Persons to be Employed

There are currently 5 direct employees of the quarry operation, including Michael Petith. Depending on the level of activity in the building and construction industry, up to 7 persons can be employed.

In addition, there is indirect employment created within the construction and landscaping industries through contractors using the material produced in the quarry.

Further, up to 40 tonnes of sandstone products are exported each year, creating further indirect employment in the transport and related industries.

Closure of the quarry, which would result from refusal to grant consent to this application, would result in the loss of all this employment.

3.1.5 Machinery and Equipment

The following is a schedule of the machinery currently used on the subject site:

- 3 excavators;
- 2 forklift trucks;
- 1 dump truck;
- 2 compressors;
- 3 sandstone saws;
- 1 hydra splitter;
- various hand tools;
- 1 x 6 tonne truck;
- a water tank which can be carried on the 6 tonne truck; and
- 1 x 12 tonne truck with a 12 tonne trailer.

Additionally, some purchasers organise their own truck transportation.

3.1.6 Incidental Materials, Fuel etc. Stored On Site

A 5,000 litre diesel tank is located on site for refuelling of machines. The tank is located within a bund with a capacity greater than that of the tank, to ensure that any leaks or spillages are contained.

3.1.7 Energy Requirements and Usage

The existing and proposed development requires electrical power for the administration and staff amenities and to operate some machinery. The largest electrical requirement is for the operation of the large diamond-tipped saw which is driven by a 75 kilowatt electrical motor. Three phase electrical power is connected to the site.

The future energy requirements of the operation are expected to be similar to those of the existing operation.

3.1.8 Hours of Operation

The proposed hours of operation are:

- 6 days per week (Monday to Saturday, inclusive);
- 6.30am to 4.30pm (Monday to Saturday, inclusive); and
- Closed on Sunday and all public holidays.

3.1.9 Access

Access for both the existing and the future site operations will be via the existing entrance on Smallwood Road. This entrance will be used by all vehicles gaining access to the site.

3.1.10 Parking

There is adequate room on site for parking of all employee and site vehicles both for the existing and future operations.

3.1.11 Landscaping

Natural regrowth is occurring along the eastern, lower edge of the quarry and this will stabilise the disturbed bank. Some planting will be undertaken to stabilise the disturbed area between the quarry and the processing area. This part of the site will be excavated in the future as the quarry expands, but the planting is intended to reduce erosion in the interim period.

No other landscaping or rehabilitation works will be undertaken until the extraction operation is completed and these matters are discussed later in this document.

3.1.12 Dam Relocation

The existing small dam shown on **Illustration 5** encroaches onto Smallwood Road and it is proposed to relocate it sufficiently to eliminate the encroachment. At the same time, the dam wall will be reconstructed to repair a leak. The dam will not be significantly

enlarged during the relocation and will be kept below 1,000 megalitres. Its catchment will not be altered.

3.2 Operations

3.2.1 Description of the Process

Sandstone is removed in a series of 1.2 metre benches. Much of the sandstone is removed in 1.2 metre x 1.2 metre x 2.5 metre blocks which are sawn from the quarry using an hydraulically powered saw mounted on an excavator. The blocks are split from the base using a hydraulic hammer. This method of extraction results in very little wastage and relatively little debris.

Blocks are then picked up and stacked on the quarry floor by the excavator. When required, blocks are carried to the processing area by forklift and are cut into a variety of products which are then stored, ready for loading and transportation off-site. The blocks are sawn by mounting them on a trolley which is pushed through a large, diamond-tipped circular saw. Some of the sandstone product is created by splitting using the hydra splitter, comprising a hydraulically operated wedge, to create a natural, as opposed to a cut, surface.

A variety of cut sandstone products is produced and in addition, approximately 600 tonnes per year of crushed sandstone which accumulates as a result of the extraction operation, is collected and periodically sold. The small amount of over-burden which is not suitable for sale will be kept for use in the site rehabilitation.

Sediment from the floor of the quarry and from a settling chamber which is part of the recycled water system for the circular cutting saw, is periodically removed and sold as a byproduct.

3.2.2 Range of Products

The range of sandstone products includes:

- Handsplit flagging and squared flagging;
- Sawn flagging;
- Slabs
- Capping;
- Pier caps;

- Dimension blocks;
- Ballast blocks;
- Boulders;
- Crushed sandstone;
- Reconstituted products; and
- Heritage and restoration stone.

By far the largest proportion of sandstone will continue to be removed by sawing and splitting, since this represents the best value and gives the highest return.

These cut and split products are loaded onto trucks, either directly or on pallets, by forklift. The byproduct material and the crushed sandstone is loaded by excavator.

3.2.3 Expected Life of Quarry

It is proposed that the finished quarry floor level will be at approximately RL 70 AHD and that the quarry face will be extended to the west and north from its existing location by approximately 40 metres. A volume of approximately 129,000 cubic metres equal to 310,000 tonnes is available for extraction and in addition approximately 5,000 cubic metres of overburden will need to be stripped. These volumes have been calculated from the survey of the site dated April 2001 and the proposed finished shape of the quarry. No drilling has been carried out to confirm the quality of the stone to be extracted, but based on the material extracted to date, it is expected that the quality will remain high.

The operator has advised that the current operation and the proposed future operation has an extraction and transportation potential of 60 tonnes per day, equivalent to approximately 17,000 tonnes per year. This rate of production allows for public holidays, rain periods and equipment maintenance during a typical month.

It is noted that demand for the various products is related to the level of building activity within the market area of the quarry and the actual rate of production is likely to vary from the optimum levels described above.

Assuming a volume of material available for extraction equal to 310,000 tonnes and a rate of extraction of 17,000 tonnes per year, the quarry has an expected life of approximately 18 years.

3.2.4 Quality of Material

Sandstone in the quarry includes the following:

(a) A Grade - used for furniture, fireplaces, decorative uses - approximately 45% of the total resource;

(b) B Grade - similar uses to A grade, but lower quality, also paving products - approximately 35% of total resource;

(c) Walling product and paving - approximately 10% of total resource;

(d) Boulders used for landscaping - approximately 7% of total resource;

(e) Crushed sandstone and material from sediment basins - approximately 3% of total resource.

3.2.5 Site Management

The quarry operator will be responsible for the following components of the operation:

Quarry Planning
Planning the day to day and long-term extraction of sandstone, taking into account the soil and water management plan, safety, access and future rehabilitation.

Soil and Water Management
Carrying out the various tasks listed in Morse McVey's Soil, Water and Rehabilitation Strategies (refer to **Appendix E**).

Sales and Marketing
Arranging to sell the products and coordinating the rate of production with the rate of sales.

Maintenance
Maintaining site equipment as well as the access tracks.

Safety
Ensuring that the operation is carried out in a safe manner and in accordance with the relevant guidelines and statutory requirements.

Compliance
Ensuring that the operation complies with any conditions imposed by BHSC or other relevant authorities.

3.2.6 Recycled Stone

Some material is brought to the site for processing using the fixed saws. This material comprises stone from demolished buildings or from large excavations. During the 12 months ended in June 2001, approximately 185 tonnes of stone were transported onto the site, involving approximately 22 separate deliveries, or an average of less than one delivery per fortnight.

This part of the operation is expected to continue at approximately the same rate, although depending on activity within the building industry, both the total amount of stone processed in this manner and the peak rate of delivery will fluctuate. No substantial increase in the amount of recycled stone is planned, although it would be reasonable to allow say, up to 100 trucks per year, or 2 trucks per week.

4.0 ASSESSMENT OF KEY ENVIRONMENTAL ISSUES, DESCRIPTION OF RELEVANT ENVIRONMENT AND ANALYSIS OF ENVIRONMENTAL IMPACT

4.1 Planning Context

4.1.1 Baulkham Hills LEP 1991

The site is currently zoned Rural 1(b) pursuant to the provisions of Baulkham Hills Local Environmental Plan (BHLEP) 1991. In accordance with BHLEP 1991, the proposed development is defined as an "extractive industry" described as follows:

> *"'extractive industry' means –*
>
> *(a) the winning of extractive material; or*
>
> *(b) an industry or undertaking nor being a mine, which depends for its operations on the winning of extractive material from the land upon which it is carried out."*

For the purposes of BHLEP extractive material is defined as:

> *"'extractive material' means sand, gravel, clay, turf, soil, rock, stone or any other similar substance"*

In accordance with **Clause 9** of BHLEP 1991, extractive industries are development which are permissible with the consent of Council.

The area generally surrounding the subject site to the south, west and north is also zoned Rural 1(b). This zoning provides a minimum subdivision area of 10 ha . Additionally, this zoning provides that additions or alterations relating to an existing dwelling, agriculture (other than aquaculture), bushfire hazard reduction, forestry and home activities are uses permissible without the consent of Council. The amendments to the Environmental Planning and Assessment Act of 1998 are noted, in that some of these uses now require development consent, however they are not relevant to the assessment of this application. The zone also provides for a significant range of uses with the consent of Council including the following:

> *"advertising structures; agricultural products establishments; bushfire fighting establishments; cemeteries; child care centres; clubs; community facilities; convenience stores; dams; dwelling houses; exhibition homes; extractive industries or industries directly associated with, or dependent upon extractive industries; firewood establishments; helipads; heliports; landscape supply establishments; leisure facilities; open space; pig keeping establishments; places of worship; poultry farming establishments; public buildings; recreation areas; recreation facilities; restaurants; retail plant nurseries; roadside stalls; rural industries; rural workers dwellings; sawmills; stables; stock and sale yards; utility installations (other than gas holders or generating works); veterinary establishments; wholesale plant nurseries."*

These potential uses for the land also apply in regard to the long term envisaged land use of the subject site, being a matter discussed within this EIS.

Clause 34 of BHLEP 1991 is specific to extractive industry development and states that Council must aim to ensure that extractive industries are not carried out in areas of particular environmental sensitivity. Further, extraction should be undertaken in accordance with management and planning provisions as contained in any plan of management adopted by the Council and take into consideration various matters

regarding issues of traffic and visual impact. These matters are addressed within later sections of this EIS.

There are no other provisions within BHLEP 1991 which are considered to be of specific relevance to the subject proposal.

4.1.2 Section 79C of the Environmental Planning and Assessment Act, 1979 (as amended)

In determining a development application, Council is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:

"(a) the provisions of:

(i) any environmental planning instrument, and

ii) any draft environmental planning instrument that is or has been placed on public exhibition and details of which have been notified to the consent authority, and

(iii) any development control plan, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates,

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,

(c) the suitability of the site for the development,

(d) any submissions made in accordance with this Act or the regulations,

(e) the public interest."

The format of this EIS ensures the assessment of the relevant matters for consideration. As the proposed development is being treated as designated development as prescribed by the Environmental Planning and Assessment Regulation, the application requires notification under the provisions of the Environmental Planning and Assessment Act, as well as under Council's Notification Policy. Should any objections by way of the notification process be received, we would ask the opportunity to address these concerns prior to Council's final determination of the application.

4.1.3 Schedules 2 & 3 of the Environmental Planning and Assessment Act Regulation 1994

The Environmental Planning and Assessment Regulations 1994 (as amended), lists designated development for the purposes of the Act, relevant to the proposal as the following:

> *"Extractive industries that obtain extractive materials by methods including excavating, dredging, tunnelling or quarrying or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating and;*
>
> *(1) Obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per annum, or*
>
> *(2) Disturb or will disturb a total surface area of more than 2 hectares of land by:*
>
> *(a) clearing or excavating, or*
>
> *(b) constructing dams, ponds, drains, roads or conveyors, or*
>
> *(c) storing or depositing overburden, extractive material or tailings, or*
>
> *(3) are located:*
>
> *(a) in or within 40 metres of a natural waterbody, wetlands or an environmentally sensitive area, or*
>
> *(b) within 200 metres of a coastline, or*

(c) in an area of:

(i) contaminated soil, or
(ii) acid sulphate soil, or

(d) on land that slopes at more than 18 degrees to the horizontal, or

(e) if involving blasting within;

(i) 1000 metres of a residential zone, or
(ii) 500 metres of a dwelling not associated with the development, or

(f) within 500 metres of the site of another extractive industry that has operated during the last 5 years."

The proposed development falls under the definition of "Extractive Industries" in Schedule 3, and for the purpose of this application is accepted as being a "designated development" having regard to the following:-

(a) It is estimated that 116,000 cubic metres of sandstone and 5,000 cubic metres of overburden will be extracted over the life of the development. This application seeks approval for operations for approximately 18 years, as an average total of 6,050 cubic metres of material would be extracted per annum. This is less than 30,000 cubic metres/annum as defined by Schedule 3 of the Environmental Planning and Assessment Regulation 1994.

(b) The development could disturb up to a total surface area of approximately 3 hectares of land. This is greater than the area contained in Schedule 3.

(c) The quarry is not located within 40 metres of a natural waterbody, wetland or environmentally sensitive area or 200 metres of a coastline

(d) The development is not located within an area of contaminated soil or acid sulphate soil.

(e) The development is not located on land that naturally slopes at an angle of more than 18 degrees to the horizontal, except arguably for very small, isolated areas

such as a rock outcrop. The quarry face, which is not part of the natural topography is, of course, steeper than 18 degrees.

(f) The quarry does not involve blasting

(g) The development is not located within 500 metres of the site of another known extractive industry which has operated within the past 5 years.

4.1.4 State Environmental Planning Policies

4.1.4.1 SEPP No. 11 - Traffic Generating Developments

The aims, objectives, policies and strategies of this Policy are to ensure that the Roads and Traffic Authority

(a) is made aware of; and

(b) is given an opportunity to make representations in respect of, developments referred to in Schedule 1 or 2.

"Extractive industries" are referred to in Schedule 1 and therefore this application must be referred to the RTA for consideration by the Regional Traffic Committee in accordance with the provisions of State Environmental Planning Policy No. 11.

4.1.4.2 SEPP No. 37 - Continued Mines and Extractive Industries 1993

This Policy was established to ensure that all mines and extractive industries were identified and, if not already operating under a consent, lodged a development application with the appropriate authority and received consent.

The subject quarry did not register under the Policy and this application seeks to ensure that formal approval is granted so that the operation can continue.

4.1.5 Regional Environmental Plans

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

The land is subject to the provisions of Sydney Regional Environmental Plan (SREP) No. 20.

Clause 4 of SREP No. 20 states:

> *"(1) The general planning considerations set out in clause 5, and the specific planning policies and related recommended strategies set out in clause 6 which are applicable to the proposed development, must be taken into consideration:*
>
> *(a) by a consent authority determining an application for consent to the carrying out development on land to which this plan applies,"*

The general planning considerations detailed in clause 5 applicable to this application are:

> *"(a) the aim of this plan, and*
>
> *(b) the relationship between the different impacts of the development or other proposal and the environment, and how those impacts will be addressed and monitored."*

The aim of the plan is "*... to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.*"

This EIS and supporting documentation seeks to ensure that the potential environmental impacts of the development are considered and minimised. It is considered that the proposed development is in accordance with the provisions of SREP No. 20.

4.1.6 Development Control Plan No. 500

4.1.6.1 Community Participation

The DCP seeks to encourage community participation during the preparation of development applications and to ensure community participation within the assessment and management of extractive industries.

The provisions of the DCP apply to all types of extractive industries. In this instance, a quarry has operated from the site for a number of years and is for a small scale operation in terms of the type of operations anticipated by the DCP. The application will

require public notification as a component of the assessment process and this level of community involvement is considered appropriate and adequate in the circumstances.

The Development Application which was lodged with BHSC in 2000 was the subject of a Conciliation Conference organised by BHSC and held on 31 May 2000. A copy of the minutes of that Conference are attached as **Appendix D**.

The main issues arising from the Conference are:

(a) whether the proposal should be regarded as "designated development";

(b) potential for adverse impacts on flora and fauna, including on the nearby Glenorie Wildlife Refuge;

(c) potential for adverse impacts on the Broadwater Swamp;

(d) whether the proposal was appropriate given the increase in rural residential development in the surrounding area and the proximity of the Sydney Newcastle Gas Pipeline. Both of these concerns seemed to be related to blasting which is not now part of the quarry operation and is not proposed in this application;

(e) the number of truck movements to and from the site.

All of these issues are covered in this EIS.

4.1.6.2 Setbacks

The stated objectives in respect of setbacks are as follows:

(a) To provide an effective buffer to protect the high landscape quality of the Shire;

(b) To protect the habitats of threatened species, populations and ecological communities;

(c) To maintain and enhance the Rural-Residential streetscape of the Shire; and

(d) To maintain and enhance the character and amenity of the existing Rural-Residential activities.

The quarry location satisfies all of the required setbacks as contained within the Prescriptive measures with the exception of the 10m setback from any boundary with adjoining private land and the 30m setback from a public road.

The subject site is adjoined to the east by a former State Forest and the existing (as opposed to the proposed) quarry operations are located approximately 5 metres from the boundary. To the north, the operation will be within approximately 6 metres of the adjoining boundary. The applicable matters contained within the Performance Criteria are that *"extractive operations should provide setbacks to roads and adjacent property boundaries capable of maintaining a landscape buffer which enhances the visual environment of road users and residents"*.

The location of the quarry is determined by the extent of quarry activities which have been undertaken within the site to date and it is important to note that the setbacks of the existing sandstone quarry were established well before Council formulated and adopted DCP No. 500. So far as the eastern boundary is concerned, the adjoining land is regarded as private and a 10 metre setback is therefore appropriate.

The proposed quarry will be located at a distance of approximately 12 metres from the boundary and will therefore comply with the standard. The setback area can be planted to stabilise the area and to form a landscape screen.

The land to the north is owned by the Petith family and a lesser setback than the standard is considered appropriate.

As is indicated within this EIS and supporting reports, the quarry operations are to be undertaken in such a manner as to ensure there are no adverse environmental impacts upon the adjoining lands and other undisturbed land within the subject site. The provision of a reduced setback will not impact upon potential habitats of threatened species.

In respect of the 30 metre setback to a public road, Smallwood Road adjoins the subject site and an existing dam is located partially within the road reserve. It is the intention of the proponent to relocate the dam clear of the road reservation as part of this application, although the dam will still be within the 30 metre setback. Relevant to consideration of this provision is the requirement that "*extractive operations should provide setbacks to roads and adjacent property boundaries capable of maintaining a landscape buffer which enhances the visual environment of road users and residents*". In this regard, the location of the dam is considered to be consistent with the rural-

residential character of the area, and is an existing feature. It is appropriate that the dam be located entirely within the subject property and the modified dam location is shown on **Illustration 5**.

In the circumstances, it is considered reasonable and appropriate to vary the required setbacks.

4.1.6.3 Transport

The objectives of the DCP seek to primarily *"maintain and upgrade the safety and efficiency of the existing external road network"* and provide internal roads *"in accordance with established and recognised road construction"*.

The DCP nominates the provision of a 20m width for internal access roads and that alternative design may be considered by Council having regard to the specific needs of the operation.

The site is located at the end of the constructed portion of Smallwood Road. There are existing access roads constructed to provide access to the quarry. The existing access roads, both the public and the internal private roads, provide adequate and appropriate access for the needs of the existing and proposed quarry operation.

The application involves approximately six (6) truck movements per day in association with the extraction of sandstone from the property. In addition, there are up to 100 truck movements per year on a sporadic basis, associated with sandstone material bought onto the site from demolition sites for processing and resale.

The low volume of traffic generated from the quarry activities is considered unlikely to have any significant impact upon traffic levels or safety on the road system in the locality. The application is required to be referred to the Sydney Regional Development Advisory Committee (SRDAC) under the provisions of SEPP 11.

4.1.6.4 Water Resources

This element is addressed in the report of Morse McVey & Associates contained at **Appendix E** of this EIS.

The Morse McVey & Associates report contains a water management strategy in respect of surface water management. The strategy states that the operation will harvest the

surface runoff for use in production operations, water from production operations will be recycled and that no additional water will be required. The capture of all surface water ensures that sedimentation is able to be contained within the proposed sediment basins. An analysis of the water requirements concludes that there is a surplus supply of water on the site for site operations.

4.1.6.5 Visual Amenity and Scenic Quality

The topography of the site and environs and the location of the quarry activities is such that the quarry operations are visible from limited locations only.

In this regard, the provisions of the DCP seek to achieve adequate setbacks to ensure that quarry activities are appropriately screened and then rehabilitated following the completion of extraction of sandstone from the land. The proposed quarry operations are an expansion of the existing quarry area and are to be undertaken in such a manner as to ensure there is no adverse environmental impact upon the adjoining lands. The quarry will be rehabilitated after extraction is completed, and although the resultant landform will necessarily vary from that of the natural landform, it will eventually blend with the natural surroundings as native vegetation regrows.

It is considered that the measures available to be enforced as a result of the development consent process are sufficient to ensure that the development will not have an adverse impact upon visual amenity and scenic quality of the site and environs in the short and longer term.

4.1.6.6 Flora and Fauna

This element is addressed in the Flora and Fauna Impact Assessment of Ecotone Ecological Consultants Pty Ltd contained at **Appendix F** of this EIS.

The Flora and Fauna Impact Assessment was originally undertaken by Connacher Travers (refer to **Appendix F**) at a time when it was proposed to carry out extraction activities on an expanded site and within an existing watercourse. These activities potentially affected Red Crowned Toadlets (*Pseudophryne australis*) directly. The Flora and Fauna Impact Assessment presented in **Appendix F** now concludes that the restriction of development within areas near the drainage lines will reduce impacts on the population of Red Crowned Toadlets present in the vicinity, outside the subject site and that no Species Impact Statement is required. Ecotone also consider that an 8-part test is required for the Giant Burrowing Frog and have included the test in their

assessment. It is concluded that there will be no impacts on this species and a Species Impact Statement is not required. Further, it is necessary to ensure that soil and sedimentation practices ensure that the quarry activities do not lead to degradation of watercourses. This is an objective of the proposed measures contained within the Soil, Water and Rehabilitation Strategies.

The Flora and Fauna Impact Assessment contains a number of other recommendations such as controlling weeds, planting existing and newly created bare soil and ensuring that best practice techniques for containment of pollutants are applied.

An assessment of the site was undertaken in accordance with the provisions of State Environmental Planning Policy No 44 -Koala Habitat Protection and "*it is concluded that the subject site does not constitute Core Koala Habitat as defined*".

In accordance with Section 5(A) of the Environmental Planning and Assessment Act 1979, the eight part test has been undertaken.

Five (5) threatened species have been identified in the vicinity of the subject site, being Yellow Bellied Glider, Glossy Black Cockatoo, Red Crowned Toadlet, Pambula curviflora ssp. curviflora and acacia bynoeana. There is one endangered species within Baulkham Hills Local Government Area being hibbertia incana. It is concluded that the life cycle of these species is unlikely to be disrupted such that a viable local population of any of these threatened species will not be placed at risk of extinction as a result of the proposed quarry operations.

No significant area of known habitat for any of the above threatened species is proposed to be modified or removed and no suitable habitat is present within the subject site. The proposed development will not serve to isolate interconnecting or proximate areas of habitat for these species. The species are considered to be well represented within the region.

The report concludes that "*The proposed continuation of sandstone quarrying within the mostly disturbed areas of this quarry site, is unlikely to have a significant effect on any threatened species, endangered ecological communities or endangered populations. With the proposed runoff containment within the quarry, water re-use and the discharge of water with only very low levels of suspended solids, no adverse effect on the Broadwater Swamp is anticipated.*" Approval of this application enables the imposition of conditions to enable the management options within the Flora and Fauna Impact Assessment to be implemented.

4.1.6.7 Heritage and Archaeological Resources

A review of report entitled *"Preliminary Assessment of Aboriginal Archaeological Site Potential: Hillside & Pitt Town Road Area*, (Sydney NSW dated December 1994 to Don Fox Planning Pty Ltd), indicates that there are no known aboriginal relics or sites within the subject property or it immediate surrounds. The NPWS, in its letter of 2 May 2000 (see **Appendix C**) advised that "*there are unlikely to be any Aboriginal or threatened species issues within the boundary of the quarry area that would pose a constraint to future quarrying activities.*" Accordingly it is not considered necessary in this instance to undertake an additional archaeological study of the subject property.

Aboriginal sites and relics are protected pursuant to provisions of the National Parks and Wildlife Act, 1974. Should any suspected archaeological relics or sites be uncovered during the undertaking of future extraction works, work should stop immediately and the National Parks and Wildlife Service be notified. A condition of consent could be imposed to this effect.

4.1.6.8 Soil Conservation

This element is addressed in the report of Morse McVey & Associates contained at **Appendix E** and **Section 4.3** of this EIS.

4.1.6.9 Acoustic and Air Quality Management

An acoustic audit report has been prepared by Atkins Acoustics and is presented in **Appendix G**. Approval is not sought for blasting to be undertaken and a condition of consent could be imposed to this effect. The location of the quarry is distant from adjoining residential properties. Quarry operations have been undertaken from the property for a number of years and during that time there have been no reported complaints in relation to noise from the premises. The quarry operations are considered to have a minimal noise impact and this view is supported by the acoustic audit report.

The proposal is similarly likely to have minimal impacts in terms of air quality due to the minor nature of the extraction works proposed and location of the quarry operations. In this regard, the most likely impact is from dust. To control dust pollution, the following measures are recommended:

(a) The use of a water cart, or other means of reducing dust, during operating hours as required;

(b) The movement of vehicles within the site being limited to the internal access roads;

(c) During periods of high wind, the cutting saws are to be sprayed with water; and

(d) The extent of areas exposed should be minimised and planting of areas of the site which are not immediately required for operational purposes should be undertaken.

Adoption of the above measures should ensure that dust pollution is appropriately controlled.

4.1.6.10 Extraction Program

It is proposed to continue extraction in the manner currently employed on site, which involves removing blocks of 1.2 metres depth from the quarry floor. The operating area is moved progressively to allow for efficient operation of the machinery. Because the sediment basin is within the quarry floor, the location of the basin is moved periodically to allow the whole area to be worked. The quarry will be progressively enlarged in a westerly direction.

The manner of extraction proposed is in keeping with the element objectives nominated within the DCP and is shown schematically on the cross-sections presented in **Illustration 6**.

4.1.6.11 Rehabilitation

The site is proposed to be rehabilitated in accordance with the provisions of the DCP, Details are contained within the report prepared by Morse McVey & Associates at **Appendix E**.

The strategy seeks to ensure that the rehabilitated landscape integrates with the surrounding landscape, with due regard to the ecology of the area and stockpiles of clean topsoil and overburden to maintain the viability of soil and seed source are maintained. A series of principles are contained within the Morse McVey & Associates Report at **Appendix E** as to the manner in which rehabilitation works are to be undertaken and monitored. These principles include:-

a) The final landform will integrate with the pre-existing natural terrain;

b) Only clean topsoil and overburden stockpiles will be used to maintain viability of the soil and seed source;

c) Crushed sandstone and stockpiled subsoil is available and will be used for rehabilitation;

d) The lands will be rehabilitated with native species endemic to the area;

e) After the extraction phase has been completed, schedule works so that the duration from the conclusion of land shaping to completion of final rehabilitation is less than 20 working days;

f) Progressive rehabilitation can not be achieved given the small site size;

g) Any erosion and sediment control measures will be maintained in a functioning condition until all earthworks are completed and the site rehabilitated. Where appropriate, remove soil conservation structures as the last activity in the site stabilisation program;

h) Monitoring of soil conservation works will be conducted at least once per year with findings documented and submitted to the council.

The report concludes that the rehabilitated landform will be consistent with adjoining land and the proposal meets the requirements of DCP 500.

4.1.6.12 Social and Economic Assessment

Cut sandstone is a relatively scarce resource within the region. Only two other known quarries operate in the same manner as the subject site, being quarries at Gosford and Winmalee. The continuation of quarry operations on the subject land will provide for a continued supply to a number of construction and landscape markets. The methods employed to extract sandstone and the variety of products sold ensure that there is very little wastage, thus maximising use of the available resource.

Any reduction of supply resulting from closure of the operation would tend to increase the price of the products supplied from the quarry, since competition would be reduced.

There are normally between five and seven direct employees of the quarry operation, and there is indirect employment within the construction and landscape industries. In addition, material is prepared for export.

The quarry is already established and does not face any start up costs, which would apply to any new operation.

The quarry can be operated economically in a manner which satisfies the relevant legislation and the recommendations of this EIS.

4.1.6.13 Ecologically Sustainable Development

There will be continued demand for cut sandstone in the construction and landscape industries. In regard to the principles of ecologically sustainable development, the continued operation of the quarry will provide:

- means to ensure the rehabilitation of the quarry area;
- An extraction and processing method which is efficient and ensures that there is little wastage of the resource;
- Products which minimise the amount of stone required; eg veneered concrete blocks;
- Facilities to process material from demolition sites, so that this material can be re-used and reduce the demand for freshly quarried stone.

Thus, although sandstone is not a renewable resource, and therefore the operation on the subject site cannot strictly be regarded as "sustainable", the operation does make the best use possible of the resource available.

In relation to the requirement of DCP 500 to submit an ESD summary report, the following schedule has been prepared.

DCP Criteria	Response
The precautionary principle involving an evaluation of measures to avoid serious or irreversible damage to the environment.	This EIS has thoroughly evaluated the risk of damage to the environment, including impacts on flora and fauna, hydrology of local streams, impacts on the Broadwater Swamp, noise, dust, groundwater and water quality and has also considered how to rehabilitate the site at the conclusion of extraction operations.
Means of ensuring intergenerational equity.	The quarry meets the community demand for sandstone products by producing sandstone in an efficient manner, thus minimising wastage and maximising use of the available resource, and maximising the resource available for future generations.
Means of conserving biological diversity.	Continuation of the use of the existing operation has been demonstrated to have minimal impact on flora and fauna in the vicinity and also within the nearby Broadwater Swamp.
Recognition of the global dimension of impacts including greenhouse gas emissions.	By producing stone in the most efficient manner, the community demand for sandstone products is satisfied in the least disruptive way. As far as possible, machinery on-site is powered by electricity. Other mobile machinery, including the trucks used to transport product, is diesel powered.
Conservation of cultural, educational, and recreational attributes of the locality and region.	There are no cultural, educational or recreational attributes of the locality or the region which will be disturbed by the proposal.
Economic and social consequences.	The proposal currently employs between 5 and 7 workers and contributes to the economy of the region. Closure of the operation would result in the loss of this employment and presumably, transfer of the employment to a similar operation outside the region.
An overview of the operating and mining procedures including environmental objectives, occupational health and safety, and staff training.	These aspects of the operation are discussed elsewhere in this EIS.

DCP Criteria	Response
Risks, safeguards and contingency arrangements.	Apart from the normal workplace risks associated with such an activity, all risks associated with the operation can be addressed by responsible management as discussed elsewhere in this EIS. These risks include: • Failing to maintain the sediment control basins; • Clearing excessive bushland; • Failing to maintain the site drainage; • Releasing water from the sediment control basin without ensuring that it meets the relevant criteria; • Failing to properly rehabilitate the site; • Failing to adequately water disturbed areas during dry, windy conditions • Long periods of heavy rain which could overflow the sediment basins.
Achieving social equity and community satisfaction.	On the one hand, the community requires resources such as sandstone products and on the other hand, requires these to be obtained in a manner which minimises impacts on the environment. This EIS has evaluated the impacts of this existing quarry operation and concludes that it is run in an efficient manner, with minimal impacts on the environment. The concerns of the community as expressed at the Conciliation Hearing in May 2000 have been addressed.
Water resource management including sub-surface water flow patterns and quality for other users.	The soil, water and rehabilitation strategies report prepared by Morse McVey & Associates Pty Ltd has examined the water management and concludes that there will be little or no effect to other users of the resource including the wildlife which uses the Broadwater Swamp. There will be no impact on groundwater resources.
Waste management/minimisation strategy.	Virtually all material won from the site is used in one form or another, including material caught in the sediment traps which is sold as crushed sandstone. The processing equipment is also used to recycle sandstone won from demolition projects and occasionally from large city excavations and the like.

4.1.6.14 Post Extraction Land Use

As detailed above in **Section 4.1.1,** the existing planning controls provide for a variety of landuses with the most likely envisaged land use being rural residential. It is noted that over the life span of the operations, planning controls may change and the final landform is such as to be able to accommodate a variety of uses. In accordance with the

current planning controls the site is zoned Rural 1(b), with a minimum allotment area of 10 ha for rural residential development.

It is difficult to predict the exact land use which would be undertaken on the site at the end of the expected quarry life of about 20 years. Changes to planning controls and demands for certain land uses are likely to occur before the life of the quarry has expired. Accordingly, it is important that the final landform provides for a range of environmentally suitable end uses, with the specific choice being made at the appropriate time.

The final rehabilitated quarry floor would provide sufficient potential building platforms to cater for a variety of envisaged end uses. It is currently proposed to plant out the quarry floor so as to recreate the natural landscape as closely as possible.

4.1.6.15 Compliance Table

In respect to DCP 500, the following table summarises the various prescriptive measures set out in DCP 500, discusses how these measures are dealt with by the subject proposal and comments on compliance by the proposal. .

Prescriptive Measure	Description of Proposal	Comment
Community Participation • Community interaction	The proponent attended a mediation conference organised by Council in May 2000. The proposal discussed at that conference was essentially the same as the current proposal.	Complies.
• Community views, values and concerns.	The views, values and concerns expressed at the conciliation conference have been taken into account.	Complies.
• Local community groups.	The subject quarry has been in operation for some time and does not require input into the planning, operation and management.	Not relevant.
• Management committee	Committee can be established if considered desirable.	Can be conditioned to comply.
• Industry understanding	The various proposals can be initiated if considered desirable.	Can be conditioned to comply.

Prescriptive Measure	Description of Proposal	Comment
Setbacks		
• Setback to adjoining property boundaries.	The existing extraction area encroaches to within 10 metres of the eastern boundary of the site and previous workings encroached on the land to the east. The existing quarry area pre-dates DCP No. 500. The proposed extraction area will have a setback of approximately 12 metres from the eastern boundary and approximately 6.5 metres from the north-western boundary. Note that the land to the east is not Crown land but has been handed to the local Aboriginal Land Group; the land to the north is controlled by the family which operates the quarry.	Minor non-compliance (see comment).
• Public road.	The working area and the quarry are both setback more than 30 metres from Smallwood Road.	Complies.
• National Park State Forest or Crown Land.	There are no National Parks, State Forests or Crown lands in the immediate vicinity.	Complies
• Heritage, archaeological, geological and cultural sites or relics.	There no relevant sites or relics in the vicinity.	Complies
• Watercourses.	The Department of Land & Water Conservation has confirmed that the proposed workings are not within 40 metres of the top bank of the nearest watercourse.	Complies
• Public or community facility.	There are no public or community facilities in the vicinity.	Complies
• Private residences.	There are no private residences not associated with the extraction within 100 metres of the site.	Complies
• Electricity transmission lines.	There are no electricity transmission lines within the vicinity.	Complies
Transport		
• Internal access carriageways.	The internal carriageways are less than 20 metres but have been established for many years and are considered adequate.	Could be approved by Council as an alternative design.

Prescriptive Measure	Description of Proposal	Comment
• Setbacks to boundaries, environmentally sensitive areas and private residences.	The proposal complies in all respects except for the access road adjoining the northern boundary. Note that the property to the north is controlled by the Petith family which operates the quarry.	Considered to comply.
• Location of internal access carriageways.	The illustrations attached to this EIS show that the internal access road has been designed to provide access to the extraction area throughout its life.	Considered to comply.
• Standard of construction	The internal access roads have been developed over many years and are considered suitable for the purpose. They will be extended progressively as to a similar standard as the extraction area is extended.	Considered to comply.
• Roads Act and SEPP 11	SEPP 11 requires that proposals for extractive industry or mining be referred to the Traffic Authority. **Appendix C** contains a letter from the Roads & Traffic Authority providing comments in relation to the proposal.	Considered to comply.
• Weighbridge dockets and log books.	The application is for the continuation of an existing use which has relatively low traffic movements.	Not relevant.
Visual Amenity and Scenic Quality		
• Landscape and site analysis.	**Illustration 8** is a panorama comprising a series of photographs taken from above the existing extraction area while **Illustration 4** is an aerial view of the site. It can be seen that the site is very isolated and not visible from any readily accessible points.	Not relevant.
• Setbacks	The setbacks will be provided for the proposed extraction area. The existing quarry area in some parts encroaches within the setback but pre-dates DCP 500.	Minor non-compliance (see comment).
• Preservation of areas of visual sensitivity.	Because of its isolation the site is not considered to be visually sensitive.	Complies
• Machinery and equipment storage.	Machinery used for extracting sandstone is left in the quarry area and is generally not visible from the adjoining lands. Other machinery is left in the processing area which as for the quarry area is not generally visible.	Not relevant.

Prescriptive Measure	Description of Proposal	Comment
• Perimeter screen planting.	The site is already surrounded by bushland and in any case is not visible from accessible areas.	Not relevant.
• Rehabilitation	This EIS contains proposals to rehabilitate the site on completion of extraction.	Complies
Water Resources		
• Groundwater impact assessment report.	There are no groundwater resources which will be affected by the proposal - refer to letter from DLWC in **Appendix C.**	Not relevant.
• Groundwater level.	There is no groundwater level within 2 metres of the base of the extraction area.	Complies
• Bores and pumps.	There are no bores or pumps which will intercept the water table.	Not relevant.
• Groundwater monitoring	The proposal will not affect the groundwater table.	Not relevant.
• Water management plan.	Refer to relevant section of this EIS.	Dealt with elsewhere.
• Water management strategy	Refer to the Soil, Water and Rehabilitation Strategies prepared by Morse McVey & Associates Pty Ltd in **Appendix E** of this EIS.	Complies
Flora and Fauna		
• Flora and fauna assessment.	Refer to the Flora and Fauna Assessment carried out by Ecotone Ecological Consultants Pty Ltd and Conacher Travers Environmental Consultants in **Appendix F** of this EIS.	Complies
• Species Impact Statement.	The 8-Part test carried out as part of the Fauna and Flora Assessments concluded that there would be no significant impacts on threatened species, populations or ecological communities.	Complies
• Flora and fauna monitoring program.	If considered necessary the proponent can be required to prepare and submit a flora and fauna monitoring program.	Can be included in a condition of consent.
• Buffer zones	There are no National Parks, State Forests, Crown lands or critical habitats in the immediate vicinity. The comments by MPWS (refer to letter in Appendix C) have been taken into account.	Complies

Prescriptive Measure	Description of Proposal	Comment
• Biological survey	The Flora and Fauna Assessments included biological surveys.	Complies
Heritage and Archaeological Resources • Archaeological study	NPWS has confirmed that there are unlikely to be any items of Aboriginal heritage within the study area (see **Appendix C**).	Not relevant.
• Archaeological material	NPWS will be advised if any archaeological material is found.	Can be included in conditions of consent.
• Buffer zones	There are no known archaeological sites within the vicinity.	Not relevant.
Soil Conservation • Sediment and erosion control measures.	Sediment and erosion control measures are in place in both the extraction and the processing area.	Complies
• Installation and maintenance of sediment control devices.	Sediment control devices are installed and maintained in both in the extraction and processing areas.	Complies
• Progressive clearing.	Clearing will only be carried out to extend the extraction area shown on the approved plans.	Can be included in conditions of consent.
• Nominated qualified supervisor.	The proponent, Mick Petith, will be the nominated qualified supervisor.	Can be included in conditions of consent.
• Soil stripping, storing and replacement.	The site naturally contains very little topsoil. This will be stockpiled for use during rehabilitation.	Complies
• Sediment control measures.	**Appendix E** of this EIS contains a report by Morse McVey & Associates, containing detailed recommendations in relation to sediment controls.	Complies
• Tailing pond measures.	The proposal does not include provision of a tailing pond.	Not relevant.

Prescriptive Measure	Description of Proposal	Comment
Acoustic Management • Acoustic assessment report.	**Appendix G** of this EIS contains a report by Atkins Acoustics which assesses the range of noise levels generated by the extraction and processing equipment.	Complies
• Acoustic management plan.	The existing operation complies with the requirements of the DCP and with EPA noise criteria.	Consent condition not required.
• Setback to residences.	There are no residences within 100 metres of the extraction activities.	Complies
• Cell technique.	Because of the nature of the sandstone extraction, it is not feasible to use the cell technique.	Not relevant.
• Environmental Noise Control Manual 1994.	The proposal meets the relevant acoustic standards.	Complies
• Road traffic noise.	The proposal only results in low levels of traffic activity which will not increase significantly in the future.	Complies
• Hours of operation.	The proposed working hours are in accordance with the DCP.	Complies
Air Quality Management • Air quality assessment report.	The proposal is for continuation of an existing use which because of the method of extraction and processing, can be seen not to cause excessive concentrations of dust or other emissions.	Air quality assessment report not required.
• Dust suppression equipment.	All items of cutting equipment in the processing area are fitted with water sprays to suppress dust. The excavator mounted saw in the extraction area is sprayed when necessary to reduce dust.	Complies
• Wind activated water sprinkler systems.	Because of the nature of the stockpiled material (eg. sandstone blocks), wind activated systems are not considered useful. Access tracks are watered to reduce dust.	Not relevant.
• Stockpiles.	As described above, stockpiles do not require stabilisation.	Not relevant.

Prescriptive Measure	Description of Proposal	Comment
• Dust suppression measures.	The EIS contains information about dust suppression measures including water sprays on cutting equipment and spraying access roads.	Complies
• Covering trucks.	Where relevant, truck payloads are covered to comply with DCP 500 and with other relevant legislation.	Complies
• Blasting.	There are no proposals for blasting within the subject site.	Not relevant. Can be included in a condition of consent.
• Access roads.	The site gains access from Smallwood Road which is itself unsealed, but which operates satisfactorily. As described above, internal access roads are watered as required to reduce dust generation.	Not relevant.
Extraction Programme • Extraction programme plan.	As described in the EIS and demonstrated on **Illustration 6**, it is proposed to progressively extract sandstone over the life of the quarry.	Complies
• Reducing depth and area of extraction.	Impacts on groundwater, flora, fauna, archaeology and other sensitive site features have been taken into account in designing the extraction area.	Complies
• Progressive rehabilitation.	As described in the EIS, it is not considered practical to stage the extraction and rehabilitation. The EIS contains a rehabilitation plan which will be implemented at the conclusion of extraction. Because of the relative ease and therefore low cost involved in rehabilitating the site compared to, say, a sand extraction proposal, Council is requested not to impose payment of a rehabilitation bond in this instance.	Not relevant.
• Landowners' commitment.	There is only one owner involved, being the proponent.	Complies
Rehabilitation • Stripping topsoil.	As described previously, there is very little topsoil naturally occurring on the site. As far as practical, topsoil will be stockpiled for use in the future rehabilitation.	Complies

Prescriptive Measure	Description of Proposal	Comment
• Rehabilitation.	As described in the EIS, rehabilitation will include endemic native plants.	Complies
• Topsoil in bund walls.	There are no proposals for bund walls on-site.	Not relevant.
• Direct seeding.	Rehabilitation will be carried out in accordance with best practice.	Considered to comply.
• Permanent ground cover.	Only those areas of the site required for extraction, processing, stockpiling and access roads will be disturbed and these areas cannot practicably be stabilised.	Not relevant.
• Native plants and grass covers.	As described in the EIS, the site will be planted with endemic native plants and grass covers.	Complies
• Collection, processing and storage of native seeds.	The rehabilitation plan calls for consultation with NPWS, Council and local groups to assist with species identification and the most suitable establishment techniques. Since this work will not be undertaken until completion of extraction, a fully detailed plan has not been prepared at this time.	Can be included in conditions of consent.
• Composition of seed mixes.	Refer to above comments.	Can be included in conditions of consent.
• Weed infestation.	The rehabilitation plan as set out in **Appendix E** of the EIS, includes proposals for minimising weed invasion.	Can be included in conditions of consent.
• Re-establishing nutrient cycles.	The rehabilitation strategy set out in **Appendix E** proposes to use fast growing species to re-establish cover as quickly as possible and this will naturally re-establish the nutrient cycle.	Complies
• NPWS licence for seed collection.	A licence will be obtained if necessary from NPWS for seed collection.	Can be included in conditions of consent.
• Regular maintenance.	The rehabilitation strategy set out in Appendix E includes provision to maintain and restore damaged areas.	Complies

Prescriptive Measure	Description of Proposal	Comment
• Rehabilitation strategy.	**Appendix E** of the EIS contains a rehabilitation strategy. In this instance, an annual rehabilitation management plan is not relevant since rehabilitation will only be carried out on completion of extraction.	Considered to comply.
• Backfill material.	No waste materials will be disposed of within the site.	Complies
• Rehabilitation bond.	As discussed above, lodgement of a rehabilitation bond is not considered necessary in this instance.	Not relevant.
Social and Economic Assessment		
• Public meeting.	The proponents attended a public conciliation conference organised by Council in May 2000. Although that conference was held in relation to a Statement of Environmental Effects for an earlier development application, the proposal was essentially the same as outlined in this EIS.	Complies
• Economic appraisal report.	This application is for the continuation of an existing quarry business which has been established over many years and has developed a market which includes TAFE's, Councils, government departments and private companies as well as individual householders. The business employs up to 7 people and has demonstrated its viability by operating profitably over many years. Should the operation cease to exist, the price of cut sandstone would no doubt increase to reflect either the decreased competition (because of fewer suppliers) or the increased cost to be faced by another operator starting up a new extraction area.	Economic appraisal report not considered relevant.
• Alternative options.	As described above, this proposal is for the continuation of an existing business which has already established a market for each of the resources it produces. The EIS discusses the option of closing the operation, but concludes that the current operation should continue.	Complies
• Social impact assessment.	Because the proposal is for the continuation of an existing use, a social impact assessment is not considered relevant, since approval of the proposal will not result in any change to employment or any other of the matters outlined in DCP 500.	Not relevant.

Prescriptive Measure	Description of Proposal	Comment
Ecologically sustainable development • ESD summary report.	The EIS includes an ESD summary report.	Complies
• DCP objectives.	The EIS has demonstrated compliance or non-relevance for all objectives.	Complies
• Schedules 2 and 3 of the EP&A Regulation 1994.	Considered in **Section 4.1.3** of this EIS	Complies
• Annual management plans.	These plans are relevant to the ongoing management and operation of the quarry.	Not relevant.
Post Extraction Land Use • Promoting post extractive land uses.	The EIS proposes that the extractive area be rehabilitated as natural bushland.	Complies
• Conflict with adjoining operations.	There is no extraction operation on the adjoining lands.	Not relevant.
• Revegetation species.	The site is proposed to be revegetated with native species.	Complies
• Prior site erosion.	All drainage lines in the vicinity of the site are considered to be stable.	Not relevant.
• Post extractive stability.	If considered relevant, Council can require a geotechnical certificate at the completion of extraction.	Not considered relevant for this application.
• Farm management plan.	The post extraction land use is not agricultural.	Not relevant.

Prescriptive Measure	Description of Proposal	Comment
Environmental Management Systems • Water management plan.	The EIS has discussed the possible potential impacts of the proposal on the surrounding environment and has also discussed how these impacts will be eliminated or reduced. The elements of this discussion which are relevant to water management could readily be drawn into a water management plan addressing the matters listed in Section 2.18 of the DCP.	Can be included in conditions of consent.
• Waste management plan.	It is not proposed to import waste material into the site.	Not relevant.
• Social impact management plan.	The operation has been running for many years and is well integrated into the Baulkham Hills LGA.	Not relevant.
• Management committee.	A management committee could be established if required.	Can be included in conditions of consent.
• Environmental management plan.	If required, an annual environmental management plan can be submitted to Council.	Can be included in conditions of consent.

4.2 Impacts on Surface and Groundwater Resources and Water Management Proposals

Morse McVey & Associates Pty Ltd were engaged to analyse the impacts of the proposal on surface and groundwater resources and to propose water management systems which would minimise any impacts, and a copy of their report is attached as **Appendix E**.

Morse McVey conclude that the proposal will have an insignificant impact on surface waters in terms of water retained and used on site and will not affect groundwater as discussed below.

4.2.1 Surface Water

The site is located near the top of a ridge and therefore has a very limited upstream catchment. Downstream the site drains into Fern Creek which is located approximately 300 metres from the site. Fern Creek in turn drains into Kelly's Creek near to the upstream limit of the Broadwater Swamp Wetland and thence into the Hawkesbury River which is approximately 12 kilometres as the crow flies from the site.

