Environmental Impact Statement

Proposed Clay/Shale Extraction Operation

Lot 3 - 275 Adams Road
Luddenham NSW

Prepared for

Badger Mining Company Pty Limited
275 Adams Road Luddenham NSW

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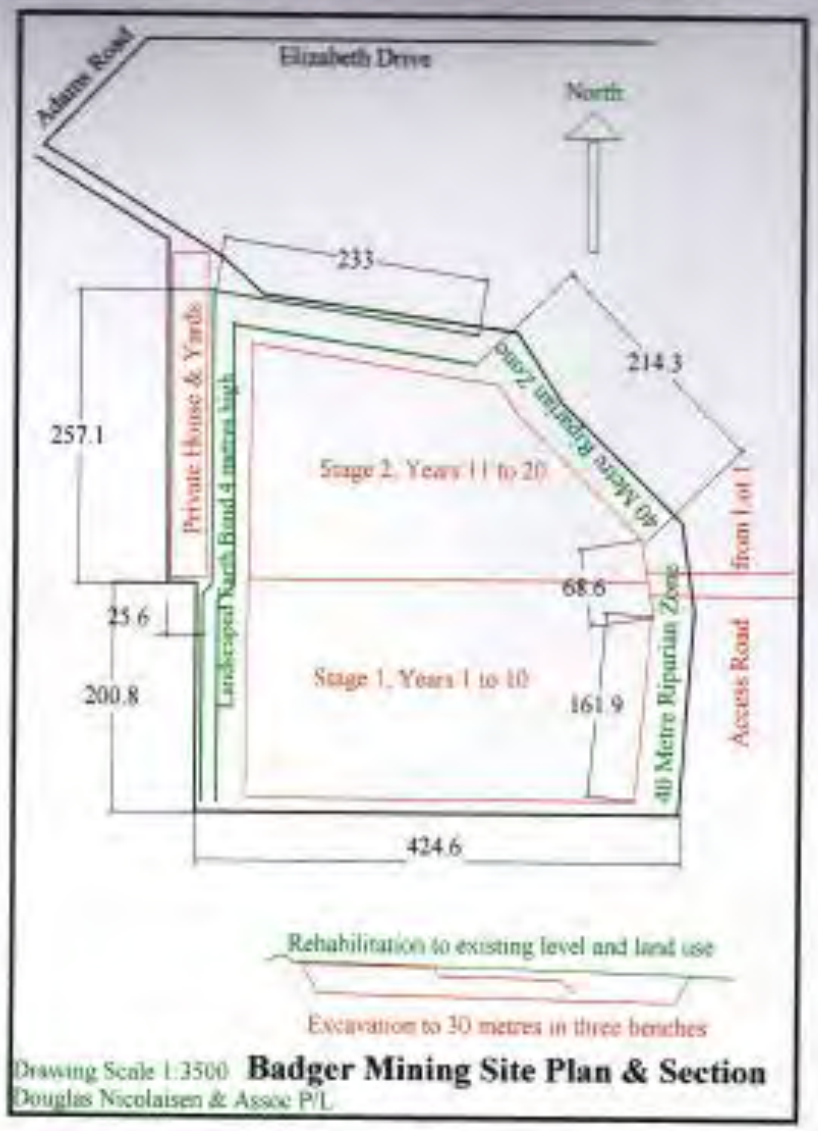
Addendum for inclusion in the Badger Mining Company Pty Ltd Environmental Impact Statement for the proposed clay/shale extraction at Lot 3 205 Adams Road Luddenham NSW

3.2.2 Figure 4 – Quarry Development Outline **Page 30**



2.6.1 Agency Consultation **Page 24**

As part of the integrated development in accordance with the former Department of Land & Water Conservation (now D.I.P.N.A.R) a Part 3A Permit under the Rivers and Foreshores Improvement Act, 1948 will be required.