All runoff from the disturbed area of the subject site is either captured as roof water for potable use or is directed into a sedimentation basin.

Water from the sedimentation basin is pumped up to the processing area for use as lubrication for the circular saw, or as mixing water for reconstituted products. Excess water is discharged from the sediment basin after treatment to remove excess soil particles and nutrients, or alternatively can be used for irrigation.

Morse McVey have analysed the effect of the quarry and the processing works on the surface water flows and have concluded that:

(a) 39% of flows will be removed from the site's catchment for potable and non-potable uses;

(b) the water used on-site will represent 0.1% of the flows from the sub-catchment which contains the site and discharges into the Broadwater Swamp; and

(c) the water retained on-site represents 0.014% of the total catchment of the Broadwater Swamp.

Morse McVey conclude that the quantity of water removed from the catchment is an insignificant proportion of the total flows into the Broadwater Swamp and this amount will not affect the hydrological regime of the swamp.

The above calculations will apply during the life of the quarry. Morse McVey have proposed rehabilitation works after the quarry operation is completed and, with these works in place, the surface water flows will essentially be the same as for the natural catchment.

4.2.2 Groundwater

As described in ***Section 3.2 Groundwater*** of Morse McVey's report, advice was obtained from the Department of Land & Water Conservation that a clearance of at least 2 metres is required between the quarry floor and the watertable beneath.

Morse McVey carried out an inspection of the site on two occasions and found no evidence of water seepage within the immediate area and concluded that there is no watertable within 2 metres of the floor of the proposed quarry extension.

It is concluded that there will be no impact on groundwater resources as a result of the quarry operations.

4.2.3 Water Management Proposals

Morse McVey have carried out a detailed investigation of the quarry operations and have proposed a water management system to capture and treat silt laden runoff from the quarry and the processing area.

Morse McVey propose to capture all runoff from the site and direct it into a basin in the floor of the quarry. From this basin, some water will be pumped to a holding tank in the processing area and this water will be used as lubricant for the circular saw.

The lubrication system for the saw involves recycling water through a series of settlement tanks from which material is periodically removed and sold. Any overflow or runoff from the processing area is directed back to the sediment basin in the floor of the quarry.

Runoff from the tracks is collected in table drains and directed into the sediment basin in the floor of the quarry.

During periods of extended rain, the inflow to the basin will exceed the amount of water required for lubrication and other processes and after treatment the excess water will be released into the downstream watercourse.

Morse McVey have provided a detailed set of management practices which will ensure that the impact of the quarry on water quality will be minimised.

Appendix E contains a copy of Morse McVey's report including detailed calculations and volumes of sediment basins.

4.3 Soil and Erosion Controls

As an integral part of the consideration of water management on the site, Morse McVey also considered the impact on soils and erosion. The water management practices outlined in **Section 4.2** also include management of soil and erosion on the site and ensure that during the operation of the quarry transport of eroded soil from the site is minimised.

Once the quarry operation is completed, Morse McVey have proposed rehabilitation works which will, in the long run, fully stabilise the site by encouraging the regrowth of native vegetation and, at that time, the site will be performing in a similar manner to the surrounding natural bushland. In the interim period between completion of quarry operations and the full establishment of the rehabilitation works, Morse McVey propose that the sediment basin remain in use to ensure that excess soil is not eroded from the site.

4.4 Noise and Dust Impacts

4.4.1 Noise Impacts

Approval is not sought for blasting to be undertaken. The quarry is remote from adjoining residential properties and quarry operations have been undertaken on the property for a number of years with no reported complaints in relation to noise from nearby premises.

All machinery is fitted with muffling equipment as required by the appropriate authorities.

An environmental noise audit was conducted for the quarry by Atkins Acoustics and is attached as **Appendix G.** For the purpose of assessing noise from the quarry, noise measurements were conducted at the quarry and the boundaries of the residential properties identified as 5 Smallwood Road and 196 Halcrows Road, Glenorie.

The audit revealed that without the subject quarry operating the ambient noise was controlled by a nearby quarry, a nursery, road traffic, and the natural elements. The subject quarry noise was also audible at both reference measurements locations. Without the subject quarry operating the background noise levels at both residential properties ranged between 32-38dB(A).

From the assessment by Atkins Acoustics of the location of the residential properties, they would expect that with normal variation, the background noise levels could reduce to 30dB(A) or below. Hence, in accordance with the EPA Industrial Noise Policy, a background level of 30dB(A) has been adopted for assessing noise from the quarry. In accordance with the EPA guidelines, the noise is assessed at the most affected point on or within the residential property boundary or, if this is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence.

The field measurement results confirmed the subject quarry noise at the boundaries of the Smallwood Road and Halcrows Road properties was 34dB(A) and 32dB(A), respectively, and satisfied the recommended project assessment goals of 35dB(A). A copy of the Environmental Noise Audit Report by Atkins Acoustics is presented in **Appendix G**.

4.4.2 Dust Impacts

The quarry operations create little dust and as with the noise impacts, no complaints have been received as a result of the past operations of the quarry.

Water is used to minimise dust resulting from operation of the fixed and excavator mounted circular saws.

The quarry operator waters the site access tracks and processing area to ensure that dust problems are minimised.

4.5 Transport

Two trucks operate from the site, each making approximately two trips per day. Customers' own trucks also visit the site accounting for a further two trips per day. Cut sandstone is prepared for export and this involves approximately one container truck per week. Up to 100 trucks per year sporadically bring material to the site to be re-cut.

It is assumed that four of the five employees (with the exception of Mr Petith) drive to the site each day, thus requiring a total of four trips. It is assumed that a further, say, two casual visits per day could be expected.

Thus, a total of up to 14 vehicles enter and leave the site each day.

This volume of traffic is considered insignificant even on the relatively quiet rural roads which provide access to the site.

4.6 Bushfire Hazard

Although the quarry is surrounded by bushland and is in an area regularly effected by bushfires, the site itself is mostly free of vegetation and, therefore, provides an excellent buffer to bushfires. The floor of the quarry itself is currently 20 metres wide and is obviously totally free of vegetation. Similarly the processing area, although it has a number of scattered trees, has a low fuel loading and is approximately 25 metres in width.

It is thus concluded that no additional buffers are required to provide safe refuges for both men and equipment.

4.7 Impacts on Adjoining Land Uses

The only activities which are carried out on adjoining lands are a nursery and two residential dwellings. The remaining land surrounding the site is Crown Land or former State Forest now owned by the Local Aboriginal Council.

Both the nursery and the residence are located some at least 500 metres rom the site. In addition, this application is for extension of an existing use which has been carried out on the subject site for many years.

It is concluded that continuation of the existing use will have little or no impact on the surrounding land.

4.8 Visual Impacts

As outlined in **Section 4.1.6.5 Visual Amenity and Scenic Quality**, the topography of the site and environs and the location of the quarry activities is such that the quarry operations are visible from limited locations only and not from any public road or private land. **Illustration 8** comprises a panorama looking over the quarry towards the vacant land to the east.

Although the quarry will be extended as a result of this application, the area which will be affected by the extension is already substantially cleared of vegetation and/or is highly disturbed . Thus, the proposal will not worsen the visual impact of the quarry although the landform will certainly change.

The quarry will be rehabilitated following completion of the quarry operation and will eventually be returned to natural bushland, or other Council approved use under the prevailing statutory planning controls applying to the subject property in the future.

It is concluded that the quarry and associated processing area will have limited visual impact on the surrounding area.

4.9 Rehabilitation Measures

Morse McVey has prepared a detailed rehabilitation strategy to meet the requirements of DCP 500. Morse McVey analysed the existing site and the surrounding area and made a series of recommendations to ensure that the site is rehabilitated as soon as possible after the extraction of sandstone is completed. Morse McVey suggest that although the site is too small to allow rehabilitation to proceed in parallel with the extraction process, that some revegetation can occur within the next three to five years along the eastern edge of the existing quarry site.

The final landform suggested by Morse McVey retains the cut batters left by the quarry operation but places at least 300mm of crushed sandstone, sub-soil and top-soil material on the floor of the quarry to provide material for revegetation. The base of the quarry underneath the soil material is to be shaped to ensure that it is free-draining, and this will involve excavation of an outlet through the wall of the quarry.

Morse McVey recommend a mixture of fast growing cereal crops and suitable native species and further that NPWS and local conservation groups are to be consulted before the final plant species are selected.

The objective of the rehabilitation and revegetation process is to quickly stabilise the area, taking account of whatever end use is ultimately approved for the site.

4.10 Impact on the Broadwater Swamp Wetland

The Broadwater Swamp Wetland (Wetland No. 128 under REP 20) is located some 600 metres downstream from the site. The total catchment of the Broadwater Swamp is greater than 2,000 hectares compared to the area of the site of approximately 2 hectares. As discussed in **Section 4.2** above and in greater detail in Morse McVey's report (refer to **Appendix E**), the amount of water used on-site for processing and domestic use will represent some 0.014% of the total inflows to the Broadwater Swamp, and this can be considered a negligible effect, well below the level of accuracy of the calculations and also well below the annual variations in rainfall and runoff.

Morse McVey also discuss the impact of the potential for increased transport of soil and clay particles as well as nutrients from the disturbed site. Morse McVey conclude that an additional 115 kilograms of suspended solids (an increase of 0.5% over the natural condition), 0.10 kilograms of total phosphorus (an increase of 0.05% over the natural condition) and an increase of 1.5 kilograms of total nitrogen (an increase of 0.07% over the natural condition) will occur each year during the lifetime of the quarry operations. Following cessation of the quarry operations and rehabilitation of the site, the net impact will be zero when compared to natural bushland.

It is concluded that the quarry will have an insignificant impact on Broadwater Swamp in terms of water use, nutrients and suspended soils, provided the recommendations in the water management plan suggested by Morse McVey are implemented and managed correctly.

4.11 Impact on Flora and Fauna

The site was originally studied by Conacher Travers Pty Ltd in 1999, attached as **Appendix F**. This investigation covered a wider area than the current site. The current proposal has been examined by Ecotone Pty Ltd (see **Appendix F**), who were provided

with a copy of the original Conacher Travers report. Ecotone conclude that although a number of threatened flora and fauna species have been identified as potential species within the overall study area (ie. the subject site and the immediately surrounding area) the proposed continuation of quarrying is planned to be entirely within an area that has been extensively disturbed in the past by clearing of vegetation and subsequent quarrying over a number of years.

Where present at all, the vegetation of the subject site is limited to small, isolated patches of trees and low shrubs. Very minor edge areas of the locally common Sandstone Forest vegetation surviving on the quarry site might need to be cleared in order to implement the erosion and drainage controls associated with the proposal.

No threatened flora or fauna species were recorded on the site.

No species of native fauna were found to be critically dependent on the habitats of the quarry site for their survival, therefore no significant negative impacts on the flora or fauna in the vicinity of the site are anticipated.

The two threatened flora species observed by Conacher Travers within the broader study area, if currently present, are not within the subject site and are a minimum of 50 metres to the north of the boundary of the quarry. Ecotone conclude that no formal assessment of impact on flora species under the provisions of Section 5A of the EP & A Act 1979 is required.

Evidence of three threatened fauna species (Glossy Black Cockatoo, Red-crowned Toadlet and Yellow-bellied Glider) was recorded within the broader study area, although not within the subject property, by Conacher Travers in 1999. No threatened fauna species was detected during the supplementary field surveys within the quarry area. Conacher Travers completed Section 5A assessments for the Glossy Black Cockatoo, the Red Crowned Toadlet and the Yellow Bellied Glider, as part of their assessment for a more extensive quarry than is currently proposed. Those Section 5A assessments concluded that no significant effect was anticipated. Ecotone comment that an eight part test for the Giant Burrowing Frog is warranted but also note that the ecology and habitat of that species are very similar to those of the Red Crowned Toadlet. Ecotone completed the Section 5A Assessment for the Giant Burrowing Frog and concluded that no significant impact would result to this species and that a Species Impact Statement is not required.

Ecotone conclude that the proposed continuation of sandstone quarrying to be sited wholly within the disturbed quarry area will result in no potential to adversely effect any threatened species and that a species impact statement is not required. It is also concluded that the proposal will have no adverse effect on the fauna and flora of the Broadwater Swamp.

5.0 JUSTIFICATION FOR THE PROPOSAL

5.1 Need and Justification for the Proposal

The Petith's have been operating a sandstone extraction operation on the subject site since the mid 1970's and have developed an efficient operation which directly employs five staff (up to seven at times) and indirectly supports the building and landscaping industry in the area as well as providing material for export.

The operation has been expanded over time and now extracts sandstone using sophisticated machine mounted and fixed sawing equipment to minimise waste and to eliminate the need for blasting. The relatively small amount of waste products are collected and sold separately.

There is only a small amount of overburden to be removed to expose the sandstone material which is of high quality.

Although only a minor part of the operation, demolition sandstone materials are brought to the site and recut thus minimising the need for freshly quarried stone.

The quarry provides material to a number of TAFE's, Councils, Government departments and private companies, all of whom are reliant on a regular source of supply. If the quarry were to be closed down, these clients would be forced to find an alternative source of supply. No doubt an alternative would be found, but in the first place the cost of the material would probably increase to reflect the decreased competition and possibly greater transport distances. In the second place, the alternative source of supply would be likely to have a similar, or greater, impact on the environment as the current proposal, which is for the continuation of use of an existing sandstone quarry.

5.2 ESD Principles

This matter has already been discussed under **Section 4.1.6 - Development Control Plan No. 500**. It was concluded in that Section that, although sandstone is not a renewable resource and therefore the operation on the subject site cannot strictly be regarded as "sustainable", the operation meets the demand for sandstone products by the building, construction and landscape industries in a very efficient manner and in addition, provides facilities to recycle and process sandstone from demolition sites.

5.3 Alternatives Considered

The alternatives available are:-

a) Continuing use of the existing quarry;

b) Development of another site, by the current proponents or by others;

c) Cessation of the use of sandstone materials in the construction and landscaping industries;

d) Approval of continuation of the current use but using different extraction methods.

The subject site has been in use for sandstone extraction for many years. The specific attributes of the site and the existing use which reinforce the suitability of the site include the following:-

a) Location within a viable distance of a market for the product, namely the western and north western developing regions of Sydney;

b) The continuation of an established business known to clients and potential markets;

c) The site is already disturbed and continuation and expansion of the use will not significantly affect the environment on site or the surrounding environment;

d) Because the operation already exists the assessment of environmental problems such as erosion and sediment control, together with solutions to these problems are made somewhat easier;

e) The site can be rehabilitated at the end of the quarry operation and although the land form will certainly be altered from its natural state, the final landform will ultimately blend with the surrounding bushland;

f) The operation can easily be managed to comply with adequate environmental controls.

No specific effort has been made to locate an alternative site for a sandstone quarry, but it is considered likely that most sites would face similar, if not worse environmental situations when compared to the subject site. It is acknowledged that the subject site is upstream from the Broadwater Swamp, which certainly deserves a high level of protection and which is achieved by the proposal. However, this situation is common in the Sydney area with run off from sandstone ridges flowing into the surrounding bushland, much of which is National Park or under some other form of protection. There are relatively few dwellings affected by the subject proposal, especially since approval for blasting is not being sought and traffic from the proposal is not significant on the rural roads which are used. Other sites are likely to be similarly affected.

As discussed above, the quarry proposal and the other similar operations provide sandstone products to meet the demand of the building and landscaping industries. It would be possible for the Government to legislate against the use of such products, but such legislation is not currently contemplated.

The current proposal uses sandstone extraction methods which minimise wastage and environmental damage. Further, the environmental controls such as the sediment basins and rehabilitation work are considered more than adequate. No reasonable alternate conditions of approval are available and it is considered that the suggested method of operation is more than adequate to protect the environment.

6.0 CONCLUSIONS AND KEY FINDINGS

6.1 Benefits of the Proposal

The proposal provides for the extraction and processing of sandstone for use in the construction and landscaping industries. The benefits of the proposal have been outlined throughout this EIS and include the following:-

a) Continuation of employment opportunities for five persons, and up to seven persons, directly, plus additional indirect employment in the construction, landscaping and transport industries.

b) The efficient and economical production of a wide range of sandstone products.

c) Economic inputs to the local and regional economy.

d) Recycling and reprocessing of some demolition stone materials.

e) A mechanism to provide for the orderly management of the extraction and processing operation including the provision of soil and water management.

f) A mechanism to provide for rehabilitation of the site at the cessation of the quarry operation.

Accordingly, the proposed development is considered to have net benefits subject to the imposition of appropriate conditions which have been identified within this EIS.

6.2 Potential Environmental Impacts

Potential environmental impacts originally identified at **Section 1.4 Major Issues** can be summarised as follows:-

a) Soil and Water Management, particularly related to the discharge of silt laden stormwater from the site.

b) Impact on the surrounding bushland and nearby habitat areas, particularly on the Broadwater Swamp Wetland (Wetland No. 128 under REP 20).

c) Truck movements to and from the site.

d) Rehabilitation of the site following completion of extraction.

The assessment undertaken at **Section 4.0** of this report concludes that the proposal will be acceptable having regard to relevant environmental considerations and the imposition of appropriate and ameliorative measures.

6.3 Compilation of Ameliorative Measures

Having regard to the issues addressed and the assessment made within the proceeding sections of this report, the following is a compilation of ameliorative measures determined to be appropriate for the proposal.

General

1. The proposal should operate generally in accordance with the development plans and details contained within this EIS;

2. The quarry operator should prepare a site management plan to ensure that the site is operated in accordance with the recommendations of this EIS and other guidelines and statutes;

3. The health and safety of the operators to be ensured by:-

   (a) Compliance with the relevant Occupational Health & Safety regulations;

   (b) All equipment and machinery to be installed and/or used in accordance with manufacturer's specifications;

   (c) All access areas to be kept clean and clear;

   (d) Unauthorised or untrained personnel are not permitted unsupervised within the facility;

   (e) All staff are provided with suitable protective and safety clothing;

(f) A first aid station is to be established and maintained on the site;

(g) Operators are to be trained and be appropriately licenced to operate the equipment on site;

Air Quality

4. Site access tracks and the cutting saws are to be sprayed with water whenever required to minimise dust;

5. Stockpiles of loose material, where present, are to be kept moist, especially in windy conditions;

6. All truck loads are to be covered when not unloading or loading;

Water Issues

7. The sediment basin in the quarry floor and the settling basin for the fixed circular saw are to be maintained and de-silted as recommended in the Morse McVey Report;

8. Site drainage is to be maintained to ensure that all run off from disturbed areas is directed into the sediment basins;

9. Water is to be discharged from the sediment basins only when it meets the quality specifications outlined by Morse McVey;

10. Water is only to be discharged in a dispersed manner and not as a concentrated stream;

11. As far as practicable, all disturbed areas including the future extension of the quarry are to be replanted to minimise erosion;

12. Overburden material which has been or is to be removed is to be formed into a mound along the lower eastern edge of the quarry and this mound is to be replanted immediately;

13. The sediment basin is to be maintained in the floor of the quarry until the final site rehabilitation has been established.

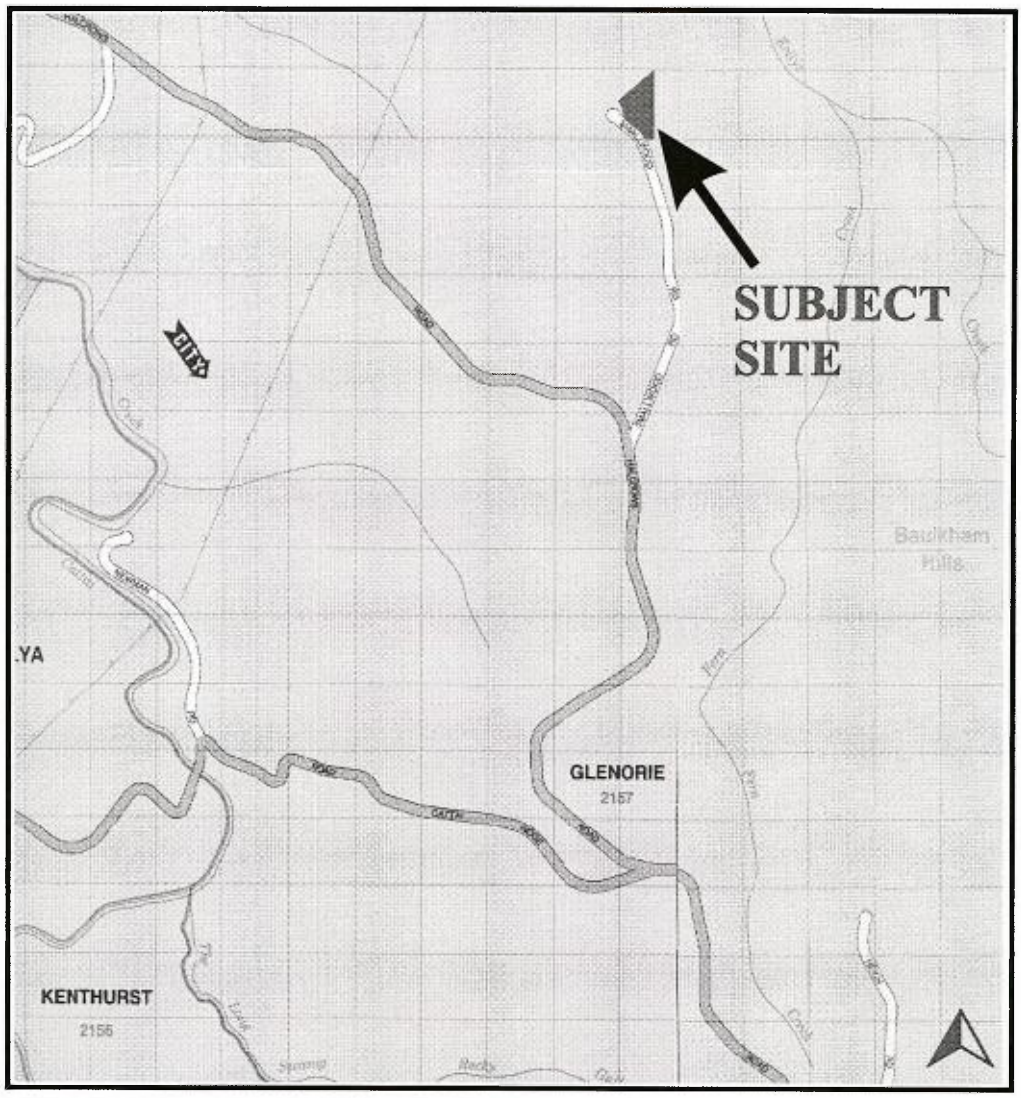
6.4 Conclusion

The proposal provides for the extraction and processing of sandstone from the subject site and thus provides a valuable resource for the construction and landscaping industries. This EIS has considered the range of possible impacts which could result from the continuation of the existing use and has suggested a number of ameliorative measures. The EIS has also considered the benefits of continuing the existing sandstone quarry use.

Having regard to the above, it is considered that the proposal is satisfactory subject to the imposition of appropriate ameliorative measures as recommended and will provide significant benefits to the community without causing significant harm to the environment. Accordingly, the proposal is recommended for approval.

Don Fox Planning
PTY LIMITED

ILLUSTRATIONS



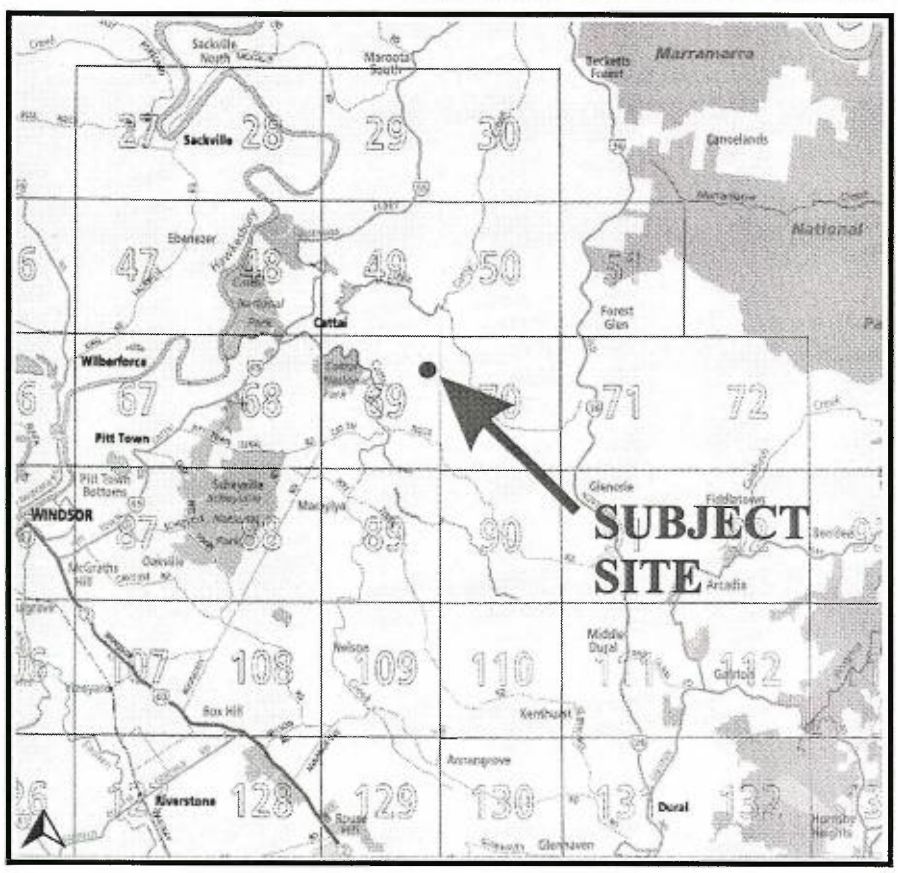
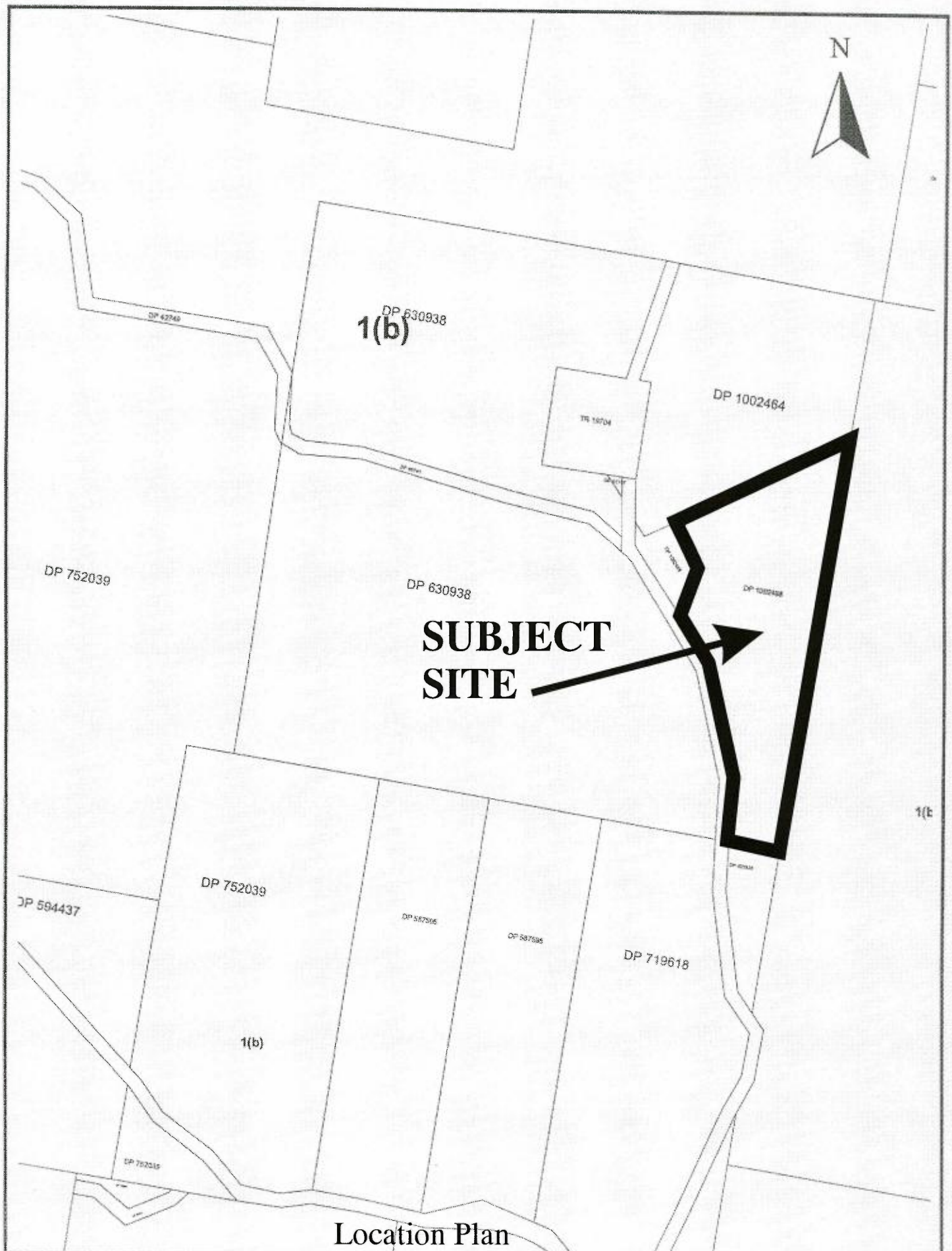


ILLUSTRATION 1.
LOCALITY PLAN
P4311 November 2001
Don Fox Planning



Location Plan

BAULKHAM HILLS SHIRE COUNCIL

ILLUSTRATION 2.

SITE PLAN

P4311 November 2001

Don Fox Planning

NOTE:- DAM COLLECTS WATER RUNOFF FROM SANDSTONE CUTTING OPERATIONS, DESILTS IT AND THE WATER IS THEN PUMPED BACK TO THE SANDSTONE CUTTING AREA.

NOTES:-
1 THE LEVELS AND DETAIL ON THIS PLAN HAVE BEEN DETERMINED BY STADIA METHODS AND ARE WITHIN THE GENERAL ACCEPTED ACCURACY FOR SUCH A SURVEY.
2 THE RELATIONSHIP OF IMPROVEMENTS TO PROPERTY BOUNDARIES IS DIAGRAMMATIC ONLY. THE TRUE POSITIONS ARE SUBJECT TO FINAL SURVEY.
3 DIMENSIONS HAVE BEEN CALCULATED FROM INFORMATION SUPPLIED AND ARE SUBJECT TO FINAL SURVEY.
4 THE SERVICES AND DETAIL SHOWN ON THIS PLAN HAVE BEEN PREPARED FROM A COMBINATION OF FIELD SURVEY AND OFFICE CALCULATION. THE PLAN MAY NOT SHOW THE FULL EXTENT OF ABOVE GROUND STRUCTURES AND SUB SURFACE SERVICES. PRIOR TO ANY EXCAVATION OR CONSTRUCTION IT IS RECOMMENDED THAT THE LOCATION OF STRUCTURES AND SERVICES BE VERIFIED BY FIELD INSPECTION. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN.
5 ALL LEVELS MUST BE REFERRED BACK TO THE BENCHMARK B.M. NAIL IN ROCK R.L. 97.84 (ASSUMED)
6 THE CONTOUR INTERVAL IS 1 METRE.

ILLUSTRATION 3
Topographic Plan

Revision: 26/6/2001 Amend Datum and Additional Contours

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Designed		Scale 1:500	Principal: DON FOX PLANNING PTY LTD
Drawn A.N.C.		Datum APPROX. A.H.D.	Project:
Checked B.A.B.		L.G.A. BAULKHAM HILLS	
Date 4/4/2001		L.G.A. Ref. –	

Drg. No. 28020ET
Sheet No.1 of 1 sheets
Our Ref. 2802

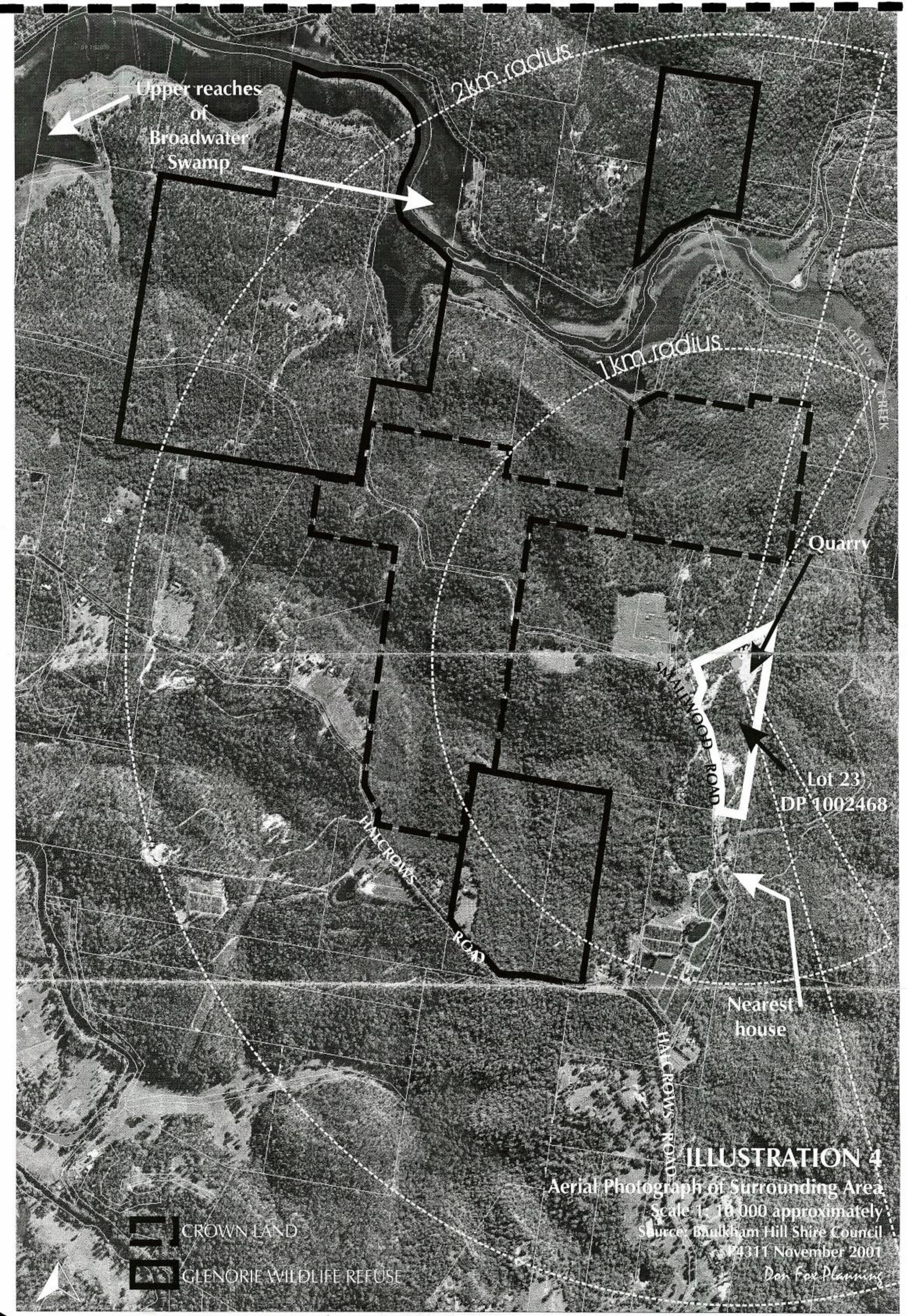

ILLUSTRATION 4

Aerial Photograph of Surrounding Area

Scale 1: 10 000 approximately

Source: Baulkham Hill Shire Council

4311 November 2001

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20
D.P. 1002464

EASEMENT FOR TRANSMISSION LINE (3 WIDE) VIDE D.P. 1002464

22
6218m²
D.P. 1002468

23
9.018ha
D.P. 1002468

10
D.P. 630938

SMALLWOOD ROAD

FIBRO COTTAGE
METAL SHED
METAL SHED
FIBRO COTTAGE
TANK
FIBRO COTTAGE
GARDEN AREA
DAM
SANDSTONE CUTTING AREA
STACKING OF STOCK AND MACHINERY
NATURAL BUSHLAND
NATURAL BUSHLAND
NATURAL BUSHLAND
EXCAVATION AREA
SILT DISPOSAL
SILT FENCE
SANDSTONE EXTRACTION AREA
1:50 POINT
BENCHMARK NAIL IN ROCK R.L. 106.34 (APPROX. A.H.D.)
BLOCK WALL
ROCK LEDGE
ROCK EDGE
TOP
BOTTOM
CENTRE
NATURAL GULLY

Access to Quarry
Grade = 1:6

Bench at RL 85.0 approx

Line of North South Section

Line of East West Section

Proposed Quarry Floor at RL 70.0 approx

Proposed Quarry Face

Drainage outlet

Existing small dam
Approximate location only from survey by Peter McCartney

Proposed dam relocation

Proposed open sided shed over work area

Extent of Site

Lot 23 DP 1002468

147° 07' 00" 170.21

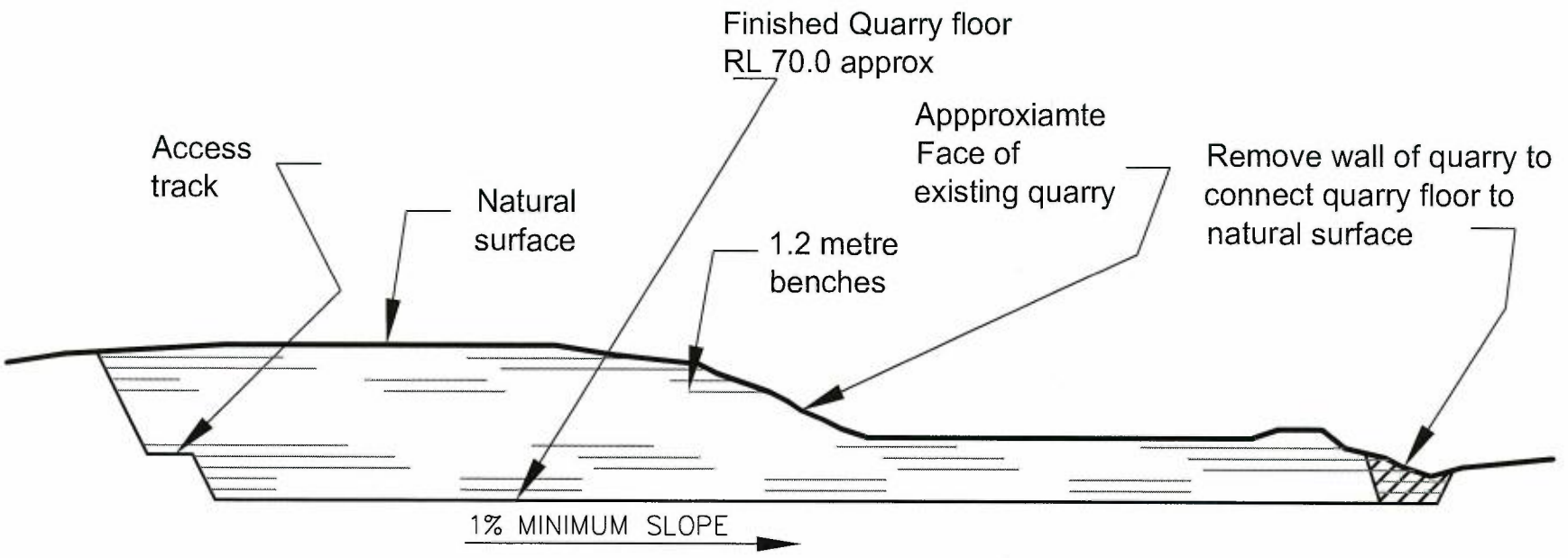
Hatched area indicates approximate extent of existing quarry

ILLUSTRATION 5
Proposed Quarry Extensions

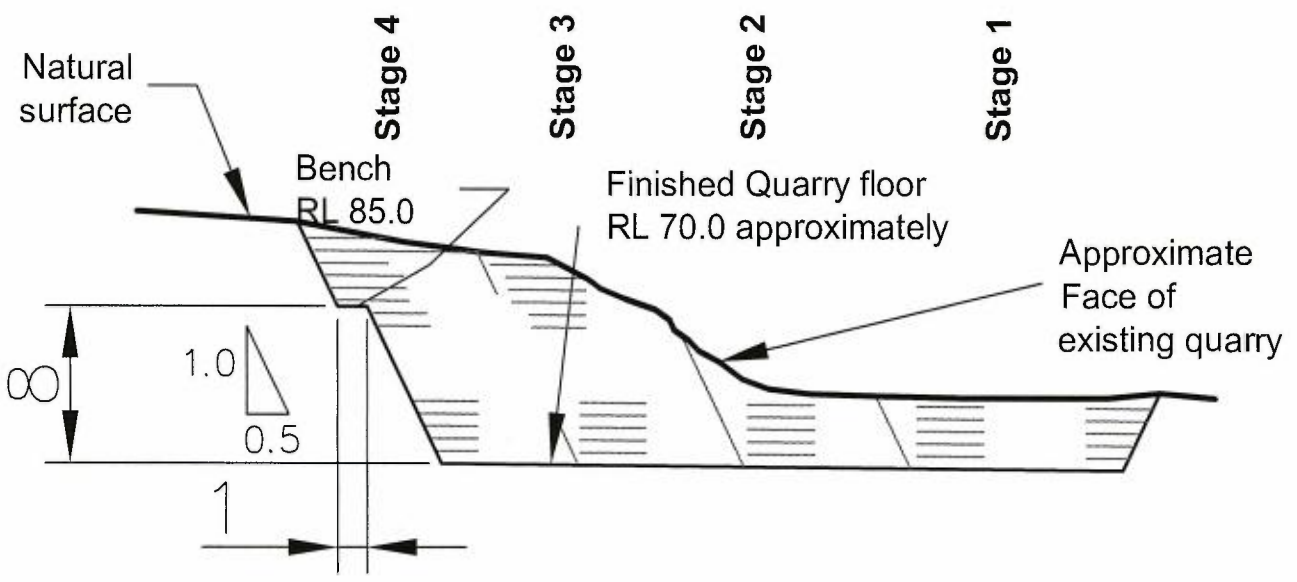
Don Fox Planning Pty Ltd

Positive Earthmoving

File name	Date	Scale	Revision
Roger\Petith\EIS\4311	Nov.2001	1/1000 (A3)	



NORTH SOUTH SECTION



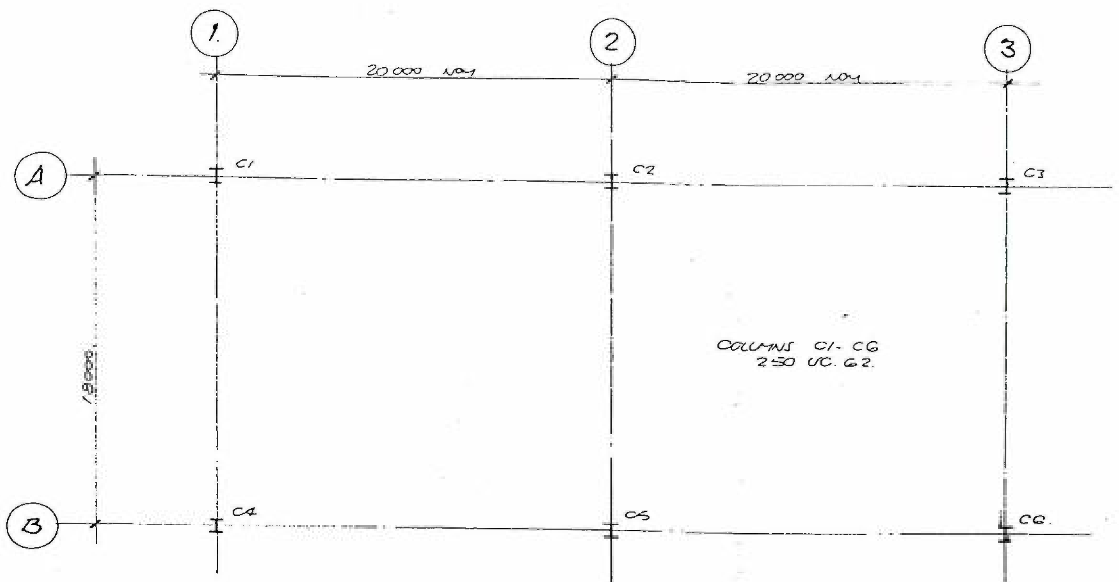
EAST WEST SECTION

Petith Quarry
Positive Earthmoving

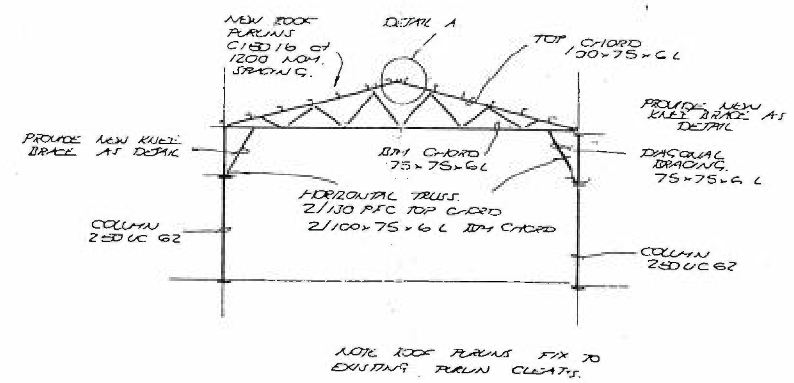
ILLUSTRATION 6
Quarry Cross Sections

Don Fox Planning Pty Ltd

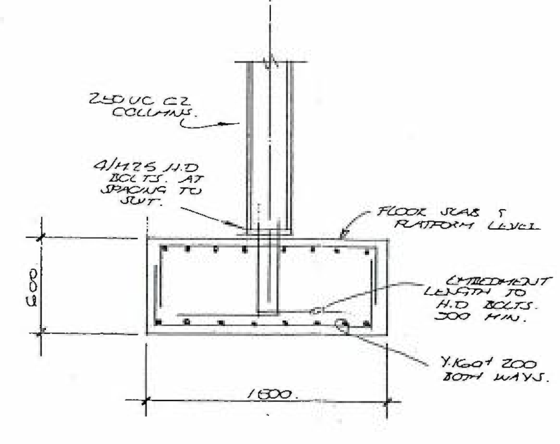
File name	Date	Scale	Revision
4311 petith\acad\x sec.dwg	Nov. 01	NTS	



COLUMN SET OUT PLAN

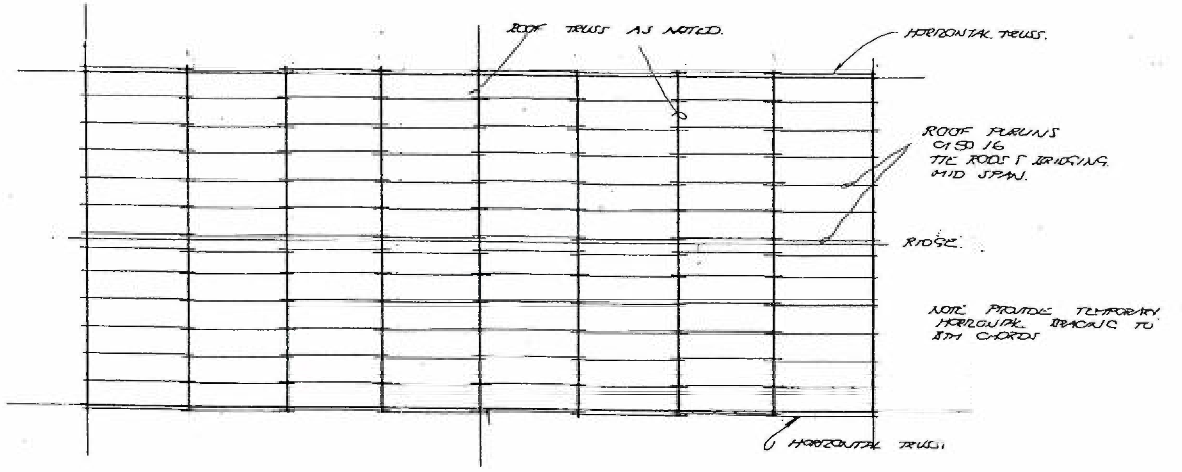


TYPICAL SECTION.

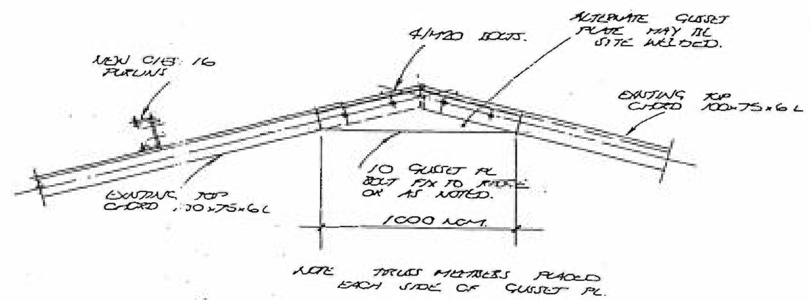


FOOTING PAD GRID A.

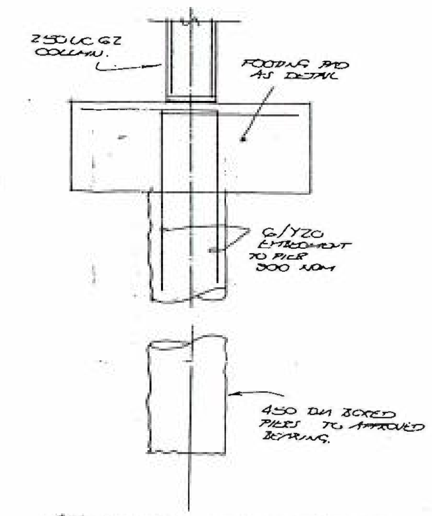
1. BOLTS PLATE TO SUIT EXISTING BASE PLATES TO 250UC62.
2. FOOTING PADS TO APPROVED BEARING.



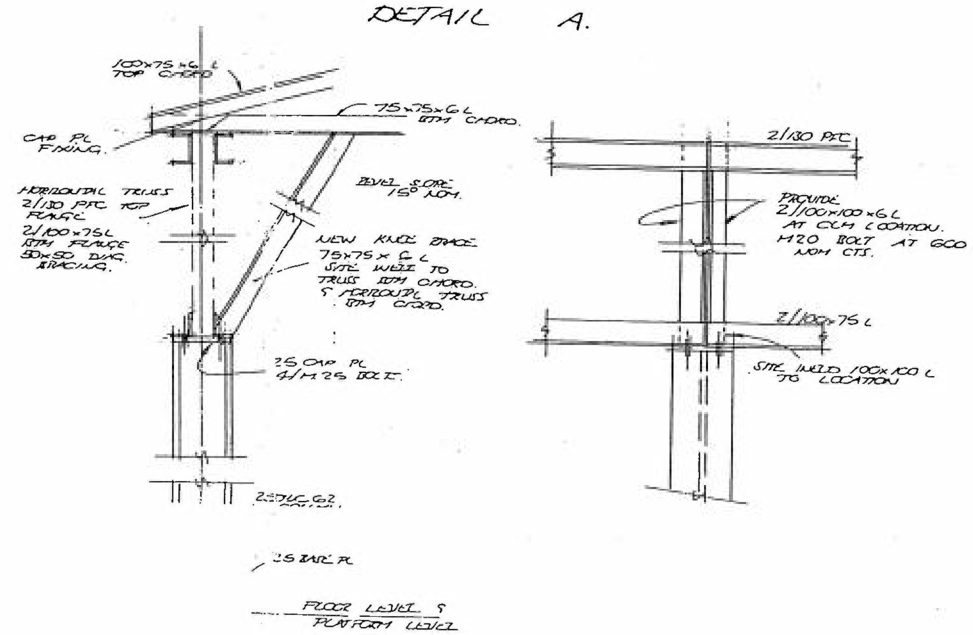
ROOF PLAN.

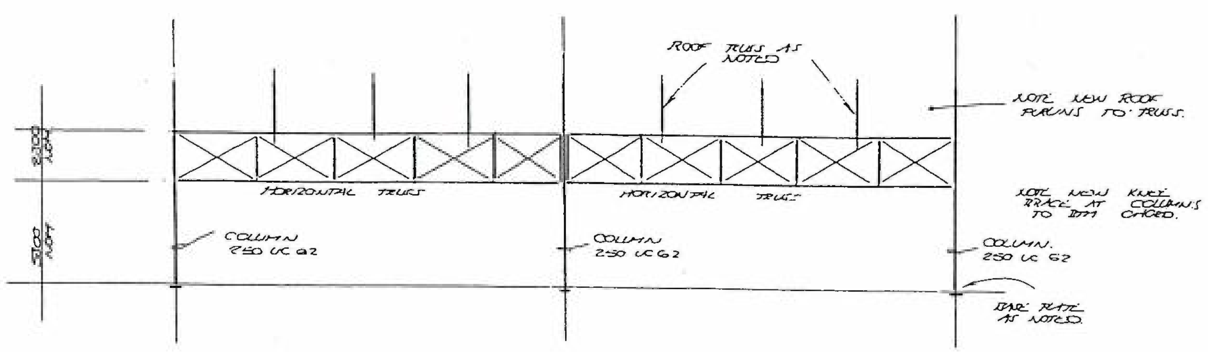


DETAIL A.



FOOTING PAD GRID B.





WALL ELEVATION.

CONCRETE

C1 —ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 1480 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

C2 —CONCRETE QUALITY:

Element	Slump	Max. size Aggregate	Cement Type	Concrete Grade
ALL	80	20	A	25MPa

NO ADMIXTURES SHALL BE USED WITHOUT THE APPROVAL OF THE ENGINEER.

C3 —CLEAR CONCRETE COVER TO REINFORCEMENT SHALL BE AS FOLLOWS UNLESS OTHERWISE SHOWN:—

Element	Condition 1 Not to be exposed to weather, ground water or fresh water	Condition 2 To be exposed to weather, ground water or fresh water	Condition 3 Cast against other formwork or the ground
Pad footings & pile caps	—	65	75
Strip footings	—	50	65
Bored or cast piers	—	50	75
Columns	40	[illegible]	[illegible]
Walls, incl. retaining walls	20	30	65
Beams	25	[illegible]	65
Slabs, incl. joist & hollow block construction	20	30	65
Reinforcement adjacent to hollow blocks integral with structure	5	—	—

Note: 1. Slabs and Beams poured over a membrane on ground are included as Condition 2.
2. Slabs exposed to corrosive vapours, corrosive ground water, sea water or spray are to have reinforcement cover as noted on the drawings.
3. Cover in Slabs and Beams may have to be increased to comply with requirements of fire rating.

C4 —SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.

C5 —CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE LOCATED TO THE APPROVAL OF THE ENGINEER.

C6 —BEAM DEPTHS ARE WRITTEN FIRST AND INCLUDE SLAB THICKNESS, IF ANY.

C7 —NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.

C8 —REINFORCEMENT IS REPRESENTED DIAGRAMATICALLY. IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.

C9 —SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN. THE WRITTEN APPROVAL OF THE ENGINEER SHALL BE OBTAINED FOR ANY OTHER SPLICES. WHERE THE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT.

C10—WELDING OF REINFORCEMENT WILL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.

C11—PIPES OR CONDUITS SHALL NOT BE PLACED WITHIN THE CONCRETE COVER TO REINFORCEMENT WITHOUT THE APPROVAL OF THE ENGINEER. THE CONCRETE COVER TO EMBEDDED PIPES OR CONDUITS SHALL BE A MINIMUM OF 20MM.

C12—REINFORCEMENT SYMBOLS:—

- S—DENOTES GRADE 230S HOT ROLLED DEFORMED BARS TO AS 1302.
- C—DENOTES GRADE 410C COLD WORKED DEFORMED BAR TO AS 1302.
- R—DENOTES GRADE 230R HOT ROLLED PLAIN BARS TO AS 1302.
- F—DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS 1304.
- W—DENOTES HARD-DRAWN PLAIN WIRE TO AS 1303.

NOTE: ALL BAR REINFORCEMENT SHALL BE TEMPCORE UNLESS APPROVED OTHERWISE.

C13—ALL REINFORCEMENT FABRIC SHALL COMPLY WITH AS 1303 AND AS 1304 AND SHALL BE SUPPLIED AS FLAT SHEETS.

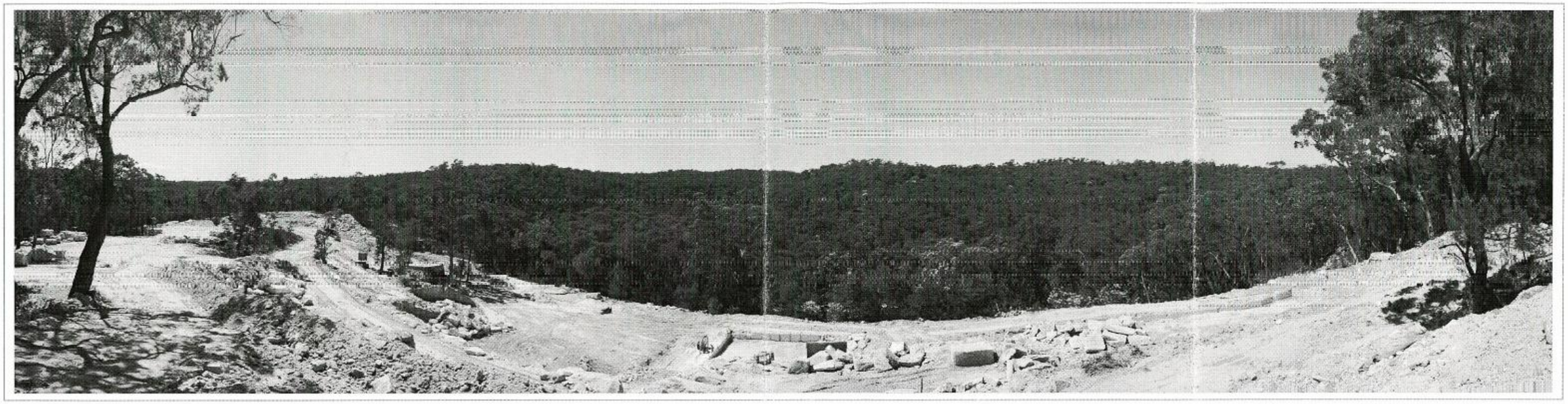
C14—ALL THE REQUIREMENTS OF THE ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE.

ILLUSTRATION 7. PROPOSED MACHINERY SHED

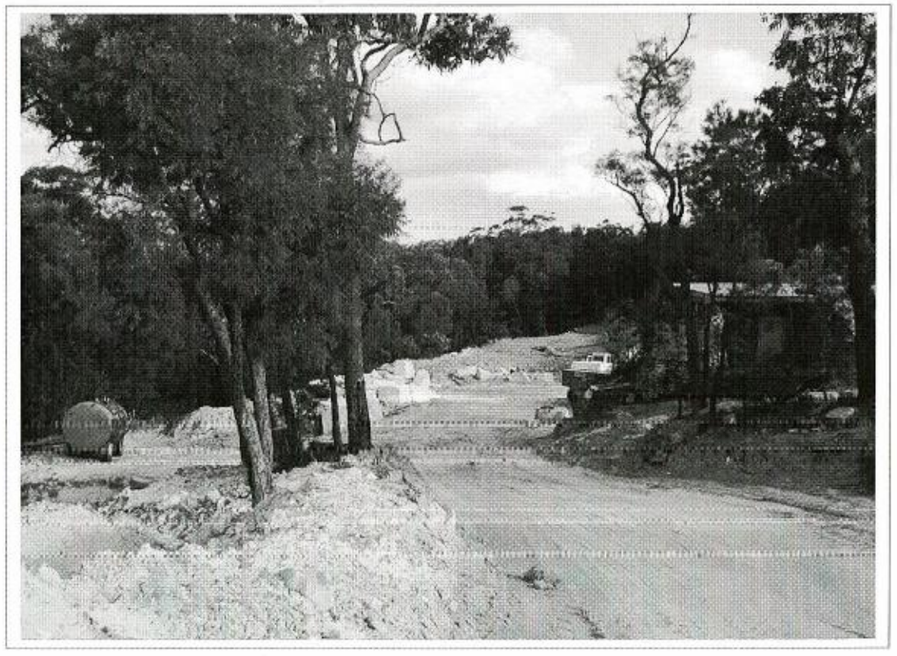
P4311 November 2001

GREG TIMEWELL & ASSOCIATES ACN 002 490 966
Engineering Design & Project Management
5 Tania Close
Hornsby Heights NSW 2077
Telephone: (02) 9476 6485

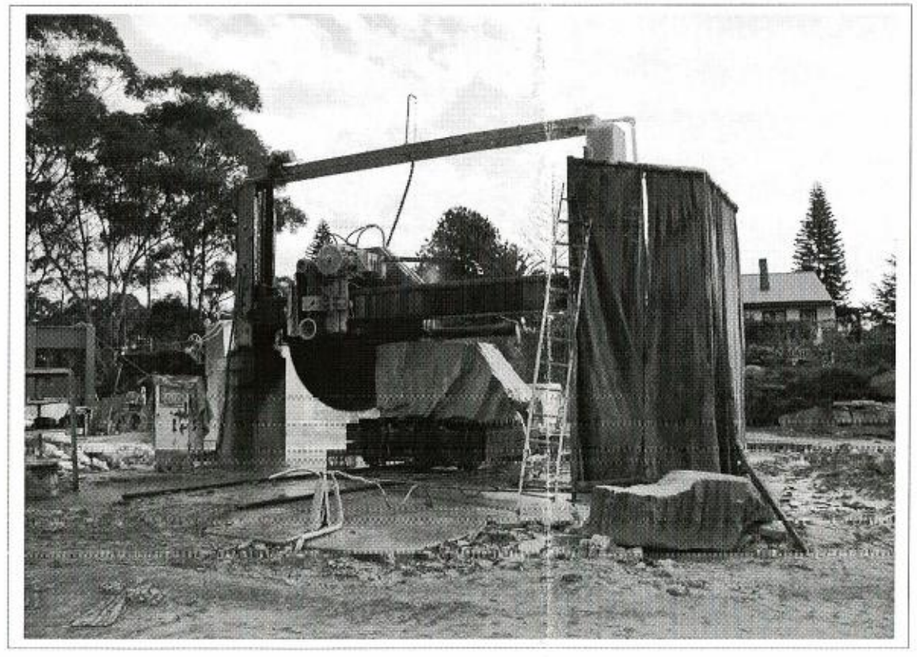
DESIGNED	G.T.	PROPOSED DEVELOPMENT 172 SMALLWOOD RD GLENORIE MR M. ~~FERRIS~~ Petith
DRAWN		
CHECKED		
APPROVED	[signature]	1 NOV 99
RELOCATED SHED DETAILS	DRAWING NO.	REV'N.



PHOTOGRAPH 1 Panorama overlooking Quarry to the east



PHOTOGRAPH 2 Typical access track



PHOTOGRAPH 3 Large fixed circular saw

ILLUSTRATION 8.
SITE PHOTOGRAPHS
P4311 November 2001
Don Fox Planning

Don Fox Planning
PTY LIMITED

APPENDIX A

For Office Use Only

DA NO: .....

CC NO: .....

FEES: .....

DATE: .....

RECEIPT NO:.....

BAULKHAM HILLS SHIRE COUNCIL

DEVELOPMENT CONSENT, CONSTRUCTION CERTIFICATE and/or OTHER APPROVAL

MADE UNDER THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

For assistance in completing this form please contact Council on 9843 0555

(Please read the statement concerning privacy on the back of this form)

Details must be printed in block letters with black ink. *Please tick in appropriate boxes below.*

TYPE OF CONSENT, CERTIFICATE OR APPROVAL (NOTES ON REVERSE)

- ☑ **Development Consent** (see note 1)
- ☐ **Building Construction Certificate** (see notes 2 & 9)
- ☐ **Engineering Construction Certificate** (see note 3)
- ☐ **Complying Development Certificate**
- ☐ **Integrated Development Consent** (see note 4)
- ☐ **Occupation Certificate** (see note 5)
- ☐ **Subdivision Certificate** (see note 6)
- ☐ **Appoint Council as Certifying Authority** (see note 7)
- ☐ **Other Approval** *(As under s68 Local Government Act 1993)* (see note 8):

PROPERTY DESCRIPTION

ADDRESS	SUBURB	LOT	DP or SP
QUARRY VIEW SMALLWOOD RD	GLENORIE	23	DP 1002668

APPLICANT'S DETAILS

Name	POSITIVE EARTHMOVING		
Address	QUARRY VIEW SMALLWOOD RD		
Suburb	GLENORIE	*P'code* 2157	
Phone	9652 0589	*Fax*	
Signature			

BUILDER'S DETAILS

Name			
Address			
Suburb		*P'code*	
Phone		*Fax*	
Signature		*Licence No*	

OWNER/S DETAILS

Name/s	D AND C PETTH				
Address	172 SMALLWOOD RD				
Suburb	GLENORIE		*Postcode* 2157		
Phone	9652 1783	*Fax* 9652 2669		*Mobile*	
Signatures of ALL owners	D.B. Petth C. Petth			*Date*	8/11/01

I/We own the subject land and consent to Council Officers entering the premises for the purpose of carrying out inspections in conjunction with this application, without first giving written notice

NOTE: If the owner is a Company or Owners Corporation, its Common Seal must be stamped over the signature/s, otherwise the Managing Director must sign and clearly indicate the A.C.N.

DESCRIPTION OF PROPOSAL

CONTINUATION OF USE FOR EXISTING SANDSTONE QUARRY

Cost of Development: $ 1CL9,000

FOR SUBDIVISION ONLY*

Number of Additional Lots:-

Total Number of Lots Created:-

Lot Numbers:- *From:* *To:*

Creation of New Road? *YES* *NO*

For further information ask staff for Subdivision Fact Sheet

NOTES

1.	**Development Consent:** A development consent is required under the provisions of the Environmental Planning & Assessment Act 1979 (EPAA) for building, work, use, subdivision or demolition. This is also known as a Development Application or DA.
2.	**Building Construction Certificate:** A Building Construction Certificate referred to in s109C(1)(b) of the EPAA certifies that a building erected in accordance with nominated plans and specifications will comply with the regulations referred to in s81A(5) of the EPAA. (eg. Building Code of Australia, Australian Standards, Conditions of Development Consent).
3.	**Engineering Construction Certificate:** An engineering construction certificate referred to in s109C(1)(b) of the EPAA certifies that engineering work carried out in accordance with the nominated plans and specification will comply with the regulations referred to in s81A(5) of the EPAA. (eg. Current "BHSC's Design Guidelines" and "BHSC's Works Specification".
4.	**Integrated Development Consent:** Integrated Development Consent relates to development where consent is required from Council and from one or more other approval bodies referred to in s91 of the EPAA. Applicants should indicate below other approvals required to be obtained. (Please tick required approval authority).

Fisheries Management Act 1994	Section 144	Section 201	Section 205					
Heritage Act 1977	Section 58							
National Parks and Wildlife Act 1974	Section 90							
Protection of the Environment & Operations Act 1997								
Rivers and Foreshores Improvement Act 1948	Part 3A							
Roads Act 1993	Section 138							
Waste Minimisation & Management Act 1995	Section 44							
Water Act 1912	s10	s13A	s18F	s20B	s20CA	s20L	s116	Part 8

5.	**Occupation Certificate:** A certificate referred to in s109C(1)(c) of the EPAA authorises the occupation and use of a new building or a change of use for an existing building. This is not an interim occupation certificate, this requires a separate application form.
6.	**Subdivision Certificate**: A certificate referred to in s109C(1)(d) of the EPAA authorises the registration of a plan of subdivision under Division 3 of Part 23 of the Conveyancing Act 1919.
7.	**Principal Certifying Authority:** The principal certifying authority (PCA) appointed under S109E of the EPAA. The EPAA requires that a person who proposes to carry out development (the applicant) involving building work or subdivision work, subsequent to development consent, must appoint a PCA prior to commencement of that work. The applicant may appoint Council (for building or subdivision work) or an accredited private certifier (for building work only) as the PCA. The role of the PCA and the conditions/terms that would apply if Council is appointed as the PCA are explained in a separate fact sheet. The applicant is required to appoint a PCA and, where the PCA is not Council, notify Council of that appointment at least 2 days before work commences. **NB: Should the applicant wish to appoint Council as the PCA at the initial application stage, please tick the appropriate box on the front of this form.**
8.	**Other Approval:** Other approval previously obtainable only under the provisions of s68 of the Local Government Act 1993 (LGA) (eg. install a manufactured home, storm-water drainage, install a sewage management system, [septic tank], certain activities in public places, operate a caravan park, operate amusement devices, operate a mortuary). Any such approval not sought as part of this application requires a separate application under the LGA.
9.	**Schedule to Construction Certificate Application** *(please fill in details below if lodging a Construction Certificate)* **(A)** Total Area of the Land (sq. metres)..... **(B)** Gross Floor Area of the Proposed Addition or New Building (sq. metres)..... **(C)** Material/s of Walls..... Material/s of Floor..... Material/s of Roof..... Material/s of Frame..... ** Builder's Email Address:.....

PRIVACY NOTIFICATION FORM - GENERAL

The personal information that Council has collected or is collecting from you is personal information for the purposes of the Privacy and Personal Information Protection Act 1998. The intended recipients of the personal information are:

- **officers within the Council;**
- **data service providers engaged by the Council from time to time;**
- **any other agent/contractor of the Council; and**
- **other Statutory Authorities.**

The supply of the information by you is not voluntary. If you cannot provide or do not wish to provide the information sought, the Council may be limited in dealing with your request etc. Council has collected this personal information from you in order to process your request/application etc. You may make application for access or amendment to information held by Council. You may also make a request that Council suppress your personal information from a public register. Council will consider any such application in accordance with the PPIPA.

Council is to be regarded as the agency that holds the information.
Enquiries concerning this matter can be addressed on 9843 0120 to the Privacy Officer.

APPENDIX B

12 JAN 2001

Department of
Urban Affairs and Planning

Mr Robert Player,
Don Fox Planning Pty Ltd,
P.O. Box 230,
PENNANT HILLS NSW 1715

Development and Infrastructure
Assessment
Level 22, 1 Farrer Place
Sydney NSW 2000
PO Box 3927,
SYDNEY NSW 2001

Telephone: 02 93912384
Facsimile: 02 93912151
Email: valerie.smith@duap.nsw.gov.au

Contact: Val Smith
Our reference: P00/00459

Dear Mr Player,

Proposed Extension of Sandstone Quarry, 172 Smallwood Road, Glenorie
Lot 11 DP630938 and Lot 23 DP 1002468

Thank you for your Form A and attachments dated 2 November 2000 seeking the Director-General's requirements for the preparation of an Environmental Impact Statement for the above development.

Under Clause 73(1) of the Environmental Planning and Assessment Regulation 1994 (the Regulation), the Director-General requires the EIS to specifically address the following key issues listed below. You should note however, that if the Development Application to which these requirements relate is not made within two years of the date of this letter, Clause 73(b) of the Regulation requires you to consult further with the Director-General prior to lodging the application.

Specific Issues

- impacts of the proposal on surface and groundwater resources, and proposed water management proposals;
- impact on soils and erosion controls;
- noise and dust impacts and proposed mitigation measures;
- impact of product haulage on the local and regional road system;
- bushfire hazard and proposed mitigation measures,
- impacts on adjoining land uses;
- visual impacts;
- rehabilitation measures;
- consideration of the objectives and provisions of the relevant environmental planning instruments including Baulkham Hills Local Environmental Plan 1991, Baulkham Hills Development Control Plan No 500, State Environmental Planning Policy (SEPP) 11(Traffic Generating Developments) and SEPP 20 (Hawkesbury-Nepean River), in particular Part 2-General Planning considerations.
- potential impact of the proposal on Broadwater Swamp Wetland (Wetland No 128 under REP 20);
- impact on flora and fauna, particularly 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, or 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)

Attachment No 1 outlines the statutory matters that must be included in any EIS under Clauses 71 and 72 of the Regulations.

The Department's EIS guideline '*Extractive Industry-Quarries*' should also be consulted in the preparation of the EIS. The Guideline is available for purchase from the Department's Information Centre, 1 Farrer Place, Sydney or by calling (02) 9391 2222.

Development Applications 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 for the proposal. You have not identified any approvals that you may need if you are granted development consent. If 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. Although not indicated on your Form A, it is considered that the Environment Protection Authority may be an approval bodies for this proposal and should be consulted on this matter.

When lodging your Development Application, you must lodge at least one copy of the Development Application and supporting documentation (including a fee of $275 GST inclusive) with each of the agencies from whom you need an integrated approval.

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, in particular the Department of Land and Water Conservation (DLWC), National Parks and Wildlife Service (NPWS), Environment Protection Authority (EPA), Department of Mineral Resources (DMR), Hawkesbury-Nepean Catchment Management Trust (HNCMT), State Forests, and Roads and Traffic Authority (RTA).

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 may also be required for certain actions on Commonwealth land. 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.

Please contact Val Smith on (02) 9391 2384 if you require any further information regarding the Director-General's requirements for the EIS.

Yours faithfully,

Gordon Kirkby 10/1/01

Gordon Kirkby
A/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 exhibited 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.

– ✧ –

Don Fox Planning
PTY LIMITED

APPENDIX C

Our Ref: ERM010537
Your Ref: 4311.9.RG.NS

9 October 2001

LAND & WATER CONSERVATION

Don Fox Planning
PO Box 230
PENNANT HILLS NSW 1715

Attention: Roger Gain

Dear Sir,

Re: Proposed extension to Sandstone Quarry,
172 Smallwood Road, Glenorie

Thank you for your letter dated 2 July 2001, we apologise for the length of time to reply.

Groundwater matters are dealt with in section 4.2.2 of the main EIS, and in section 3.2 of the supporting Soil, Water and Rehabilitation Strategies prepared by Morse McVey & Associates P/L. From the information and assessment presented it appears unlikely that the proposed cut sandstone operation for this development will intersect the regional groundwater table associated with the underlying sandstone aquifer. Accordingly, the Department does not raise any concerns with the proposal as present in the EIS. However if any amended or future proposal is presented that results in a proposal for deeper quarrying, the department will require that any proposal will be greater than 2 metres higher than the highest groundwater level in the location.

In relation to the removal of a small dam and the construction of a similar size dam, this will only need to be an integrated development for this department, if the new dam has a capacity of 1000 cubic metres or more.

It is noted that the final use of the site is to return it to native vegetation. The department supports this final landuse. The department wishes to state that alternative future landuses, such as using the site as a fill location, would not be supported

I trust the above comments are useful. Could you please direct any questions or correspondence to Greg Brady, Environmental Review Co-ordinator, phone contact (02) 9895 7441.

Yours sincerely,

12 OCT 2001

For Marwan El-Chamy
Manager Resource Access
Sydney/South Coast Region

Department of Land and Water Conservation Sydney / South Coast Region
Sydney Metropolitan Office Level 9, 2-10 Wentworth Street Parramatta 2150 P.O. Box 3935 Parramatta 2124
Telephone: (02) 9895 7503 Facsimile: (02) 9895 7255

Your reference
Our reference MJB: 52650

29 August 2001

The Manager
Don Fox Planning Pty Ltd
PO Box 230
PENNANT HILLS NSW 2120

STATE FORESTS

State Forests of
New South Wales
Cumberland State Forest
Locked Bag 23
Pennant Hills NSW 2120
Phone 1300 655 687
or (02) 9871 3377
Fax (02) 9872 6447

Dear Sir/Madam,

Re: Continuation of use of existing Sandstone Quarry Lot 23, DP 1002468, Smallwood Road, Glenorie.

I refer to your letter of 14 August 2001 in relation to the above matter.

We confirm that the former Maroota State Forest No. 978 was revoked on 16 July 1976. State Forests of NSW have no interest in any other land in the vicinity of this quarry and therefore has no comment on this proposal.

Yours sincerely,

Michael Berry
MANAGER
CUMBERLAND STATE FOREST

3 SEP 2001

Our Reference : SRF4318 SR269

16 JUL 2001

NSW EPA

Sydney Region

Mr R. Gain
Don Fox Planning P/L
PO Box 230
PENNANT HILLS NSW 1715

Dear Mr Gain

DRAFT ENIVIRONMENTAL IMPACT STATEMENT (EIS)
CONTINUATION OF USE OF EXISTING SANDSTONE QUARRY, GLENORIE

I refer to your letter dated 2 July 2001 requesting comments from the Environment Protection Authority (EPA) on the above draft EIS.

Under the Protection of the Environment Operations (POEO) Act 1997, a licence is not required for an extractive industry that obtains, processes or stores for sale or re-use an intended quantity of less than 30 000 cubic metres per year of extractive material (Schedule 1 – Schedule of EPA-licensed activities). It appears that the proposed activity will not require a licence under the Act as the quarry will only be extracting 6050 cubic metres per year. In this case, Baulkham Hills Shire Council will be the appropriate regulatory authority for the activity under the POEO Act. The EPA will therefore not be providing comments on the draft EIS.

If you wish to discuss the contents of this letter please contact Audrey Yim on (02) 9995 6833.

Yours sincerely

pp TIM GILBERT
Principal Officer Sydney Industry

Environment Protection Authority
PO Box 668 Parramatta NSW 2124 Australia
Level 7 79 George Street Parramatta NSW 2150
Telephone 61 2 9995 5000
Facsimile 61 2 9995 6900
ABN 43 692 285 758
www.epa.nsw.gov.au

MINERAL RESOURCES NEW SOUTH WALES

NSW DEPARTMENT OF MINERAL RESOURCES
Minerals and Energy House, 29-57 Christie Street
St Leonards, NSW 2065, Australia
P.O. Box 536 St Leonards 1590
Phone (02) 9901 8888 · Fax (02) 9901 8777
DX 3324 St Leonards · www.minerals.nsw.gov.au

Mr R Gain
Don Fox Planning Pty Ltd
PO Box 230
PENNANT HILLS NSW 1715

Our reference:L00/0057
Your reference:4311.11.RG:NS

Dear Sir

PROPOSED EXTENSION OF SANDSTONE QUARRY, 172 SMALLWOOD ROAD, GLENORIE

I refer to your letter of 2 July 2001 concerning the above proposal.

The draft Environmental Impact Statement generally addresses issues of relevance to this Department satisfactorily. However some of the plans are not included in the copy sent to the Department and the two plans which were included are not labelled. It is also difficult to relate the two plans included in the draft to each other. The plan numbered 2802 which is presumed to correspond to Plan No 4 in the list of illustrations in the Table of Contents does not clearly indicate the relationship between the existing quarry and the proposed extension. The existing quarry and proposed extension need to be clearly identified.

The basis on which the size and quality of the available resources have been determined is not specified. It is unclear whether these estimates are based on drilling results or on extrapolation from the existing quarry. It is also not clear what proportion of the sandstone is expected to be extracted in the form of sawn blocks. A geological cross section would help to clarify the characteristics and distribution of the various types of sandstone present.

The Department has no objections in principle to the proposed extension. If you have any further queries concerning this matter, please contact Mr I Paterson on (02) 9901 8368.

Yours faithfully,

S R Lishmund
for Director-General
25/7/01

27 JUL 2001

NSW NATIONAL PARKS AND WILDLIFE SERVICE

Mr Roger Gain
Don Fox Planning
PO Box 230
PENNANT HILLS NSW 1715

Contact: Elise Stocker
Ph. 9585 6575

Dear Roger

RE: PROPOSED EXTENSION OF SANDSTONE QUARRY
172 Smallwood Road, Glenorie

Thank you for your letter received 10 July 2001 in which you consulted with the National Parks and Wildlife Service (NPWS) on the above proposal.

The NPWS understands that the proposal involves the removal of appropriately 600 tonnes of crushed sandstone per year over the next 10 to 20 years. Associated activities include the relocation of a small farm dam at Smallwood Road and landscaping and rehabilitation works.

Correspondence to the Baulkham Hills Shire Council, dated 10 May 2000, raised issues of NPWS concern with regard to the previous proposal. The NPWS understands that the proposal has not been significantly altered and therefore reiterates concerns raised (see attached).

In addition, the NPWS considers that insufficient information has been provided with regards to the proposed relocation of the farm dam. It is advised that the EIS should contain further detail on the proposed relocation, the justification for the relocation and the flora and fauna impacts, particularly with regard to the Red Crowned Toadlet.

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,

7.08.01

Lou Ewins
Manager, Conservation Planning Unit
CONSERVATION PROGRAMS AND PLANNING DIVISION
CENTRAL DIRECTORATE

Conservation Programs
& Planning Division
Level 6
43 Bridge Street
PO Box 1967
Hurstville NSW
2220 Australia
Tel: (02) 9585 6678
Fax: (02) 9585 6442
www.npws.nsw.gov.au

Copy

Ron Zwicker
Town Planning Co-ordinator
Baulkham Hills Shire Council
PO Box 75
CASTLE HILL NSW 1765

Your Reference: DA 3101/00

Dear Mr. Zwicker,

RE: Proposed Continuation of Sandstone Quarry, Lot 11 DP 630938 & Lot 23 DP 1002498, Smallwood Rd, off Halcrows Rd, Glenorie

I refer to the meeting held on 27 April 2000 to inspect the site of the above development proposal and discuss submissions received from agencies, including the National Parks and Wildlife Service (NPWS).

The site inspection indicated that the area has been extensively disturbed and has been in active use as a sandstone quarry for the last twenty to thirty years. Only a small site (approximately 20 by 20 metres) within the area that is proposed for future quarrying contains remnant vegetation (scattered trees). Even this area has been subject to disturbance, including its current use as one of a number of cut sandstone storage areas that exist across the site.

Based on the site inspection the NPWS considers that there are unlikely to be any Aboriginal heritage or threatened species issues within the boundary of the quarry area that would pose a constraint to future quarrying activities. As indicated at the site meeting, it was not possible to provide advice to this effect based on a review of the assessment material previously forwarded to the NPWS. The NPWS now considers that the on-site inspection has clarified the range of matters included in the earlier NPWS submission.

However, the NPWS would also like to re-iterate comments made at the site meeting regarding the need to adequately address potential edge and off-site impacts that may occur from continued quarrying. In particular, Council should ensure that the applicant provides clear details of measures that will be employed to address: the management of soil and water movement from the site (especially considering the downstream location of Broadwater Swamp); buffers to adjoining bushland; methods for monitoring the effectiveness of controls; and likely rehabilitation measures once the quarry operations have ceased.

The previous NPWS submission also noted that mitigation and amelioration measures were not adequately detailed or were not cross-referenced between different components of the assessment documentation (eg. the flora and fauna report and Soil, Water and Rehabilitation Strategy). The NPWS would therefore recommend that all proposed mitigation and control measures be consolidated in a single document to enable Council to assess the adequacy of these.

In relation to rehabilitation plans, the NPWS understands that it may not be possible for precise, detailed plans to be provided at this stage given that extraction will revolve around various parts of the site depending on the demand for different sandstone products at different times. Nevertheless, the applicant should be able to commit to some general rehabilitation principles (such as types and quality of any soil to be imported, use of indigenous plant species, etc) and a broad time-frame.

I trust the above comments will assist Council in its assessment of the development application. If you have any general queries regarding this matter please call me on (02) 9585 6921.

Yours sincerely

Ray Fowke
Conservation Planning Officer
Conservation Programs and Planning
Central Directorate

Your Reference:	*4311.frmRG/LR*
Our Reference:	*RDC00/1396*
Contact:	*Allen Chan*
Telephone:	*(02) 9831 0012*
Facsimile:	*(02) 9831 0107*

12 SEP 2001

RTA

www.rta.nsw.gov.au
Roads and Traffic Authority
ABN 64 480 155 255
Sydney Client Services
State Network Services
81 Flushcombe Road
Blacktown NSW 2148
Telephone (02) 9831 0931
Facsimile (02) 9831 0932
PO Box 558
Blacktown NSW 2148
DX 8120 Blacktown

7th September, 2001

Director
Don Fox Planning Pty Ltd
DX 4721
Pennant Hills

Attention: Mr Roger Gain

Dear Sir,

Proposed Continuation of Use of Existing Sandstone Quarry, Lot 23, DP 1002468, Smallwood Road, Glenorie.

I refer to your letter dated 14th August 2001 (Reference 4311.frmRG/LR) relating to the subject development application.

The RTA's previous comments on the development are still current. The developer is to take note of the following into consideration:

1. Council will need to be satisfied that Halcrows Road and Smallwood Road is suitable for heavy vehicle usage. Smallwood Raod is currently narrow and unsealed and would be difficult for 2-way truck flow at any one time. Should any increase in heavy vehicle movements be anticipated, then Smallwood Road would need to be upgraded to Council's satisfaction.

2. Width of driveway entrance off Smallwood Road to Council's satisfaction.

3. All trucks using the site should be able to enter and leave in forward direction.

4. All roadworks/ traffic facility works associated with the development is to be at no cost to the RTA.

Please address all further inquiries regarding this application to the Development Assessment Unit, RTA Transport Planning, PO Box 558, Blacktown, NSW, 2148 or phone (02) 9831 0012.

Yours sincerely,

Hadi Kazemi
Development Assessment Manager
Sydney Client Services

APPENDIX D

17 July 2000

C Petith
172 Smallwood Road
GLENORIE NSW 2157

Our Ref: 3101/00

Dear Sir/Madam

CONCILIATON CONFERENCE NOTES

Proposal: Continuation of Existing Sandstone Quarry
Property: Smallwood Road off Halcrows Road, Glenorie

I refer to the abovementioned conciliation conference held at Council on 31 May 2000 and attach for your information the notes taken at this meeting.

Should you have any enquiries, please contact Ron Zwicker of Council's Planning Services Group on 9843 0279.

Yours faithfully

P.Lee

Peter Lee
MANAGER - MAJOR/SPECIAL PROJECTS

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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

CONCILIATION CONFERENCE

WEDNESDAY 31 MAY 2000 - 7.00 PM

COMMITTEE ROOM 1

DEVELOPMENT PROPOSAL:	Development Application No. 3101/00 – Proposed Continuation of an Extractive Industry – Sandstone Quarry
PROPERTY:	Lot 11, DP 630938 & Lot 23, DP 1002498, Smallwood Road, off Halcrows Road, Glenorie
APPLICANT:	Positive Earthmoving (Mr M. Petith)
PROPERTY OWNER:	Mr D. Petith & Mrs C. Petith
FILE No:	DA 3101/00
PRESENT:	Mr Simon Kinchington – Manager – Planning Policy (Chairperson) Mr Ron Zwicker – Town Planning Co-ordinator Mr Michael Petith (Applicant) & Mrs Carol Petith (Part-Owner) Mr Rob Player (Director, Don Fox Planning Pty Ltd acting on behalf of applicant) Mr Rick Morse (Director, Morse McVey & Associates Pty Ltd acting of behalf of applicant) Ms Jocelyn Howden (Objector) Mr Syd Ball (Objector) Mr Daniel Steiner (Objector) Interested Property Owners, Residents & Submittors (see attached list)
APOLOGIES:	Councillor John Griffiths, Mayor Councillor Sonya Phillips, Deputy Mayor Councillor Cathy Aird Councillor Margaret Ferrara Councillor Martin Tolar
START:	7.15 pm
FINISH:	9.35 pm
COMMENTS:	Following a brief introduction by the Chairperson, the following main issues were discussed:

General Discussion

Mr Rob Player (Director, Don Fox Planning Pty Ltd) opened the formal discussions & provided a brief overview of the proposal. Mr Player then indicated that the quarry has been in operation for approximately 20 – 30 years, but Council in the mid- 1990's advised the operators / owners that the quarry was in fact unauthorised.

Mr Player indicated that this proposal was on a "without prejudice" basis (since his client's maintain their view that the quarry benefits from "existing use rights"), in order to formalise the approval of the quarry operation and upgrade existing on-site facilities, including an all-weather protection canopy over the main cutting saw machine.

The chairperson then asked Mr Steiner to address the conference.

Mr Steiner stated that he was a property owner in proximity to Little Cattai Creek. Mr Steiner then stated that the Statement of Environmental Effects (prepared by Don Fox Planning Pty Ltd) contained a number of inaccuracies. In this respect, Mr Steiner stated that this application is not simply a matter of formalising existing activities & is 'fatally flawed' given that the application was in fact a "Designated Development" since the quarry site involved (i) slopes in excess of 18° (ii) in excess of 2 hectares of disturbance & (iii) dwellings (not associated with the development) are situated within a 500 metre radius of the site, particularly properties, to the northeast of the site.

Mr Steiner then stated the proposal was subject to a number of inadequacies or omissions, namely: (i) no staging plans (ii) no details of the proposed second storage tank or dam (iii) no specific details of the water outlet in the quarry pit, 6 metres below the natural ground level. The specific plans which were considered inaccurate / unclear included Figures 1, 2 & 4.

Mr Steiner also indicated that the property owner of Lot 62 (Mr Gary Warner) was not notified of the proposal in the original advertisement of the application nor advised of this conference. Mr Zwicker in response stated that this clerical notification procedures would be reviewed, in order to redress this oversight.

Mr Steiner then referred to a number of photographs in his possession including a 1947 photograph which indicated that a fruit orchard only with no evidence of any quarrying activities. Mr Steiner then referred to a 1991 photograph which appeared to show the commencement of the quarrying activities.

Mr Steiner also stated that the quarry is now at the common property boundary with the Crown Reserve (Maroota State Forest) & also raised the questions as to the accuracy of the survey information, to guarantee that the quarry has not encroached into this Crown Reserve area.

Mr Steiner also requested that the Flora & Fauna Report be revised to incorporate a similar map as per the map contained in the Statement of Environmental Effects.

At this point, the chairperson provided a summary of the key issues made by Mr Steiner for consideration and response by the applicant's consultants.

The chairperson then requested Mr Ball to address the conference.

Mr Ball stated that he represented himself & his partner (Ms Eastaway). Mr Ball indicated that the Glenorie Wildlife Refuge was formally gazetted by the NSW Government in 1986. This refuge covers a total site area of 131 hectares, inclusive of his property & the adjoining property in the ownership of Mr & Mrs Howden. Mr Ball indicated that 1 quarry was already approved by Council on Halcrows Road & an additional quarry may pose some adverse environmental impacts upon the wildlife refuge.

Mr Ball concurred with the photographs tendered by Mr Steiner given that noise impacts from blasting activities, only commenced in the early 1990's. Mr Ball also alleged that prior to the early 1990's the operator was involved in the removal of bushrock from the subject site & surrounding properties, including the Crown Reserve. At this point, the chairperson stated that this conference should focus on the specific application and not alleged past practices.

Mr Ball then stated the quarry operation may pose adverse impacts upon threatened flora & fauna species. This also included potential eutrophication & siltation impacts upon Broadwater Swamp, which is a designated wetland under Sydney Regional Environmental Plan No. 20 – Hawkesbury – Nepean River.

Mr Ball also stated that the quarry may be subject to adverse land slippage impacts, particularly into the adjoining Crown Reserve. In this respect, no re-vegetation program has been proposed to address this issue.

Mr Ball indicated the location of the quarry was inappropriate given the increase in rural residential landholdings in the locality and the potential adverse noise impacts associated with the quarrying activity, especially blasting impacts. Mr Ball also suggested that the current application be held in abeyance pending the completion of Council's Rural Land Study.

Mr Ball also raised concerns with the quarry's proximity to the existing Sydney – Newcastle petroleum / gas pipeline and associated blasting impacts.

At this point, the chairperson provided a summary of the key issues made by Mr Ball for consideration and response by the applicant's consultants.

The chairperson then requested Ms Howden to address the conference.

Ms Howden stated that her property also formed part of the overall Glenorie Wildlife Refuge. This refuge comprises 131 hectares and adjoins Lot 11 and provides a wildlife corridor link with Broadwater Swamp. The wildlife refuge may be adversely affected, particularly due to noise and water pollution impacts.

Ms Howden stated that the Broadwater Swamp wetland system is recognised as a regionally significant wetland and is a highly productive & diverse ecosystem. This wetland ecosystem provides an important juvenile nursery for saltwater species. Ms Howden stated that any change in the hydrological regime by way of the any reduction in overland run-off into the catchment may adversely impact upon the function of the wetland system.

Ms Howden also stated that the quarry operation is likely to pose adverse siltation impacts upon the wetland system.

catchment may adversely impact upon the function of the wetland system.

Ms Howden also stated that the quarry operation is likely to pose adverse siltation impacts upon the wetland system.

Ms Howden also questioned why Lot 11, DP 630938 was included in the application.

Mr Player in response indicated that the application included Lot 11 since the proposed dam slightly encroached into Lot 11. Mr Player then indicated that 2 alternative options are available, namely: (i) amendment of the application to delete Lot 11 or (ii) provision of additional details of the proposed dam.

At this point, the chairperson provided a summary of the key issues made by Ms Howden & the other two key objectors, for response by the applicant's consultants.

Subsequently, the chairperson summarised the main issues raised by the key objectors & then requested Mr Player to address the conference. The chairperson also asked Mr Steiner as to provide Council with written advise as to whether or not he would agree to the release of his submission for Don Fox Planning Pty Ltd to review and respond to. Mr Steiner indicated that the 18° slopes referred to in his submission were in fact based upon the applicant's survey plan.

Mr Player urged Council to determine as to whether or not the application was in fact a "Designated Development". Mr Player also indicated that his client would be happy to accept a condition of consent restricting the quarrying operation to areas of less than 18° slopes.

Mr Player then stated that the application specifically states that the quarry will not involve any blasting works. Accordingly the 500 metre separation distance referred to in the "Designated Development- Extractive Industries" under Schedule 3 of the NSW Environmental Planning & Assessment Regulations 1994 does not apply.

Mr Player also indicated that the application was lodged on a "Without Prejudice" basis to gain formal consent for the quarry, notwithstanding the long-standing dispute with Council as to whether the quarry benefits from any "existing use rights".

Mr Player indicated that the NSW National Parks & Wildlife Service recently had signed-off the application in respect to threatened flora & fauna species. Notwithstanding this, Mr Player confirmed that Conacher Travers would be requested to provide a further review of the impact of the development upon the Broadwater Swamp ecosystem, including improved maps.

Mr Player then stated that the site was zoned Rural 1(b) and hence, the proposed extractive industry – sandstone quarry was permissible upon the Rural 1(b) zoned land, subject to Council's consent. Mr Player also indicated that a range of other landuses are in fact permissible within this zone. Accordingly, the proposed deferment of the application, pending the completion of the Rural Lands Study review was unreasonable.

Mr Morse indicated that his firm will review the potential off-site issues, including siltation & eutrophication impacts. Mr Morse indicated that the proposed soil & water management plan is far in excess of the NSW EPA guidelines. Mr Morse also indicated that a condition of consent may be imposed by Council requiring the submission of company records regarding any discharges into the catchment or receiving waters.

Mr Zwicker also indicated that a condition of consent would be imposed requiring the submission of an Environmental Management Plan, in the event that Council ultimately supported the application. Mr Zwicker also indicated that Council's Extractive Industry Compliance Officer would also undertake regular site inspections to monitor the performance of the operation in terms of compliance with all conditions of consent.

At this point, Mr Ball again reiterated that the quarry operation was likely to involve blasting works. Mr Petith however, stated that the quarry operation will only involve the use of mounted saws with no blasting, at any time. Mr Petith then indicated that the noise impacts experienced by Mr Ball may in fact come from other noise sources. Mr Ball in response stated that the noise impacts emanated directly from quarry blasts.

Mr Petith indicated that the quarry would operate between 6.30 am to 4.30 pm Mondays to Saturdays with no work being carried out on Sundays or Public Holidays. The applicant's financial consultant also stated that the quarry operation would be restricted to current 20 truck movements per .week. This was consistent with the company's current truck movements.

Mr Ball however, stated that the development will involve at least 30 truck movements per week. In response, Mr Player stated that the operation would involve a relatively low traffic generation rate upon the surrounding local road network.

Mr Player also indicated that the Rural Lands Study will take in the order of up to 3 years to complete. Mr Player Council is not legally in a position to defer consideration of this application until the completion of this study, under the Act.

Mr Morse indicated that the change to the reduction in the hydrological regime is likely to be in the order of 0.1% for the sub-catchment or 0.14% for the total catchment. This will however, be subject to further review. Accordingly, a further supporting report will be prepared to address the full impacts upon the wetland. Mr Zwicker also requested that this review also address the impacts upon the Glenorie Wildlife Refuge, if applicable.