FORM 2

Submission of
Environmental Impact Statement (EIS)
Prepared under the Environmental Planning and Assessment Act, 1979 Section 78A

EIS Prepared by:

name: Mr Douglas Nicolaisen

qualification: M.Mgmt, B.E. Hons. (Civil), E.E.C, FQSA, MAAS, MEIA

address: 1 Belwarra Avenue
FIGTREE NSW 2525

in respect of: Establishment and operation of a clay/shale quarry; transport of product to markets; rehabilitation of land following completion of extraction.

Development application:

applicant name: Badger Mining Company Pty Limited (ACN 095 666 384)

applicant address: 275 Adams Road LUDDENHAM NSW 2745

land to be developed: Lot 1 DP 741238, Lot 3 DP 623799

Environment Impact Statement: An environmental Impact Statement (EIS) is attached.

Certificate: I, Douglas Nicolaisen, of 1 Belwarra Avenue Figtree, NSW, hereby certify that I have prepared the contents of this Statement and to the best of my knowledge:

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

Signature: Douglas Nicolaisen

Name: Douglas Nicolaisen

Date: 30 May 2003

Table of Contents

Table of Tables

Table of Figures

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Badger Mining Company Pty Limited proposes to develop and operate a clay/shale quarry at premises situated at Lot 3, 275 Adams Road Luddenham. The property is owned by Messrs L Harpley Snr, L Harpley jnr and G Harpley. The same people are also the principals of Badger Mining Company Pty Limited.

Badger Mining Company also holds a lease on Lot 1, 2420 Elizabeth Drive Luddenham for a period of 6 years with the Commonwealth of Australia, the owners of the land. The quarry administration and support facilities and access to the quarry are to be established on Lot 1.

1.2 PROJECT JUSTIFICATION

This projects is justified on the basis of the following facts:

- The site has been identified as containing 6,800,000 tonnes of clay/shale suitable for the manufacture of bricks.
- The NSW Department of Minerals has conducted tests on the material and identified that more than 50% of this material will produce light fired brick colours, a product that is in high demand and short supply in NSW.
- Consequently, the site has been listed in Schedule 1, Division 1 of SREP No. 9, Extractive Industry (No.2), as being a resource of state significance that should be extracted under relevant planning and environmental controls.
- The site is included by the Planning NSW document Shaping Western Sydney as a significant economic resource that should be utilised before sterilisation by unsympathetic development. Planned and managed extraction of the Badger Mining site is in conformance to the aims and objectives of this principal planning guideline.
- This deposit can be economically extracted and provided to brick manufacturers.
- A steady demand for light coloured bricks is evident and can be expected to increase in the future.
- The implementation of the proposal under the control of the management and control measures proposed will ensure that the quarry produces no significant environmental or social impacts.
- Rehabilitation of the quarry site with selected quality materials will reproduce the existing contours of the site with an improved agricultural capability above that presently available.

- The current zoning allows the proposed activity with planning consent.

1.3 PROJECT DESCRIPTION

The implementation of the project will proceed in three phases, establishment, extraction and rehabilitation.

1.3.1 Establishment phase

The initial or establishment phase of the project will consist of several components that will commence simultaneously;

- Establishment of a 4 metre high earth bund along the western boundary and 150 metres of the northern boundary of the site. This bund will be landscaped and form a permanent part of the operational site.
- Establishment of the loading out area in the south east corner of the site.
- Construction of a bridge across Oakey Creek.
- Construction of a sealed road across Lot 1 from the bridge into Lot 3 to Elizabeth Drive.
- Erection of a two metre chain wire security fence around the extraction area.
- Establishment of an onsite nursery for the care of tube stock and advanced plants to be used in the initial landscaping and the propagation of seedlings from seeds sourced from the site as part of the ongoing landscaping plan.
- Conduct bore tests to define the exact location and specific characterisation of the layers within the deposit.

1.3.2 Extraction Phase

The extraction of the deposit will proceed in two stages. The first stage will open the southern half of the property, leaving the northern half untouched. The clay/shale will be extracted from three or four benches worked into the slope of the site, such that the high ridge on the western boundary assists with totally shielding the dwellings from any sound emissions from the activities. This stage is expected to take 10 years to complete.