Following this, the chairperson opened the conference up to general discussion & questions. Ms Mitchell from Halcrows Road indicated that her family had lived in the area since the 1920's & was fully aware of the consequences of floods within the wetland system. Ms Mitchell also indicated that the Petith quarry had operated for a long period of time. Mr Punch (Halcrows Road) also supported this viewpoint and also indicated that the area was subject to a high bushfire hazard risk.

Mr Gaynor indicated that the application should include the full quarry operation & disturbance areas including access tracks, processing areas & holding tanks.

Mr Gaynor also asked Mr Morse what in fact constituted a 5 day event. Mr Morse responded to this request and indicated that the soil and water management plan was designed to comply with the NSW EPA guidelines.

Mr Petith stated that his quarry was the one of only a handful of quarries left in NSW, which buy & cut stone on-site. Mr Petith indicated that 2 other quarries (1 in Gosford & 1 Winmalee) operate in a similar fashion with the Winmalee quarry being surrounded by

residential areas. Mr Petith indicated that the quarry currently supplies a range of sandstone products to a number of TAFE's, Councils, government departments & private companies. Mrs Petith also indicated that the property was purchased under option in 1975 & was finally transferred in 1976.

Mr Steiner indicated that the setback of the quarry was inconsistent with the 40 metre setback requirement, off the Crown Reserve.

Mr Player stated that the 40 metre setback requirement as contained in the Development Control Plan was not a "development standard" & hence, may be varied under the circumstances. Mr Player further indicated that this control was impractical given that the quarry area was also already heavily disturbed.

Conclusion / Outcome

In conclusion, the chairperson summarised the key issues discussed at the conference. Mr Player also confirmed that further review work would be undertaken in respect to the issue as to whether or not the proposal was a "Designated Development". Mr Player & Mr Morse also agreed to undertake a further review of the proposal's potential impact upon the Broadwater Swamp wetland system & any necessary additional mitigation measures, in order to address any such impacts.

The meeting was formally closed at 9.30 pm.

Don Fox Planning
PTY LIMITED

APPENDIX E

Soil, Water and Rehabilitation Strategies

for a Sandstone Quarry and Proposed Extension

Smallwood Road, Glenorie

Prepared by:

Sean Harris
Morse McVey & Associates Pty Ltd
PO Box 138 Picton 2571
Phone: (02) 4677-1668 Fax: (02) 4677-1709
Email: rmorse@ozemail.com.au

May 2001

Contents

Figures

Drawing

Tables

Appendices

1 Introduction

This report has been prepared by Morse McVey and Associates Pty Ltd at the request of Positive Earthmoving. The study relates to a development application for:

- an existing sandstone quarry that has been operating since 1943 off Smallwood Road, Glenorie (figure 1)
- a proposed extension of the quarry (up to two hectares) to be undertaken over the next 10 to 15 years.

The existing quarry covers a 2,000 square metre area, comprising a 100 metre by 20 metre platform cut into the side of a sandstone ridge. Sandstone blocks are extracted from the quarry and hauled to a nearby processing site where they are processed into units of various sizes.

The report has been prepared as part of an Environmental Impact Statement according to the Environmental Planning and Assessment Act (1979). The specific issues identified by the Director-General of Urban Affairs and Planning include the following:

- impacts of the proposal on surface and groundwater resources, and proposed water management proposals
- impact on soils and erosion controls
- rehabilitation measures
- objectives and provisions of the relevant environmental planning instruments including Baulkham Hills Local Environmental Plan 1991, Baulkham Hills Development Control Plan No. 500, and SREP 20 (Hawkesbury-Nepean River)
- potential impact of the proposal on Broadwater Swamp Wetland (Wetland No 128 under SREP 20).

Field work was undertaken by the company's Mr Sean Harris on 2 March 1999 and 3 May 2001. Five soil samples were taken and sent to the Department of Land and Water Conservation's Research Centre at Scone, a NATA-registered laboratory. Tests included particle size analysis (both chemical and mechanical dispersion), dispersion percentage and classification under the Unified Soil Classification System. Other physical and chemical information is taken from Murphy (1992). The results of these tests and some derived information are shown at Appendix I.

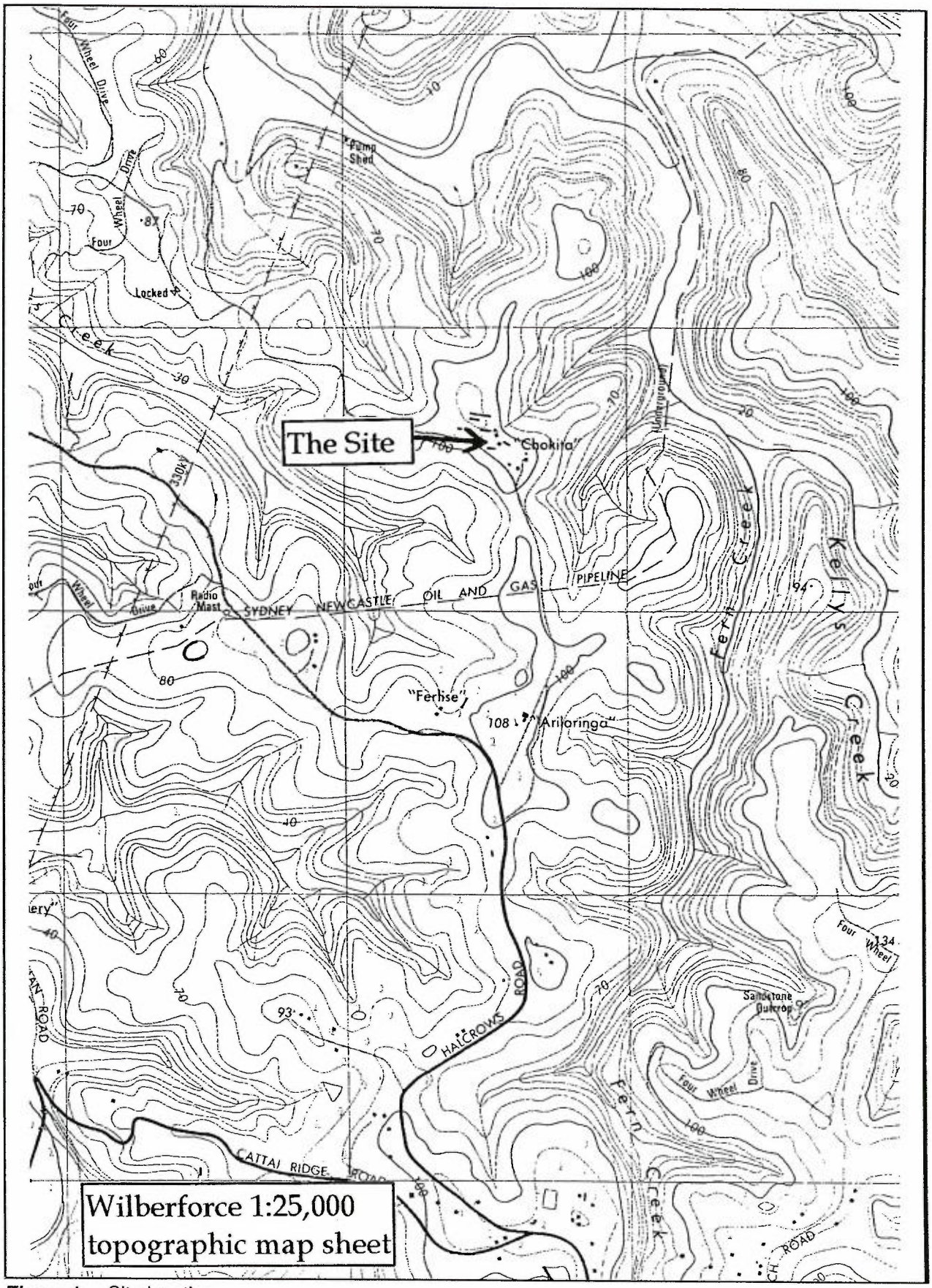


Figure 1 Site location

2 Site Description

2.1 Climate

The average annual rainfall recorded at the Glenorie Post Office rainfall station is 982 mm with an average of 88 rain days per year. Rainfall is higher during the first half of the year, with most during major storms associated with the passage of cold fronts and thunderstorms. Low intensity, prolonged rainfall is rare. The rainfall erosivity (*R*) factor for the site is 2,940 (low-moderate rating) (Appendix II).

2.2 Topography and Drainage

The site includes level to gently undulating broad crests and ridges on plateau surfaces with less than 20 metres relief and gradients usually less than 5 per cent. The processing site is on a plateau surface (RL 98 m) while the quarry is approximately 150 metres to the north east and on the sideslope of a ridge (RL 70 to RL 80 m) (Drawing 995034-01A). The processing site consists of a 6,000 square metre area that includes:

- sedimentation and water holding tanks.
- sandstone cutting machine
- storage of processed materials.

The top of the existing quarry cutting is at RL 85 metres, dropping vertically to RL 76 metres at the floor, resulting in a 9-metre stepped face of Hawkesbury Sandstone. The floor of the quarry extends for approximately 20 metres from the toe of the quarry face to the outside edge. The quarry and processing area are internally draining. Any stormwater runoff from outside these areas drains to the Hawkesbury River via Fern Creek (figure 1).

2.3 Soils

The soils of the plateau surface are fine to coarse grained, typical of the Faulconbridge Soil Landscape described by Bannerman and Hazelton (1990). The site investigations confirmed the following soil materials on the plateau surface (figure 2):

Layer 1: 0 to 100 mm, loose, black, loamy sand (typical of fb1) – to be stripped from the site and stockpiled prior to operations

Layer 2: 100 to 300 mm yellow, clayey sand (typical of fb2)

Figure 2 shows a third layer can occur (fb3), however, this was not observed at the site. Samples were taken from fb1 and fb2 for laboratory analysis, the results of which are shown at Appendix I. A sample of crushed sandstone was also taken for laboratory analysis, because this material is a byproduct of cutting operations at the quarry face, and is the material that needs to be managed for erosion and sediment control purposes.

Insert Drawing 995034-01A here – Quarry and processing area

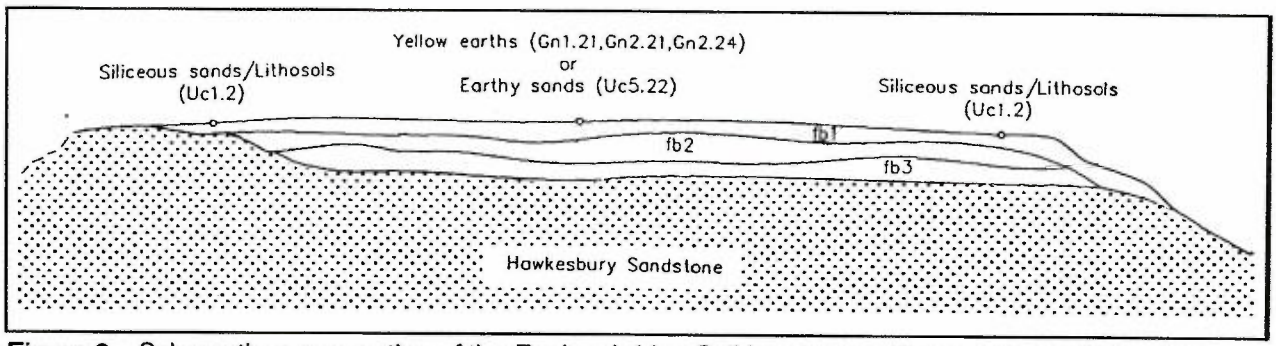


Figure 2 Schematic cross-section of the Faulconbridge Soil Landscape (Bannerman and Hazelton, 1990)

Our field investigations, supported by Bannerman and Hazelton (1990), suggest that these soils have the following properties:

- very low fertilities and very low cationic exchange capacities
- very strongly acid
- low water holding capacities and highly permeable
- shallow depths
- low organic matter contents.

Their high permeabilities and loose, coarse structures result in low erodibilities (*K*-factor of 0.022) when exposed to sheet flows.

2.4 Extraction area

The current extraction area (Drawing 995034-01A) is approximately 2,000 square metres in area (about 20 metres wide and 100 metres long). The top of the cut (or cliff) is at RL 85.3 and drops 9.3 metres to the floor of the quarry at RL 76.0. The proposed quarry extraction plan results in an increase in area to two hectares by expanding in a westerly direction to excavate sandstone on the eastern side of the ridge. The cut at its highest point will be at RL 90 while the floor will be at RL 70, producing a 20-metre wall.

Within the floor of the extraction area, crushed sandstone (loose, clayey sand material) accumulates as a by-product of the extraction operations. The material is sold periodically (approximately 600 tonnes per year), so the actual depth will depend on how much has accumulated over any particular period. However, it is usually no more than 1 metre deep at the site of sandstone extraction. The crushed sandstone is identified as "Site 3 (crushed sandstone)" in Appendix I.

Stormwater runoff is captured in an existing sediment basin within the floor of the quarry (design capacity 188 m^3 (Appendix IV), currently 750 m^3). The water is pumped to a sediment basin at the processing site once the suspended sediment has settled (figure 3) following the *Soil and Water Management Plan*. Currently, this mostly occurs within three days of the conclusion of a storm event (Mick Petith, pers. com.) because the basin needs to be free of water during sandstone extraction.

A dirt haul track (loop road) connects the processing site with the extraction area with gradients of up to 20 per cent. Runoff from the dirt haul track is channelled within a table drain along its inside edge, until it is discharged into the sediment basin within the quarry floor. Captured sediment is removed and sold as sand fill.

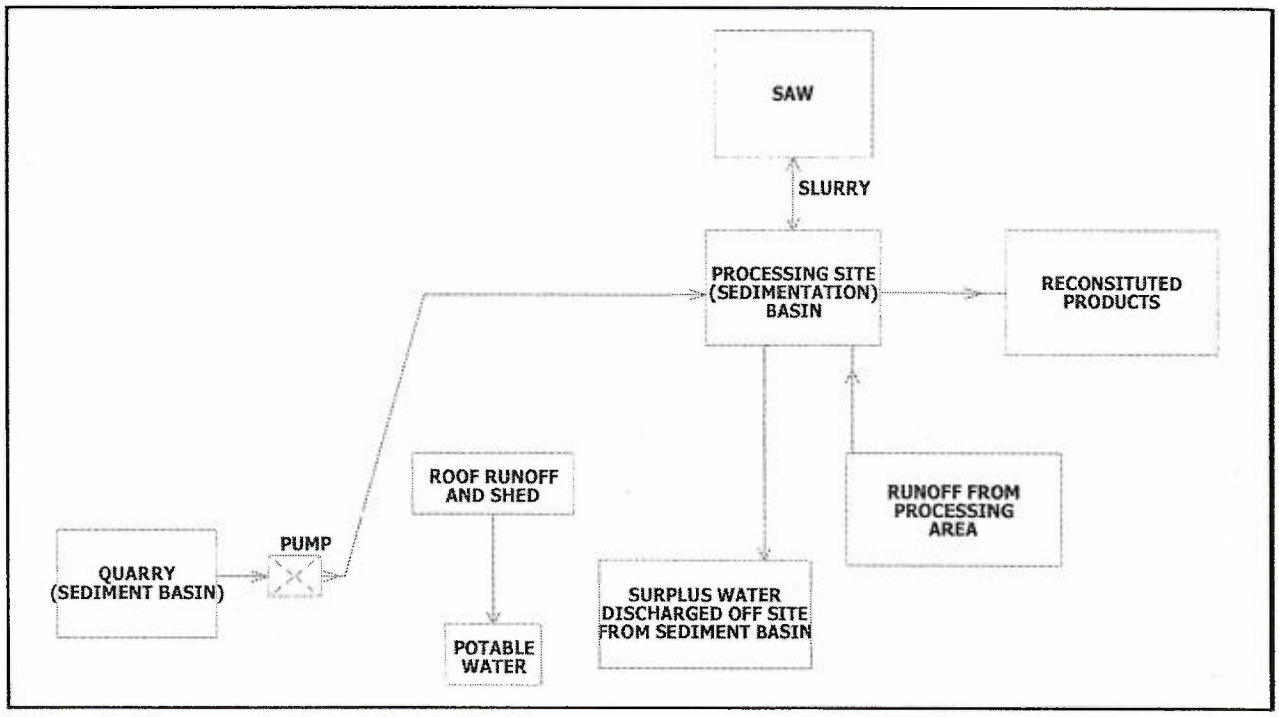


Figure 3 The water cycle

2.5 Processing Site

The processing site (Drawing 995034-01A) occupies a 6,000 square metre parcel of land that includes a storage area for the processed sandstone and a cutting machine for processing the sandstone. A shed is proposed to be built over the cutting machine to provide covered storage.

The sandstone cutting machine requires water for lubrication. The slurry produced from this process contains a fine, crushed sandy material that is collected in a two chamber sedimentation tank. The sedimentation basin at the processing site has a capacity of 155 cubic metres (Appendix IV) and is about 10 metres downslope of the cutting machine. After the slurry settles in the first chamber, cleaner water drains to a second chamber from where it is recycled back to the saw for lubrication and for washing down the factory floor (figure 3). Sediment is periodically removed from the tank using an excavator bucket to remove and stockpile the material before its eventual sale as a byproduct.

3 Statutory Requirements

3.1 Slope and Protected Land

Small individual parcels of land occur on the subject lands with gradients steeper than 18 degrees from the horizontal, although the average gradient is much less than this. The presence of slopes steeper than 18 degrees from the horizontal is relevant if mapped as State protected land. It should be noted that State protected land means:

(i) land that is identified in an order under section 7 of the Native Vegetation Conservation Act, 1997, as State protected land; and

(ii) any land defined as protected land under section 21AB of the Soil Conservation Act 1938 (as in force immediately before the repeal of that section by the Native Vegetation Conservation Act).

The DLWC have statutory responsibility for protecting the state's soil and water resources, including mapping of protected land and responding to public enquiries on protected land matters. An enquiry to the DLWC shows that the subject lands are not affected by protected land.[1]

3.2 Groundwater

The quarry floor is 76 m AHD. A further six metres is to be extracted from the floor, taking it to RL 70m. It is unlikely that groundwater will seep into the basin, because of its relatively high position in the landscape and location on a dry, sandstone ridge.

Following advice from Mr Dan McKibbin of the Department of Land and Water Conservation, the depth to the watertable below the finished floor should be at least two metres. Mr McKibbin suggested a visual inspection of the escarpment immediately below the site as an acceptable approach. The inspection should seek visible signs of water seeping from the rock face, either through free water at the surface or the growth of plants that suggest wet environments (e.g. ferns).

The escarpment below the site was inspected on the 27 April 2000 and again on 3 May 2001. No water seepage was found within 50 metres below the existing ground surface at the top of the escarpment. As the excavation is to extend a only further six metres below the existing ground surface, there is no watertable within two metres of the floor of the proposed excavation.

1 A request was made to the Department of Land and Water Conservation to search for Protected Land on the site. Ms Joanne Lewis of the Solicitor Enquiries section provided advice on the 6 June 2001 that none of Lot 10, DP 630938 is affected by Protected Land.

4 Water Management Strategy

4.1 Introduction

4.1.1 This *Water Management Strategy* has been prepared to meet the requirements of the Baulkham Hills Shire *Extractive Industries Development Control Plan №500*. The relevant element objectives adopted for the *Water Management Strategy* are:

(i) To conserve and effectively manage the sustainability of water supplies and resources of the Shire; and

(ii) To protect downstream drainage patterns including location, quantity and quality of waters.

4.1.2 Catchment areas and drainage lines have been determined from survey of the site at 1:400 scale and confirmed by field inspection.

4.1.3 Peak storm flows and storm water volumes have been calculated using methods outlined in Chapter 14 of *Australian Rainfall and Runoff* (1987).

4.1.4 All peak storm flows and stormwater volumes have been calculated by a suitably qualified engineer.

4.1.5 Design of soil and water management works accord with the Department of Housing's *Managing Urban Stormwater: Soils and Construction* (1998) (the "Blue Book").

4.1.6 Any surplus waters will either be:

- used for irrigation of cleared pasture lands—a 0.5 hectare area is available for this purpose, or
- disposed to the receiving waters—these waters will have less than 50 milligrams per litre suspended solids.

4.2 Water Sources

4.2.1 A proportion of all surface runoff waters will be harvested for use in production operations.

4.2.2 Waters used in production operations will be recycled, reducing the reliance on water captured within the sediment basin.

4.2.3 No supplemental waters are required for production operations.

4.3 Water Quality

4.3.1 All water collection structures, including sediment basins, will be designed by a suitably qualified engineer.

4.3.2 All water quality control structures will be designed to ensure zero net impact on receiving waters:

- up to the 90th percentile, 5-day storm depth for suspended solids; and
- and based on average annual runoff concentrations for total phosphorus and total nitrogen.

Sufficient measures will be taken to flocculate suspended solids and trap them as required by the site conditions.

4.3.3 Management strategies will be implemented to ensure that the capacity to capture runoff from the 90th percentile, 5-day storm depth is always available, other than during or within five working days from rainfall events.

4.4 Risk Management

4.4.1 The structural stability and available stormwater capacity of the two major sediment control structures will be monitored regularly.

4.4.2 Works will be designed to ensure that all collection waters and any spillages are contained within the site up to the 90th percentile, 5-day storm depth.

4.4.3 Water/slurry pipelines will be inspected every six months for maintenance purposes. Any necessary repairs will take place at this time.

4.4.4 Regular monitoring of surface and groundwater conditions will be conducted to ensure the water quality goals are being met (clause 4.3.2, above).

4.5 Water Requirements

4.5.1 Water for the sandstone cutting operation will be obtained from capture in the quarry floor sediment basin and from runoff from the processing area. It will be transferred to a holding tank at the processing site and recycled through the sedimentation tank (figure 3). The cutting operation requires 3,000 litres per day (Mick Petith, pers. com.) or 940 kilolitres per year (3,000/1,000 × 6/7 × 365). Current water requirements for the sandstone cutting operations have been met from water supply captured from the sediment basin within the quarry floor.

4.5.2 Water will be required for the reconstituted sandstone products at 500 litres per week (Mick Petith, pers. com.) or 26 kilolitres per year (500/1,000 × 52).

4.5.3 Potable water requirements are calculated for 10 persons during normal operating hours for drinking, cooking, toilet, showers, washing and cleaning. For these purposes, allow 150 litres per person per day or 470 kilolitres per year for 10 people (150/1,000 × 6/7 × 365 × 10).

4.5.4 So, the site requires 470 kilolitres per year of potable water and 966 kilolitres per year of waters for other operations. Surplus water will be disposed to the receiving waterway or used for irrigation.

4.6 Water Yield

4.6.1 Potable waters will come from runoff from a proposed shed roof that has a surface area of 800 square metres. It will discharge an average of about 700 kilolitres (0.982 × 0.9 × 800) to a 120,000 litre tank (figure 3) each year, assuming a 90 per cent yield.

4.6.2 The hard surface areas in the processing area yield about 687 kilolitres per year, assuming a 70 per cent yield and an area of at least 1,000 square metres (0.982 × 0.7 × 1,000).

4.6.3 The remaining lands in the processing area yield about 982 kilolitres per year, assuming a 20 per cent yield and a catchment area of at least 5,000 square metres (0.2× 0.982 × 5,000).

4.6.4 The extraction area yields about 1,374 kilolitres per year, assuming a 70 per cent yield and an area of at least 2,000 square metres (0.982 × 0.7 × 2,000).

4.6.5 So, there is a surplus of water on the site as follows:

- potable waters, about 230 kilolitres per year (700 - 470)
- other waters, more than 2,077 kilolitres per year ((982 + 687 + 1,374) - 966)).

5 Soil and Water Management Plan

5.1 Introduction

5.1.1 The *Soil and Water Management Plan* (*SWMP*) has been prepared to meet the requirements of the Baulkham Hills Shire *Extractive Industries Development Control Plan №500* for *Soil Conservation*. It is based on the Department of Housing (1998) *Managing Urban Stormwater: Soils and Construction* (the "Blue Book"). The *SWMP* includes this commentary and Drawing № 995034-01A.

5.1.2 The *SWMP* assumes that the quarry is internally drained with any water captured in the sediment basin to be pumped to a holding tank as required.

5.1.3 The sedimentation basin within the quarry floor has a design storage capacity of 188 cubic metres (currently 12m x 25m x 2.5m = 750 cubic metres), while a sedimentation tank at the processing site provides at least 155 cubic metres of additional storage.

5.2 Background

5.2.1 The site is on the Faulconbridge Soil Landscape (Bannerman and Hazelton 1990) (Section 2.3) with the soil materials being identified through a soil survey. Important site physical characteristics are identified in Table 1.

5.2.2 The soils are assumed to be Soil Hydrologic Group C.

(i) The peak flow runoff coefficient (Department of Housing, 1993) is 0.88 for these soils—used to size catch drains and energy dissipaters. It is based on a 20-year time of concentration storm event of 137 mm per hour.

(ii) The volumetric runoff coefficient (Department of Housing, 1998) for this site is 0.58 for the soils—used to size sediment retention basins. It is based on the rainfall depth for the 5-day, 90th percentile event at Wilberforce (47.6 mm/hr).

5.2.3 The likely soil loss is calculated with the Revised Universal Soil Loss Equation *(RUSLE)*. The value *R* and *K*-factors are given in Table 1. Other factors are:

(i) LS-factor is 4.16, assuming slope lengths of 80 metres and typical upper slope gradients for works areas of 15 per cent

(ii) *P*-factor is 1.3

(iii) *C*-factor assumed to be 1.0 for bare soil.

5.2.4 The sediment storage zone is calculated using the estimated soil loss for the site over two months because the *LS*-factor is greater than 2.0.

Table 1 Important Site Physical Characteristics

Constraint/Opportunity		Value
Rainfall erosivity		low to moderate ® = 2,940)
Topsoil (fb1) erodibility: sheet flow		low (K = 0.011)
Subsoil (fb2) erodibility: sheet flow:		moderate to high (K = 0.046)
Slope gradients : Quarry		low to moderate (10% - 15%)
Processing site		low (2-3%)
Calculated soil loss :	fb 1	175 tonnes/ha/yr
	fb 2	731 tonnes/ha/yr
Soil Loss Class:	fb 1	very low (Class 1)
	fb 2	high (Class 5)
Soil texture group:	fb 1	*Type C*
	fb 2	*Type C*
Per cent dispersibility (whole soil)		
	fb 1	6.3%
	fb 2	1.1%
	crushed sandstone	4.5%
Soil Hydrologic Group		Group C
Runoff coefficient:	volumetric	moderate to high (0.58, based on 90th percentile of 47.6 mm at Wilberforce, Table 6.5 of Dept Housing, 1998)
	peak flow	moderate to high (0.88) (Department of Housing, 1993)

Note: further information on terms used in this Table is in Appendix II.

5.3 General Instructions

5.3.1 Read this commentary with Drawing 995034-01A, the engineering plans and any other plans or written instructions issued in relation to development at the subject site.

5.3.2 Ensure contractors undertake all soil and water management works as instructed in the *SWMP* and constructed following the guidelines stated in the "Blue Book".

5.3.3 Inform all subcontractors of their responsibilities in minimising the potential for soil erosion and pollution to downslope areas.

5.3.4 All soil and water management works shown on Drawing 995034-01A and not already implemented will be installed as soon as practicable.

5.4 Erosion Control

5.4.1 Within five days of a storm event, remove sediment from table drains and cross drains to ensure stormwater continues to fall to sediment basin.

5.4.2 The soil erosion hazard on the site will be kept as low as practicable by minimising disturbance. Some ways of doing this are outlined in Table 2.

Table 2 Limitations to Access

Land use	Access limitations	Comments
Extraction	Land disturbances beyond five (preferably two) metres from the edge of the operations shown on the work plans are prohibited.	All site workers should clearly recognise these areas and they should be clearly marked – suitable materials include barrier mesh, sediment fencing, etc. The project manager will determine their actual location on site. They can vary in position to conserve existing vegetation best while being considerate of the needs of efficient works activities.
Access roads	Roads and tracks are limited to a width that are the minimum necessary to allow safe operation of heavy equipment.	
Remaining lands	Land disturbances are prohibited except for essential management works.	

5.4.3 Extraction will take place within a defined work area that includes the quarry and processing site.

5.4.4 Entry to land not involved directly in the extraction process will be prohibited and will be managed as natural bushland.

5.4.5 Limit vehicular access to the site to that essential for construction work.

5.4.6 Stockpiles of topsoil (SD 4-1) will be located at least five metres from areas of likely concentrated or high velocity flows, especially drainage lines and access roads. If necessary, earth banks or drains will be constructed to divert localised run-on.

5.4.7 Earth batters of stockpiled crushed sandstone can have maximum gradients of 2(H):1(V) during the works program but will be laid back to lower grades before the rehabilitation program starts. Final batter gradients will not exceed:

- 4(H):1(V) on northerly and westerly facing batters
- 3(H):1(V) on batters with other aspects.

5.4.8 Final landform sandstone rock faces will have:

- batters no steeper than 0.5(H):1(V)
- a 3-metre wide berm 5 metres below the top of the quarry cut.

5.4.9 All waterways, drains, spillways and outlets will be constructed to be stable as

follows:

- life expectancy of less than 5 years, adopt the 20-year t_c event
- life expectancy of 5 to 10 years, adopt the 50-year t_c event
- life expectancy of more than 10 years, adopt the 100-year t_c event.

To help in this, line them with materials that accord with Table 5.1 in the "Blue Book" for soils with high erodibilities.

5.4.10 Cross drains (SD 5-2) will be constructed on roadways to reduce erosion of the pavement, especially when periods of rain are expected and/or the site will temporarily shut down (e.g. weekends). The maximum distance between these drains should be considerate of slope gradients as shown in figure 4. Cross drains are not necessary on slopes less steep than 9 per cent.

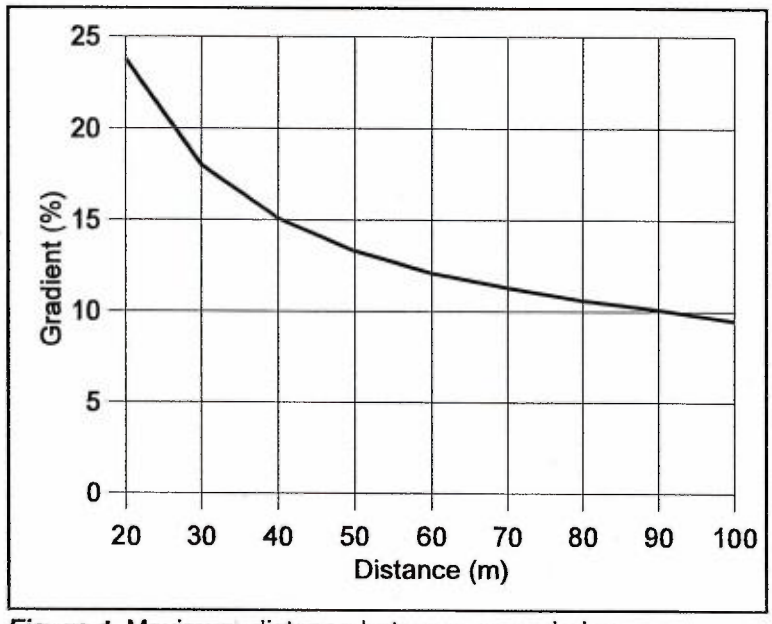


Figure 4 Maximum distance between cross drains

5.4.11 While *C*-factors are likely to rise to 1.0 during the work's program, they should not exceed those given in Table 3.

Table 3 Maximum Acceptable *C*-factors at Nominated Times During Works

Lands	Maximum *C*-factor	Remarks
Waterways and other areas subjected to concentrated flows, post construction	0.05	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows.
Stockpiles	0.10	Applies after ten working days from completion of formation

All lands, including waterways and stockpiles during construction	0.15	Applies after 40 working days of inactivity, even though works might continue later

5.4.12 The requirements of Clause 5.4.11 can be achieved in the short term (temporary protection for up to six months) with either:

(i) a suitable soil binder:
- Terra-Control® or equivalent in areas of sheet flow, e.g. topsoil stockpiles
- anionic bitumen emulsion sprayed over hessian cloth (at 0.5 L/m^2) in areas of concentrated flow, e.g. diversion banks and waterways;

(ii) a temporary vegetative cover.

Apply soil binders following the manufacturers instructions.

5.4.13 Where practical, works will be phased so that:

(i) minimal lands are exposed to the forces of soil erosion at any one time; and

(ii) site stabilisation measures are progressively installed throughout the development phase.

5.5 Pollution Control

5.5.1 The sediment basin will collect runoff from haul roads, quarry site and processing area. Roadside drains and sediment traps will be inspected after each storm event and any maintenance works will be carried out within five days of the conclusion of a storm event.

5.5.2 Other than during or within five days of a storm event, the sediment basins will have design capacities to capture more than:
- 188 cubic metres of sediment-laden water in the extraction area
- 154 cubic metres of sediment-laden water at the processing site.

NB: While the soils are coarse and not significantly dispersible, these are sized for the 90th percentile, 5-day depth.

5.5.3 Discharges to receiving waters will contain less than 50 mg/L suspended solids. This can be achieved using acceptable flocculation measures as described in Appendix E of the "Blue Book".

5.5.4 Surplus water will be returned to the natural drainage system, but only when the water has settled (naturally or flocculated with supernatant if necessary) and contains less than 50 milligrams per litre of suspended solids. Waters from the sediment basin will be discharged to the bush in a controlled (sheet flow)

manner to prevent erosion. Disposal over a rock shelf will be acceptable for this purpose.

5.5.5 To ensure the design capacity is maintained, one or more pegs will be placed in the sediment basin to show clearly the level at which design capacity occurs and when sediment will be removed. Surplus sediment will be removed withing five days of the conclusion of a storm event.

5.5.6 Sediment from any trapping device will be disposed in locations where further erosion and consequent pollution to downslope lands and waterways will not occur.

5.5.7 Remove temporary soil and water management structures only after the lands being protected are stabilised.

5.6 Rehabilitated Landform

5.6.1 Procedures for revegetation after sandstone extraction is complete will include appropriate soil amelioration for low fertility, low pH and low pore water holding capacity where necessary (Appendix G, "Blue Book").

5.6.2 The floor of the final landform will be RL 64.0m, 6 metres lower than the current quarry floor.

5.6.3 The proposed extraction program will extend the quarry in a westerly direction for a distance of approximately 60 metres from the existing sediment basin.

5.6.4 The top of the quarry face will be at RL 90m, 26 metres higher than the quarry floor.

5.6.5 The sandstone quarry face will be battered at 0.5(H):1(V), with a mid level berm (approximately 3 metres wide) placed 5 metres from the top of the quarry cut. This will drop a further 15 metres to the base.

5.6.6 A safety fence will be built along the top of the quarry cut.

5.6.7 The eastern batter that borders with Maroota State Forest will be rehabilitated with local soil material and native vegetation. This easterly facing slope will be built with a 3(H):1(V) batter.

5.6.8 The floor of the quarry will be revegetated with improved pasture species. When the floor of the quarry has been reached, crushed sandstone, subsoil and topsoil material will be applied to a depth of at least 300mm.

5.6.9 Drainage from the quarry will be designed to prevent surface or subsurface ponding of water behind an impenetrable barrier of sandstone.

5.6.10 Surface conditions are to be graded to enable runoff to flow to an intermittent drainage line next to the existing quarry. Erosion and sediment control measures may include permanent contour banks and sediment traps.

5.7 Site Monitoring & Maintenance

5.7.1 Waste receptacles will be emptied as necessary. Disposal of waste will be in a manner approved by the site superintendent.

5.7.2 The site superintendent will inspect the site at least weekly paying particular attention to:

(i) ensuring that drains operate properly and effect any necessary repairs;

(ii) removal of spilled sand or other materials from hazard areas, including lands closer than five metres from areas of likely concentrated or high velocity flows, especially waterways and access roads;

(iii) removal of trapped sediment whenever less than design capacity remains for the sediment basins;

(iv) ensuring rehabilitated lands have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate;

(v) constructing additional erosion and/or sediment control works as might become necessary to ensure the desired water control is achieved, i.e. make ongoing changes to the *Plan*;

(vi) maintaining erosion and sediment control measures in a functioning condition until all earthwork activities are completed and the site is rehabilitated; and

(vii) removal of temporary soil conservation structures as the last activity in the rehabilitation program.

5.7.3 The site superintendent will keep a log book, making entries at least weekly and immediately before forecast rainfall and/or site closure, recording:

- daily rainfall
- the condition of any soil and water management works
- applications of any flocculating agents to sediment retention systems
- volumes of water discharged from sediment retention systems
- remedial works.

The book will be kept on-site and made available to any authorised person on request.

6 Rehabilitation Strategy

6.1 Introduction

6.1.1 This *Rehabilitation Strategy* has been prepared to meet the requirements of the Shire of Baulkham Hills *Extractive Industries Development Control Plan Nº500.* The relevant "performance criteria" of the rehabilitation strategy include:

(i) Rehabilitated landscape will integrate with the landscape of the pre-existing surrounding terrain;

(ii) Due regard to the ecology of the native plants and animals, plant growth and the appropriate mechanisms for plant reproduction will be given the prevailing soil and geological regime;

(iii) Only clean topsoil and overburden stockpiles will be used to maintain viability of the soil and seed source; and

6.2 Site analysis

6.2.1 The property is dominated by open forest vegetation, with a mosaic of cleared areas under improved pasture species.

6.2.2 Native vegetation is present within some of the proposed two hectare quarry site, but most of the site is occupied by stockpiles of soil material, the existing quarry site and access tracks. A list of native plant species is included in the *Flora and Fauna* consultants report.

6.2.3 No "conservation areas" were identified within the existing or proposed quarry site. Issues relating to flora and fauna are contained in the *Flora and Fauna* consultants report.

6.2.4 The existing landform is characterised by plateau surfaces and undulating rock outcrops.

6.2.5 The following soil and site constraints were identified during the field assessment.

- highly permeable, acid, sandy soils of low fertility
- high permeability and poor moisture holding capacity
- moderate sheet erosion hazards on steep slopes (>20%)
- high gully erosion hazards under concentrated flows.

6.2.6 Crushed sandstone and stockpiled subsoil is available for rehabilitation. The results of soil analysis is included in Appendix I.

6.3 Principles

6.3.1 The lands will be rehabilitated with native species endemic to the area.

6.3.2 Design will accord with:

(i) the relevant sections of Department of Housing's guidelines *Managing Urban Stormwater: Soils and Construction* (1998) (the "Blue Book"); and

(ii) the *SWMP*, particularly Clauses 5.4.11, 5.4.12 and 5.4.13.

6.3.3 After the extraction phase has been completed, schedule works so that the duration from the conclusion of land shaping to completion of final rehabilitation is less than 20 working days.

6.3.4 Progressive rehabilitation can not be achieved given the small site size.

6.3.5 Successful revegetation of lands requires:

- selection of appropriate plant species, fertiliser(s) and ameliorant(s)
- application of sufficient water for germination and to sustain plant growth if rainfall is insufficient
- an adequate maintenance program.

Proper investigation of each of these matters on a site-specific basis is usually required.

6.3.6 Areas not satisfactorily revegetated will be investigated to determine the reason for failure. Then undertake appropriate remedial action, including replacing any lost topsoil and resowing the site.

6.3.7 Extraction will occur within defined areas. Adequate control measures will be used to ensure that extraction operations only occur within these defined areas.

6.3.8 Clearly visible barriers will be installed to limit access to vegetative buffer zones and rehabilitation areas.

6.3.9 Control measures to minimise wind erosion will be used in disturbed areas throughout the duration of the development. Dust and site disturbance will be kept to a minimum always.

6.3.10 Any erosion and sediment control measures will be maintained in a functioning condition until all earthworks are completed and the site rehabilitated. Where appropriate, remove soil conservation structures as the last activity in the site stabilisation program.

6.3.11 Monitoring of soil conservation works will be conducted at least once per year with findings documented and submitted to the council.

6.4 Revegetation

6.4.1 The revegetation program will vary according to the amount of material that needs to be removed before the final landform has been accomplished.

6.4.2 The eastern edge of the existing quarry site will be ready for revegetation in three to five years.

6.4.3 The revegetation program will ensure:

- the availability of acceptable soil materials
- correct site preparation
- the selection of the most suitable establishment techniques
- the selection of appropriate plant species, fertiliser(s) and ameliorant(s)
- the application of sufficient water for germination and to sustain plant growth if rainfall is insufficient
- an adequate maintenance program.

Proper investigation of each of these matters will be undertaken on a site-specific basis.

6.4.4 As the overall aim is to provide soil stability and ecological values using native species, quick growing species will be selected (i.e., *Acacia sp*).

6.4.5 Exotic species may also be required for specialised applications. Selected species are to have:

- low risk of an invasion to the surrounding habitat, or inhibiting the establishment of native plant species.
- promoting low erosion hazards and the establishment of native plant species.

Further, the NPWS and local conservation groups are to be consulted before the final plant species are selected.

6.4.6 Weed invasion on areas being rehabilitated with native vegetation will be controlled through:

- use of native soil and topsoil material
- no additional fertilisers or animal manures
- mulching with weed free materials
- selection of native grass and shrub species adapted to low fertility soils.

6.4.7 A cover crop of suitable annual cereal species may be used on areas being revegetated with native species (Table 4). Supplementary planting and inoculation will be undertaken if required.

6.4.8 Surfaces that must accept high flows will be turfed with reinforced sods so that they can safely carry design flows on completion and following Table 5.1 of the "Blue Book".

6.4.9 Areas not satisfactorily revegetated will be investigated to find out the reason for failure. Then, appropriate remedial action will be undertaken, including:

- maintenance of erosion and sediment control structures
- replacing any lost topsoil
- weed and pest management
- initial watering to help establishment
- application of lime or gypsum to control soil pH and improve structure
- resowing the site if required.

Table 4 Plants for Revegetation

Plant Type	Selection Criteria
Perennial grasses and legumes	• dense prostrate habit capable of carrying surface water
Annual cereals and grasses	• non persistence for temporary cover • quick ground cover and reduction of surface erosion hazards • cover protection for establishment of natives
Native grasses	• non invasive, low maintenance for natural areas • fire tolerance, aesthetics and habitat similar to surrounding vegetation
Native trees and shrubs	• where appropriate, any rows will be placed normal to prevailing wind direction for dust prevention • sown as screens from noisy or unsightly operations and equipment • sown as buffer to the egress of sediment toward protected environments maintained by National Parks and Wildlife Service, Department of Land and Water Conservation or like organisation.

6.5 Post development management requirements

The sediment basin will be retained after the quarry ceases to operate so it will continue to remove most of the sediment entrained. Until the site has been adequately rehabilitated, the sediment basin will need to be maintained at design capacity (188 cubic metres).

The plant species used in the rehabilitation program will be self-sterile, exotic annuals and endemic, native perennials, negating the likelihood of invasions to the swamp. Weed species may invade the site during rehabilitation, particularly if the re-vegetation has left bare exposed areas or in locations that are too harsh for the seed mix being used. However, this is a matter of management to ensure all areas are rehabilitated with the most suitable (non invasive) plant species, and any weeds that do establish are to be removed.

7 Water Quality Modelling

7.1 Introduction

To assess the stormwater impacts of the proposed development, the computer program AUSQUAL was used to model pollutant generation for undeveloped and developed catchment scenarios. The water quality component of AUSQUAL is based on assigning export coefficients for unit area loadings of nominated diffuse pollutants.

Output data from AUSQUAL provide the basis for estimating the pollutant loads (kilograms per year) retained by the proposed water quality structures. The modelling is based on pollutant loads published for similar land uses in the area, assuming no water quality controls.

The model was run for the two hectare development site and the 2,000 hectare catchment that drains to Broadwater Swamp which includes Fern Creek, Kellys Creek and Virgin Creek. The export coefficients for the two relevant rural land uses, namely extractive industry and unimproved pasture are shown in Table 5. The proportion of lands in these uses are shown in Table 6 while the results of modelling the two hectare development site are summarised in Table 7.

Based on the proposed expansion of the quarry, the modelling presented in Table 7 shows an increase in suspended solids, total nitrogen and total phosphorus loadings by 2,974, 4.0 and 0.7 kilograms per year respectively.

Table 8 shows the results of the water quality modelling for the 2,000 hectare catchment of Broadwater Swamp without any water quality controls. Without controls, it shows a change in the loadings to Broadwater Swamp for suspended solids, total nitrogen and total phosphorus of 12 per cent, 0.2 per cent and 0.4 per cent, respectively.

Table 5 Export Coefficients for Various Rural Land Uses

Land use	Suspended solids (mg/L)	Total nitrogen (mg/L)	Total phosphorus (mg/L)
Extractive industry	400	0.7	0.1
Bushland	5	0.5	0.04

Note The developed site consists of crushed sandstone overlying a rock basement from where the rock is extracted. Particle size analysis of the crushed rock includes 93 per cent sand, two per cent clay and five per cent silt. The nutrient content of this material likely to be very low, and for this reason, the export coefficients are less than coefficients used on sand or blue metal quarry sites.

Table 6 Land Use Areas of Two Hectare Development Site

Phase	Quarry		Processing area		Bushland		Total area
	ha	%	ha	%	ha	%	ha
Pre development	0	0	0	0	2	100	2
Existing development	0.4	20	0.6	30	1	50	2
Peak development	1.4	70	0.6	30	0	0	2
Post development	0	0	0	0	2	100	2

Note: Quarry and processing area combined for modelling purposes.

Table 7 Summary of Average Annual Pollutant Loads from Two Hectare Development Site

Phase	Average runoff (ML/yr)	Average annual export (kg/yr)		
		Suspended solids	Total nitrogen	Total phosphorus
Pre/ post development	4.5	22.6	2.3	0.2
Existing development	9.7	2996	6.4	0.8
Peak-development	14.9	5970	10.4	1.5
Increase in runoff and pollutant [1]	5.2	2974	4	0.7

1 Comparison between existing 1 hectare quarry and proposed expansion to 2 hectares

Table 8 Summary of Average Annual Pollutant Loads to Broadwater Swamp - Without Basin

	Average runoff (ML/yr)	Average annual export (kg/yr)		
		Suspended solids	Total nitrogen	Total phosphorus
Pre / post development [1]	4517	22,586	2,258	180.7
Existing development [2]	4522	25,560	2,262	181.3
Peak development [3]				
Quarry site (0.1%)	15	5,970	10.4	1.5
Bushland (99.9%)	4513	22,563	2,256	180.5
Total	4528	28,533	2,266	182
Increase in runoff and pollutant [4]	6	2,973	4	0.7

Notes

1. 2,000 hectare catchment of Broadwater swamp with 100 per cent bushland.
2. 1 hectare quarry represents 0.05% of the 2,000 hectare subcatchment of Broadwater Swamp
3. 2 hectare quarry represents less than 0.1% of the 2,000 hectare subcatchment of Broadwater Swamp
4. Comparison between existing 1 hectare quarry and proposed expansion to 2 hectares

7.2 Impact mitigation

Under the proposed expansion, the water quality modelling shows that 5,947 kilograms of sediment will be disturbed by stormwater runoff. The bulk of this material is coarse sand, most of which will be deposited prior to leaving the site. However, the clay and silt fractions and some sand will remain in suspension, requiring a sediment basin to remove them from the water column.

The particle size analysis (Appendix I) suggest that the clay and silt particles comprise seven per cent of the crushed rock material – this is equivalent to 417 kilograms per annum (ie., 7% of 5,947). As a result, the amount of suspended material

to be discharged from the site will depend on how much of this fine material can be retained in the basin and the quantity of water to be discharged as surplus water, bearing in mind that only about 61% of the total runoff from the site or 2,307 kilolitres of stormwater per annum is surplus to requirements and will be discharged.

Before any surplus water is discharged from the sediment basin, water will need to be flocculated to reduce the level of suspended solids to less than 50 milligrams per litre to comply with the Department of Housing (1998). Thus, the total quantity of sediment can be calculated as 2,307 kilolitres x 50 milligrams per litre = 115 kilograms per year. Through flocculation, the level of nutrients will also decrease because they are bound to the suspended material and removed from the basin.