The second stage of the extraction, years 11 to 20 will be the opening of the second half for extraction in the same manner as for stage 1. **(See Fig 4 & Fig 5, Section 3.2.1)**

1.3.3 Rehabilitation Phase

Rehabilitation material will be sourced from selected and controlled locations such that it satisfies the criteria for Inert Waste Class 2 specified by the NSW EPA. This decision allows the site to rehabilitated without it becoming a 'rubbish dump' with all the attendant environmental and management problems. The completion of rehabilitation will be a minimum of 300mm of top soil and pasture establishment such that the current activities possible for the site are available as a minimum.

Because of the time span between commencement of extraction operations and the commencement of rehabilitation activity and the resultant uncertainty of source and tonnage of acceptable materials, it is proposed that a separate application be lodged for the rehabilitation development closer to the time of such work being possible.

1.4 ENVIRONMENTAL IMPACTS MITIGATION MEASURES

1.4.1 Existing Environment

The environment of the site and surrounding properties is modified rural, consisting of grazing, poultry farms, crops in hot house environments and some dwellings **(See Fig 1)** and having the following general characteristics:

Site

The site is a 19 hectare flat site sloping gently from the south west to the north east. The site is predominently grass covered or denuded earth caused by constant wear by corralled horses. Small copses of remnant vegetation exist along the eastern boundary (Oakey Creek), adjacent to the onsite dam in the north east corner and in the horse yards on the western boundary.

The area is considered dry with an annual rainfall less than 800 mm per year. The dense nature of the deposit and the presence of an ironstone hardpan minimise infiltration such that the small amount of ground water present on the site has long residence time and high salt levels. This renders it unsuitable for agriculture and stock, but able to maintain the trees and grasses present on the site.

Ground Water

Hydrogeological investigations have shown that the occurrence of groundwater on the site is rare and its quality poor, because of the dense nature and characteristics of the deposit material.

Groundwater velocities and recharge capabilities from surface water are low to very low, ensuring there are no aquifers of water resource bearing potential beneath the site or in its immediate locality.

Surface Water

There is no surface water on either Lot 3 or Lot 1. The common boundary between the sites is the banks of Oakey creek respectively.

Oakey Creek

Oakey Creek is an ephemeral drainage line that flows only under the influence of sufficient rainfall in its catchment. Most of the year it is a discontinued line of evaporating pools becoming increasingly more saline. An online dam was constructed pre 1940 that collects some runoff from adjoining properties. Its water quality is marginally better than that in Oakey Creek, especially immediately after rain events.

Figure 1: Surrounding Land Use

Acoustic

The acoustic environment of the site is dominated by the high traffic flows on Elizabeth Drive during the hours of 0500 to 1700, and by the daily overflight of small aircraft doing circuit training and aerobatic manoeuvres from local airports. This activity produces a general acoustic environment between 45 and 55 dB(A) Leq between the hours of 0700 and 1700 with occasional expeditions to 65 dB(A) Leq. During night time the levels drop to 35 dB(A) Leq.

Air

Air quality in the locality is generally good and typical of a rural agricultural area. Predominant activity is grazing horses, poultry farms and market gardening. All market gardening conducted in the local area is green house based so there is no ploughing or similar traditional agricultural activities that are recognised to have the potential to raise or generate dust. There are no sources of dust identified any where in the area that would compromise the local air quality.

1.5 EXPECTED IMPACTS AND MITIGATION

Because of the strict management controls proposed and dedication to conformance with all relevant legislation and industry codes by the proponent, the development will not generate any unacceptable impact on the environment, the community or the local infrastructure.

As well as the operational controls for the extraction of material, this proposal includes an ongoing practical implementation of a Bush Management and Weed Eradication Plan and a detailed Landscaping Plan.

1.5.1 Groundwater

Historical hydrogeological studies conducted on the site and surrounding area by C J Douglas & Partners have confirmed the poor quality of local groundwater because of the very low permeabilities, the related low hydraulic gradients and the resultant high salt take up rates from the strata. These studies have also concluded that there would be negligible groundwater sufficient to have any practical effect on the operation of the proposed extraction and related rehabilitation of the site.