A study undertaken by the University of Western Sydney at Glenmore Park (Ross, 1991) assessed the effectiveness of water quality control structures for sediment and nutrient retention. The study found that 85 per cent of the total phosphorus concentration was associated with the clay fraction (<0.002mm), which in this case accounts for only two per cent of the soil material. Based on the calculated 0.7 kilogram increase in phosphorus runoff from the site (Table 8), and a conservative estimate of 75 per cent attachment to clay particles, the basin will retain 0.5 kilograms per year, leaving only an extra 0.2 kilograms per year to be discharged from the site at the peak of development. [2] Taking into account the 39 percent of water to be retained for processing operations, the amount of phosphorus is further reduced to 0.12 kilograms per annum.

In regards to nitrogen, this pollutant will also be treated by the sediment basin, but is more likely to be dissolved in the water column than attached to particulate matter. The pollutant removal curve for nitrogen published by the Department of Land and Water Conservation (1998) compares removal with hydraulic retention time. The sediment basin is at least five times larger than what is required to capture the design storm event, providing at least five days of hydraulic retention time. The DLWC (1998) curve for nitrogen removal indicates a 40 per cent removal rate is possible with five days of hydraulic retention. The water quality modelling estimated 4 kilograms of nitrogen to be generated by the proposed increase in quarry operations, but this is reduced to 2.4 kilograms in accordance with the DLWC curve, taking into account the 39 percent of water to be retained for processing operations, the amount of nitrogen is reduced to 1.5 kilograms. Table 9 provides a summary of pollutant load after treatment in the sediment basin.

2 Note that, while the clay content is very low (Appendix I), it is 100 per cent dispersible.

Table 9 Export of Pollutants after Treatment within Sediment Basin

Pollutant	Developed Condition	
	Without controls	With Controls*
Suspended Solids	5,947 kilograms	115 kilograms
Total phosphorus	1.3 kilograms	0.1 kilograms
Total nitrogen	4 kilograms	1.5 kilograms**

* Assumes sediment basin and water recycling.

** 0.4 x 4 = 1.6 - 4 = 2.4; .39 x 2.4 = 0.936 - 2.4 = 1.46

When the results shown in Table 9 are compared with the predevelopment pollutant load already entering Broadwater Swamp, the proposed development represents 0.5 per cent increase in suspended solids, 0.05 per cent increase in total phosphorus and 0.07 per cent increase in total nitrogen loadings. These results suggest the development will have a negligible impact on the receiving waters during peak development. However, the loads post development are lower for all three pollutants (Table 8).

The above assumptions were cross checked using the Revised Universal Soil Loss Equation (RUSLE). The RUSLE model is designed to predict the long term, average, annual soil loss from sheet and rill flow at nominated sites under specified management conditions. The equation is represented by:

$$A = R\ K\ LS\ P\ C$$

where, A = computed soil loss (tonnes/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length factor

P = erosion control practice factor

C = ground cover and management factor

However, the RUSLE only predicts the entrainment of soil in the erosion process and does not predict how far it might move before sedimentation occurs. The movement of sediment within the stormwater runoff is determined, among other things, by the size of the soil particles. So, at this site it is estimated that most of the fine and coarse sand and gravel fractions of the topsoil (fb2 - crushed sandstone) will only be transported a short distance, whereas most of the clay and silt fraction will be transported within the water column as suspended solids.

Assuming all the coarse sand and gravel fractions are retained on the site (trapped in litter, natural depressions, or retained within the sediment basin), only the fine sand, silt and clay fractions are expected to leave the site without water quality controls. Therefore, the amount of clay and silt that could be discharged from the site if no water quality controls were implemented is based on the expected discharge of surplus water and the amount of clay and silt to be suspended in the water column. Table 10 estimates the amount of clay and silt that could be suspended in the water column, and assumes there is no sediment basin to provide treatment.

Table 10 Mobile Soil Material

Phase of development	Soil material	Total soil loss from site (tonnes)*	Percentage of clay and silt (%)	Potential discharge within stormwater ** (kg)
Pre development	fb1	2.8	14	392
Peak development	fb2	28	7	196
Post development	fb2	1.75	7	122.5

* Results of RUSLE, and includes clay, silt, fine sand, coarse sand and gravel

** Includes clay and silt fraction only; assumes no water quality treatment controls

At peak and post development scenarios, a maximum of 7 per cent of total soil loss from the site is expected to become mobile and enter the sediment basin each year under average conditions. This represents 196 kilograms at peak development and 123 kilograms at post development. While this is a negligible amount, a large part of this will be retained within the sediment basin, and unlikely to be discharged to the creek.

It can be seen that the total soil loss from the site predicted by the RUSLE method (2,800 kg per year) is comparable to the quantity predicted by the water quality modelling (5,970 kg per year). The fact that the RUSLE model predicted a lower rate of sediment loss than the AUSQUAL model is a consequence of the difference in models, rather than an error in calculation. The comparison between the two models at least shows the results from the water quality modelling are a conservative estimate, and once the *controls* are considered in this evaluation, the potential impact of the proposed development will be minimal.

8 Protection of the Receiving Creek and Broadwater Swamp.

8.1 Maintenance of Water Quantity During Development

Water is extracted from the catchment through the collection of surface water runoff and used to lubricate the saw during processing operations. Tables 11, 12 and 13 show the catchment yield and water requirements to be withdrawn from the site catchment. In particular, Table 11 shows that no more than 39 per cent will be removed from the site's catchment for essential site works, representing:

- only 0.1 per cent of the 250 hectare subcatchment (Table 11)
- less than 0.014 per cent of the 2,000 hectare catchment that drains to Broadwater Swamp (Table 12).

Table 11 Proportion of Water to Be Withdrawn From the Site Catchment

Catchment Sources	Water captured (maximum) (kL)*	Water requirements (kL)	Surplus water available for return to creek	
			(kL)	(%)
Non potable water from the quarry and processing site, including: - hard areas of processing site - remaining areas of processing site - extraction area	3,043	966	2,077	68
Shed roof - potable	700	470	230	32
Total	3,743	1,436	2,307	61

* Assuming all storm depths are less than the 90th percentile, 5-day depth.

Table 12 Proportion of Water to Be Withdrawn From Subcatchment

Catchment area	Catchment yield	Reduced yield to swamp due to quarry water requirements of 1436 kL
The subcatchment that includes the quarry site and drains to Broadwater Swamp is approximately 250 hectares.	1,227.5 megalitres per year, assuming a 50 per cent yield	0.1%

Table 13 Proportion of Water to Be Withdrawn From Entire Catchment

Catchment area	Catchment yield	Reduced yield to swamp due to quarry water requirements of 1436 kL

Total catchment (including Fern Creek, Kellys Creek, Virgin Creek) that drains to Broadwater Swamp downstream of the quarry is greater than 2,000 hectares.	9,820 megalitres per year, assuming a 50 per cent yield	0.014%

Therefore, the quantity of water removed from the catchment is an insignificant proportion, and this amount and will not affect the hydrological regime of Broadwater Swamp.

9 Conclusion

The proposed quarry extension will result in the overall footprint being increased to two hectares due to the expansion of the quarry face from 0.4 to 1.4 hectares. The quarry will continue to be internally drained, with all water being collected in a sediment basin and a portion being used for quarry operations.

The sediment basin and associated erosion control measures are consistent with the requirements of the *Department of Housing (1998) Managing Urban Stormwater.* Furthermore, the size of the sediment basin is sufficiently large enough to provide further nutrient reduction, thereby reducing the level of nutrients in discharged stormwater to an insignificant amount.

The sandstone resource is large enough to allow the operation to continue for the next 10 to 15 years. Rehabilitation of the final landform will be undertaken at various stages, and will include a mix of native vegetation on the battered slopes and quarry floor. This will be consistent with the surrounding land uses that include pockets of cleared land within a predominately native vegetation land use.

The water quality modelling, based on AUSQUAL and the RUSLE suggests the quarry will have an insignificant impact on Broadwater Swamp in terms of water use, nutrients and suspended solids (sedimentation). This assumes the quarry operates in accordance with the *Soil and Water Management Plan.*

Results of Soil Tests

Site	Soil Material	Particle Size Analysis (mechanical dispersion)					Dispersion Percentage	Emerson Aggregate Test	Organic Matter (%)	Unified Soil Classification	Electrical Conductivity (dS/m)	pH	RUSLE Structure Grade (Rosewell, 1993)
		Clay	Silt	Fine Sand	Coarse Sand	Gravel							
1	fb1	10	4	15	66	5	53	5	0.62	SC	0.06	5.1	2
2	fb2	1	37	7	54	1	6	6	0.41	CL	0.12	4.6	2
3	crushed sandstone	2	5	21	72	<1	100	5	0.03	SM	0.03	6.1	2

Site	Soil Material	Particle Size Analysis (chemical dispersion)				
		Clay	Silt	Fine Sand	Coarse Sand	Gravel
1	fb1	14	6	12	63	5
2	fb2	37	6	3	53	1
3	crushed sandstone	4	4	20	72	<1

Appendix II: Site and Soil Terms

R-factor

The rainfall erosivity factor, *R*, is a measure of the ability of rainfall to cause erosion. It is the product of two components: total energy (*E*) and maximum 30 minute intensity for each storm (I_{30}). However, Rosewell and Turner (1992) have identified a strong correlation between the *R*-factor and the 2-year ARI, 6-hour storm event. The *R*-factor is calculated using the Department of Conservation and Land Management's computer program, *RAINER*. This program computes the *R*-factor from interpolated rainfall values drawn directly from Pilgrim (1987). *RAINER* has assigned the subject lands an *R*-factor of 2,940.

K-factor

The soil erodibility factor, *K*, is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Texture is the principle component affecting *K*, but structure, organic matter and permeability also contribute. In the RUSLE, it is a quantitative value experimentally determined. See Appendix I.

LS-factor

The slope length-gradient factor, *LS*, describes the combined effect of slope length and slope gradient on soil loss. It is the ratio of soil loss per unit area at any particular site to the corresponding loss from a specific experimental plot of known length and gradient. Our slope length for disturbance was based on a maximum of 80 metres, this being normal practice for properly managed sites. There was no reason to vary this as soil loss potential was found quite low. Slope gradients were based on field records of slope taken by clinometer from the eight sample sites depicted on the site map. Maximum slope in the works area (excluding batters that are discussed elsewhere) will be 15 per cent. Therefore, *LS* is assigned a value of 4.16.

P-factor

The erosion control practice factor, *P*, is the ratio of soil loss with a nominated surface condition ploughed up and down the slope. It is reduced by practices that reduce both the velocity of runoff and the tendency of runoff to flow directly downhill. At construction sites, it reflects the roughening or smoothing of the soil surface by machinery. The *P*-factor here is 1.3, that normally assigned to urban construction sites.

C-factor

The cover factor, *C*, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. The *C*-factor is different from the runoff coefficient used in the rational method.

The most effective method of reducing the *C*-factor is maintenance, or formation of a good ground cover. The best practices are those that reduce both the soil exposed to raindrop impact and the erosive effects of runoff. The *C*-factor assigned here is 1.0,

typical of that for bare soil.

Soil Loss

The Soil Loss Class system described here places sites into seven groups that differ because of varying calculated soil loss. These groups assume that a soil loss of 37.5 tonnes per hectare per fortnight (half-month) can be managed easily using conventional erosion and sediment control techniques (Morse and Rosewell, 1996).

The Soil Loss Classes
(adapted from Morse and Rosewell, 1996)

Soil Loss Class	Calculated soil loss (tonnes/ha/yr)	Erosion hazard
1	0 to 250	very low
2	251 to 300	low
3	301 to 375	low-moderate
4	376 to 500	moderate
5	501 to 750	high
6	751 to 1,500	very high
7	1,501 to 3 750	extreme

Appendix III: Calculations

(i) Storm Flow Calculations

Peak flow or discharge is given by the Rational Formula:

$$Q_Y = 0.00278 \times C_{10} \times F_Y \times I_{Y,tc} \times A$$

where:
- Q_Y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years (Section 11.4.9)
- F_Y is a frequency factor for "Y" years
- A is the area of catchment in hectares (ha)
- $I_{Y,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Catchment area, A = 2 ha

Time of concentration (tc) = $0.76 \times (A/100)^{0.38}$ (Chapter 5 of *AR&R*, 1987)
= $0.76 \times (2/100)^{0.38}$
= 0.17 hours
= 10 minutes

Peak flow runoff coefficient C_{10} = 88 %

ARI storm event	Storm intensity (mm/hr)	Frequency factor (F_y)	Peak flow (m^3/s)
1 yr, tc	66	0.62	0.10
10 yr, tc	120	1.00	0.29
20 yr, tc	137	1.12	0.37
100 yr, tc	176	2.57	1.11

(ii) Sediment Basin Surface Area

$A = Q/vs$

where A = required surface area of basin
Q = peak flow rate in design storm (m3/sec); and
Vs = settling velocity of design particle (m/s)

where Vs = 0.00029m/s

Q Peak discharge for 1year ARI storm is given by the Rational Formula:

$Q_1 = 0.00278 \cdot C_{10} \cdot F_1 \cdot I_{1yr,\ 1hr} \cdot A\ m^3/sec$

C_{10} = 0.88
F_1 = 0.62
A = 2 ha
I_{1yrtc} = 66 mm/hr

$Q_1 = 0.00278 \cdot C_{10} \cdot F_1 \cdot I_{1yrtc} \cdot A\ m^3/sec$
$= 0.00278 \times 0.88 \times 0.62 \times 66 \times 2$

Q = 0.2 m^3/sec

The settling zone will be designed to settle a 0.02mm particle in a 0.25 year ARI storm event (ie 0.25 x 1 year ARI).

Q (tc, 0.25 Yr ARI) = 0.025

$V_{settling}$ = 0.00029 m/s

Therefore

$A_{(type\ C)} = Q / V_{settling}$

= 0.025 / 0.00029

= 86.20m^2

The minimum settling zone depth of 0.6 metres is adopted, so the settling zone volume is:

$V_{settling\ zone}$ = Area x Depth
= 86 m^2 x 0.6 m
= 52m^3

(iii) Sediment Storage Zone

The basis of determining the size of the sediment zone volume is based on criteria for calculations provided in Table 6.1 of Department of Housing (1998). This states that the sediment storage zone capacity is designed for at least the estimated average 2 month soil loss, as estimated by RUSLE when:

- K factor (soil erodibility) = 0.04 or greater; or the
- LS factor (slope length/ gradient) = 2.0 or greater

The K factor is calculated as 0.046 and the LS is 4.16, so the 2 month soil loss is adopted.

$$V = \frac{A\ (0.17\ R\ K\ LS\ P\ C)}{1.3}$$

where: V is the volume of the structure (m^3)
A is the disturbed catchment area (ha)

0.17 2 month soil loss
RKLSPC are normal RUSLE factors (Appendix III)
1.3 is a factor to convert tonnes to cubic metres based on a typical density of saturated sediment of 1.3

$$V = \frac{A\ (0.17\ R\ K\ LS\ P\ C)}{1.3}\ m^3$$

where:

a	=	2ha
R	=	2940
K	=	0.046
LS	=	4.16
P	=	1.3
C	=	1.0

$$V = \frac{2\ (0.17\ \times 2094 \times 0.046\ \times 4.16\ \times\ 1.3\ \times\ 1.0)}{1.3}\ m^3$$

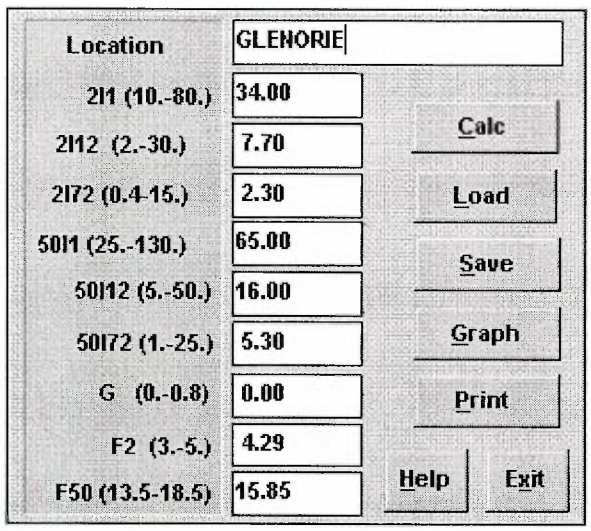
$$= \quad 136\ \ m^3$$

Total volume of sediment basin = volume of settling zone + volume of sediment storage:

$$= \quad V\ +\ V$$
$$= \quad 136\ m^2 + 52\ m^2$$

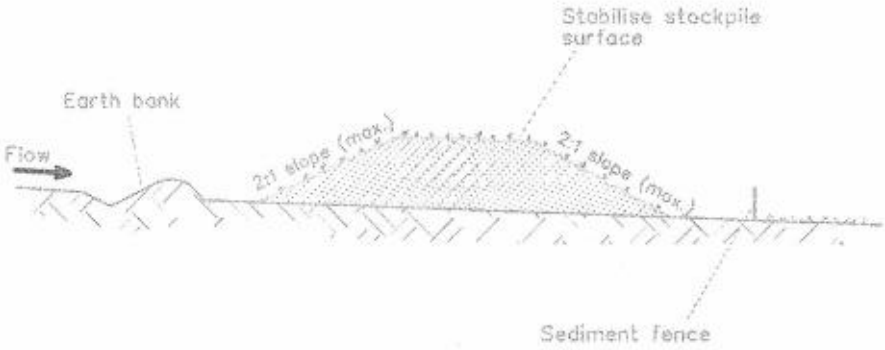
$$= \quad 188\ m^3$$

Appendix IV: IFD Tables for Glenorie



ARI \ DUR	5m	6m	10m	20m	30m	1h	2h	3h	6h	12h	24h	48h	72h	User
1	85	80	66	47.8	38.8	26.5	17.6	13.8	9.01	5.93	3.79	2.36	1.74	0.00
2	109	103	84	61	49.8	34.0	22.6	17.7	11.7	7.70	4.95	3.11	2.30	0.00
5	139	130	107	78	63	43.3	29.1	22.9	15.2	10.2	6.63	4.23	3.16	0.00
10	155	146	120	87	71	48.7	32.9	26.0	17.3	11.6	7.65	4.92	3.70	0.00
20	178	167	137	100	81	56	37.8	30.0	20.1	13.5	8.95	5.80	4.38	0.00
50	207	194	159	116	95	65	44.3	35.2	23.7	16.0	10.7	6.98	5.30	0.00
100	229	215	176	129	105	72	49.2	39.2	26.4	17.9	12.0	7.90	6.02	0.00
User	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

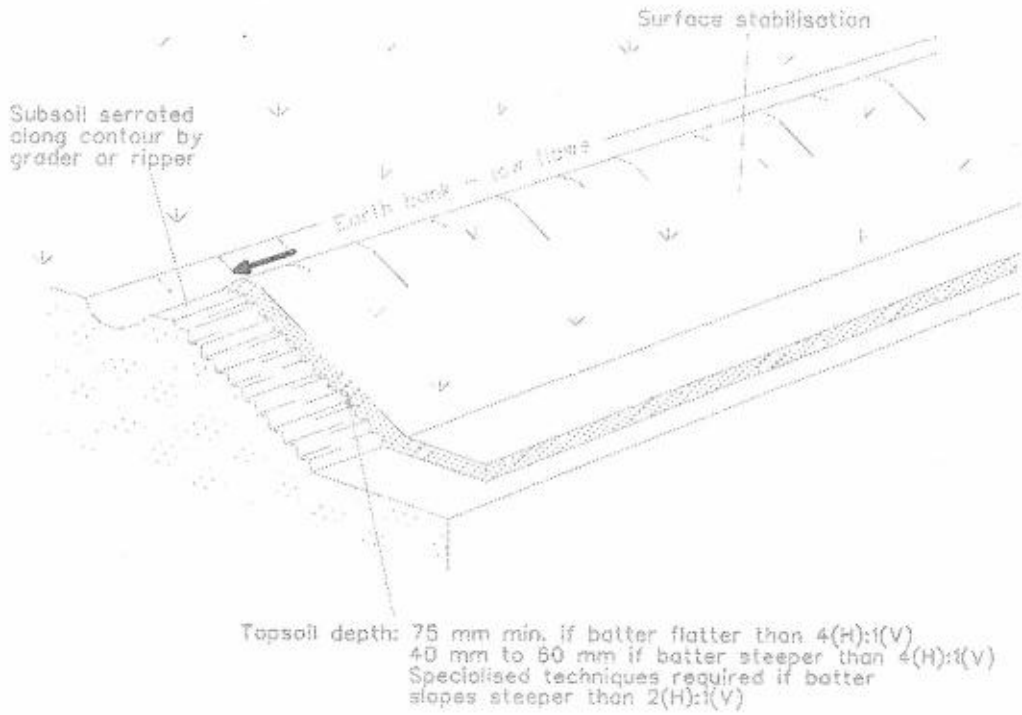
Appendix V: Standard Drawings



Construction Notes

1. Locate stockpile at least 5 metres from existing vegetation, concentrated water flows, roads and hazard areas.
2. Construct on the contour as a low, flat, elongated mound.
3. Where there is sufficient area topsoil stockpiles shall be less than 2 metres in height.
4. Rehabilitate in accordance with the SWMP/ESCP.
5. Construct earth bank (Standard Drawing 5-2) on the upslope side to divert run off around the stockpile and a sediment fence (Standard Drawing 6-7) 1 to 2 metres downslope of stockpile.

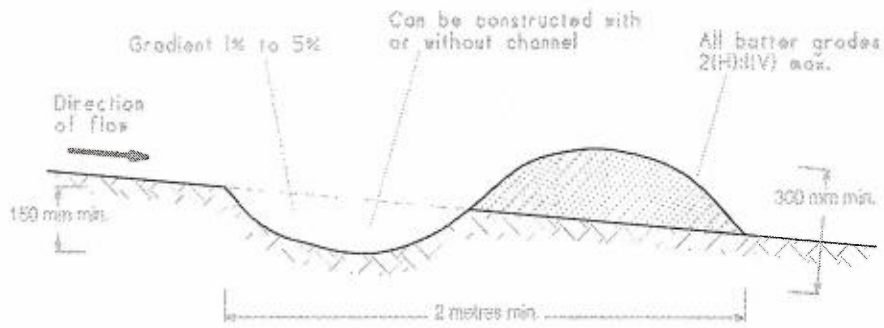
STOCKPILES SD 4-1



Construction Notes

1. Scarify ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the SWMP/ESCP.
3. Rip to a depth of 300 mm where a compacted layer occurs.
4. Replace topsoil.

REPLACING TOPSOIL SD 4-2

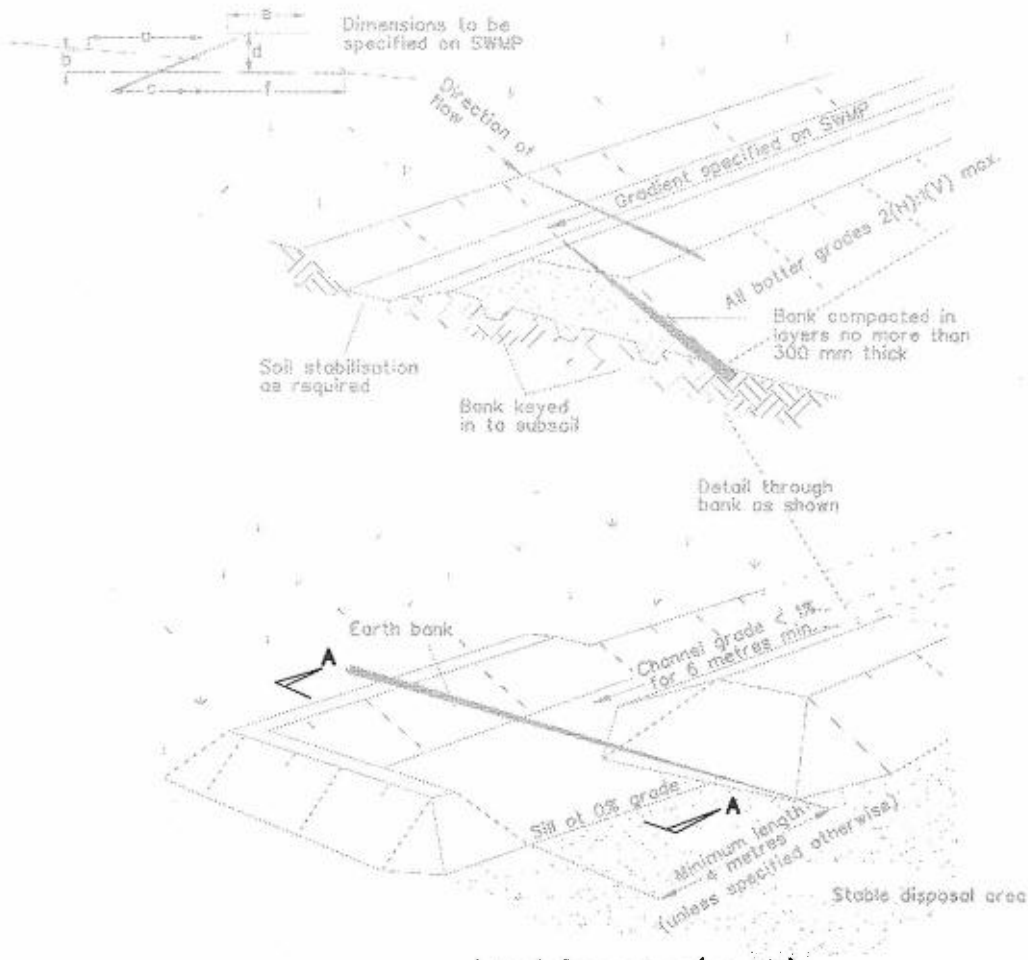


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Construct with gradient of 1 per cent to 5 per cent.
2. Avoid removing trees and shrubs if possible.
3. Drains to be of circular, parabolic or trapezoidal cross section as opposed to V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Permanent or temporary stabilisation of the earth bank to be completed within 10 days of construction.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free of projections or other irregularities that will impede normal flow.

EARTH BANK (LOW FLOW) SD 5-2



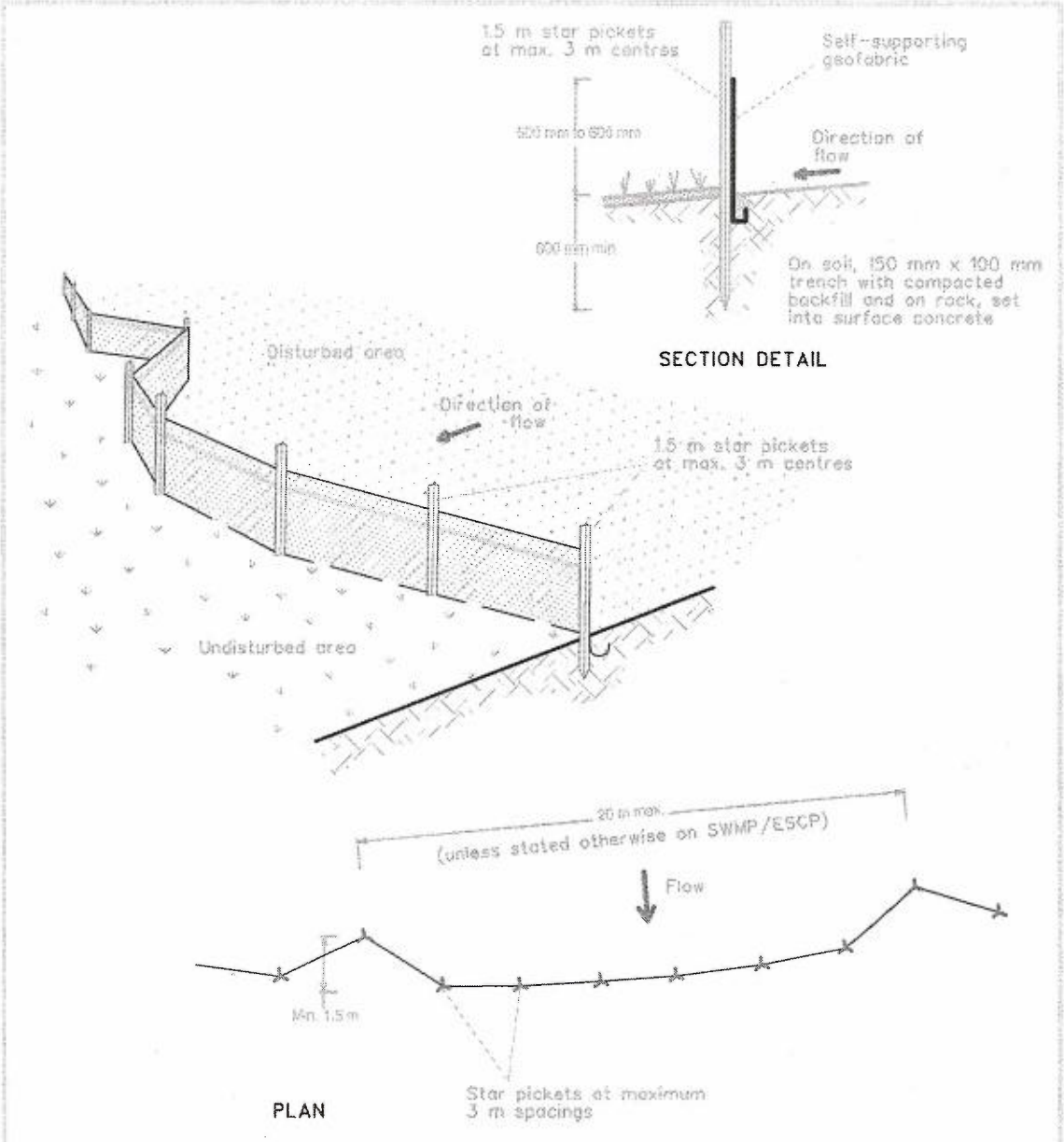
Level Spreader (or Sill)

Section AA

Construction Notes

1. Construct along gradient as specified.
2. Avoid removing trees and shrubs if possible.
3. Drains to be of parabolic or trapezoidal cross section as opposed to V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Permanent or temporary stabilisation of the earth bank to be completed within 10 days of construction.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free of projections or other irregularities that will impede normal flow.

EARTH BANK (HIGH FLOWS) SD 5-3



Construction Notes

1. Construct sediment fence as close as possible to parallel to the contours of the site.
2. Drive 1.5 metre long star pickets into ground, 3 metres apart.
3. Dig a 150 mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
4. Backfill trench over base of fabric.
5. Fix self-supporting geofabric to upslope side of posts with wire ties or as recommended by geofabric manufacturer.
6. Join sections of fabric at a support post with a 150 mm overlap.

SEDIMENT FENCE SD 6-7

Insert Drawing 5 here

Appendix VI: Bibliography

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Don Fox Planning
PTY LIMITED

APPENDIX F

FLORA AND FAUNA IMPACT ASSESSMENT FOR THE PROPOSED CONTINUATION OF AN EXISTING SANDSTONE QUARRY AT 172 SMALLWOOD RD, GLENORIE

Prepared for
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EEC PROJECT No. 0068

30 October 2001

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1.0 INTRODUCTION

This section provides background on the overall proposal, the relevance of NSW and Commonwealth environmental legislation and the general aims of the study. Brief reference is made to the nature of vegetation potentially affected by the proposed development. Information relating to the nature of the abiotic and biotic environment of the study locality is provided.

1.1 Background and Scope

This Flora and Flora Survey and Threatened Species Assessment has been prepared at the request of Don Fox Planning Pty Ltd. It examines the flora and fauna potentially affected by the continued operation of a sandstone quarry at Lot 23 DP 1002468, 172 Smallwood Road, Glenorie.

The present study draws on a previous flora and fauna survey and assessment report prepared by Conacher Travers Pty Ltd, addressing an expanded quarry area including both Lot 11 DP 630938 and Lot 23 DP 1002468, as was originally proposed in 1999/2000. The report is attached as Appendix 1.

The future operation of the sandstone quarry is hereafter referred to as *the proposal*. The general aims of this assessment are to:

- describe the existing biological environment of the study area in relation to flora and fauna;
- discuss the potential impacts of the proposal for any threatened species that occur or are likely to occur within the area affected by the proposal; and
- provide discussion on measures to mitigate any potential impacts.

The environmental studies have been conducted in three stages:

- the first stage being an updated review of available ecological literature pertaining to the site and surrounding locality and preliminary habitat assessment of the study site;
- the second stage being the review of previous targeted field surveys carried out by Conacher Travers, 1999 and the completion of supplementary field surveys for threatened species currently regarded as potential subject species, and surveys to investigate the inherent biological attributes of the site.
- the third stage being the assessment of potential impacts on flora and fauna associated with the current proposal and the preparation of the 8 part test of Section 5A of the Environmental Planning and Assessment Act 1979.

Within this report, reference is given to the relevant sections of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), NSW *Threatened Species Conservation Act 1995* (TSC Act), NSW *National Parks and Wildlife Act 1974* (NP&W Act), NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and subsequent amendments to these. Specific consideration is given to Section 5A of the *EP&A Act*.

For this report,

- the *subject site* is defined as the land area directly affected by the proposal, being the proposed final extent of the quarry area and associated facilities, the relocated dam adjacent to the eastern edge of Smallwood Road and the access road.
- the *study area* consists of the subject site plus the immediately surrounding land potentially affected by the proposal and subsequent activities.

- the *study locality* is the area of land within a ten (10) kilometre radius of the subject site.

A plan of the location of the study area is provided as **Figure 1**.

1.2 General Description of the Study Area

The study area is situated within a predominantly bushland area, on a plateau and easterly slope of a sandstone ridge to the west of Fern Creek, a tributary of Little Cattai Creek.

The immediately surrounding study locality is characterised by a rugged topography on Hawkesbury Sandstone, with deeply dissected gorges draining into Little Cattai Creek and ultimately to the Hawkesbury River.

The land-use of the area is primarily rural. Very little rural pasture-land exists within the study locality. The only major roads in the immediate area of the subject site are Halcrows Road and Cattai Ridge Road. The Sydney-Newcastle Oil and Gas Pipeline passes within a kilometre of the subject site, to its south and east.

1.3 Description of the Subject Site

The subject site consists of a large cut sandstone quarry occupying a small plateau on an elevated ridgetop location and an upper easterly slope. The subject site, being the northern part of Lot 23 DP 1002468, is almost entirely cleared as a result of previous sandstone extraction, but a few patches of trees and some low shrubs remain. It is surrounded to the north, south and east by undeveloped private land, mostly bushland. To the west is a cleared and grassed paddock and sheds.

The extent of the subject site is shown in **Figure 2**.

1.4 Description of the Proposal

It was proposed in January 2000 to expand the footprint of the quarry to include both Lot 11 DP 630938 and Lot 23 DP 1002468, and a Flora and Fauna Assessment Report was prepared by Conacher Travers Pty Ltd addressing that proposal.

The current proposal is for quarry operations to continue within the existing quarry area, being within the northern part of Lot 23 DP 1002468 only. Apart from the relocation of the small farm dam adjacent to Smallwood Road, no development is proposed in the southern part of Lot 23.

The subject site is owned by Mr and Mrs Petith of Positive Earthmoving, who have been operating the existing quarry for many years. It is proposed to continue the sandstone extraction within essentially the same land area as that affected by the existing quarry facilities, but to extract the sandstone from a larger excavation and along benches to a greater depth.

In this way the operational parts of the quarry will remain within a confined area and runoff can be contained and treated.

Figure 2 is a plan of the quarry showing the boundary of Lot 23 DP 1002468, the existing quarry and the current proposal.

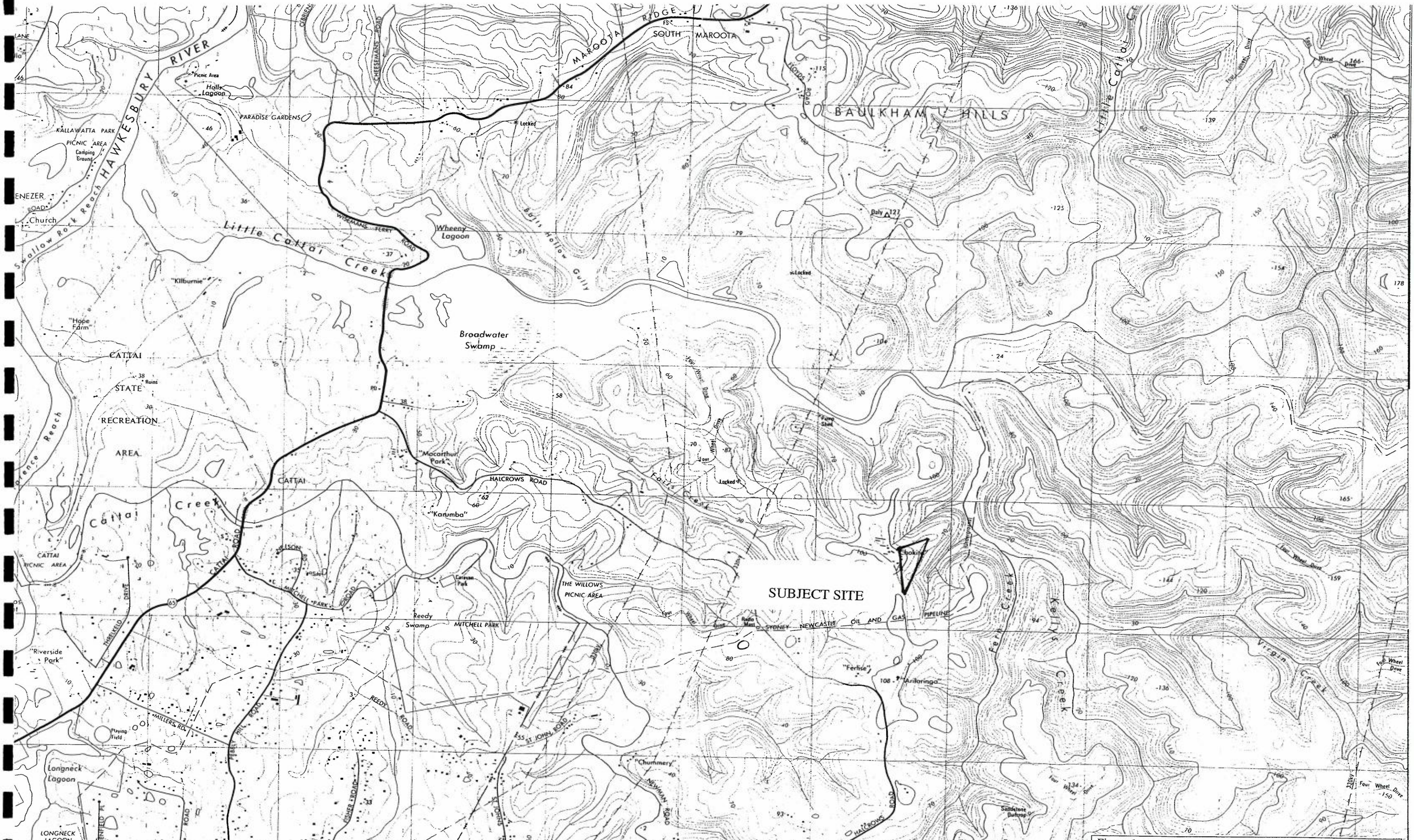

Figure 1.

LOCATION OF THE SUBJECT SITE

Flora and Fauna Impact Assessment for a Sandstone Quarry at 172 Smallwood Road Glenorie	Page 3
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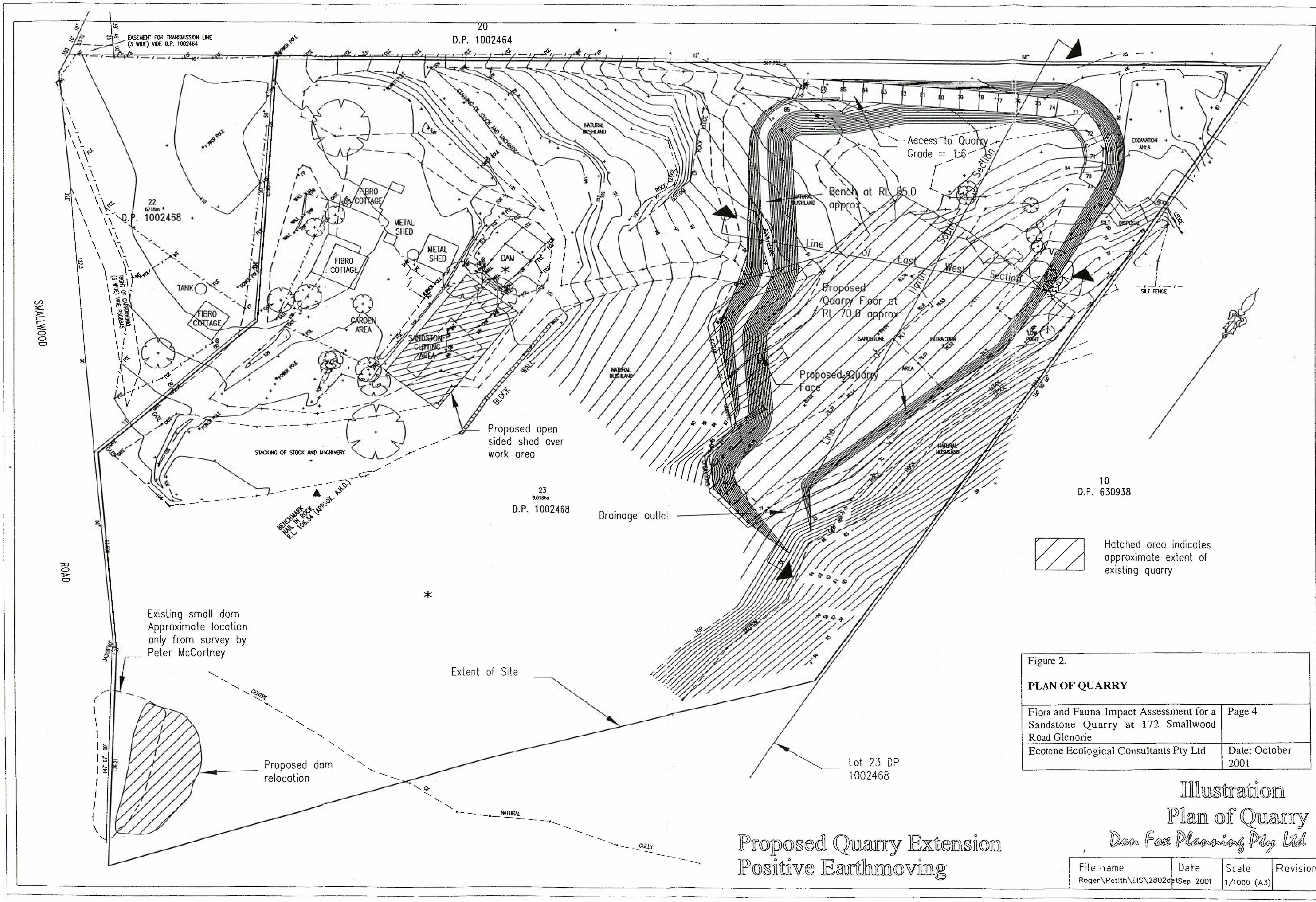
20
D.P. 1002464
EASEMENT FOR TRANSMISSION LINE
(3 WIDE) VIDE D.P. 1002464
22
D.P. 1002468
FIBRO COTTAGE
FIBRO COTTAGE
FIBRO COTTAGE
METAL SHED
METAL SHED
TANK
DAM
GARDEN AREA
SANDSTONE CUTTING AREA
NATURAL BUSHLAND
STACKING OF STOCK AND MACHINERY
BLOCK WALL
Proposed open sided shed over work area
BENCHMARK NAIL IN ROCK R.L 106.54 (APPROX. A.H.D.)
23
D.P. 1002468
Drainage outlet
Access to Quarry
Grade = 1:6
Bench at RL 85.0 approx
Line of East West Section
North South Section
Proposed Quarry Floor at RL 70.0 approx
Proposed Quarry Face
EXCAVATION AREA
SILT FENCE
SANDSTONE
EXTRACTION AREA
10
D.P. 630938
Hatched area indicates approximate extent of existing quarry
SMALLWOOD ROAD
Existing small dam Approximate location only from survey by Peter McCartney
Proposed dam relocation
Extent of Site
CENTRE OF NATURAL GULLY
Lot 23 DP 1002468
Proposed Quarry Extension
Positive Earthmoving
Illustration
Plan of Quarry
Don Fox Planning Pty Ltd
File name Roger\Petith\EIS\2802det
Date Sep 2001
Scale 1/1000 (A3)
Revision

Figure 2.

PLAN OF QUARRY

Flora and Fauna Impact Assessment for a Sandstone Quarry at 172 Smallwood Road Glenorie	Page 4
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2.0 FIRST STAGE ECOLOGICAL INVESTIGATION – PRELIMINARY ASSESSMENT

Section 2.0 documents the methodology and results of all stage one ecological investigation. This involved a review of the records of threatened species in the locality and wider region and a description of the habitat types present within the study site. Through analysis of the habitats present on the study site, and known habitat of local threatened species, an assessment was made of the relative likelihood of those threatened species known to occur within the study locality, occurring within the actual subject site.

2.1 Review of Local Threatened Species and Other Records

In order to determine those threatened flora and fauna species that are known to occur within the study locality, a review of available data has been undertaken. From the review, a list of threatened species known to occur in the locality was generated. This review has been utilised in the assessment of those threatened species that are potential subject species (based on known habitat requirements of each local threatened species in relation to the habitat of the study site). Potential subject species are defined as those threatened species considered likely to occur in the habitats present within the study area (NPWS 1996). Therefore, such species would be potentially impacted by the proposal.

A review of the documented records of the locations of threatened flora and fauna species within the study locality has been undertaken. Threatened species records were accessed from the NPWS Atlas of NSW Wildlife Database for the Penrith and Sydney 1: 100 000 mapsheets (updated to April 2001) and from the Flora and Fauna Assessment Report prepared by Conacher Travers Pty Ltd in December 1999, that addressed the more extensive sandstone quarry then proposed.

2.1.1 Flora

From the review, a total of twenty (20) threatened or protected flora species are known to occur within the Study Locality. Of these, 16 species are listed by the *Threatened Species Conservation Act 1995*, five as Endangered and the remainder as Vulnerable. Five of the species are listed by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, as Vulnerable (Schedule 2). Fourteen species are listed as Rare or Threatened Australian Plants (ROTAP) by Briggs and Leigh (1996) (see **Table 1** below). One endangered species (*Acacia bynoeana*) and one vulnerable species (*Pimelea curviflora* ssp. *curviflora*) as listed under the TSC Act, have been detected within the Study Area (Conacher Travers, 1999).

2.1.2 Fauna

A total of twenty (20) threatened terrestrial fauna species listed on the *Threatened Species Conservation Act 1995* have previously been recorded within or near the study locality, including two (2) insectivorous bat, three (3) marsupial, thirteen (13) bird, one (1) snail and one (1) amphibian species. Of these, three are currently listed as Endangered on Schedule 1 of the *TSC Act* and the remainder as Vulnerable on Schedule 2 of the Act. One of the species (Regent Honeyeater) is also listed as nationally Endangered and Migratory by the Commonwealth *EPBC Act 1999*. The local threatened fauna species are listed below in **Table 2.** Three vulnerable species (Glossy Black Cockatoo, Red-crowned Toadlet and Yellow-bellied Glider) as listed under the TSC Act, have been detected within the broader study area (Conacher Travers, 1999).