The density of the deposit has been assessed as preventing realistic groundwater flows into the excavation and following proper rehabilitation completion, restoring the existing hydraulic gradients throughout the site.

Evaluation of the ground water quantities and permeability of the material have estimated that the open excavation may experience seepage less than 0.657 litres per square metre per day. This small quantity allied to the high evaporation rates in the area will ensure that no significant quantities of groundwater accumulate in the excavation.

1.5.2 Surface Water

The site is characterised by a lack of surface water in a low rainfall area. The only surface water near to the site is Oakey Creek, which forms the eastern boundary without being part of the site. The ownership of the creek is vested in the crown.

The project has been designed to allow no discharge from any disturbed part of the site. Uncontaminated surface water will continue to flow from the undisturbed areas of the site.

The only impact to be expected will be the small reduction in surface flow off the site to Oakey Creek.

Direct rainfall onto disturbed areas will be guided into the excavation and irrigated onto the landscaping. Supplies will be supplemented with potable water as required.

1.5.3 Oakey Creek

The waters in Oakey Creek that flow past the proposed development are generated by rainfall in the upper reaches of the catchment, south of the project site, and are maintained only while there is sufficient water running off the area to generate a surface flow. The waters traditionally flowing from the project site will be reduced by not more than an estimated 3% by the removal of the site from the catchment over the full life of the project. When rehabilitation has been completed the rainfall runoff will have been fully re-established.

The 3% reduction in surface flows to the creek brought about by the complete removal of the site from the catchment, has been estimated by hydraulic engineers who conducted the flood study on Oakey Creek related to this proposal. *See Brinks Report 00262.F dated 2 November 2001, Revised Flood Study, Oakey Creek Catchment Upstream of Elizabeth Drive, Luddenham for Badger Mining Company Pty Ltd. Report 10 Technical Volume.*

This small reduction in flows to Oakey Creek over the term of the proposal is not considered to be significant in terms of the flows in Oakey Creek.

There will be no discharges from any aspect of the project into Oakey Creek. There will be no withdrawal of waters from Oakey Creek.

1.5.4 Acoustic

The acoustic environment of the neighbouring properties to the site will not be significantly impacted by the proposed development because of the following mitigating circumstances and controls:.

- The construction of a 4 metre high earth bund between the site and the two potentially affected residential premises.
- The landscaping of the earth bund;

- The horizontal distance separation between the working areas of the proposal and the residences;
- The vertical distance separation between the residences and the working areas as the extraction area drops below the surface level;
- The acoustic controls that will be maintained on all plant and equipment working in the extraction area;
- The distance separation between the loading area and transport road off the site;
- The existing sound levels of the area generated by high traffic flows on Elizabeth Drive;
- The existing sound levels of the area generated by the constant use of the sky above the site as a dedicated light aircraft training area;
- The only time that any sound levels will exceed the INP Amenity Criteria will be the construction of the bund at the closest points to the residences; and
- The negotiated agreement with residents for times of work on the establishment of the bunds at the closest positions to the two residences.

Because all aspects of the proposal are restricted to between 0700 and 1700 Monday to Friday, it is the daytime acoustic environment that is considered by this EIS.

Assessment of the impact of the machinery that will be used in the project has identified sound levels up to 61 dB(A) may be experienced by the two dwellings during the initial establishment phase while the bunds are being constructed. This will be for short periods and as these levels are currently experienced on the site at times, they are not expected to cause any significant inconvenience. Management techniques will include negotiation with the residents to carry out the closest work at times when the dwellings are not occupied and in the middle of the day. When the bunds are completed near the dwellings the risk of unacceptable sound levels will be removed.

During the extraction phase all work will be behind the bunds, at distances up to 500 metres from the dwellings and below ground level. These factors will each render the sound generated by the equipment inaudible at the dwellings. All transport will be at least 500 metres from the dwellings at all times and accordingly will be inaudible.

1.5.5 Air

Air quality impact modelling of the proposed development has demonstrated that no aspect of the excavation of the resource, or the rehabilitation of the void will generate dust dispersion and deposition at any off-site receptor that exceeds relevant air quality criteria.