Table 1. Threatened Flora records for the study locality

Species – Scientific Name	Status (TSC and NP&W)	Status (EPBC)	ROTAP Risk Code	No. of records within 10 km of site	Earliest / Latest record within 10 km of site	Distance and direction of nearest record to site
Acacia bynoeana	E1	V	2VCa	11	1995/1998	5.5 km SW from site. (2km West to Anaparoo)
Acacia gordonii	E1	-	3RCi	6	1975/1998	1.5 Km SE from site. (0.5 km NE to Arilaringa)
Acacia pubescens	V	-	3VCa	15	1960/1999	4.5 km SE from site. (0.3 km NW to Marayla Park)
Actinotus helianthi	P13	-	-	1	2000/2000	4.5 km SE from site. (0.7 km SE to Michinbury park)
Ceratopetalum gummiferum	P13	-	-	1	2000/1000	4.5 km SE from site. (0.7 km SE to Michinbury Park)
Darwinia biflora	V	V	2VCa	3	1994/1998	3.5 km SE from site. (1.0 km SW to Hillside)
Dillwynia tenuifolia	V	-	2RCa	4	1998/1998	1.5 km NW from site.
Epacris purpurascens var purpurascens	V	-	2KC-	2	1995/1996	4.5 Km from site. (1 km NE to Anaparoo)
Eucalyptus sp. Cattai	E1	-	-	2	1998/1999	2.5 km SW from site. (1 km NE to Chummery)
Grevillea longifolia	P13	-	2RC-	1	1997/1997	5.5 km NE from site.
Grevillea parviflora	V	-	-	1	1998/1998	5.5 km N W from site
Kunzea rupestris	V	V	2Vca	2	1992/1996	3.5 km NE from site.
Leucopogon fletcheri ssp fletcheri	E1	-	2RC-	1	1997/1997	5.5 km NW from site.
Lomatia silaifolia	P13	-	-	1	2000/2000	4.5 km SW from site.
Melaleuca deanei	V	-	3RC-	1	1994/1994	4.5 km SE from site (0.7 km S to Hilllside)
Micromyrtus blakelyi	V	V	2VCi	3	1995/1997	4.5 km NW from site. (0.2km to Skyandus)
Pimelea curviflora var curviflora	V	-	-	2	1997/1998	3.5 km NW from site. (1 km SE to Wheeny Lagoon)
Pultenaea parviflora	E1	-	2E	3	1997/1999	1.5 km SW from site.
Tetratheca glandulosa	V	V	2VCi-	11	1995/19999	3.5 km NW from site. (1 Km NW to South Maroota)
Zieria involucrata	V	-	2VCa	1	1995/1995	4.5 km NW from site. (0.7 km NW to Pacific Park Picnic Area)

Notes:
310600 6284500 are the co-ordinates of the centre of the study area.
Nomenclature follows Harden (1990-1993) and Harden & Murray (2000).

Status (TSC): refers to the State*Threatened Species Conservation Act* 1995
- E1 – Schedule 1, Part 1: Endangered Species
- V – Schedule 2: Vulnerable Species

(NP&W) refers to the *National Parks and Wildlife Act* 1979
- P13 - Protected Species

Status (EPBC): refers to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
- E - Endangered Species
- V - Vulnerable Species

ROTAP coding (Briggs and Leigh 1996)

2	Geographic range in Australia less than 100km
3	Geographic range in Australia greater than 100km
V	Vulnerable Species: not presently endangered, but possibly at risk in future due to continuing depletion or land-use change
R	Rare Species: rare in Australia, but currently without any identifiable threat
K	Poorly known: suspected, but not definitely known to belong to one of the above categories. Field distribution information presently inadequate
C	Reserved: indicates taxon has at least one population within a national park, or other proclaimed conservation reserve or in an area otherwise dedicated for the protection of flora
a	indicates that 1000 plants or more are known to occur within a conservation reserve(s)
i	indicates that less than 1000 plants are known to occur within a conservation reserve(s)
-	when used in conjunction with C indicates reserved population size is not accurately known
t	indicates that the total known population is reserved

Please note: These records are based on information supplied by the National Parks and Wildlife Service and other sources, and may contain errors or omissions Locations given are only accurate to within at least 0.5 kilometre in any direction.

Table 2. Threatened Fauna records for the study locality

Scientific Name	Common Name	Status (EPBC)	Status (TSC)	No. of records within 10 km of subject site	Earliest/ Latest record within 10 km of subject site
Ninox connivens	Barking Owl	-	V	1	1998/1998
Ixobrychus flavicollis	Black Bittern	-	V	6	1979/1992
Ephippiorhynchus asiaticus	Black-necked Stork	-	E1	1	1996/1996
Limosa limosa	Black-tailed Godwit	-	V	4	1985/1992
Irediparra gallinacea	Comb-crested Jacana	-	V	3	1966/1997
Mormopterus norfolkensis	East Coast Free-tail Bat	-	V	1	1997/1997
Falsistrellus tasmaniensis	Eastern False Pipistrelle	-	V	3	1997/1999
Stictonetta naevosa	Freckled Duck	-	V	26	1982/1986
Calyptorhynchus lathami	Glossy Black-Cockatoo	-	V	15	1992/1998
Phascolarctos cinereus	Koala	-	V	2	1993/1998
Cacatua leadbeateri	Major Mitchell Cockatoo	-	V	1	1982/1982
Tyto novaehollandiae	Masked Owl	-	V	4	1996/1998
Grantiella picta	Painted Honeyeater	-	V	1	1982/1982
Ninox strenua	Powerful Owl	-	V	10	1984/1996
Pseudophryne australis	Red Crowned Toadlet	-	V	47	1996/2000
Xanthomyza phrygia	Regent Honeyeater	E, Mi	E1	22	1954/1983
Dasyurus maculatus	Spotted-tailed Quoll	-	V	1	1998/1998
Lophoictinia isura	Square-tailed Kite	-	V	1	1992/1992
Petaurus australis	Yellow-bellied Glider	-	V	37	1996/1998
Meridolum corneovirens	Cumberland land snail	-	E1	7	1976/1999

310600 6284500 are the co-ordinates of the centre of the study area.

Status (TSC): refers to the NSW *Threatened Species Conservation Act* 1995
E1 – Schedule 1, Part 1: Endangered Species
V – Schedule 2: Vulnerable Species

Status (EPBC): refers to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
E - Endangered Species V - Vulnerable Species Mi - Migratory Species

Please note: These records are based on information supplied by the National Parks and Wildlife Service and other sources, and may contain errors or omissions.

2.2 Habitat Assessment of the Study Site

A preliminary habitat assessment was undertaken as the first stage of the field investigations. Investigations for the preliminary habitat assessment comprised a site inspection, noting floral and faunal habitat types and features. Using this habitat assessment, and the known habitat preferences of the listed threatened flora and fauna species, a determination of the likelihood of occurrence of subject species was made. The possible factors investigated and assessed for the study area included:

Flora:
- Type and Structure of Vegetation;
- Dominant Species;
- Subjective assessment of Floristic Diversity;
- Disturbance Regime, both past and ongoing
- Extent of Weed Invasion;
- Potential occurrence of Local Threatened and Significant Flora Species

Fauna:
- Presence and Frequency of Large Mature Trees, Dead Trees and Hollow-bearing Trees;
- Height of Upper Strata
- Density of Shrub and Ground Cover;
- Presence of Fallen Timber and Rock Outcrops;
- Presence of Wet Areas or Waterbodies;
- Assessment of Previous and Present Land Use and Disturbance Regimes;
- Extent of Connectivity, Movement Corridors and Refugia;
- Presence of Critical Habitat Elements for Local Threatened Species;
- Searches for evidence of the presence of Threatened Species; and
- Fauna species diversity (all fauna observed or signs of fauna were recorded).

From these site assessments it was possible to:

- identify the areas of the study site that contain potentially significant habitats for threatened species and local biodiversity;
- determine the areas of the site that require detailed field survey;
- identify potential site constraints from an ecological perspective; and
- generate a list of local and regional threatened species regarded as potential subject species.

The preliminary habitat assessment (based on Conacher Travers, 1999 and supplementary field surveys in April 2001) indicates that the overall study area comprising the existing quarry and surrounding relatively natural bushland, contains three different structural habitat types.

These comprise:

- Quarry Area consisting of bare ground where previous sandstone extraction has occurred;
- Cleared grassy paddock and house area (adjacent to subject site);
- Sandstone Ridge-top Woodland/Open Forest (adjacent to subject site)

Quarry Area (Cleared, bare ground with small patches of trees)

Floral Habitat Elements: This habitat type occupies the bulk of the subject site in area, representing the existing quarry area. Extensive areas of bare and exposed ground characterise this habitat type. As such, it is extremely depauperate in terms of native vegetation, which is restricted to scattered, regenerating shrubs and several small patches of remnant trees. The species are the same as those of the surrounding natural habitat types.

Faunal Habitat Attributes: Poor habitat for most native fauna species due to the bare sandy ground. The small patches of trees/shrubs do contain some larger mature trees with hollows, sandstone ledges and some native shrub species but would appear to be too small and isolated from other vegetation to support a resident fauna population except for smaller fauna such as garden skinks. Fallen timber is scarce except for small trigs and bark. The shallow water bodies in the quarry area are too turbid and actively used by machinery to provide frog habitat.

Cleared Grassy Paddock and House Area

Flora Habitat Elements: Mostly kikuyu grass and cultivated shrubs with scattered moderate-sized indigenous and cultivated trees

Faunal Habitat Attributes: Poor habitat for most native fauna species due to the lack of natural vegetation. Some common species tolerant of open paddocks and urban environments such as skinks and birds are likely to occur

Sandstone Ridge-top Woodland/Open Forest (adjacent to subject site and east of the small farm dam adjacent to Smallwood Road)

Flora Habitat Elements: Relatively natural vegetation with trees to 15 metres (Yellow Bloodwood, Grey Gum, Red Bloodwood and Narrow-leaved Apple), sparse to moderate shrub layer and sparse groundcover between bare sandstone shelves. Few weeds present.

Faunal Habitat Attributes:
Good fauna habitat values with a range of sizes of tree hollows, rocky areas and fallen timber. A diverse bird, mammal and reptile fauna is expected.

2.3 Determination of Local Threatened Flora and Fauna as Potential Subject Species

Through an analysis of the known habitat requirements of local threatened flora and fauna species, in relation to the habitats present within the study site, a list of potential subject species has been compiled. The majority of these species have been specifically addressed by field surveys within the study locality by Conacher Travers, 1999 and by supplementary surveys by this firm (described later in the text). Discussion on the potential impacts on these species as a result of the proposal are provided in Section 4.0 of the report.

2.3.1 Threatened Flora

An assessment of the relative likelihood of the threatened flora species previously recorded in the study locality occurring within the subject site is provided below in **Table 3**.

Table 3. Assessment of the Potential for Threatened Flora Species to Occur within the Study Area

Scientific Name	**Distance from site and date of nearest record**	**Preferred Habitat and comments***	**Likelihood Of Occurrence**
Amperea xiphoclada var. *papillata*	10 km, 1999	Eucalypt forest along creeks and on hillsides. Sandy soils from alluvium and sandstone, medium nutrients[a].	**Low to moderate** - suitable habitat is present, but the nearest record is remote.
Astrotricha crassifolia	6 km, 1999	Dry ridgetop in shrubby woodland in very infertile shallow to deep sandy soil from sandstone. Water table permanently low, moisture supply intermittent[b].	**Moderate** - suitable habitat is present, but not many nearby records exist.
Boronia fraseri	2 km, 1969	Mainly in wet sclerophyll forest and in rainforest in gullies on sandstone*.	**Low** - suitable habitat is not present.
Boronia serrulata	2.5 km, 2000	Moist heath in sandy situations*.	**Moderate to high** - suitable habitat is present, and a few recent nearbv records exist.
Callistemon linearifolius	7 km. 1999	Dry sclerophyll open-forest on sandy to clayey soils on sandstone[c].	**Moderate** - suitable habitat is present, but the nearest record is relatively distant.
Callistemon shiressii	6.5 km. 1992	Moist eucalypt forest, riparian forest or rainforest gullies on shale ridges*, steep hillsides, gullies, and occasionally riverbanks. Clay or sandy loams on shale or alluvium, medium nutrients[c].	**Moderate** - suitable habitat is available by the creek, but the nearest record is relatively distant.
Darwinia glaucophylla	1.5 km, 2000	Scrub, heath or woodland on shallow, sandy soils on sandstone hillsides and ridges. Often rooted at edge of sandstone exposures and extending over bare rock surfaces. Low nutrients, poorly drained[c].	**High**, because of the number and proximity of recent records and the presence of suitable habitat.
Darwinia peduncularis	8 km, 1958	Open-forest or woodland on rocky hillsides and ridges in sandy soil over sandstone, low nutrients, well-drained[c].	**Low** - although suitable habitat is available, the nearest records are old and remote (south of Broken Bay).
Darwinia procera	5 km, 2000	Moist protected creek-beds and at the head of sheltered, narrow gullies in woodland on sandy soil or sandy alluvium from Hawkesbury Sandstone, low nutrients[c].	**Moderate** - marginally suitable creekline habitat is available.
Eucalyptus camfieldii	3 km, 1925	Ridgetops in coastal scrub heath on sandy soils over sandstone or loamy soil with coffee rock, low nutrients[c], often of restricted drainage*.	**Low** - although suitable habitat is available, the single record in the study locality is historic.
Gonocarpus salsoloides	1 km, 1998	Swampy areas on deep sands or sand over sandstone, low nutrients, poorly drained[d].	**Low** - suitable habitat is not present.
Grevillea shiressii	3 km, 1990	Creek banks in wet sclerophyll forest. Sandy soil on Hawkesbury Sandstone*.	**Moderate** - suitable habitat may be available by the creek, but wet sclerophyll forest is not present.
Melaleuca biconvexa	10 km, 2000	Eucalypt open-forest on creekbanks and floodplains in medium-nutrient, poorly-drained soils.	**Low** - although marginally suitable habitat may be present

			by the creek, the site is probably too elevated and recent records are remote.
Micromyrtus blakelyi	10 km, 1921	Grows in heath in shallow sandy soil in depressions on sandstone rock platforms on ridges. Low nutrients[c].	**Low** - the single record for the study locality is historic and remote.
Prostanthera askania	5 km, 1926	Understorey in or adjacent to rainforest, on sandy soils overlying sandstone[e]	**Low** - no rainforest exists in or adjacent to the site, and the nearest record is historic.
Prostanthera junonis	6 km, 2000	Drainage lines or seepage areas, usually in shallow, coarse, gravelly white-grey sandy soils[e] and yellow loam overlying Hawkesbury Sandstone in open woodland communities[d]	**Moderate** - drainage areas with suitable soil are present, but the nearest record is not close.
Syzygium paniculatum	8 km, 1995	Closed moist forest and littoral or gallery rainforest, generally associated with permanent creek systems and riparian habitat. On coastal dune sand, creek alluvium or clay loams with low-medium nutrients[c].	**Low to moderate** - marginally suitable habitat is available by the creek, but no recent nearby records exist.
Tetratheca glandulosa	3.5 km, 1998	Sandy or rocky woodland, heath or scrub*	**Moderate to high** - suitable habitat is present.
Typhonium eliosurum	7 km, 1925	Rainforest margins and along creek banks*.	**Low** - although creek bank habitat is present, the single record in the study locality is relatively distant and historic.

* Harden (1990-1993) and Harden & Murray (2000).
[a]Benson and McDougall (1995)
[b]Benson and McDougall (1993)
[c]Benson and McDougall (1998)
[d]Benson and McDougall (1997)
[e]Conn (1997)

All of the listed threatened flora species within the study locality have at least a moderate likelihood of occurring within the broader study area. While the number of threatened species recently recorded within the study locality is relatively high, it is anticipated that the limited area of uncleared bushland within the subject site would reduce the chances of any threatened species occurring. Nevertheless, all the species listed are considered to be potential subject species on the subject site.

2.3.2 Threatened Fauna

An assessment of the habitats on the site to support threatened fauna species (*TSC Act* 1995) is presented in Table 4 below.

Table 4. Assessment of the Potential for Threatened Fauna Species to Occur within the Study Area

Species	Preferred Habitat	Likely Presence within Study Area
Spotted-tailed Quoll	Inhabits a variety of habitat types from moist and wet sclerophyll through to dry forests and woodlands on the edge of open grasslands. Requires large hollowed logs for den sites.	Potential habitat is present within the Sandstone Ridge-top Woodland/Open Forest portions around the margins of the study area. Considered to be of **low to moderate** likelihood of occurring within the more natural parts of the study area.
Koala	Open Forest and Woodland containing specific feed tree species.	Whilst feed trees such as Grey Gums are represented within the Sandstone Ridge-top Woodland/Open Forest around the margins of the study area, few other suitable feed tree species are present Considered to be of **low** likelihood of occurring within parts of the study area.
Yellow-bellied Glider	Prefers tall, moist vegetation types with an abundance of preferred sap feeding trees and tree hollow resources.	Potential habitat containing a preferred sap-feeding tree (Grey Gum) and tree hollows exists within the study area. Some Grey Gums were found to have abandoned v-notch feeding scars Considered to be of **moderate to high** likelihood of occurring within parts of the study area.
Cumberland Plain Land Snail	Cumberland Plain Woodland	Sandstone Ridgetop Woodland/Open Forest is unsuitable habitat for this species. Considered to be of **low** likelihood of occurring within parts of the study area.
East Coast Freetail Bat, Eastern False Pipistrelle.	Forage over a variety of habitats and require small dead spouts and other crevices in trees for roosting.	Due to the presence of potential foraging habitat within both the wider study area and the subject site, these species may occur. The limited presence of hollow-bearing trees within the quarry and relatively common similar habitat in the adjacent land suggests that the habitat within the study area would not be critical to any local population. Considered to be of **moderate** likelihood of occurring within parts of the study area.
Regent Honeyeater	The wandering nature of this species makes it difficult to assess. The preferred tree species on which the bird feeds in the locality is Swamp Mahogany.	This species is unlikely to occur. Furthermore, large areas of better quality habitat for this species occur throughout the wider locality. Considered to be of **low** likelihood of occurring within parts of the study area.
Swift Parrot	Frequents sclerophyll forest and woodlands where winter flowering eucalypts are present. A wide ranging nomadic and migratory species tending to be attracted on an opportunistic basis to large areas of forest providing winter foraging resources.	Few winter flowering eucalypt species represented on the site, suggesting the species is unlikely to occur. The Swift Parrot is unlikely to be critically reliant on the habitat present. Considered to be of **low** likelihood of occurring within parts of the study area.
Glossy Black Cockatoo	She-oaks represent important food components in the diet of this species. Requires tree hollows for nesting.	The Glossy Black Cockatoo has some potential to forage on the she-oaks within the study area. Considered to be of **moderate** likelihood of occurring within parts of the study area.
Powerful Owl	Requires the presence of suitable arboreal prey species (Common Ringtail Possums, gliders and birds) and large tree hollows for nesting. Utilises a large home range.	Prey of the Powerful Owl and possibly nest hollows would be present in the wider study area. Considered to be of **moderate** likelihood of occurring within parts of the study area.

Species	Preferred Habitat	Likely Presence within Study Area
Masked Owl	Prefers dry open forest and woodland habitats, with sparse understorey. The Masked Owl predominantly preys on ground dwelling fauna, in particular rodents, on forest margins.	The Sandstone Ridge-top Woodland/Open Forest occurring around the margins of the study area is suitable habitat for this species. The margins of the cleared quarry area could be used for foraging by this species but no further clearing of native vegetation is proposed. Considered to be of **moderate to high** likelihood of occurring within parts of the study area.
Barking Owl	Open forests, woodlands, dense scrubs, foothills; river red gums, other large trees near watercourses, penetrating otherwise open country; paperbark woodlands.	Foraging habitat is present within the naturally vegetated parts of the study area. Considered to be of **low to moderate** likelihood of occurring within parts of the study area.
Black Bittern	Favours well vegetated permanent creeks and larger waterbodies, particularly containing Typha and other tall aquatic vegetation required for shelter and nesting sites. Also found in creeks through paperbark swamps and open forest	Suitable habitat may be present along Kellys Creek to the east of the study area. Considered to be of **low** likelihood of occurring within parts of the study area.
Red-crowned Toadlet and Giant Burrowing Frog	Requires wet crevices within small drainage lines on sandstone.	The study area is good habitat although most of the subject site itself is unsuitable due to the removal of much of the sandstone. Considered to be of **high** likelihood of occurring within parts of the study area.

Note: No habitat exists within the study area for the Freckled Duck, Comb-crested Jacana, Black-necked Stork or Bar-tailed Godwit so these species have been excluded from any further discussion. The record of Major Mitchell Cockatoo is likely to be from an aviary escape and has also been excluded from further discussion. The above tables 3 and 4 detail information regarding the habitat requirements of the threatened flora and fauna species which have previously been recorded in the locality or have distributional ranges which incorporate the study locality and have been recorded in similar habitat types. The information provided above determines the potential for each species to occur within the habitats of the study area.

Table 5. Threatened Species potentially occurring within the Study Area

FLORA	*FAUNA*
All listed species above in Table 3	Yellow-bellied Glider Spotted-tail Quoll Powerful Owl Masked Owl Barking Owl Glossy Black Cockatoo Regent Honeyeater East Coast Free-tail Bat Eastern False Pipistrelle Red-crowned Toadlet Giant Burrowing Frog

3.0 SECOND STAGE ECOLOGICAL INVESTIGATION - FIELD SURVEYS

The actual proposed development area (subject site) for this proposal is distinctly different from the surrounding study area. The proposed development has now been sited within land previously cleared of vegetation and quarried for sandstone for some considerable time, leaving a barren and heavily disturbed landscape in most parts. This being the case, a number of the fauna species considered to have some potential to occur within the study area, can be eliminated from further discussion due to the absence of suitable habitat within the subject site (development area). Therefore, the proposal confines the area potentially affected by the proposal to the development area (subject site) itself.

This information is used to guide field survey work on the subject site such that the techniques adopted are adequately designed to target species that have potential to occur and be affected by the proposed development. In this regard eight (8) threatened flora species and four (4) threatened fauna species are considered as potential subject species for the subject site and were specifically targeted during the field surveys. These are listed below.

Table 6. Threatened Species considered to be Subject Species

FLORA	*FAUNA*
All listed species above in Table 5	Red-crowned Toadlet Giant Burrowing Frog Yellow-bellied Glider Glossy Black Cockatoo

3.1 Floral Investigations

3.1.1 Methodology

Comprehensive flora field surveys were undertaken within the broader study area in December 1998 (Conacher Travers, 1999) with supplementary surveys for the present study carried out in May 2001.

While survey and assessment of the existing flora present within the bushland parts of study area was performed by Conacher Travers, 1999, the supplementary surveys for the present study concentrated on the existing quarry area now proposed for continued extraction.

The field surveys of Conacher Travers, 1999 involved:

- foot traverses to delineate boundaries of vegetation communities;
- shrub and tree surveys using linear transects; and
- forb and herb surveys using 1 square metre quadrats

The structure and main floristic elements for each vegetation community were described and a list of the flora species observed, was presented in the Conacher Travers, 1999 report.

The supplementary flora survey involved foot traverses of the few remnant patches of trees and shrubs within the quarry area noting the main flora species and searching for any of the threatened flora species known from the literature review, to occur in the general locality.

3.1.2 Results

Conacher Travers, 1999 identified four broad vegetation communities within the vegetated parts of the overall study area:

- Southern Slope Open Forest;
- Northern Slope Open Forest
- Riparian Open Forest;
- Ridgetop Woodland

The spatial distribution of these vegetation communities is shown in **Figure 2.2** of the Conacher Travers Report. Details of each community are presented in **Section 2.**2 in the Conacher Travers Report. The full Conacher Travers Report is attached as **Appendix 1**.

Table 7. Characteristics of the remnant vegetation within the Quarry Area

Stratum	Height	% cover +	Main species	Comments
Shrub and ground layers	<1 m	10-20	*Acacia suaveolens* *A.. hispidula* *A. linifolia* *Actinotus helianthi* *Pomax umbellata* *Andropogon virginicus** *Paspalum dilatatum** *Pennisetum clandestinum** *Juncus usitatus* *Pimelea linifolia* *Entolasia stricta* *Grevillea sericea* *Platysace* *Epacris pulchella* *Hakea laurina* *Banksia spinulosa*	The vegetation is on Hawkesbury Sandstone with extremely shallow skeletal soil or practically no topsoil.
Trees	15-20 m	<10	*Eucalyptus punctata* *Corymbia gummifera* *Corymbia eximea* *Angophora bakeri* *Allocasuarina littoralis*	Several groups of 4 to 5 trees with a few shrubs

+ foliage projective cover
* non-indigenous species

Of the 121 flora species observed by Conacher Travers within the broader study area only a very small number occur within the few remnant patches of vegetation within the quarry area.

Threatened and Significant Species

Conacher Travers 1999, detected two flora species listed as threatened in the *Threatened Species Conservation Act 1995* within the broader study area. These were *Pimelea curviflora* ssp. *curviflora* and *Acacia bynoeana*. Both of these species were mapped by Conacher Travers 1999, as occurring on a north-facing slope to the north of the existing quarry.

Despite intensive searches during the current field investigations, neither species was found within the area previously mapped as their location by Conacher Travers, 1999 or within the remnant vegetation within the existing quarry. Both are distinctive species so it can be concluded that neither species occurs within the quarry or within 50 metres of the northern boundary of the existing quarry.

Overall Floral Significance

The flora of the broader study area forms part of the Sydney Sandstone Complex (predominantly Sydney Sandstone Ridgetop Woodland) as defined by Benson and Howell (1994). This is a common and widespread community type on Hawkesbury Sandstone in the Sydney, Hawkesbury River and Broken Bay areas. It is well-represented in a number of National Parks and conservation reserves.

3.2 Faunal Investigations

3.2.1 Methodology

From the preliminary assessment of the habitat types within the study area and subject site, it was found that while the surrounding land was relatively natural Woodland/Open Forest, most parts of the quarry area are entirely cleared of vegetation. Since the previous Conacher Travers Flora and Fauna Assessment Report involved full fauna surveys (including mammal trapping) within the adjacent Woodland/Open Forest areas, the supplementary fauna surveys were confined to the mostly cleared parts of the land comprising the existing quarry area.

This being the case and that only very limited fauna use is likely to occur, targeted searches for only those threatened fauna groups that may occur in disturbed sandstone areas or may utilise the few patches of trees within the quarry area were carried out.

Birds (and any other fauna detected) were recorded opportunistically while on the site at various times of the day. Birds and bats were considered the main fauna groups likely to be present, despite the intense previous use of the site. The small patches of trees were searched for evidence of fauna present including scratchmarks, droppings, sap feeding scars. Spotlighting, call playback for Yellow-bellied Gliders and Ultrasonic Detection for bats was also carried out for by one observer for approximately 1.5 hours around dusk around the small patches of trees within the quarry on 1 June 2001.

3.2.2 Results

The fauna surveys carried out by Conacher Travers 1999, detected the presence of a range of fauna species within the relatively natural Woodland/Open Forest areas surrounding the quarry, including evidence of several threatened fauna species. They were the Glossy Black Cockatoo (*Calyptorhynchus lathami*), Red-crowned Toadlet (*Pseudophryne australis*) and the Yellow-bellied Glider (*Petaurus australis*).

Despite suitable weather conditions for the supplementary fauna surveys, few fauna species were observed within the quarry area, mostly birds and skinks. The presence of old overgrown v-notches in one large Grey Gum provided evidence of historic use of this tree within the existing quarry by the Yellow-bellied Glider. No evidence of recent use was found and no response was obtained from the playback of calls of this species or from spotlighting. It is expected that the tree has been abandoned as a feed tree by this species since the commencement of quarrying many years ago.

Some more recent chew marks were observed on another mature Grey Gum within the quarry area, but these are more typical of a smaller glider such as the Sugar Glider or Squirrel Glider.

Spotlighting did not detect any gliders in the quarry area. A Sugar Glider and a Masked Owl were heard calling in the far distance to the south-east of the quarry.

Extensive areas of habitat for the threatened Giant Burrowing Frog (*Heleioporus australiacus*) and Red-crowned Toadlet (*Pseudophryne australis*) appears to be present outside the subject site, but within the wider study locality. The extensive excavation and drainage changes that have previously occurred within the quarry mean that no suitable habitat is present there.

4.0 THIRD STAGE ECOLOGICAL INVESTIGATION - IMPACT ASSESSMENT

4.1 Overview of Potential Impacts Associated with the Proposal

While a number of Threatened Flora and Fauna Species have been identified as potential subject species within the overall Study Area, the proposed continuation of quarrying is planned to be entirely within an area that has been extensively disturbed in the past by broad-scale clearing of vegetation and subsequent quarrying over a number of years. While the quarry excavation is located close (14 metres at its closest point) to the eastern boundary of Lot 23, all activities are at the quarry floor and there is no likelihood of any uncontrolled discharge of pollutants from this area. Along the northern boundary the quarry access road and ramp to the quarry floor are located immediately adjacent to the Lot 23 boundary. In this area the potential for off-site discharge of runoff from the road has been eliminated by the construction of an earth mound along most of the boundary and by the ramp being located inside the cutting associated with the quarry.

Where present at all, the vegetation of this area is limited to small isolated patches of trees and low shrubs. Very minor edge areas of the locally-common sandstone forest vegetation surviving around the quarry area might also need to be cleared in order to implement the erosion and drainage controls associated with the proposal or for the extension to the quarry excavation. No threatened flora or fauna species were recorded on the site.

No species of native fauna were found to be critically dependent on the habitats of the quarry site for their survival. Therefore, no significant negative impacts on the flora or fauna in the vicinity of the site are anticipated.

Otherwise, the main potential issue to flora and fauna is management of runoff from the site and into adjacent drainage lines. A broad strategy for management of runoff has been provided in plans for the proposal, mainly in the form of measures to intercept and treat runoff wholly within the quarry area (see Soil, Water and Rehabilitation Strategies report (Morse McVey & Associates). Further suggested details for runoff management are given in the Recommendations section of this report.

The habitats around the small farm dam currently encroaching on Smallwood Road, were found to be similar to those occurring elsewhere around the locality. In the narrow strip of land between the dam and the existing alignment of Smallwood Road, a number of exotic plants such as Daisies and a Jacaranda tree have been planted in a garden bed. To the north of the dam are some Scribbly Gums and a small Jacaranda tree occur, and to the south are grasses including Whisky Grass. The land falls away from the eastern edge of the dam where the relocation is proposed to occur and a number of Scribbly Gums, Teatrees (*Leptospermum* sp.) and exotic grasses will need to be cleared in order for the reconstruction to proceed. It is expected that the aquatic macrophytes occurring around the eastern edge of the dam will be removed despite the fact that the dam will be reconstructed only 5 metres to the east of its current location. The water in the dam was found to have a high level of suspended solids during the site inspection and is therefore likely to support only a very restricted assemblage of aquatic fauna.

While no threatened species is likely to inhabit the dam itself, it is possible that habitat for the Red-crowned Toadlet and Giant Burrowing Frog occurs to the east and downslope of the existing dam. The very minor area of land directly affected by the dam relocation in comparison with the extensive areas of similar and better habitat in the locality, means that the direct impacts on these species from construction will be insignificant. Provided that the discharge of the dam water (which

contains high levels of suspended solids) is avoided by the implementation of the recommendations provided later in this report, then no adverse indirect effects on downslope habitat for these frog species is anticipated.

Potential Impacts on Broadwater Swamp

The Department of Urban Affairs and Planning have identified the potential for impacts from the proposal on Broadwater Swamp wetland (Wetland No. 128 under SREP 20) as an issue. Under SREP 20 the policy regarding flora and fauna is: *Manage flora and fauna communities so that the diversity of species and genetics within the catchment is conserved and enhanced.*

From our investigation of the proximity and location of the swamp in relation to the quarry, it would appear that the main area of Broadwater Swamp lies approximately three kilometres to the north west of the quarry, but under SREP 20, Wetland No 128 is mapped as extending up to the gully below the subject site.

The continued operation of the quarry will involve the removal of only a few additional trees within the catchment. The future quarry operation involves some expansion of the quarry footprint within the area currently impacted by the quarry and associated facilities, plus excavation to a greater depth. No removal of habitat for threatened species, populations and ecological communities, aquatic habitats, wetland flora, rare flora or fauna, riverine flora, flora with heritage value, habitats for indigenous and migratory species of fauna or existing or potential fauna corridors will occur.

All structures associated with the continued quarry operation are located within areas that are already cleared or disturbed.

The site will be rehabilitated following the completion of extraction and land shaping (see Soil, Water and Rehabilitation Strategies report by Morse McVey & Associates). This will involve the use of native flora species indigenous to the area and ultimately return the site to relatively natural habitat.

The main area of Broadwater Swamp lies approximately three kilometres to the north west of the quarry. The upper reaches of the swamp do however extend to Kellys Creek downslope of the quarry. The quarry rim in this area lies at approximately 70 m AHD which is some 50 metres above Kellys Creek. It is proposed to contain silt and runoff within the existing quarry area so that any surplus waters will be either used for irrigation of cleared pasture lands or disposed to the receiving waters. Such waters will have less than 50 milligrams per litre suspended solids. With this and the other soil and water management measures proposed in the Soil, Water and Rehabilitation Strategies report, there is unlikely to be any adverse effect from silt or runoff on the Broadwater Swamp.

Therefore it is unlikely that there will be any adverse effect on the Broadwater Swamp or any habitat for migratory bird species.

4.2 Threatened Species Assessment (Section 5A of the EP&A Act 1979)

The *TSC Act* was gazetted in late 1995 and aims to conserve threatened species, populations and ecological communities of animals and plants. Specific objectives of the *Act* are to: -

a) conserve biological diversity and promote ecologically sustainable development;

b) prevent the extinction and promote the recovery of threatened species, populations and ecological communities that are endangered;

c) protect critical habitat of those threatened species, populations and ecological communities;

d) eliminate or manage certain processes that threaten the survival or evolutionary development of those threatened species, populations and ecological communities;

e) ensure that the impact of threatening actions are properly assessed; and

f) encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The *EP&A Act 1979* was amended by the *TSC Act 1995*. As a result, section 5A (the 'eight-part test') was created which aims to improve the standard of consideration and protection afforded to threatened species, populations and communities, and their habitats in the planning process. The outcome of any threatened species assessment should be that developments and activities are undertaken in an environmentally sensitive manner, and that appropriate measures are undertaken to minimise adverse effects on threatened species or their habitats. Determining authorities have an obligation under the *EP&A Act* to consider whether a proposal is likely to significantly affect threatened species, populations or ecological communities, or their habitats. In this regard, the determining authority must take into account the 'eight-part test.' Discussions of species investigated under the provisions of Section 5A have been detailed below:

4.2.1 Threatened Flora

No threatened flora species were recorded on the subject site and the two threatened flora species observed by Conacher Travers within the broader study area, if currently present are a minimum of 50 metres to the north of the boundary of the quarry. The subject site contains only a very small area of disturbed habitat with any potential to contain threatened flora species and this is miniscule by comparison with the extensive areas of similar vegetation communities and habitats contained within the adjacent Sandstone Woodland/Open Forest areas. Therefore, no formal assessment of impact on flora species under the provision of Section 5A of the *EP&A Act 1979* is required.

4.2.2 Threatened Fauna

Quarry Area

Evidence of three threatened fauna species was recorded within the broader area by Conacher Travers 1999. No threatened fauna species was detected during the supplementary field surveys within the quarry area.

The proposed continuation of sandstone quarrying activities has been deliberately sited wholly within the disturbed quarry area and containment and treatment of runoff are other important components of the proposal. As a result of this the proposal is therefore considered to not have the potential to adversely affect any threatened species.

Section 5A assessments of impact were prepared by Conacher Travers for the Glossy Black Cockatoo, Red-crowned Toadlet and Yellow-bellied Glider and these indicated that even with the more extensive area then proposed for quarrying, no significant effect was anticipated.

We consider that an 8 part test for the Giant Burrowing Frog (*Heleioporus australiacus*) is also warranted. The ecology and habitat requirements of that species are similar to those of the Red-crowned Toadlet. Conacher Travers concluded from applying the 8-part test to the Red-crowned

Toadlet , that no significant impact on the species was expected. Nevertheless an 8-part test follows for the Giant Burrowing Frog.

Giant Burrowing Frog

(a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction;* and

No Giant Burrowing Frogs have been detected either within the quarry area or within the larger study area addressed in the Conacher Travers Flora and Fauna Report.

While no habitat for this frog species is likely to occur within the existing quarry area due to the extensive disturbance to surface sandstone ledges and to small drainage and seepage lines, habitat may occur in seepage areas downslope of the quarry. Measures to minimise the risk of indirect and off-site water pollution that could have the potential to impact on habitat for this frog species have been adopted in the proposal and are included in the Soil, Water and Rehabilitation Strategies report (Morse McVey & Associates, 2001). It is concluded in that report that only a miniscule change to flows, sediment and nutrients within the catchment, will result from the development.

Therefore no disruption such that a viable local population of Giant Burrowing Frogs is placed at risk of extinction, is likely to occur.

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

Not Applicable.

(c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*

To assess this part of the Section 5A Assessment, a review of known habitat and regional distribution is provided:

The Giant Burrowing Frog is widely distributed within the Sandstone areas of the Sydney Basin Biogeographic Region. Extensive areas of such habitat are contained within conservation reserves.

No records of the Giant Burrowing Frog appeared on the search of the NSW NPWS Wildlife Atlas Records for the locality, but the habitat requirements of this species suggest that suitable habitat may occur adjacent to the subject site and elsewhere in the locality wherever relatively natural sandstone habitat occurs.

Clearly, habitat suitable for this species is relatively common in the locality. A significant area of known habitat will not be removed or modified by the proposed continuation of sandstone extraction and processing.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas for a threatened species, population or ecological community.*

No isolation of known habitat for Giant Burrowing Frogs will result from the continued operation of the sandstone quarry.

(e) *whether critical habitat will be affected.*

No designated areas of Critical Habitat have been listed under the TSC Act at this time. No assessment under this Part is required.

(f) *whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.*

We expect that the regional habitat for this frog species would be adequately represented in the many conservation reserves on Sandstone in the Sydney area.

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.*

None of the currently listed Threatening Processes will result from the proposed continuation of sandstone extraction within the quarry area.

(h) *whether any threatened species, population or ecological community is at the limit of its known distribution.*

The Giant Burrowing Frog occurs from the Hawkesbury Sandstone areas of the central coast of NSW to eastern Victoria.

The Giant Burrowing Frog is not at the limit of its known distribution in the Glenorie area.

Therefore, based on this assessment, the proposal to continue extraction within the sandstone quarry area, is not expected to cause significant disruptions or loss of habitat for any local population of Giant Burrowing Frogs. Consequently, a Species Impact Statement is not required to be submitted with the Development Application.

Relocation of Small Dam

An assessment of impact on threatened species from the relocation of the small farm dam adjacent to Smallwood Road was not included in the 8-part tests carried out by Conacher Travers. The only threatened species with any potential for adverse effect from the minor relocation (dam to be relocated 5 metres to the east of its current position) of the dam are the Red-crowned Toadlet and Giant Burrowing Frog. The 8 part test for these species and specifically addressing the dam relocation, follows:

Red-crowned Toadlet and Giant Burrowing Frog

(a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction;* and

While no habitat for either frog species occurs within the existing dam or within the area proposed for the dam's relocation, patches of habitat are expected to occur in seepage areas downslope of the dam. Measures to minimise the risk of indirect off-site effects on habitat for these two frog species have been included in the recommendations section of this report and will be adopted in relocating the dam. These include provisions to eliminate the possibility of the water currently held in the dam, that has a high level of suspended solids, entering adjacent drainage lines.

The relocated dam is expected to maintain the existing drainage regime within any drainage line or seepage zones to the east and downslope of the dam.

Therefore no disruption such that a viable local population of Red-crowned Toadlets or Giant Burrowing Frogs is placed at risk of extinction, will occur.

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

Not Applicable.

(c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*

To assess this part of the Section 5A Assessment, a review of known habitat and regional distribution is provided:

The Red-crowned Toadlet and to a lesser extent the Giant Burrowing Frog, is widely distributed within the Sandstone areas of the Sydney Basin Biogeographic Region. Extensive areas of such habitat are contained within conservation reserves.

The Red-crowned Toadlet has been recorded some 47 times within a 10 km radius of the study area over the period 1996 to 2000 (NSW NPWS Wildlife Atlas Records). No records of the Giant Burrowing Frog appeared on the search of the NSW NPWS Wildlife Atlas Records, but the habitat requirements of this species are very similar to those of the Red-crowned Toadlet

Clearly, habitat suitable for both species is relatively common in the locality. A significant area of known habitat will not be removed or modified by the proposed relocation of the small farm dam.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas for a threatened species, population or ecological community.*

No isolation of known habitat for Red-crowned Toadlets or Giant Burrowing Frogs will result from the proposed development.

(e) *whether critical habitat will be affected.*

No designated areas of Critical Habitat have been listed under the TSC Act at this time. No assessment under this Part is required.

(f) *whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.*

The Red-crowned Toadlet is widely distributed within the Sandstone areas of the Sydney Basin Biogeographic Region. Extensive areas of such habitat are contained within conservation reserves.

The Red-crowned Toadlet has been recorded some 47 times within a 10 km radius of the study area over the period 1996 to 2000 (NSW NPWS Wildlife Atlas Records) and extensive areas of habitat for both frog species is expected to occur within the local area.

We expect that the regional habitat for both frog species would be adequately represented in the many conservation reserves on Sandstone in the Sydney area.

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.*

None of the currently listed Threatening Processes will result from the proposed relocation of the small farm dam, since only a very small area (approximately 150 square metres) of vegetation will be removed.

(h) *whether any threatened species, population or ecological community is at the limit of its known distribution.*

The Red-crowned Toadlet is widely distributed within the Hawkesbury Sandstone areas of the Sydney Basin within a radius of approximately 160 km of Sydney. Extensive areas of such habitat are contained within conservation reserves.

The Giant Burrowing Frog occurs from the Hawkesbury Sandstone areas of the central coast of NSW to eastern Victoria.

Neither the Red-crowned Toadlet nor the Giant Burrowing Frog is at the limit of its known distribution in the Glenorie area.

Therefore, based on this assessment, the proposal to relocate the small farm dam approximately 5 metres to the east of its current location adjacent to Smallwood Road, is not expected to cause significant disruptions or loss of habitat for any local population of Red-crowned Toadlets or Giant Burrowing Frogs.

Consequently, a Species Impact Statement is not required to be submitted.

4.3 Commonwealth Environment Protection and Biodiversity Conservation Act, 1999

The EPBC Act was gazetted on the 16th July 2000 replacing several earlier Commonwealth statutes. This Act focuses Commonwealth interests on matters of national environmental significance including integrated biodiversity conservation and the management of important protected areas. The Act also establishes a streamlined environmental assessment and approvals process.

The matters of national environmental significance (NES) as identified in the Act which require assessment and approval to be addressed by the Commonwealth include:

- World Heritage properties
- Ramsar wetlands
- Nationally threatened species and ecological communities (Part 13, Division 1, Subdivision A of the EPBC Act)
- Migratory species
- Commonwealth Marine areas
- Nuclear actions (including uranium mining)

The assessment and approval process complies with any action that has, will have or is likely to have a significant impact on a matter of national environmental significance. An 'action' is defined as a project, development, undertaking or an activity or series of activities.

This flora and fauna survey and impact assessment report was carried out to address the proposal to continue sandstone extraction within the quarry area on the site. The assessment involved a review of literature pertaining to all threatened species previously recorded from the locality in addition to field surveys and assessment of the potential for threatened species of flora and fauna to utilise the habitats of the proposed development area. Based on the assessment process and representation of habitats on the site, it is concluded that none of the locally recorded threatened or migratory fauna species as listed in the *EPBC Act* 1999, were found to occur on the site or indeed are considered to have potential to occur. Furthermore the proposed development site does not contain an area considered of national environmental significance as listed above.

The proposal has also incorporated soil, water and rehabilitation strategies that reduce the potential for adverse effects on the Broadwater Swamp, some distance downstream of the subject site, to a negligible level.

Therefore a specific assessment process under the provisions of the *EPBC Act* 1999 is not considered to be necessary for the proposed development, since it is not likely to significantly affect any matters of NES. A referral to Environment Australia is not therefore required.

5.0 CONCLUSIONS

The proposed continuation of sandstone quarrying within the mostly disturbed areas of this quarry site, is unlikely to have a significant effect on any threatened species, endangered ecological communities or endangered populations.

With the proposed runoff containment within the quarry, water re-use and the discharge of water with only very low levels of suspended solids, no adverse effect on adjacent land or the Broadwater Swamp is anticipated.

6.0 RECOMMENDATIONS

In general, the proposal is expected to impose little impact on the overall biodiversity of the study area. It is believed that these impacts will not affect populations of any threatened species, ecological communities or populations.

An outline of suggested additional habitat management and rehabilitation measures is given below:

- Current best practice techniques for containment of silt and pollutants during any activities involving earthworks should be applied in order to protect downstream water quality. These could include strategic placement of measures such as silt fences, hay bales, and temporary or permanent containment ponds and detention basins.

- It is important to permanently stabilise any pre-existing or newly-created bare soil around the perimeter of the quarry in order to avoid erosion and subsequent silt laden runoff leaving the quarry site. This could be achieved (depending on the situation) by mulching and/or matting (particularly slopes), sowing of single-season hybrid grasses and ultimately revegetation with locally indigenous species. It would be of advantage to the flora and fauna of the study area to revegetate or allow and encourage natural regeneration of vegetation, in any large patches of the quarry area where extraction has been completed. This would also incidentally enhance the visual qualities of the site.

- Some weed species (particularly Whisky Grass) are proliferating on the quarry site, around the small farm dam near Smallwood Road and on adjacent land. It is recommended that any infestations of these weeds both within and outside the quarry area itself, should be controlled promptly by hand removal or appropriate herbicide application to avoid further dispersal by wind or water. The judicious use of chemical herbicides may be warranted, but advice should be sought on the best control methods available. Follow-up control of new seedlings and of re-infestations by such weeds will also be required.

- The application of fertilisers in any rehabilitation work is not recommended due to the presence in this locality of soils that are naturally nutrient-poor.

- It is recommended that the water currently within the small farm dam, containing a high level of suspended solids, should not be released into the adjacent drainage lines unless the suspended solids level can be significantly reduced. It may be possible to avoid discharge altogether if the new dam wall is constructed prior to the removal of the existing one. If this is not possible, the dam could be pumped out until the construction work for the relocated dam is completed.

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8.0 APPENDICES

Appendix 1. Conacher Travers Pty Ltd Flora and Fauna Assessment Report of December 1999

CONACHER TRAVERS

environmental consultants

FLORA AND FAUNA ASSESSMENT REPORT

FOR

PROPOSED SANDSTONE QUARRY
172 SMALLWOOD ROAD
GLENORIE

DECEMBER 1999
(REF: 8083)

Conacher Travers Pty Ltd - ACN 083 610 173

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FLORA AND FAUNA ASSESSMENT REPORT

FOR

PROPOSED SANDSTONE QUARRY
172 SMALLWOOD ROAD
GLENORIE

DECEMBER 1999

Conacher Travers

Environmental Consultants

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Document No	Issue	Description	Prep'. date	Verification by Author	Approved by Director
8083	10/12/99	Final	December 99	JT	

PREFACE

This Flora and Fauna Assessment Report has been prepared by *Conacher Travers Pty Ltd* to identify the flora and fauna characteristics of Lot 11 DP 630938 and Lot 23 DP 1002468 172 Smallwood Road, Glenorie. An assessment in relation to Section 5A of the Environmental Planning and Assessment Act has also been completed to determine if the proposed development is likely to significantly affect threatened species or their habitats.

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CONTENTS

FLORA AND FAUNA ASSESSMENT

FLORA AND FAUNA ASSESSMENT REPORT FOR PROPOSED SANDSTONE QUARRY 172 SMALLWOOD ROAD, GLENORIE

SECTION 1 – INTRODUCTION

1.1 Background

Conacher Travers Pty Ltd has been engaged by Mr and Mrs Petith to complete a Flora and Fauna Assessment for the proposed quarrying of sandstone within the property of Lot 11 DP 630938 and Lot 23 DP 1002468 172 Smallwood Road, Glenorie.

This Flora and Fauna Assessment has been prepared to assess the potential impacts of the proposed development on the flora and fauna of the site and in particular of threatened species and their habitat. This report will also provide information to enable a decision to be made on whether a Species Impact Statement will be required in accordance with Sections 109 and 110 of the *Threatened Species Conservation Act* 1995.

1.2 Site Details

The subject site, known as Lot 11 DP 630938 and Lot 23 DP 1002468 172 Smallwood Road Glenorie as shown in Figure 1.1, comprises of a number of separate lots amounting to approximately 37.5 ha of partially cleared land, existing quarry and natural bushland. The subject site is bordered by private undeveloped land to the north, south and east, with clear paddocks and dwellings present on the land to the west of the site.

1.3 Proposed Activities

The proposed activity is to continue extracting sandstone from the existing quarry and to construct associated infrastructure including dams and sheds.