Air impacts generated by this proposal will be minimised or removed by the following circumstances and mitigation measures:

- the inherent characteristics of the soils that minimise dust generation potential,
- the controlled extraction of the deposit to maximise product quality,
- the haul road watering program,
- the landscaping of the western and northern boundaries,
- the inherently clean nature of the selected materials that will be used to rehabilitate the void, and
- the onsite speed control that will be exercised over all transport vehicles.

1.6 CONCLUSION

The proposal is important to the region and by extension the state because it will provide to brick making processes an ongoing supply of light firing clay and shale, a product that is in short supply.

It is the considered opinion of Douglas Nicolaisen & Associates that the proposal as defined in this document will have no unacceptable impact on the environment in any aspect of its implementation.

It is our recommendation therefore that the proposal be granted consent to proceed.

2 INTRODUCTION

2.1 BACKGROUND

Badger Mining Company Pty Ltd proposes to develop and operate a clay/shale quarry on land at 275 Adams Road, Luddenham, in Sydney's South West. The quarry site is located 2.5 kilometres east northeast from the village of Luddenham, just south of Elizabeth Drive, and is identified as Lot 3 DP623799. The land is owned by the Harpley family, who are also the Principals of Badger Mining Company Pty Ltd. Badger Mining company is the proponent of the project.

Badger mining Company Pty Ltd also has a lease on the adjoining property in the east. This property is identified as Lot 1, DP 741238, 2420 Elizabeth Drive, Luddenham. The houses and buildings on this site will provide the mine manager's residence, the company offices and meeting rooms, showers and toilets for the staff and garaging and workshop for plant and equipment.

The regional location of the site is shown at **Figure 2**.

The sedimentary strata that is at the core of this proposal is part of the geological formation known as the Bringelly Shales. This geological formation is several hundred metres thick and occurs over at least 200 sq kilometres. Therefore this proposal will affect only a minute fraction of the entire volume of the formation.

The material to be quarried from the site is to be used in brick manufacture and at least 50% of the material is known to have has the characteristics that produce a range of light coloured brick when fired. There is a short supply of these light firing clays and shales in the Sydney region and a growing demand from the domestic market particularly.

The site is within twelve kilometres of three major brick manufacturing companies, all of which have confirmed in writing their interest in negotiating long term contracts with Badger Mining Company Pty Ltd, for the purchase of the full range of materials available from the site. Another brick manufacturer has also indicated an interest in the dark clays. All grades of clay/shale at the site therefore have identified markets. Copies of the letters of interest are included in **Appendix C** to this volume.

The extraction of the material from the quarry site will create a void. It is proposed to fill the void with inert material and to rehabilitate the site to the existing contours. The inert material will comprise material classified by the NSW Environmental Protection Authority (EPA) as Inert Waste Class 2.

Materials that fall into Inert Waste Class 2 classification will typically comprise virgin excavated material, sourced from state infrastructure and other appropriate development in the wider Sydney region, and appropriate demolition materials not able to be recycled and reused in other applications. The site will ultimately be returned to its current contours and be replanted with grass species suitable for pastoral grazing, or other agricultural activity appropriate to the region.

It is planned to extract clay/shale in two consecutive stages of 10 years each. Rehabilitation of the land affected in the first stage will nominally commence in Year 11 of quarrying and continue until completed.

Figure 2: Regional Site Location

2.2 EIS PREPARATION

This environmental impact statement (EIS) has been prepared by Douglas Nicolaisen & Associates. It is supported by a number of studies carried out by other consultants, as follows:

- Community Consultation study (Molino Stewart);
- Flora and fauna study (Ambrose Ecological Services);
- Detail design study of road and bridge access to and from the site from Elizabeth Drive (Garry Ryan and Associates);

- Archaeological study (Unwin (Australia) Pty Limited);
- Ground and surface water study (Brink & Associates);
- Acoustic Assessment Report (Douglas Nicolaisen & Associates Pty Ltd);and
- Site rehabilitation study (Narelle Sonter - Botanical/Ambrose Ecological Services Pty Ltd).

These reports are contained in the Technical Appendices volume.

2.3 OBJECTIVES OF THE PROPOSAL

These are to:

- Extract the clay/shale situated on the subject site, Lot 3 DP 623799 in an environmentally sound manner and in accordance with legal requirements, ensuring that the appropriate environmental controls for dust, noise, traffic, and rainfall collection are in place;
- Fill the quarry void in an environmentally acceptable manner, using Inert Waste Class 2, and rehabilitate the site so that the final soil surface profile matches the current contours and agricultural uses are possible which are compatible with the neighbouring lands;
- Rehabilitate the riparian zone centred on Oakey Creek using appropriate flora species and weed management techniques;
- Ensure quarrying and rehabilitation operations meet or exceed industry standards and build a reputation within the industry as a best practice site for both activities; and
- Establish and operate an appropriate program for monitoring the environmental effects of the proposed activity.

Each of the above objectives of this proposal are in keeping with, consistent with and pertinent to, conformance with and the realisation of, the Aims and Objectives of **Sydney Regional Environmental Plan No. 9-Extractive Industry (No. 2) 1995 No. 574 (SREP 9(2)**, as they relate to land listed in Division 1 of Schedule 1 of SREP 9(2).

2.4 STATUTORY REQUIREMENTS

The proposal constitutes "designated development" under the Environmental Planning and Assessment Act, falling within the definitions of both "extractive industries" and "waste management facility" in Schedule 3 of the Regulation made under the Act. An EIS is therefore required to accompany the development application for the proposal.

The Minister for Planning is the consent authority for state significant development. One mechanism for a development proposal attaining this status is for the Government to place a declaration notice in the Government

Gazette. Such a declaration was made by the Minister for Urban Affairs and Planning, dated 3 September 1998, for extractive industries where:

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

The proposal that is the subject of this EIS satisfies these criteria and hence constitutes State Significant Development, making the Minister for Urban Affairs and Planning the consent authority.

The proposal qualifies as "integrated development" under the Environmental Planning and Assessment Act because approval for the proposed activity is required from more than one Statutory Authority. A number of licences, approvals and notifications will need to be obtained and made respectively for the project to proceed legally, as follows:

- Licence under the Protection of the Environment Operations Act 1998;
- Licence under the Crown Lands Act 1989.
- Conformance with Section 8 of the Mining Act 1992.
- Approval from the RTA for the design and construction of the intersection between the proposed access road from Lot 1 Elizabeth Drive and Elizabeth Drive.

The project site lies within an area zoned Rural 1A under Liverpool Council Local Environmental Plan 1997 and the proposed extractive industry is permissible with consent.

The requirements of the Director General of the NSW Department of Urban Affairs and Planning (Planning NSW) in respect of this EIS have been sought and obtained. They are contained in the correspondence from the Department that can be found in **Appendix A** to this volume. The Department also required consultation with specified authorities. These authorities have been notified of the proposal by Planning NSW. The responses that were received are included in **Appendix B** to this document and are summarised below.

There are no easements or rights of way over the site.

Consent is required from the Commonwealth Government to lodge the development application, as the landowner of Lot 1, 2420 Elizabeth Drive Luddenham, which is part of the proposed development.

The bed and waters of Oakey Creek, which runs through the site, are vested in the Crown. An occupation of Commonwealth Land licence will therefore be needed for the proposed bridge across the Creek.

The proposal has been carefully considered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and there are no implications from this legislation for the project. The details of the consideration are included in a separate submission to the Federal Department of Transport and Regional Services, a copy of which can be viewed at Planning NSW if required.

2.5 PLANNING CONTROLS

2.5.1 Liverpool Local Environment Plan 1997

The Objectives of this plan are not affected or compromised by the detail or implementation of this proposal. Extractive industry is a permissible activity on the site with consent.

A S149(2) and S149(5) Certificate obtained for the site displays the information that at al:

- Twelve (12) Liverpool Development Control Plans that apply to the land are all not applicable to this development. (1.1(c))
- There are no items of environmental heritage on the site. (2(h))
- The land is not affected by a policy that restricts the development of the land because of the likelihood of flooding.
- The land is not affected by a policy that restricts the development of the land because of the likelihood of bushfire.
- The land is within a noise affected area from the proposed Badgerys Creek Second Sydney Airport.
- The land has no potential as an Archaeological Site.