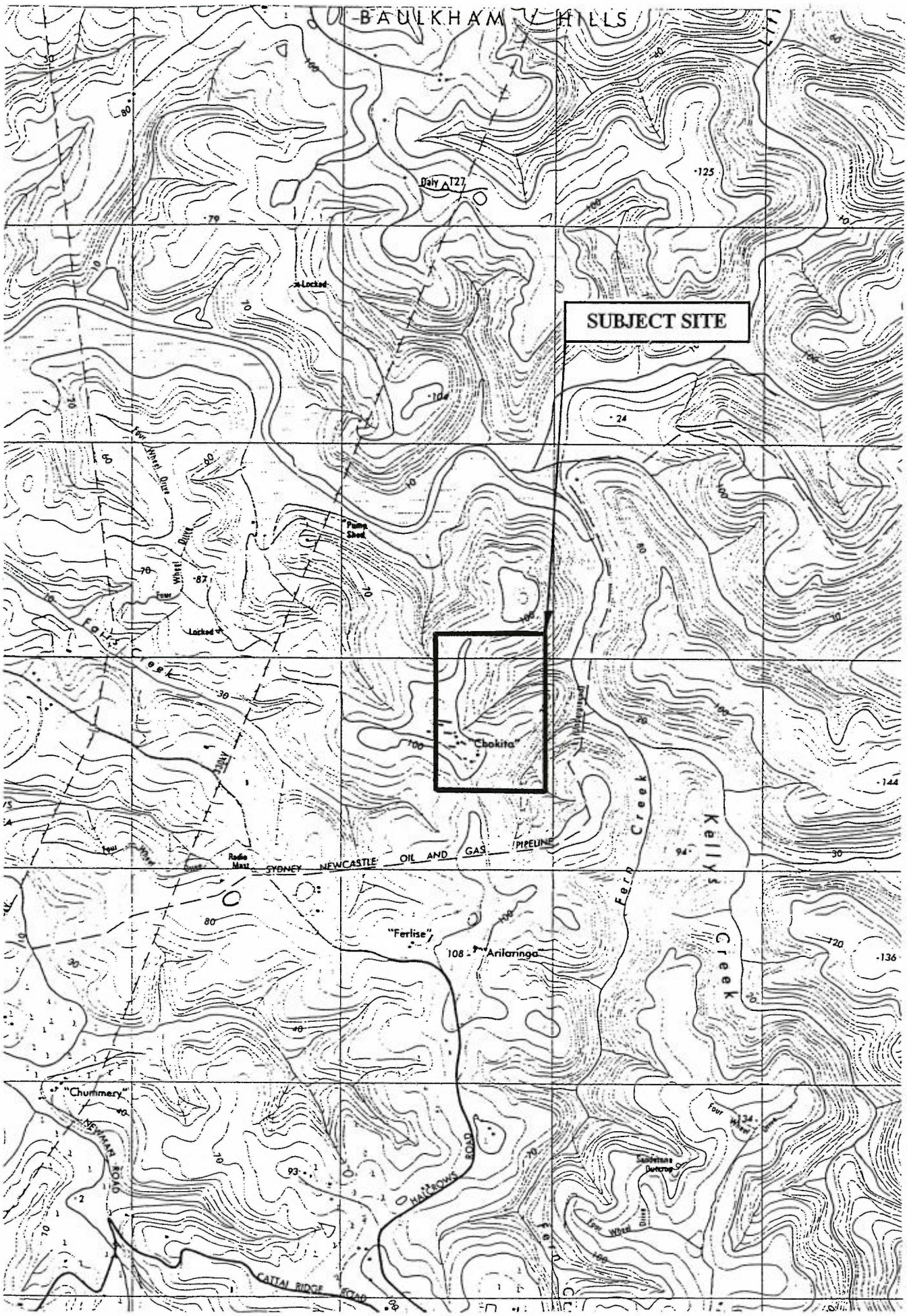
It is understood that the proposed activity will incorporate the upgrading of existing access tracks, incorporation of new access / haul roads, stormwater management structures, stockpile sites and infrastructure buildings associated with the quarrying activities.

1.4 Site Characteristics

The topography of the subject site consists of rocky ridges / moderate steep slopes characterised by the occasional sandstone bench / outcrop. The subject site ranges in elevation from approximately 44m AHD, at the lowest surveyed point within the drainage line, to 104m AHD near the residence. The quarry ranges from 90m AHD in the south west to 68m AHD in the east.

Drainage from the proposed development area is by overland flow, entering Kellys Creek and Broadwater Swamp via an ephemeral drainage line within the western section of the subject site. Water flowing from the subject site is within the sub-catchment of Little Cattai Creek part of the Hawkesbury-Nepean Catchment.

The subject site is located across the boundaries of two soil landscapes, the Hawkesbury and Faulconbridge Soil Landscapes (Bannerman and Hazelton, 1990).



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SCALE 1:25,000
CONTOUR INTERVAL 10 METRES

FIGURE 1.1
LOCATION

The Hawkesbury Soil Landscape is underlain by Hawkesbury Sandstone consisting of medium to coarse grained quartz sandstone with minor shale and laminate lenses (Bannerman and Hazelton 1990). Topography consists of rolling to very steep hills with rock outcrops occurring as horizontal benches and broken scarps to 10m high (Bannerman and Hazelton 1990). Soils in this landscape consist of loose coarse quartz sand, yellowish brown sandy clay loam and pale strongly pedal light clay.

The Faulconbridge Soil Landscape is underlain by Hawkesbury Sandstone consisting of medium to course-grained quartz sandstone with minor shale and laminate lenses (Bannerman and Hazelton 1990). Topography consists of level to gently undulating broad crests and ridges on plateau surfaces. Soils present within this formation include loose, brownish black loamy sand, earthy, yellow clayey sand, yellow, earthy sandy clay loam (Bannerman and Hazelton 1990).

Vegetation throughout the subject site consists of Ridgetop Woodland, Sydney Peppermint - Smooth Barked Apple Open Forest (drier variant), Shale / Mid-slope Open Forest, Gully Open Forest and Cleared Land. A detailed description of the vegetation and fauna characteristics is provided in Section 2 and 3.

SECTION 2 - FLORA CHARACTERISTICS

2.1 Flora Survey Methodology

To determine the likely and actual occurrence of flora species and plant communities on the subject site, field survey work and literature reviews was undertaken. The field survey was concentrated in the northern half of the site, generally to the north of the main creekline, as the areas to be cleared for the proposed development occur within this area and the rest of the site is to remain undisturbed. The methods utilised for the flora survey are as follows.

Literature Review

A review of available literature for the area was undertaken to obtain reference material and background information for this survey. These documents are listed in the References section of this Report.

The NPWS *Wildlife Atlas* database (1999a, 1999b) of threatened flora for the Penrith 1:100,000 Scale Map Sheet were accessed to develop a predictive list of threatened flora species that occur locally and could possibly occur within habitats found on the site.

Aerial Photograph Interpretation

Aerial photographs at 1:25,000 scale were utilised to identify the extent of vegetation with respect to the site and surrounding areas.

Field Survey

A field survey consisting of foot traverses along track edges and within vegetated areas was conducted to identify the occurrence of flora species and the extent and location of vegetation communities present across the subject site. This was also undertaken to determine the positioning of more intensive survey transects. This survey was undertaken on 21, 22, and 23 December 1998.

Specimens of plants not readily discernible in the field were collected for identification. Determination of species composition as well as structural descriptions of the vegetation on the site was also carried out.

Shrub and Tree Survey

Six linear transects (100 metres long) covering all vegetation communities as shown in Figure 2.1, were traversed on foot with observation and recording of all species occurring within 10 metres of the transect being undertaken.

Any hollow bearing trees located within the area covered by these transects were assessed for fauna habitat value during this survey. Any additional hollow bearing trees located during the survey that were not within these transects were also assessed.

Forb and Herb Survey

10 X $1m^2$ quadrats were distributed during each of the transects. Quadrats were sampled for the smaller flora species such as herbs and orchids.

A detailed search was carried out for terrestrial orchids in flower during the flora survey. However, as orchids flower in various seasons of the year identification of specimens not in flower is difficult.

2.2 Vegetation Description

The vegetation within the northern area of the subject site consists of Ridgetop Open Woodland and Southerly Slope Open Forest. The Riparian and Northerly Slope Open Forests form linear stands along the drainage line and adjacent lower slopes respectively. To the south of the drainage easement is another ridge formation, exhibiting Ridgetop Woodland (similar to the vegetation on the northern ridge). Northerly Slope Open Forest is situated northerly facing mid-slope, between the southern ridge and the drainage line. The location of these association, with respect to the subject site are shown in Figure 2.2. A description of these association is provided below while Table 2.1 provides a detailed species list for the site.

RIDGETOP WOODLAND

Structure:

Trees: Trees 10 to 15 metres in height with a projective foliage cover to 20%.

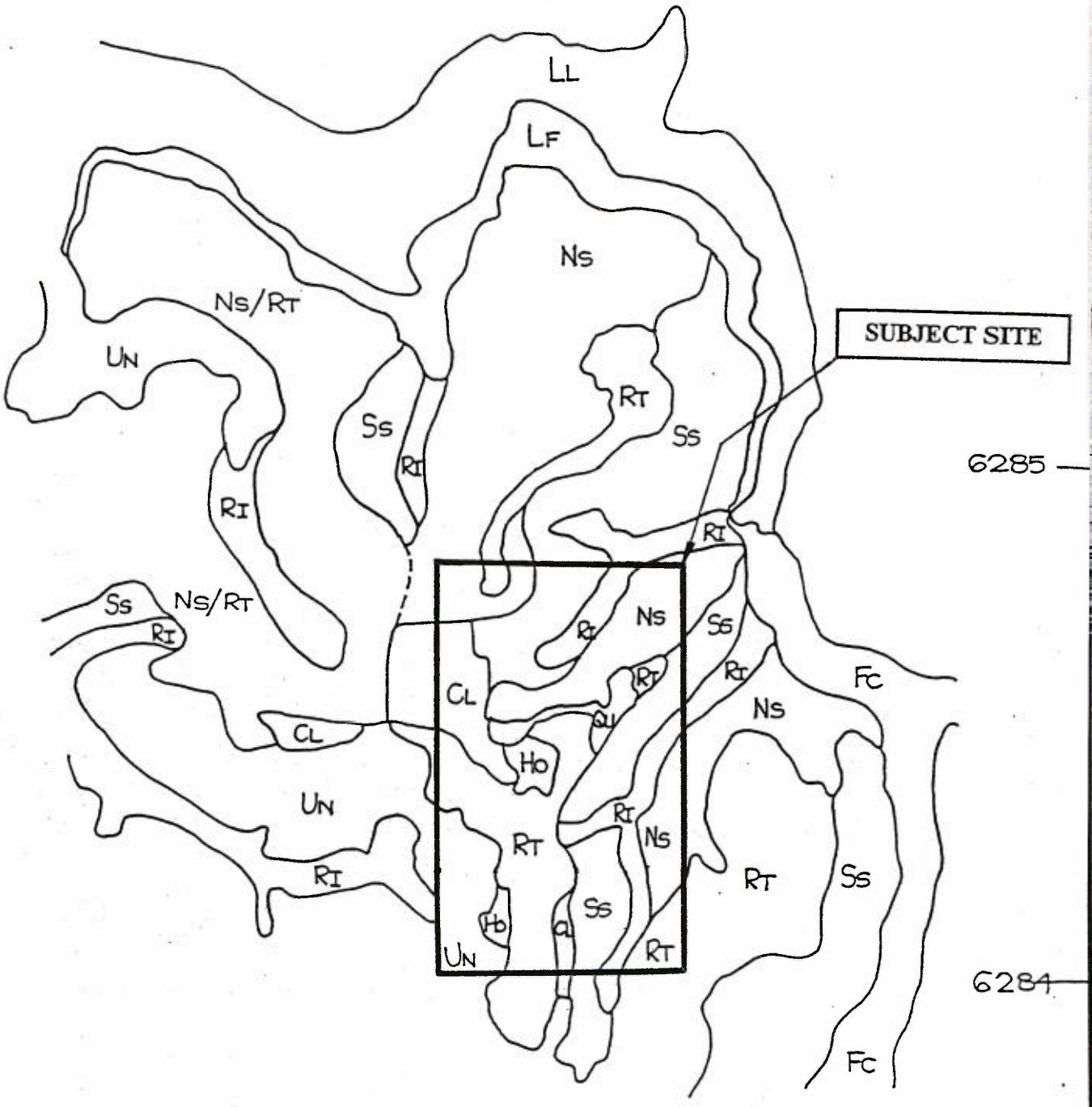
Shrubs: Sparse shrublayer to 1.5 to 2.5 metres with a variable projective foliage cover to 30%.

Groundlayer: Sparse cover of herbs and grasses above a layer of leaf litter interspersed with many areas of bare rock. Cover variable, to 40%.

Floristics:
(Main Species Present)

Trees: *Corymbia eximia* (Yellow Bloodwood), *Angophora bakeri* (Narrow-leaved Apple), *Eucalyptus punctata* (Grey Gum).

VEGETATION COMMUNITY BOUNDARIES AND SURVEY LOCATIONS APPROXIMATE ONLY - NOT SUBJECT TO DETAILED SURVEY FOR MEASUREMENT PURPOSES.



LEGEND

LL	Low Land Swamp	FC	Freshwater Creek Vegetation
RI	Riparian Open Forest	UN	Unspecified Open Woodland/Forest
LF	Low Land Forest	QU	Quarry
NS	Northern Slope Open Forest	CL	Cleared
RT	Ridge Top Woodland	HO	House Site
SS	Southern Slope Open Forest		

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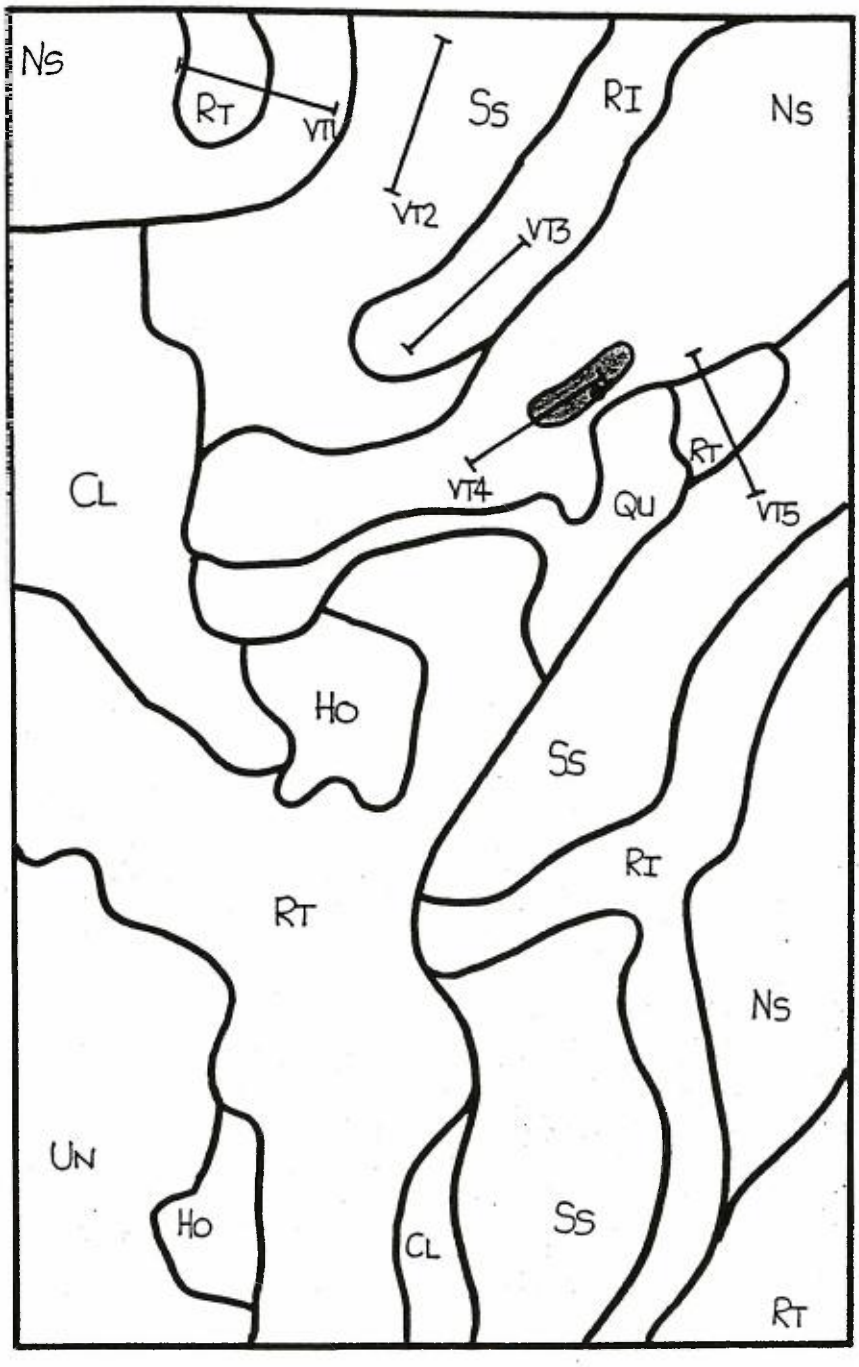
SCALE 1:12,500 (Mapped at 1:25,000)

FIGURE 2.1
VEGETATION FORMATIONS WITHIN THE STUDY AREA

VEGETATION COMMUNITY BOUNDARIES AND SURVEY LOCATIONS APPROXIMATE ONLY
NOT SUBJECT TO DETAILED SURVEY FOR MEASUREMENT PURPOSES.



RI	Riparian Open Forest	**RT**	Ridgetop Woodland
NS	Northern Slope Open Forest	**CL**	Cleared
SS	Southern Slope Open Forest	**HO**	House Site
UN	Unspecified Open Woodland/Forest	VT	Vegetation Survey Locations
QU	Quarry		*Pimelea curviflora* ssp. *curviflora*
		•	*Acacia bynoeana*

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SCALE 1:5,000 (Mapped at 1:25,000)

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FIGURE 2.2
VEGETATION FORMATIONS WITHIN STUDY SITE AND THREATENED SPECIES LOCATIONS

Shrubs: *Allocasuarina littoralis* (Black She-oak), *Lambertia formosa* (Mountain Devil), *Leptospermum polygalifolium* (Lemon-scented Tea Tree), *Pultenaea elliptica* and *Kunzea ambigua* (Tick Bush).

Groundlayer: *Schoenus ericetorum* (Heath Bog-rush), *Lomandra obliqua* (Twisted Mat-rush), *Lomandra filiformis* ssp. *filiformis* and *Platysace linariifolia*.

Disturbance:
This vegetation community is currently in good condition. There is little evidence of disturbance within this community, except for the influences associated with access tracks and quarry operations. Occasional exotic species are present including the species *Bronus sterilis* and *Andropogon virginicus* (Whiskey Grass).

Distribution and additional notes:
This vegetation community occurs throughout both of the ridge tops identified within the subject site, above or throughout extensive sandstone outcrops / ledges. The higher elevated ridge to the north contains higher quantities of sandstone floaters than the southern ridge, resulting in fewer trees and a more open structure. The understorey within the northern ridgeline is less shrubby than the ridge top woodland adjacent to the main quarry site. This vegetation association closely resembles the ridgetop vegetation, as described by Benson (1992).

SOUTHERLY SLOPE OPEN FOREST

Structure:

Trees: Trees to 15 metres in height with a projective foliage cover of approximately 30-40%.

Shrubs: Sparse and diverse shrublayer to 4 metres, projective cover to 20%.

Groundlayer: Sparse cover of herbs and grasses above a layer of leaf litter interspersed with some areas of bare rock. To 1 metre, cover 25%.

Floristics:
(Main Species Present)

Trees: Corymbia *eximia* (Yellow Bloodwood), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus punctata* (Grey Gum) and *Syncarpia glomulifera* (Turpentine).

Shrubs: *Allocasuarina littoralis* (Black She-oak), *Allocasuarina torulosa* (Forest Oak), *Astrotricha floccosa, Persoonia linearis* (Narrow-leaved Geebung) and *Xylomelum pyriforme* (Woody Pear),

Groundlayer: *Acacia echinula, Entolasia stricta* (Wiry Panic), *Platysace linariifolia*.

Disturbance:
Little evidence of disturbance to this community. This plant community is in good condition having only a few introduced species present.

Distribution and additional notes:
This vegetation community occurs throughout sheltered southerly slopes of the subject site below sandstone outcrops of the adjacent ridge tops.

A narrow ecotone is present at the lower margin of this vegetation community, where it adjoins the drainage line. This ecotone is characterised by the presence of shale affiliated species, including Grey Ironbark and Blue-leaved Stringybark. The characteristics of this

ecotone resemble some aspects of Shale / Sandstone Transition Forest, as described within Schedule 3 of the *Threatened Species Conservation Act* 1995.

RIPARIAN OPEN FOREST

Structure:

Trees: Trees 25 metres in height with a projective foliage cover up to 40%.

Shrubs: Sparse shrublayer to 8 metres with projective canopy cover to 40%.

Groundlayer: Mid-dense cover of herbs, ferns and grasses above a layer of deep moist leaf litter interspersed amongst areas of exposed rock.

Floristics:
(Main Species Present)

Trees: *Angophora costata* (Smooth Barked Apple), *Eucalyptus agglomerata* (Blue-leaved Stringybark) and *Eucalyptus paniculata* (Grey Ironbark).

Shrubs: *Allocasuarina torulosa* (Forest She-oak), *Ceratopetalum gummiferum* (Christmas Bush), *Eleocarpus reticulatus* (Blue Berry Ash).

Groundlayer: *Calochalanea dubia* (Soft Bracken), *Epacris pulchella, Gleichenia dicarpa* (Pouched Coral Fern), *Gompholobium grandiflora.*

Disturbance:
Disturbance within this vegetation community is restricted to the ephemeral creekline. Large quantities of soil have eroded into the drainage line from adjacent activities. As a result of changes in soil chemistry and structure, selected exotic species have established small populations within this vegetation community.

Distribution and additional notes:
This vegetation community occurs within the drainage line between the two ridges to the north and south. Attempts to stem the flow of eroded soils into this drainage line have been attempted, however the current status of these structures should be reviewed.

NORTHERLY SLOPE OPEN FOREST

Structure:

Trees: Trees 10 to 15 metres in height with a projective foliage cover of approximately 20%.

Shrubs: Sparse shrublayer to 3 metres. Canopy cover to 30%.

Groundlayer: Sparse cover of herbs and grasses above a layer of leaf litter. Occasional exposed rock can be encountered within this floristic association.

Floristics:
(Main Species Present)

Trees: *Corymbia eximia* (Yellow Bloodwood), *Angophora bakeri* (Narrow-leaved Apple) and *Eucalyptus punctata* (Grey Gum).

Shrubs: *Allocasuarina littoralis* (Black She-oak), *Banksia spinulosa, Exocarpus cupressiformis* (Cherry Ballart), *Lambertia formosa* (Mountain Devil), *Leptospermum trinervium* (Flaky-barked Tea Tree) and *Leptospermum polygalifolium* (Lemon-scented Tea Tree).

Groundlayer: *Entolasia stricta, Platysace linariifolia, Themeda australis.*

Disturbance:
Disturbance within this vegetation community is restricted to the pre-existing access track and clearing at the edge of the quarry site. In parts, this association is in good condition with only a small quantity of introduced species present.

Distribution and additional notes:
This vegetation community occurs across the northerly facing mid-slope of the subject site, above the Riparian Forest and below the Ridge Top Woodland. Two threatened species are found within the upper slopes of this vegetation community. These species are *Pimelea curviflora* ssp. *curviflora* and *Acacia bynoeana*. Furthermore, this vegetation community resembles many of the characteristics of the threatened ecological community – Shale / Sandstone Transition Forest and will be assessed in accordance with Section 5A - Eight Part Test of significance.

Table 2.1 Vegetation Species Observed on the Subject Site

Scientific Name	**Common Name**
Acacia bynoeana[E]	
Acacia echinula	
Acacia falcata	Sickle Wattle
Acacia hispidula	
Acacia linifolia	Flax Wattle
Acacia parramattensis	Sydney Green Wattle
Acacia suaveolens	Sweet Scented Wattle
Acacia terminalis	Sunshine Wattle
Acacia ulicifolia	-
Actinotus helianthi	Flannel Flower
Allocasuarina littoralis	Black She-oak
Allocasuarina torulosa	Forest Oak
*Andropogon virginicus**	Whisky Grass
Angophora bakeri	Narrow-leaved Apple
Angophora costata	Smooth Barked Apple
Angophora hispida	Dwarf Apple
Aristida ramosa	Wire Grass
Astrotricha floccosa	-
Baeckea ramosissima	

Cont. Table 2.1 Vegetation Species Observed on the Subject Site

Scientific Name	Common Name
Banksia spinulosa	Hairpin Banksia
Billardiera scandens	Apple Dumplings
Bossiaea heterophylla	
Bossiaea lenticularis	
Bossiaea obcordata	
Bossiaea scolopendria	-
Callistemon linearis	
Calochaena dubia	Soft Bracken Fern
Calytrix tetragona	Fringe Myrtle
Cassytha glabrella	Devil's Twine
Ceratopetalum gummiferum	Christmas Bush
Cheilanthes sieberi	Poison Rock Fern
Comesperma ericinum	Matchheads
Corymbia eximia	Yellow Bloodwood
Corymbia gummifera	Red Bloodwood
Crassula sieberiana	Austral Stonecrop
Daviesia corymbosa	-
Daviesia ulicifolia	
Dianella caerulea	Flax Lily
Dillwynia retorta	Eggs and Bacon
Dodonaea camfieldii	-
Dodonaea camfieldii	
Elaeocarpus reticulatus	Blueberry Ash
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Epacris pulchella	-
Eucalyptus agglomerata	Blue-leaved Stringybark
Eucalyptus haemastoma	Scribbly Gum
Eucalyptus paniculata	Grey Ironbark
Eucalyptus punctata	Grey Gum
Eucalyptus squamosa	Scaly Bark
Eustrephus latifolius	Wombat Berry
Exocarpus cupressiformis	Native Cherry
Gleichenia dicarpa	Coral Fern
Glycine clandestina	
*Gnaphalium americanum**	Cudweed
Gnaphalium involucratum	Star Cudweed
Gompholobium glabratum	Dainty Wedge-pea
Gompholobium grandiflora	Golden Glory Pea
Gompholobium minus	Dwarf Wedge-pea
Gonocarpus teucroides	-
Goodenia bellidifolia	
Goodenia hederaceae	-
Goodenia heterophylla	
Grevillea buxifolia	Grey Spider Flower
Grevillea mucronulata	Green Spider Flower
Grevillea speciosa	Red Spider Flower
Hakea dactyloides	Broad-leaved Hakea
Hakea sericea	Silky Hakea

Cont. Table 2.1 Vegetation Species Observed on the Subject Site

Scientific Name	Common Name
Hardenbergia violacea	
Hemigenia purpurea	Narrow-leaved Hemigenia
Hibbertia aspera	-
Hibbertia bracteata	
Hibbertia riparia	
Isopogon anemonifolius	Drumstick
Juncus pallidus	Common Rush
Kunzea ambigua	Tick Bush
Kunzea capitata	-
Lambertia formosa	Mountain Devil
Lasiopetalum rufum	-
Laxmannia gracilis	Wire Lily
Lepidosperma laterale	Variable Sword-sedge
Leptospermum polygalifolium	Lemon-scented Tea Tree
Leptospermum trinervium	Flaky-barked Tea Tree
Lepyrodia scariosa	-
Leucopogon muticus	-
Lindsaea linearis	Screw Fern
Lissanthe strigosa	Peach Heath
Lomandra confertifolia	-
Lomandra filiformis	Wattle Mat-rush
Lomandra longifolia	Spiky-headed Mat-rush
Lomandra multiflora	-
Lomandra obliqua	Twisted Mat-rush
Lomatia silaifolia	Crinkle Bush
Mirbelia rubiifolia	-
Mitrasacme paludosa	Mirtwort
Patersonia sericea	Wild Iris
Persoonia levis	Broad-leaved Geebung
Persoonia linearis	Narrow-leaved Geebung
Petrophile pulchella	Conesticks
Phyllanthus hirtellus	Thyme Spurge
Pimelea curviflora ssp curviflora^{V}	
Pimelea linifolia	Slender Rice Flower
Platycerium superbum	Staghorn
Platysace ericifolia	
Platysace linearifolia	Narrow-leafed Platysace
Podocarpus spinulosus	Plum Pine
Pomax umbellata	-
Pteridium esculentum	Bracken Fern
Pultanaea elliptica	-
Scaevola ramossisima	
Schoenus ericetorum	Heath Bog-rush
Schoenus melanostachys	
*Sida rhombifolia**	Paddy's Lucerne
*Solanum physalifolium**	-
Stipa pubescens	-
Stylidium productum	Trigger Plant
Syncarpia glomulifera	Turpentine

Cont. Table 2.1 Vegetation Species Observed on the Subject Site

Scientific Name	Common Name
Tetratheca thymifolia	-
Themeda australis	Kangaroo Grass
Xanthorrhoea media	-
Xanthosia pilosa	-
Xylomelum pyriforme	Woody Pear
Zieria laevigata	-

2.3 Threatened Flora Species

The NPWS Wildlife Atlas database (NPWS, 1999a; 1999b) flora records for the Penrith and St Albans 1:100,000 Map Sheets were accessed to determine the known occurrences of threatened flora species in the local area. A number of threatened plant species, as listed in Schedule 1 and 2 of the *Threatened Species Conservation Act* 1995, with a known distribution within the local area or in habitats similar to those found on site were identified. Target surveys of these threatened flora species were then undertaken to determine the presence of threatened flora species within the subject site. These species are listed in Table 2.2.

Two threatened flora species, *Acacia bynoeana* and *Pimelea curviflora* ssp *curviflora*, were identified on the site within proposed area of quarrying. One threatened ecological community, Shale/ Sandstone Transition Forest, has also been identified within the subject site on the northerly facing midslope adjacent to the quarry. No other threatened flora species were observed on the site.

Table 2.2 Threatened Flora Species of the Area

SPECIES	GROWTH FORM AND HABITAT REQUIREMENTS	CONSERVATION STATUS	COMMENTS
Acacia bynoeana (E)	Erect or low spreading shrub 0.2-1m tall. Grows on sandy soils in heath, woodland and open forests from Morisset to Berrima and Mittagong.	Royal NP (population unknown), Blue Mountains NP (population unknown)	Suitable habitat is present. Observed on site during floristic survey.
Darwinia biflora (V)	Erect or spreading shrub to 80cm high. Grows in heath on sandstone, or understorey of woodland on shale capped ridges. Cheltenham to Hawkesbury River.	Ku-ring-gai Chase NP (> 1000 plants), Lane Cove NP (> 1000 plants), Marramarra NP (population unknown)	No suitable habitat is present. Not observed during floristic survey.

Table 2.2 Threatened Flora Species of the Area

SPECIES	GROWTH FORM AND HABITAT REQUIREMENTS	CONSERVATION STATUS	COMMENTS
Kunzea ruprestis (V)	Erect shrub to 1.5m high. Grows in woodland and heath on sandstone, usually on rock platforms in Marramarra National Park and nearby areas.	Marramarra NP (>1,000 plants), Ku-ring-gai Chase NP (<1,000 plants).	Suitable habitat is present. Not observed during floristic survey.
Leptospermum deanei (V)	Shrub to 5m high, bark peeling in long strips. On forested slopes near watershed of Lane Cove River.	Garigal NP (population unknown).	No suitable habitat is present. Not observed during floristic survey.
Micromyrtus blakely (V)	A low spreading shrub 0.3 to 0.6m high. Grows in heath in depressions on sandstone rock platforms, restricted to areas near the Hawkesbury River.	Marramarra NP (<1,000 plants), Mougamarra NR (<1,000 plants).	Suitable habitat is present. Not observed during floristic survey.
Tetratheca glandulosa (V)	Spreading shrub to 20cm high. Grows in sandy or rocky heath or scrub from Mangrove Mountain to Blue Mountains and Sydney.	Dharug NP, Garigal NP and Ku-ring-gai Chase NP. Populations numbers for these reserves are unknown	Suitable habitat is present. Not observed during floristic survey.
Pimelea curviflora ssp curviflora (V)	Wiry herb to 30 cm high. Grows on sandy soils with increased levels of fertility, generally associated with shale lens from Allambie Heights to South Maroota.	Old records of populations < 1000 plants for Garigal NP and Muogamurra NR. Not conserved in any other reserve within its natural distribution.	Suitable habitat is present. Observed on site during floristic survey.
Acacia gordonii (E)	An erect shrub to 1 metre high. Locally, this species grows in deep sands on ridgetops and sand accumulations between sandstone platforms.	Not currently reserved within its natural distribution.	Suitable habitat is present. Not observed during floristic survey.
Persoonia hirsuta (E)	A spreading to decumbant shrub with moderate to densely hairy branches. Grows in woodlands and dry sclerophyll forest on sandstone	Blue Mountains NP, Wollemi NP, Dharug NP, Ku-ring-gai Chase NP, Marramarra NP, Royal NP and Sydney Harbour NP (all populations <1,000)	Suitable habitat is present. Not observed during floristic survey.

Table 2.2 Threatened Flora Species of the Area

SPECIES	GROWTH FORM AND HABITAT REQUIREMENTS	CONSERVATION STATUS	COMMENTS
Hibbertia incana (EP)	A prostrate shrub to 20 cm high. Grows in sandy and lateritic soils and granite from Maroota to South Australia.	Not currently reserved within the Shire of Baulkham Hills, where it is proclaimed an Endangered Population.	Suitable habitat is present. Not observed during floristic survey.
Zieria involucrata (V)	A tall erect shrub to 2m high. Grows in open forest and moist gullies.	Blue Mountains NP (population unknown), Marramarra NP (<1,000 plants), Parr SRA (>1,000 plants), Yengo NP (<1,000 plants).	Suitable habitat is present. Not observed during floristic survey.

2.4 Local Distribution of Vegetation

Vegetation within the subject site consists of Hawkesbury sandstone Ridge-top Woodland, mid-slope open forest and Gully open forest formations (See section 2.2 for descriptions). The subject site is located within the rural bushland setting of Baulkham Hills Shire LGA, between Marramarra and Cattai National Parks to the east and west respectively, and Maroota State Forest to the north. This extensive area of vegetation is characterised by heaths, open woodlands, open forests and tall open forests, with small areas of cleared lands. Cleared lands within the area are primarily used for agricultural pursuits including, stone fruit cultivation and cattle grazing, to the more recent trend of horse paddocks and hobby farming.

Ridge-top and associated north to westerly facing upper slopes vegetation within the subject site are dry (annual rainfall approximately 800mm per annum) and situated on infertile soils. Vegetation of this classification can be found throughout the Sydney Basin Bio-region on various soils such as Faulconbridge, Hawkesbury and Gymea Soil Landscapes and is described in broad terms by Benson (1992).

SECTION 3 - FAUNA CHARACTERISTICS

3.1 Fauna Survey Methodology

In order to detect the possible occurrence of threatened fauna species specific methods targeting these species were employed in addition to the standard fauna survey methods of nocturnal spotlighting and habitat searches. Habitat searches, trapping and opportunistic sampling was undertaken from the 21st to the 23rd December 1998 with trapping occurring on the nights of 21 and 22 December 1998.

Traps were set along five 100m transects throughout the subject site as shown in Figure 3.1. Locations for the site specific survey work are also shown in these figures. The results of these surveys are provided in Section 3.3.

Weather conditions during the survey were partly cloudy to fine. Temperatures were mild to warm (26-28°C) with mild nights (15-18°C), atypical of summer conditions for December. Methods utilised to survey fauna survey include the following:

Literature Review:

Review of local resource documents.

Review of the NPWS Wildlife Atlas database (NPWS, 1999a; 1999b) containing listings of threatened fauna species for the Penrith and St Albans 1:100,000 Scale Map Sheets.

Habitat Searches:

Completion of 2x3 hour day-time field traverses (6.30am-9.30am) throughout the subject site by two persons.

Ground survey methods included searches of likely niches of fauna such as dense undergrowth, around trees, under logs and rocks, aquatic and gully habitats and observation of any bird or frog calls of species not visually observed. Additionally any tracks, diggings, scats or other observable detail of the presence of fauna species was noted.

Diurnal bird censuses were undertaken during periods of relatively high bird activity (early morning, late afternoon) from central points within the site or areas of high bird activity (waterholes, stands of flowering plants, etc.). All bird species seen or heard were recorded during the census for a period of 30 minutes. Diurnal birds were also sampled opportunistically during habitat assessments and other field survey stages.

Nocturnal Survey

Completion of 2 x 2 hour (8-10pm) spotlight survey by two persons on the nights of the 21st and 22nd December 1998. This involved the use a 55 watt rechargeable spotlight with on foot traverses along existing tracks, boundary fence line, remnant woodland and of individual trees.

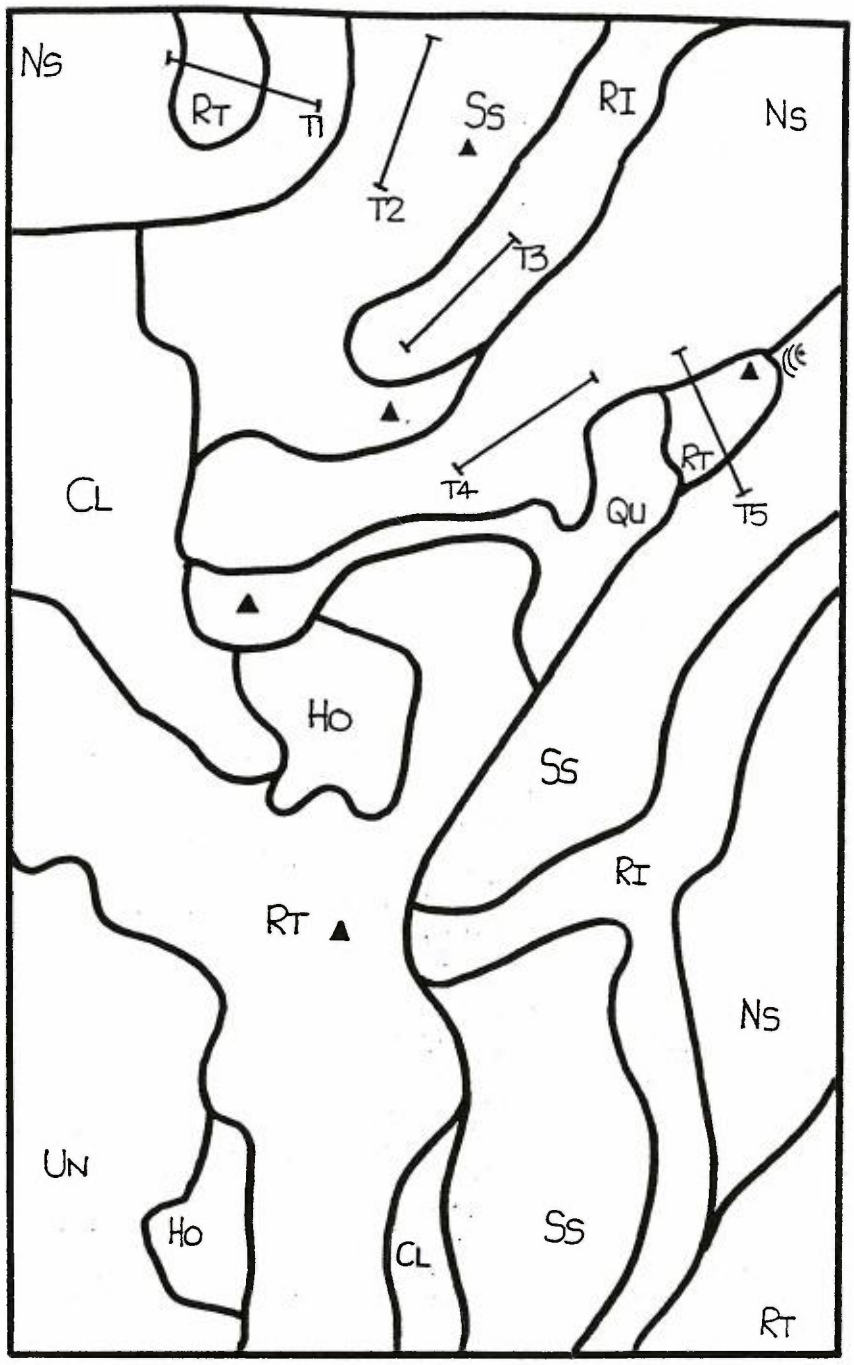
Fifteen minute "stagwatch" observations of selected tree hollows for evidence of faunal activity.

Recorded calls of the Powerful, Barking, Sooty and Masked Owls were played on a battery operated loudspeaker (13 watt power) at five minute intervals every 30 minutes for two hours at one central location commencing 15 minutes after dusk (21 and 22 December 1998). A 30 minute listening and spotlighting period was engaged after the completion of owl call playbacks.

Arboreal Mammal Survey

Four 100m transects of 5 traps each (5 Type A Elliott Traps) were set over two consecutive nights (40 trap nights). Traps were placed in suitable locations along the transects and in conjunction with terrestrial mammal trapping.

VEGETATION COMMUNITY BOUNDARIES AND SURVEY LOCATIONS APPROXIMATE ONLY
NOT SUBJECT TO DETAILED SURVEY FOR MEASUREMENT PURPOSES.



RI	Riparian Open Forest	**RT**	Ridgetop Woodland
NS	Northern Slope Open Forest	**CL**	Cleared
SS	Southern Slope Open Forest	**HO**	House Site
UN	Unspecified Open Woodland/Forest		Fauna Survey Locations
QU	Quarry	▲	Anabat Station
			Owl Call Station

N

0 100

SCALE 1:5,000 (Mapped at 1:25,000)

FIGURE 3.1
FAUNA SURVEY LOCATIONS

All traps were baited with a mixture of peanut butter, rolled oats and honey. A 50% solution of honey/water was sprayed on the tree trunks and trap support to act as an attractant for arboreal mammals.

All traps were placed in an open-ended plastic bag to provide captured animals with insulation and protection from inclement weather conditions. Traps were secured onto mounts that were attached to the trunk of eucalypts at heights ranging from approximately two to three metres. The trap mounts consisted of 500mm long hardwood planks bolted onto a steel angle bracket, which was then nailed onto the tree trunk at an incline to facilitate drainage.

Terrestrial Mammal Survey

Four 100m transects of 20 traps each (18 Type A and 2 Type B Elliott Traps) were set over two consecutive nights (160 trap nights). Traps were placed in suitable locations along the transects and in conjunction with arboreal mammal trapping.

One 100m transect of 5 traps (cage traps) were set over two consecutive nights (10 trap nights).

Elliott traps were baited with a mixture of rolled oats, honey and peanut butter and set in suitable locations next to animal diggings, burrows, fallen logs, tree trunks and animal runways. Traps were placed in an open-ended plastic bag to provide animals caught with insulation and protection from inclement weather conditions

All traps were checked each morning and closed to prevent unwanted diurnal captures. Traps were reset each afternoon and rebaited if necessary.
When released, captured animals were traced to their den sites if possible.

Chiropteran Survey

The ultrasonic calls of Microchiropteran bats were recorded onto audio cassette tapes using an Anabat II echolocation call detector at 4 locations throughout the subject site for 10 minutes each for two nights.

An Anabat II ZCA Interface Module and Anabat 5.2b Software package for an IBM Compatible computer were used to analyse the ultrasonic call patterns recorded during the field and identify those species recorded on site.

A survey for Flying-foxes was conducted by spotlighting of potential food trees and by identification of their characteristic social calls.

Harp traps were not utilised during this survey due to the absence of suitable low level flyways within the open forest.

Herpetofauna Survey:

Frog and reptile species were targeted using habitat searches, spotlighting and call playback and detection methods.

3.2 Fauna Habitats

A range of fauna habitats are present throughout the site and include:

- Vegetated areas comprising Cleared Land and Woodland;
- Hollow bearing trees;
- Fallen timber and hollow logs;
- Sparse shrub and ground cover;
- Deep litter layer;
- Extensive areas of sandstone boulders, overhangs and crevices;
- Aquatic habitats within the drainage line.

The subject site provides a range of foraging habitats including a sparse shrub and ground cover, deep litter layer and the canopy of the Open Forest and woodland for a range of species. Hollow bearing trees are distributed throughout the vegetation communities and provide suitable roosting and nesting sites for a range of mammals and bird species. Approximately 8 hollow bearing trees were identified within the area to be cleared. The shrublayer and groundcover create sparse cover providing suitable habitat and cover for terrestrial mammals.

Fallen timber, hollow logs and extensive areas of sandstone rock outcrops, boulders, overhangs and crevices are present across the site which provided a range of shelter and foraging habitats for a number of species. Aquatic habitats along the drainage line provide suitable habitats for a range of species.

3.3 Threatened Fauna Species

A search of the NPWS Wildlife Atlas Database (NPWS, 1999a; 19999b) was conducted for the threatened fauna species recorded within a 10km radius of the subject site. This revealed a number of threatened species that may be present in the area. Details on threatened species (Schedule 1 or 2) which are known to occur within the area are provided in Table 3.1.

Table 3.1 Recorded and Expected Threatened Fauna of the Area

COMMON NAME *Scientific Name*	PREFERRED HABITAT	COMMENTS
Giant Burrowing Frog *Heleioporus australiacus*	Has been recorded as breeding in burrows in the banks of small creeks. Distribution Limit- N-Near Singleton. S-South of Eden	No suitable habitat present on site.
Red-crowned Toadlet *Pseudophryne australis*	Prefers sandstone areas, breeds in grass and debris beside non-perennial creeks or gutters. Shelter under logs and rocks in non breeding periods. Distribution Limit - N-Pokolbin. S-Near Wollongong	Suitable habitat present. Species present on site.
Heath Monitor *Varanus rosenbergi*	Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops. Distribution Limit- N-Nr Broke S-Nowra Located in scattered patches near Sydney, Nowra and Goulburn.	Suitable habitat present. Species not observed during survey. (A)

Cont. Table 3.1 Recorded and Expected Threatened Fauna of the Area

COMMON NAME *Scientific Name*	PREFERRED HABITAT	COMMENTS
Square-tailed Kite *Lophoictinia isura*	Utilises mostly coastal and sub-coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and mallee that are rich in passerine birds. Distribution Limit - N-Goondiwindi. S-South of Eden.	Suitable habitat present. (A)
Glossy Black Cockatoo *Calyptorhynchus lathami*	Open forests with *Allocasuarina* species and hollows for nesting. Distribution Limit - N-Tweed Heads. S-South of Eden	Suitable habitat present. Evidence of presence due to chewed Allocasuarina.
Swift Parrot *Lathamus discolor*	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. Distribution Limit- N-Border Ranges National Park S-South of Eden	Suitable habitat present. (A)
Powerful Owl *Ninox strenua*	Forests containing mature trees for shelter or breeding & densely vegetated gullies for roosting. Distribution Limits- N-Border Ranges National Park S-Sth of Eden	Suitable habitat present. (A)
Barking Owl *Ninox connivens*	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. Distribution Limits- N-Border Ranges National Park S-Eden	Suitable habitat present. (A)
Masked Owl *Tyto novaehollandiae*	Open forest & woodlands with cleared areas for hunting. Distribution Limit - N-Border Ranges National Park S-Eden	Suitable habitat present. (A)
Painted Honeyeater *Grantiella picta*	Found in open forest, woodland and scrubland feeding on mistletoe fruits. Distribution Limit- N-Boggabilla S-Albury.	Suitable habitat present. (A)
Regent Honeyeater *Xanthomyza phrygia*	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. Distribution Limit- N-Urbanville S-Eden	Suitable habitat present. (A)

Cont. Table 3.1 Recorded and Expected Threatened Fauna of the Area

COMMON NAME *Scientific Name*	PREFERRED HABITAT	COMMENTS
Spotted-tail Quoll *Dasyurus maculatus*	Dry and moist open forests containing rock caves, hollow logs or trees. Distribution Limit- N-Mt Warning National Park. S-South of Eden	Suitable habitat present. (A)
Koala *Phascolarctos cinereus*	Inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees. Distribution Limit- N-Tweed Heads. S-South of Eden	Suitable habitat present. (A)
Yellow-bellied Glider *Petaurus australis*	Restricted to tall mature eucalypt forests including high nectar producing species and hollow bearing trees. Distribution Limit- N-Border Ranges National Park S-South of Eden	Suitable habitat present. Evidence of presence due to observed feeding scars on trees.
Squirrel Glider *Petaurus norfolcensis*	Mixed aged stands of open forests and woodlands including gum barked & high nectar producing species & hollow bearing trees. Distribution Limit- N-Lismore S-Albury	Suitable habitat present. (A)
Large Pied Bat *Chalinolobus dwyeri*	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. Distribution Limit - N-Border Ranges Nation Park. S-Wollongong.	Suitable habitat present. (A)
Little Bentwing-bat *Miniopterus australis*	Roosts in caves, old buildings and tree hollows in the open forests along the east coast of. Distribution Limit- N-Border Ranges National Park. S-Sydney	Suitable habitat present. (A)
Common Bentwing-bat *Miniopterus schreibersii*	Roosts in caves, old mines, old buildings, stormwater drains & forages in timbered areas. Distribution Limit - N-Border Ranges National Park. S-South of Eden	Suitable habitat present. (A)
Eastern Freetail-bat *Mormopterus norfolkensis*	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. Distribution Limit - N-Woodenbong. S-Pambula	Suitable habitat present. (A)
Large-footed Myotis *Myotis macropus*	Rainforests and sclerophyll forests near creeks and lakes over which it feeds. Roosts in tree hollows, caves, mines and tunnels. Distribution Limit - N-Border Ranges Nation Park. S-South of Eden.	Suitable habitat present. (A)

Table 3.2 Fauna Species Observed on and Adjacent to the Site

Scientific Name	Common Name	Method of Recording
BIRDS		
Dacelo novaeguineae	Kookaburra	O C
Alisterus scapularis	King Parrot	O C
Hirundo ariel	Fairy Martin	O
Ninox novaeseelandiae	Southern Boobook	C
Eudynamys scolopacea	Common Koel	O C
Calyptorhynchus lathami^{V}	Glossy Black Cockatoo	Sc
Platycercus eximius	Eastern Rosella	O C
Accipiter fasciatus	Brown Goshawk	O
Lichenostomus chrysops	Yellow-faced Honeyeater	O
Anthochaera chrysoptera	Brush Wattlebird	O C
Geophaps lophotes	Crested Pigeon	O C
Philemon corniculatus	Noisy Friarbird	O C
Podargus strigoides	Tawny frogmouth	C
Petroica phoenicea	Flame Robin	O C
Oriolus flavocinutus	Olive-backed Oriole	O C
Pardalotus punctatus	Spotted Pardalote	O C
Eopsaltria australis	Eastern Yellow Robin	O C
Pachycephala rufiventris	Rufous Whistler	O C
Rhipidura fuliginosa	Grey Fantail	O C
Rhipidura leucophrys	Willy Wagtail	O C
Hirundo neoxena	Welcome Swallow	O C
Corvus coronoides	Australian Raven	O
Grallina cyanoleuca	Australian Magpie-Lark	O C
Cracticus nigrogularis	Pied Butcherbird	O C
Phaps chalcoptera	Common Bronzewing	O C
REPTILES		
Pogona barbata	Bearded Dragon	O C
Phyllurus platurnus	Southern Leaf-tailed Gecko	
Lampropholis delicata	Grass Skink	O
Varanus varius	Lace Goanna	O Sc
Cryptoblepharus virgatus	Fence Post Skink	O
Ctenotus taeniolatus	Coppertail Skink	Sc
Underwoodisaurus milii	Thick-tailed Gecko	O
AMPHIBIANS		O
Crinia signifera	Common Eastern Toadlet	O
Limnodynastes peronii	Striped Marsh Frog	
Litoria fallax	Eastern Dwarf Tree Frog	C
Litoria latopalmata	Broad-palmed Rocket Frog	C
Litoria peronii	Peron's Tree Frog	C
Pseudophryne australis^{V}	Red-crowned Toadlet	C
Uperoleia laevigata	Smooth Toadlet	O C
		C

Cont. Table 3.2 Fauna Species Observed on and Adjacent to the Site

Scientific Name	Common Name	Method of Recording
MAMMALS		
Macropus rufogriseus	Red-necked Wallaby	Sc
Macropus robustus	Common Wallaroo	Sc
Wallabia bicolor	Swamp Wallaby	Sc
Antechinus stuartii	Brown Antechinus	E
Rattus fuscipes	Bush Rat	E
Trichosurus vulpecula	Common Brushtail Possum	O
Pseudocheirus peregrinus	Common Ringtail Possum	O
Petaurus australis^{v}	Yellow-bellied Glider	Sc
Petaurus breviceps	Sugar Glider	C
Acrobates pygmaeus	Feathertail Glider	O
Chalinolobus morio	Chocolate Wattled Bat	A
Chalinolobus gouldii	Gould's Wattled Bat	A
Vespadelus pumilus	Little Cave Bat	A
*Canis familiaris**	Dog	Sc
*Capra hircus**	Goat	Sc
Oryctolagus cuniculus	Rabbit	O
^{v} = Threatened Species		
* = Introduced Species		

Key to Methods of Observation

O	- Observation	S	-	Search	
C	- Call Identification	A	-	Anabat II	
Sp	- Spotlight	Sc	-	Scat, Track or Sign Identification	
E	- Elliott Trap	H	-	Harp Net	

3.5 Koala Habitat Assessment

Koala Survey:

The subject area was assessed for activity by Koalas using the following methods:

A search of the NPWS Wildlife Atlas Database (NPWS, 1999a; 1999b)

The site was surveyed on foot with all species of Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for presence of Koalas, scratch and claw marks on the trunk and scats around the base of each tree. The proportion of trees showing signs of Koala use was calculated for each transect. Additionally the location and density of droppings if found were documented.

Koalas were also targeted during spotlight surveys.

Identification and an assessment of the density of tree species listed as Koala feed trees in State Environmental Protection Policy No. 44 - Koala Habitat Protection was undertaken across the site. A count of all tree stems with a DBH (Diameter at Breast Height) >150mm was made within 20m either side of six 100m linear transects. An estimate of the percentage density of each tree species across the site was determined by averaging the percentage of stems counted along each transect.

The dominant tree species across the site are Yellow Bloodwood (*Corymbia eximia*), Thin-leaved Rough Barked Apple (*Angophora bakeri*) and Grey Gum (*Eucalyptus punctata*). Forest Oak (*Allocasuarina torulosa*), Black She-oak (*A. littoralis*), Red Bloodwood (*C. gummifera*), Blue-leaved Stringybark (*E. agglomerata*), Scribbly Gum (*E. haemastoma*) and Turpentine (*Syncarpia glomulifera*) are also present across the site at lower densities.

The site was found to contain *E. punctata* and *E. haemastoma,* two Koala feed tree species listed on Schedule 2 of State Environmental Planning Policy No 44 - Koala Habitat Protection. The central (NS) and south-western areas of the subject site are considered to form Potential Koala Habitat as the tree density of forage species is greater than 15% of the total trees present.

No Koalas were observed during the fauna survey and no evidence of Koala habitation, such as scats, claw and scratch marks, were located on the site. A check of the NPWS Atlas database (NPWS, 1999a; 1999b) did not indicate the presence of Koalas within the immediate area. Due to the lack of evidence supporting Koala habitation within the subject site, it is concluded that the subject site does not constitute Core Koala Habitat as defined by SEPP 44 legislation.

SECTION 4 - DISCUSSION AND CONCLUSION

4.1 Suggested Ameliorative Measures

The proposed activity will be confined to the northern ridge within the subject site. Vegetation clearing will also be restricted to this area, leaving the remaining vegetation throughout the subject site relatively undisturbed. It is expected that disturbances associated with the proposed activity will affect vegetation to 5 metres beyond the identified area of clearing, this resulting in the modification of these adjacent environs.

Following the detailed flora and fauna survey, it is considered that the proposed development should include tree retention in order to retain the fauna habitat attributes of the site for threatened species known to utilise the local area. Suggested measures for implementation, to aid in the reduction of short / long term impacts on resident flora and fauna species, are provided below.

DEVELOPMENT DESIGN AND MITIGATIVE MEASURES

The objective of the following ameliorative measures and suggested alterations in development design is to maximise development opportunities, whilst retaining tree canopy cover and habitat for threatened species. Measures suggested for implementation include:

Identification and retention of hollow bearing trees;

The production of a Soil and Bushland Management Plan to maintain the natural characteristics of the subject site for threatened species and to prevent the deterioration of the subject during the operation phase of the proposed activity.

CONSTRUCTION STAGE AMELIORATIVE MEASURES

The object of the following ameliorative measures is to reduce the impact of vegetation clearing and initial earthworks on fauna utilising the site, particularly for populations of

threatened species identified as utilising the subject site. The proposed / recommended construction stage amelioration measures include:

- Identification and marking of hollow bearing trees required to be cleared;
- Erection of appropriate fencing / marking tape around trees to be retained;
- For trees to be removed inspection of tree hollows by spotlight survey immediately prior to clearing to determine if hollows are being utilised by tree dwelling fauna, including threatened species. If they are being utilised the occupying fauna should be trapped and relocated to adjoining areas prior to these trees being felled;
- Hollow bearing trees to be removed should be felled in sections of approximately one metre length with inspections of the hollow sections prior to felling undertaken to determine if fauna is present within the hollow. Fauna occupying hollows should be carefully removed by an experienced fauna expert and relocated to another tree away from the area of clearing
- Minimisation of disturbance to stands of *Allocasuarina spp.*
- Restriction of clearing hollow bearing trees during the breeding season for chiropteran bats (October - December) and Yellow-bellied Gliders (August - December).
- The erection of soil erosion preventative structures for the conservation of core habitat for the Red Crowned Toadlet.
- The exclusion of vehicle access and quarrying activities within the gully, thereby alleviating the exposure of Red Crowned Toadlet populations to adverse pressures.
- Identification, marking and preservation of threatened flora species populations, namely *Acacia bynoeana* and *Pimelea curviflora* ssp. *curviflora*. Shale / Sandstone Transition Forest will be conserved as a result of the conservation of the afore-mentioned threatened species.

The above ameliorative measures should not be interpreted as final recommendations. Suggested ameliorative measures have been provided for consideration by the client and appropriate review authority responsible for the processing of this development application.

4.2 Impact on Vegetation and Fauna Habitats

Vegetation removal resulting from the proposed activity is expected to have a low overall impact on flora and fauna within the site and local area due to the limited area of vegetation to be cleared and presence of extensive areas of natural bushland remaining undisturbed throughout the subject site and the local area.

The site contains a number of habitats including a number of hollow bearing trees, shrub layer, fallen timber, hollow logs, extensive areas of sandstone boulders, extensive stands of *Allocasuarina* sp., overhangs and outcrops, deep litter layer, aquatic habitats within the drainage line and the eucalypt canopy.

The Woodland vegetation communities present on the site form part of the Sydney Sandstone Ridgetop Woodland Complex described by Benson and Howell (1994). The Sydney

Sandstone Ridgetop Woodland is widespread, occupying extensive areas of the Sydney Basin Bio-region (Benson, 1992; Benson and Howell 1994). This vegetation community is represented within a number of local conservation reserves including Berowra Valley Bushland Park, Marramarra National Park, Ku-ring-gai Chase National Park and Muogamarra Nature Reserve (Benson 1992, Benson and Howell 1994, Thomas and Benson 1985, 1991).

The Sydney Sandstone Ridgetop Woodland Complex is also represented within a large number of National Parks and other reserves within the region including: Garigal National Park, Lane Cove River National Park, Brisbane Water National Park, Dharug National Park, Popran National Park, Georges River National Park, Royal National Park, Heathcote National Park, Blue Mountains National Park, Wollemi National Park and Yengo National Park (Benson 1986, 1992, Benson and Howell 1994).

Due to the extensive areas of the site to be retained in an undisturbed condition it is considered that future clearing and development within the subject site for the proposed quarry is unlikely to result in the removal of a significant portion of vegetation.

Two threatened flora species and their habitats have potential to be significantly affected by the proposed activity. These species, include *Pimelea curviflora* ssp. *curviflora* and *Acacia bynoeana*, will be discussed in greater detail in the following section.

4.3 Impact on Threatened Species

Due to the relevance of the *Threatened Species Conservation Act* 1995, several matters need to be considered to determine whether there is likely to be a significant effect on the environment of threatened species. As identified in Section 5(A) of the *Environmental Planning & Assessment Act* 1979 the following matters need to be addressed to determine whether or not a significant effect on threatened species, populations or ecological communities or their habitats is likely to result from the proposed development.

SECTION 5A - EP&A ACT, 1979
EIGHT-PART TEST OF SIGNIFICANCE FOR THREATENED SPECIES

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to placed at risk of extinction,

Yellow-bellied Glider
The proposed activity will be restricted to the northern ridge within the subject site. The proposed quarry will remove a small quantity of trees suitable for Yellow-bellied Glider foraging (*E. punctata*). Extensive areas of suitable foraging grounds will remain within the subject site and surrounding bushland landscape during and after the proposed development. It is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

Glossy Black Cockatoo
Glossy Black Cockatoo habitat is well spread throughout the subject site, with the highest concentration of suitable forage species (*Allocasuarina* spp.) within the subject site located within the mid-slope and gully vegetation representations. The proposed activity will not remove a significant proportion of forage species from the subject site or local area for the Glossy Black Cockatoo. It is considered that the life cycle of this species is unlikely to be

disrupted such that a viable local population of this species will be placed at risk of extinction.

Red Crowned Toadlet
Red Crowned Toadlet habitat is confined to the drainage line between the two main ridges within the subject site. Currently, this habitat is suffering from extensive soil deposits, sourced from up-slope soil erosion. The proposed activity will not alter this conclusion unless revegetation, weed control and sediment control structures are installed within the drainage catchment. Provided management of this catchment is undertaken, it is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

Pimelea curviflora ssp. curviflora
The local population of the vulnerable *Pimelea curviflora* ssp. *curviflora* is restricted to the upper slopes of the Northern Slope Open Forest. The proposed activity has been tailored to avoid the removal of this population. Provided ongoing mitigation is implemented, it is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

Acacia bynoeana
One single specimen of the endangered *Acacia bynoeana* was found within the subject site. This specimen is located adjacent to the proposed activity A ridge further to the south does contain a number of specimens of *Acacia bynoeana* which are currently within undisturbed habitat. Provided that ongoing mitigation is implemented, it is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

Suitable habitat for an additional seven (7) threatened flora species was identified on site, as listed in Table 2.2. Each of these species has been identified as occurring within a 10 kilometre radius of the site (NPWS, 1999a; 1999b). Despite the presence of suitable habitat for these threatened species, none were detected within the subject site. It is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

Suitable habitat for an additional eighteen (18) threatened fauna species was identified on site, as listed in Table 3.1. Each of these species has been identified as occurring within a 10 kilometre radius of the site (NPWS, 1999a; 1999b) or is known to occur within the general vicinity. Despite the presence of suitable habitat for these threatened species, none were detected within the subject site. It is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,

No endangered populations, listed within Part 2 Schedule 1 of the *Threatened Species Conservation Act* 1995, have been identified within the subject area. However, one population *Hibbertia incana* has been identified as endangered within the Baulkham Hills Local Government Area.

Hibbertia incana

Hibbertia incana has been determined as an endangered population within the Shire of Baulkham Hills. Suitable habitat for this species is present within the area proposed for quarries. However this species was not observed on the site during the survey and is not considered to be present. It is considered that the life cycle of this species is unlikely to be disrupted such that a viable local population of this species will be placed at risk of extinction.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,

The distribution of known habitat for the Yellow-bellied Glider, Red Crowned Toadlet, Glossy Black Cockatoo and *Acacia bynoeana* is widespread throughout the region. Habitat for these species is well conserved within the region. The proposed development will not alter the status of the habitat for these species.

The distribution of known habitat for *Pimelea curviflora* ssp. *curviflora* is poorly understood and is likely to be of limited occurrence. Old records suggest that suitable habitat is conserved within two regional reserves (Garigal NP and Muogamarra NR). However, the current status of this species within these reserves is currently unknown.

Shale / Sandstone Transition Forest is distributed throughout the rim of the Cumberland Plain of the Sydney region. Representations of this community within the National Reserve estate are limited to three conservation reserves. These are Blue Mountains NP, Cattai NP and Gulguer NR. The proposed development will not remove or modify a significant proportion of this community within the region.

Suitable habitat for selected threatened flora species identified within Table 2.2 is present within the subject site. When considering the large quantity of undisturbed bushland within the area proposed for quarries and adjoining catchments. It is unlikely that the proposed activity will remove or modify a significant quantity of habitat for threatened species.

Suitable habitat for selected threatened fauna species identified within Table 3.1 is present within the subject site. When considering the large quantity of undisturbed bushland within the proposed quarry area and adjoining catchments. .It is unlikely that the proposed will remove or modify a significant quantity of habitat for threatened species.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,

Known habitat for the Yellow-bellied Glider, Red Crowned Toadlet, Glossy Black Cockatoo, Shale / Sandstone Transition Forest and *Acacia bynoeana* is widespread throughout the local area, and in some cases the region. The proposed activity will not serve to isolate interconnecting or proximate areas of habitat for these species / communities, especially considering the extensive undisturbed wildlife corridors available within the adjacent Kellys Creek and Little Cattai Creek catchments.

Known habitat for *Pimelea curviflora* ssp. *curviflora* is poorly defined and is likely to be of limited occurrence within the local area and region. Currently, this species exhibits a highly fragmented distribution, an ecological attribute probably related to the species habitat

preferences rather than the destruction of known habitat. It is highly unlikely that this species will become more isolated from interconnecting or proximate areas of habitat as a result of the proposed development (NSW Scientific Committee, 1998).

Known habitat for the remaining threatened species identified within tables 2.2 and 3.1 is widespread throughout the local area and region. The proposed development will not serve to isolate interconnecting or proximate areas of habitat for these species, especially considering the extensive wildlife corridor within Kellys Creek and Little Cattai Creek.

(e) **whether critical habitat will be affected,**

Habitats within the site have not been identified as critical habitat within the provisions of the *Threatened Species Conservation Act* 1995. This matter does not require further consideration at this time.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region,

The Yellow-bellied Glider, Red Crowned Toadlet and Glossy Black Cockatoo are all known to occur within the regional conservation network, and are considered to be well represented within these regional reserves.

Representations of *Acacia bynoeana* within the regional reserves is limited, however small populations of this species are located within Marramarra NP, Blue Mountains NP, Castlereagh NR, Royal NP and Ku-ring-gai Chase NP (All populations < 1000 individuals). This species is considered to be inadequately reserved within the regional conservation network.

Representations of *Pimelea curviflora* ssp. *curviflora* within nature reserves throughout the region are limited. Old records suggest this species is present within two conservation reserves (Garigal NP and Muogamarra NR). This species is considered to be inadequately reserved within the regional conservation network (NSW Scientific Committee, 1998).

Shale / Sandstone Transition Forest is present within three conservation reserves (Blue Mountains NP, Cattai NP and Gulguer NR). The conservation status of this community has yet to be determined. However, in considering the proximity of this Shale / Sandstone Transition Forest occurrence to Cattai NP and Maroota SF, the conservation of this vegetation community within the region should be considered as secure.

The remaining threatened species identified within Table 2.2 and table 3.1 are known to occur within the regional conservation network, and are considered to be well represented within these regional conservation reserves.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,

The proposed development has not been identified in the *Threatened Species Conservation Act* 1995 as a threatening process. This matter does not require further consideration at this stage.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution.

Of the five threatened species and one endangered ecological community present within the subject site, only *Pimelea curviflora* ssp. *curviflora* and Shale/ Sandstone Transition Forest are considered to be approaching their natural limits of distribution. *Pimelea curviflora* ssp. *curviflora* is approaching its most north-western point of distribution. Shale / Sandstone Transition Forest is considered to be approaching its most northerly point of distribution.

Of the remaining threatened species listed in Table 2.2 and table 3.1, only six species are considered to be close to their natural limit of distribution. These species include; *Kunzea rupestris* (west), *Micromyrtis blakelyi* (west), *Tetratheca glandulosa* (west), *Acacia gordonii* (north), *Hibbertia incana* (north) and *Zieria involucrata* (south).

4.4 Conclusions

Based on the detailed field survey and information provided in this report it is concluded that:

- Two threatened flora species, *Pimelea curviflora spp. curviflora* and *Acacia bynoeana* and three threatened fauna species, the Red-crowned Toadlet, Glossy Black Cockatoo and the Yellow-bellied Glider, and one endangered ecological community, SSTF, were identified within the subject site.

- The restriction of development from the northern and western sections of the proposed quarry site and the adjacent mid-slope/ riparian environs will retain extensive areas of habitat for the threatened species identified on or likely to occur within the subject site. This action will also retain a substantial stand of SSTF.

- Retention and protection of the population of *Pimelea curviflora spp. curviflora* and *Acacia bynoeana* by fencing and active management will reduce the impacts of the proposed activity on these populations. This action will also retain substantial stands of SSTF and foraging habitat for the Glossy Black Cockatoo.

- Retention and protection of the SSTF will inadvertently protect habitat for the local population of Yellow-bellied Gliders.

- The restriction of development within areas near the drainage lines will reduce impacts on the population of Red-crowned Toadlets present within the subject site.

It is considered that the proposed activity will not have a significant effect on threatened species or their habitats provided management options are implemented. It is considered that a Species Impact Statement should not be required for the proposed activity.

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APPENDIX I

THREATENED FAUNA SPECIES PROFILES

RED-CROWNED TOADLET (*Pseudophryne australis)*

General Description:
The Red-crowned Toadlet is a small frog up to 30mm in length. It is dark brown to black on the dorsal surface with a prominent bright red or orange triangle on the head and a red or orange vertebral stripe (Cogger 1992). There is a white patch on the base of each arm and the ventral surface has large black and white blotches mixed with grey, black and white mottling (Cogger 1992). The skin is smooth or has a few low warts (Cogger 1992).

The Red-crowned Toadlet can be heard calling throughout the year (Robinson 1993). The call consists of a series of grating 'ark' and longer drawn out 'squelch' notes. Toadlets may be induced to call by making loud noises near in the vicinity of their habitat (Griffiths 1997).

When breeding males move to call from leaf litter debris and rocks in and around non-perennial creek beds, as well as from rock crevices. The Red-crowned Toadlet hollows out a nesting chamber on the edge of pools among debris (Jacobson 1963). Females lay up to 20 eggs at a time and may return at regular intervals to lay clutches while males remain in the vicinity of the clutch. Tadpoles reach a relatively advanced state of development in the egg at which point they cease development until the egg chamber is flooded by rain and the eggs are washed into a nearby water body where they hatch and development is completed (Jacobson 1963).

Habitat Requirements:
The Red-crowned Toadlet inhabits the sandstone country around Sydney, particularly the Hawkesbury sandstone formations (Cogger 1992). The Red-crowned Toadlet requires temporary creeks and soaks on Hawkesbury sandstone ridges and gullies with rocks, log and leaf litter for shelter (Cogger 1992, Robinson 1993). In non-breeding periods it can be found under rocks and logs on areas of sandstone and in weathered crevices within the sandstone, often forming colonies of more than 20 individuals (Barker and Grigg 1977).

Conservation Status:
State: The Red-crowned Toadlet is listed on Schedule 2 of the Threatened Species Conservation Act (1995) as Vulnerable.
Regional: Unknown.
Local: Unknown.

Distribution and Abundance:
State: The Red-crowned Toadlet has a limited distribution and is generally confined to a radius of approximately 160km around Sydney (Cogger 1992). In NSW, this species has a northern limit at Pokolbin and a southern limit at Burrawang.
Regional: The Red-crowned Toadlet has been recorded at a number of locations regionally including few locations regionally including Pokolbin State Forest (NPWS 1998b), Somersby, Pt Clare, Woy Woy, Brisbane Waters National Park (NPWS 1998f), Winmalee, Blaxland, Blue Mountains National Park, Springwood, Bowan Mountain, Mount Riverview (NPWS 1998a), Wollemi National Park, Dharug National Park, Yengo National Park, Bradleys Swamp and Bonnie Doon (NPWS 1998g).
Local: The Red-crowned Toadlet has been detected at a number of localities within the local area including South Maroota, Hillside (NPWS 1998a), Mt Coolah, Hornsby, Muogamarra Nature Reserve, Marramarra National Park, Elanora Heights, Beacon Hill, Fullers Bridge and Kenthurst (NPWS 1998f).

Study Area: Red-crowned Toadlets were detected in the central area of the subject site, within the drainage line.

GLOSSY BLACK COCKATOO *(Calyptorhynchus lathami)*

General Description:
The Glossy Black Cockatoo is a large bird with an average body length of up to 50cm. Plumage is a dusky black colour with two panels in the tail. In males these panels are bright red while in females the panels are barred and shot with yellow. Females are also copiously blotched with yellow on the head (Schodde and Tidemann 1986).

The Glossy Black Cockatoo lives in permanent groups of up to 10 individuals (SFNSW 1995b), roosting communally at night and travelling at dawn to groves of seeding casuarina trees to feed for the day. It is a quiet and undemonstrative when feeding (SFNSW 1995a). This species has a bill structure and highly specialised feeding techniques developed for feeding almost exclusively on Casuarinas with large cones such as the *Allocasuarina littoralis, A. stricta* and *A. torulosa* (Lindsey 1992, SFNSW 1995a). This species is also known to feed on insects and the seeds of eucalypts, angophoras, hakeas, acacias and sunflowers (Blakers *et al.* 1984, Lindsey 1992). Once food resources are exhausted in one area the birds move to another (SFNSW 1995a).

The breeding season of the Glossy Black Cockatoo is between March and August. A single egg is incubated by the female and takes about four weeks (29 days) to hatch (Lindsey 1992, SFNSW 1995a). The chick fledges after about 60 days, remaining with the parents for an indefinite period thereafter (Lindsey 1992).

Habitat Requirements:
The Glossy Black Cockatoo inhabits mountain forests, coastal woodland, open forest and trees bordering watercourses where there are substantial stands of casuarinas (SFNSW 1995a). Foraging within Casuarinas tends to be concentrated on trees with greater crops of cones (Clout 1989). This species nests in the large cavities in tall old trees and often within stags.

Conservation Status:
State: The Glossy Black Cockatoo is listed on Schedule 2 of the *Threatened Species Conservation Act* 1995 as Vulnerable. This species is generally thinly distributed with highest population densities in south-eastern Queensland and north-eastern NSW (Schodde and Tidemann 1986). This species is listed as Rare within NSW (Garnett 1993).
Regional: Unknown. Likely to be similar to the State.
Local: Unknown. Likely to be similar to the State.

Distribution and Abundance:
State: The Glossy Black Cockatoo is distributed from about Eungella in Queensland along the eastern seaboard to Gippsland and the Central Highlands of Victoria. It occurs as far west as the Riverina and the Pilliga Scrub (Blakers *et al.* 1984). In NSW this species has a northern limit north of Tweed Heads and a southern limit to the south of Eden. There are no measure for abundance of this species (Blakers *et al.* 1984) although it has been noted as thinly distributed (Garnett 1993).
Regional: The Glossy Black Cockatoo has been detected throughout the region at a number of localities including the Pokolbin State Forest (SFNSW 1995a), Umina (ERM Mitchell McCotter 1994), Bouddi National Park, Brisbane Waters National Park, Katandra Reserve, Pearl Beach (Morris 1992), Oyster Cove, Raymond Terrace, Mount Sugarloaf,

Heaton State Forest (NSW NPWS 1998b), Olney State Forest, Mandalong (A. Fawcett, ISPM, *pers obs*) and around Botany Bay (NSW NPWS 1998f).
Local: There are a number of local records for the Glossy Black Cockatoo including Dharug National Park (Morris 1992), Yengo National Park, Parr National Park, Putty State Forest (Webster 1995), Blue Mountain National Park, Springwood, Annangrove, Cattai, Glenbrook, Hillside and Maroota State Forest (NSW NPWS 1998a)

Study Area: Glossy Black Cockatoos were detected by chewed *Allocasuarina* cones in the central area of the subject site.

Yellow-bellied Glider *(Petaurus australis)*

General Description:
The Yellow-bellied Glider is the largest of the Australian gliding possums with a maximum head and body length of 300mm and a maximum tail length of 480mm (Strahan 1995). Yellow-bellied Gliders tend to be grey on the dorsal surface and are whitish to orange on the ventral areas (Strahan 1995). There is an obvious black stripe on the thigh and there is usually an indistinct dorsal stripe from the crown of the head to the tip of the tail (Strahan 1995). A gliding membrane extends from the wrist to the ankle (Strahan 1995).

The Yellow-bellied Glider is an arboreal tree-dwelling mammal. The bulk of the diet of the Yellow-bellied Glider consists of plant and insect exudates including sap, nectar, honeydew and manna while arthropods and pollen are also eaten (Goldingay and Kavanagh 1991). Yellow-bellied Gliders feed extensively on the sap of eucalypts, cutting V-shaped notches into the trunks of a small number of trees (Goldingay and Kavanagh 1991). A wide variety of eucalypt species are used for sap feeding throughout the range of this species but at any one location only a small number of species of eucalypts are used (Kavanagh 1987a, 1987b, Goldingay 1986, 1989a). When foraging the Yellow-bellied Glider uses all parts of the tree (SFNSW 1995a).

Yellow-bellied Gliders live in small family groups of 2 to 5 animals, usually consisting of an adult male, one or two adult females and a small number of related juvenile or sub-adult animals (Henry and Craig 1984, Goldingay 1989a, Goldingay and Kavanagh 1991). Yellow-bellied Gliders occupy large exclusive home ranges between 30 and 65 hectares in size (Goldingay and Kavanagh 1991). Population densities of the Yellow-bellied Glider are typically low and range between 0.02 individuals per hectare at Waratah Creek, NSW (Kavanagh 1984) to 0.6 individuals per hectare at Kioloa State Forest, NSW (Davey and Norton 1990).

Mating season of the Yellow-bellied Glider occurs from September through to October with a single young being born between November and May (Russell 1995). Juveniles are carried in the pouch for 100 days and are then left in the nest for a further 60 days after which the animal fends for itself (Russell 1995).

Habitat Requirements:
The Yellow-bellied Glider is restricted to tall mature eucalypt forests found within high rainfall regions of temperate through to sub-tropical eastern Australia (Russell 1995). Forest areas known to support populations of this species are generally located on undulating or low relief landforms with soils of moderate to high fertility (SFNSW 1995a). The Yellow-bellied Glider is also known to utilise highly disturbed forest habitats such as within and adjacent to urban areas and forests that have been harvested (Braithwaite *et al.* 1988, Braithwaite 1991, Russell 1984).

Preferred habitat areas for the Yellow-bellied Glider generally contain a complex mosaic of trees (Braithwaite 1984, Davey 1984, Kavanagh 1984). Eucalypt species occurring locally that are known to be used within the State by the Yellow-bellied Glider for foraging include Red Bloodwood (*Eucalyptus gummifera*), Spotted Gum (*E. maculata*), Sydney Peppermint (*E. piperita*), Manna Gum (*E. viminalis*), Swamp Gum (*E. ovata*), Monkey Gum (*E. cypellocarpa*) and Sydney Blue Gum (*E. saligna*) (Goldingay 1989a, Goldingay and Kavanagh 1991, 1993, SFNSW 1995). Depending on the type of food being harvested and its abundance Yellow-bellied Gliders will traverse large distances (>2km) in one night when foraging (Henry and Craig 1984, Goldingay 1989b) reflecting a marked seasonal use of forest types and tree species (Kavanagh 1984).

Yellow-bellied Gliders are dependant on the presence of large hollows within mature trees for nesting and breeding, occupying several den trees within a single home range (Henry and Craig 1984).

Conservation Status:
State: The Yellow-bellied Glider is listed on Schedule of the Threatened Species Conservation Act (1995) as Vulnerable.
Regional: The Yellow-bellied Glider is considered widespread regionally (Ecotone Ecological Consultants 1995).
Local: The Yellow-bellied Glider is considered widespread within the local area (Ecotone Ecological Consultants 1995).

Distribution and Abundance:
State: The Yellow-bellied Glider is found within tall mature eucalypt forests around the eastern seaboard of Australia from the South Australian border through Victoria and NSW to central Queensland (Strahan 1995). In NSW the Yellow-bellied Glider has a northern limit in the Border Ranges National Park and a southern limit to the south of Eden.
Regional: The Yellow-bellied Glider has been recorded at a number of locations regionally including Morton National Park (NSW NPWS 1998d), Heaton State Forest (NSW NPWS 1998e), Bensville, Daleys Point (NSW NPWS 1997e), Matcham, Holgate, Wyoming, Tuggerah, Avoca, Green Point, Cockle Bay, Ourimbah (NSW NPWS 1998c), Olney State Forest, Watagan State Forest, Wyong State Forest (Ecotone Ecological Consultants 1995), Termeil State Forest, Lake Conjola, Yerriyong State Forest (NSW NPWS 1998h), Awaba State Forest, McPherson State Forest, Pokolbin State Forest, Putty State Forest and Yango State Forest (Ecotone Ecological Consultants 1995).
Local: The Yellow-bellied Glider is known from a number of local records including Blue Mountains National Park, Windsor, Stanley Park, Maroota, Maroota State Forest (NSW NPWS 1998a), Mt Coolah (NSW NPWS 1998f), and Corrabare State Forest (Ecotone Ecological Consultants 1995).

Subject site: Relatively fresh feed trees of Yellow-bellied Gliders were found in the northern area of the subject site. No Yellow-bellied Gliders were seen or heard during the fauna survey.

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APPENDIX G

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Consulting Acoustical & Vibration Engineers

ENVIRONMENTAL NOISE AUDIT
SANDSTONE QUARRY
SMALLWOOD ROAD
GLENORIE

31.5325.R1:GA165
Rev 00

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1.0 INTRODUCTION

Atkins Acoustics was commissioned by Don Fox Planning to conduct an environmental noise audit of the Smallwood Road Sandstone Quarry, Glenorie. The quarry has been operating for a number of years and is seeking approval to continue the present operations.

Baulkham Hills Shire Council requested that the audit address background noise levels, noise emitted from the quarry operations and an assessment of the noise impact at neighbouring residential properties. This report presents the results and finding of the audits and investigations.

2.0 SITE DESCRIPTION

The quarry (Appendix1) is located off Smallwood Road, Glenorie. The quarry operations (Appendix 2) include the cutting of insitu stone with a rotary saw attached to an excavator; the removal of large blocks of stone from the quarry face with an excavator; on site transport of quarried stone to the processing area; dimensional sizing of stone and flagging; on site storage and the offsite transport of finished product.

Blasting is not part of the quarry operations and not proposed.

The quarry operating hours are 7.00am to 5.00pm Monday to Friday, and 7.00am to 1.00pm Saturday.

3.0 METHODOLOGY

To assessment methodology adopted for the audit and assessment include;

- background noise measurements (without the influence of the subject quarry);
- noise audits of the existing quarry plant and equipment;
- noise measurements at nearby residential properties; and
- the assessment of the quarry noise emission.

4.0 NOISE MEASUREMENTS

The instrumentation selected for the measurements included a SVAN 912 Sound and Vibration Meter (Serial No. 2236) and a Bruel & Kjaer Sound Level Meter Type 2215 (Serial No. 615689).

The field reference calibration level of each instrument was checked before and after use with a Bruel & Kjaer Sound Level Calibrator Type 4230. The instrumentation calibration drift remained within ± 0.5dB(A).

For the purpose of assessing noise at the neighbouring properties audit measurements were conducted at the quarry and the boundaries of the residential properties identified as 5 Smallwood Road and 196 Halcrows Road, Glenorie.

4.1 Survey Dates

The site investigations and audit measurements were conducted on the morning of Monday 22 October 2001 between 7.00am. and 10.00am

4.2 Weather Conditions

The weather conditions during the survey remained calm, no cloud and temperatures between 18-24°C.

4.3 Ambient Background Noise Levels

The site audit revealed that without the subject quarry operating a nearby quarry, a nursery, road traffic, and the natural elements controlled the ambient noise.

Without the subject quarry operating the background noise levels at both residential properties ranged between 32-38dB(A). From our assessment of the property locations, we would expect with normal variations that the background noise levels could reduce to 30dB(A) or below. Hence, in

accordance with the EPA, Industrial Noise Policy (INP) methodology and guidelines, a background level of 30dB(A) has been adopted for assessing noise from the quarry.

5.0 ASSESSMENT GOALS

The INP provides procedures and goals for assessing environmental noise. The assessment procedures have two (2) components:

(1) controlling intrusive noise impacts; and
(2) maintaining noise amenity for particular land uses.

The intrusiveness of a noise source is considered to be acceptable if the $L_{Aeq,\ 15\ minute}$ level does not exceed the rated background level (RBL) by more than 5dB(A). To determine the amenity noise goal, the maximum L_{Aeq} level should not exceed recommended acceptable levels (*Table 1*). Where existing L_{Aeq} levels approach or exceed the acceptable levels, design goals are set below the existing L_{Aeq} to limit any further increase or "creep" in the ambient noise.

In accordance with the EPA guidelines, the noise is assessed at the most affected point on or within the residential property boundary or, if this is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence.

Table 1: EPA Noise Policy Amenity Criteria

Receiver Description	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	50	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial	Day	65	70
		Evening	55	60
		Night	50	55

NOTE: Daytime : (7.00am to 6.00pm)

Table 2 presents the calculated RBL's, the ambient L_{Aeq} noise levels and the resulting intrusive and amenity noise goals for residential receivers for daytime hours.

Table 2: Calculated RBL and Ambient L_{Aeq} Noise Levels for Residential Properties
dB(A) re: 20×10^{-6} Pa

Period (1)	Recommended L_{Aeq} Noise Level	RBL	Measured L_{Aeq}	Intrusive Criterion	Amenity Criterion(3)
Location 1: Smallwood Road					
Day	50(2)	30	44	35	49
Location 2: Halcrows Road					
Day	50(2)	30	46	35	48

(1) Daytime : (7.00am to 6.00pm)
(2) Criteria for residences in rural area
(3) Levels calculated from INP procedures (Table 2.2)

5.1 Recommended Goals

Having regard to the background noise levels, the ambient noise levels and the INP guidelines, the goal recommended for assessing noise from the quarry is based on the intrusive goal L_{Aeq} 35dB(A).

6.0 SURVEY RESULTS AND FINDINGS

6.1 Plant and Equipment

The subject quarry plant identified during the audit included front end loaders, trucks, an excavator, saws and a hydraulic splitter. *Table 3* presents a summary of the main plant and associated sound powers level.

Table 3: Measured Noise Levels and Sources
L_{Aeq} dB(A) re: 20 x 10^{-6} Pa

Noise Source	Sound Pressure Levels L_{Aeq}
Stone Saw (2.7 metre dia)	119
Stone Saw (1.2 metre dia.)	110
Hydraulic Splitter	83
Loader (Samsung SL180)	105
Loader (Clarke 35B)	108
Excavator (Sumitmo LS4300-F2)	103
Truck (Eculid R17)	110

6.2 Audit Measurement at Residential Properties

The audit measurements confirmed that the subject quarry noise was audible at both residential properties. The audit also confirmed that noise from a neighbouring quarry was audible at the Halcrows Road property, together with noise from a nearby nursery, road traffic, and natural elements.

The measurement results confirmed the subject quarry noise at the boundaries of the Smallwood Road and Halcrows Road properties was L_{Aeq} 34dB(A) and L_{Aeq} 32dB(A), respectively.

7.0 ASSESSMENT

An environmental noise audit was conducted for the Smallwood Road Sandstone Quarry, Glenorie. The quarry operations include the removal of stone with a rotary saw attached to an excavator; on site transport of the quarried stone to the processing area; dimensional sizing of stone and flagging; on site storage and the offsite transport of finished product. Blasting is not part of the quarry operations and not proposed.

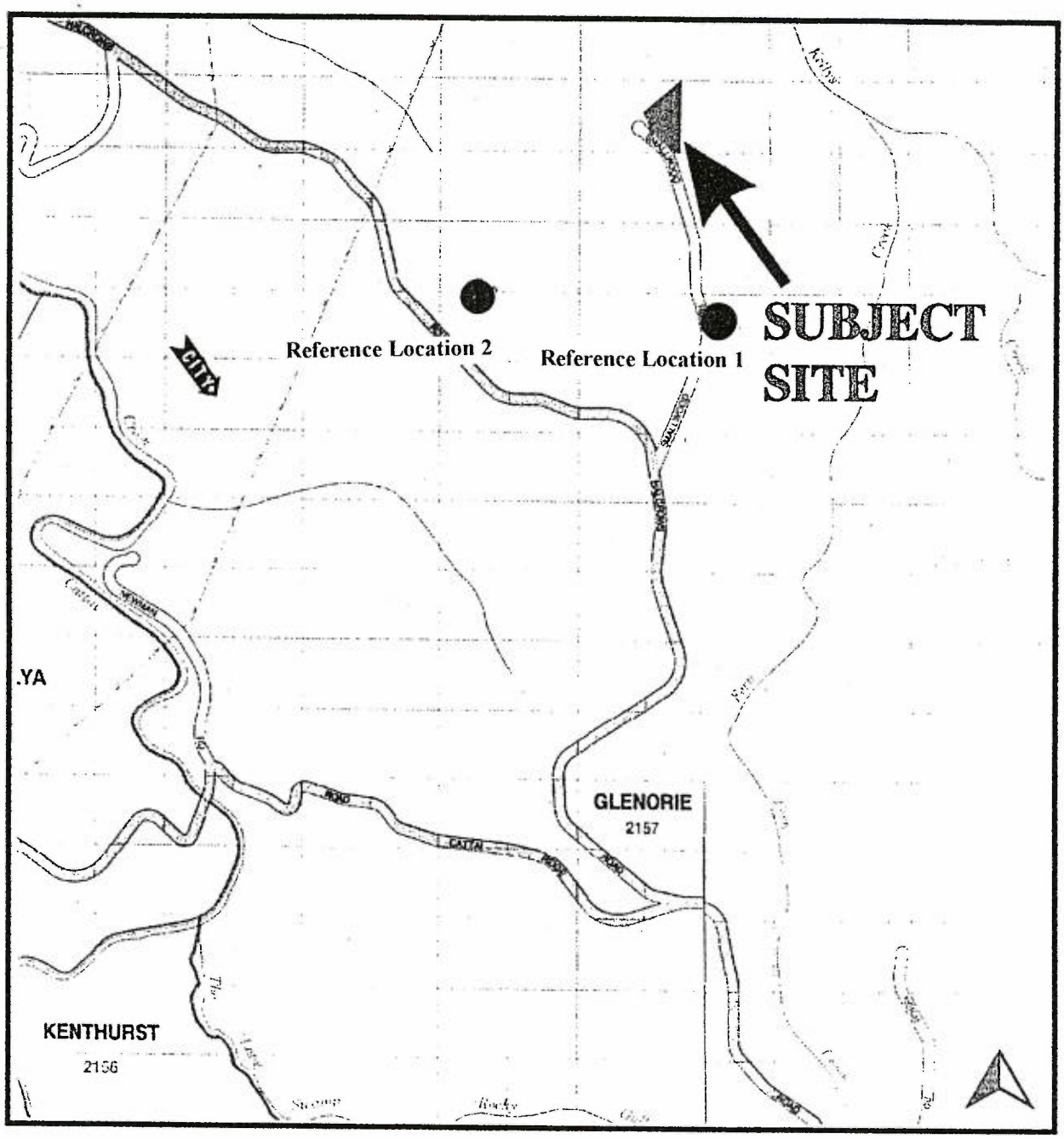
For the purpose of assessing noise from the quarry, noise measurements were conducted at the quarry and the boundaries of the residential properties identified as 5 Smallwood Road and 196 Halcrows Road, Glenorie.

The audit revealed that without the subject quarry operating the ambient noise was controlled by a nearby quarry, a nursery, road traffic, and the natural elements. The subject quarry noise was also audible at both reference measurement locations. Without the subject quarry operating the background noise levels at both residential properties ranged between 32-38dB(A).

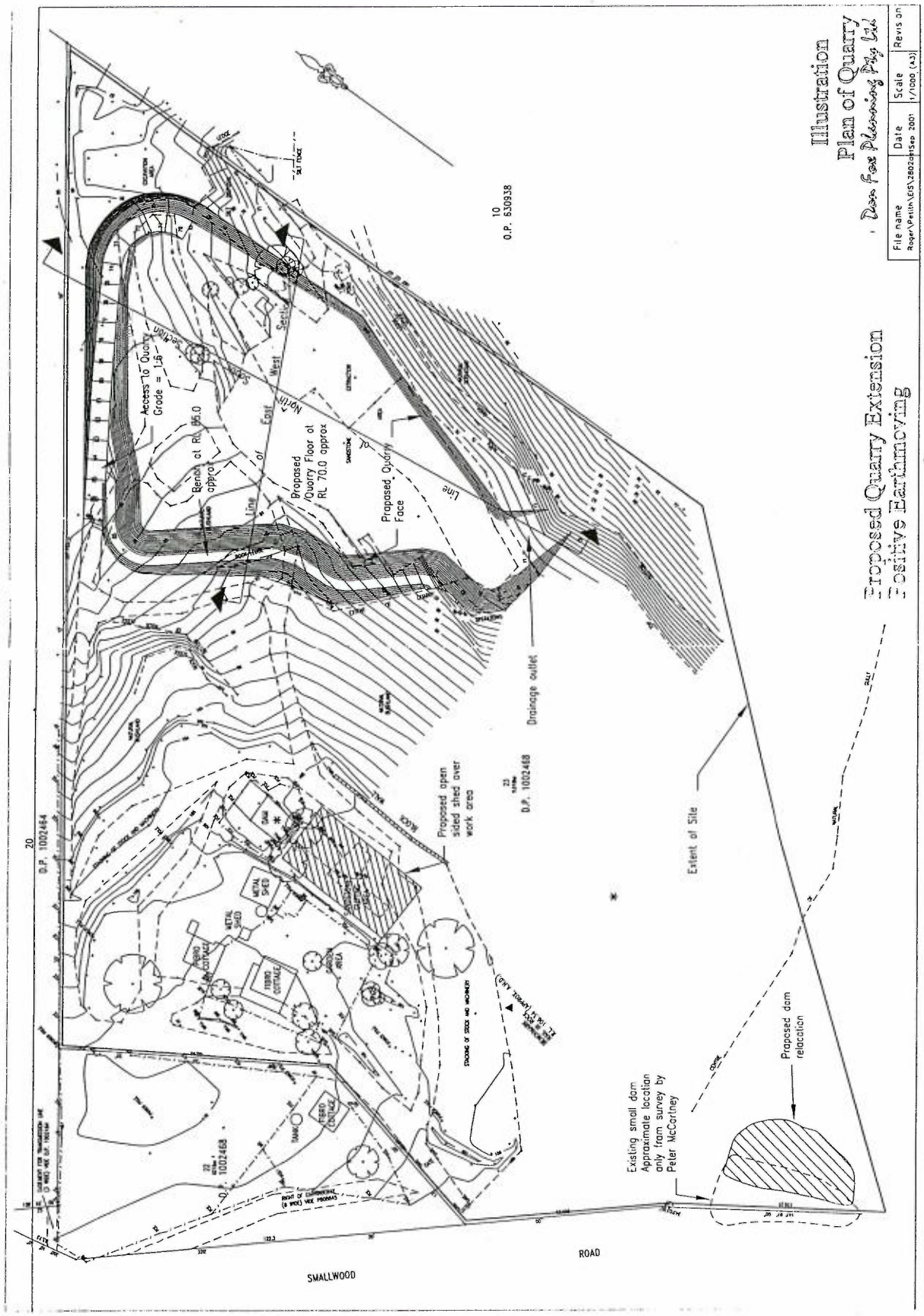
From our assessment of the location of the residential properties, we would expect with normal variations that the background noise levels could reduce to 30dB(A) or below. Hence, in accordance with the EPA, INP a background level of 30dB(A) has been adopted for assessing noise from the quarry. In accordance with the EPA guidelines, the noise is assessed at the most affected point on or within the residential property boundary or, if this is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence.

The field measurement results confirmed the subject quarry noise at the boundaries of the Smallwood Road and Halcrows Road properties was 34dB(A) and 32dB(A), respectively, and satisfied the recommended project assessment goals of 35dB(A).

APPENDIX 1: SITE LOCATION



APPENDIX 2: SITE LAYOUT



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