It is therefore assessed that there is no aspect of this proposal that contradicts or is incompatible with Liverpool Local Environmental Plan 1997.

2.5.2 Sydney Regional Environmental Plan No. 9 Extractive Industry (No.2—1995) (SREP 9(2))

The aims and objectives of SREP 9(2) are:

- To facilitate the development of extractive resources in proximity to the population of the Sydney Metropolitan Area by identifying land which contains extractive material of regional significance; and
- To permit with the consent of the Council, development for the purpose of extractive industries on land described in Schedule 1 or 2; and
- To ensure that consideration is given to the impact of encroaching development on the ability of extractive industries to realise their full potential; and
- To promote the carrying out of development for the purpose of extractive industries in an environmentally acceptable manner; and
- To prohibit development for the purpose of extractive industry on the land described in Schedule 3 in the Macdonald, Colo Hawkesbury and Nepean Rivers, being land which is environmentally sensitive.

As the subject land for this project is described at item 19 of Division 1 of Schedule 1, and the project proposal includes;

- Detailed plans for the maintenance of a high quality product; and
- Detailed plans for the managed rehabilitation of the site in conformance to best practice;

the implementation of this project is compatible with and conforming to the Aims and Objectives of SREP 9(2).

2.5.3 Sydney Regional Environmental Plan No. 20 – 1997 (SREP 20)

Sydney Regional Environmental Plan No. 20 – 1997 has the Aim of protecting the environment of the Hawkesbury-Nepean River System by ensuring that the impacts of future land uses are considered in a regional context.

Oakey Creek borders the site of the proposed development and flows into Cosgroves Creek, which in turn flows into South Creek at a point 28 kilometres or more from its confluence with the Hawkesbury River.

Oakey Creek is an ephemeral drainage line that experiences flows only after sustained local rainfall.

The project has been specifically designed to:

- Prevent any flow of contaminated waters from the project into the creek or the associated online dam;
- Draw any water from the creek or the associated online dam.

The best practice controls, the absence of any discharges from the project to the creek or its environs and the more than 30 kilometre distance between the project site and the Hawkesbury River ensures that it is compatible with and conforming to the Aims of the SREP.

2.5.4 State Environmental Planning Policy No. 11 (SEPP 11)

All aspects of SEP 11 relevant to this project are covered by the detail included in Section 3.2.3 Project Description – Transport; 4.9 Traffic Impacts – Existing Environment; and Section 5.9 Traffic Impacts – Environmental Impacts.

RTA will formally consider the proposal for an intersection on Elizabeth Drive as part of the EIS process and it is assessed that this project does not generate traffic numbers that would be considered to be significant.

2.5.5 Penrith Local Environment Plans

The following Local environment plans have been gazetted for Penrith.

PLEP 1991 – 309 Heritage Conservation

PLEP 1994 – 309 Erskine park Employment

PLEP 1996 – 309 Industrial Land

PLEP 1997 – 309 Penrith City Centre

PLEP 1998 – 309 Urban Lands

PLEP 2002 – 309 Villages of Mulgoa and Wallacia, and

PLEP – 255 Exempt and complying Development

Each of these Plans applies to specific lands within the City of Penrith as specified in each of the Plans. None of the plans has Aims and Objectives that are intended or able to be applied outside the City of Penrith.

It is therefore concluded that there is no application for the Aims and Objectives of any of the PLEPs to this proposed development.

2.5.6 Shaping Western Sydney

The Planning NSW document Shaping Western Sydney, the first overall planning strategy developed for the region, identifies the priority outcomes and presents the key policies and actions to achieve them. In respect to planning for extraction and utilisation of vital resources, the document cites the significant clay resources underlying the region, of which the Badger Mining deposit forms a part. The proposal satisfies the key policy under initiatives for extraction, (pp10 – 11 of the document) to manage the utilisation of the resource before it is sterilised by unsympathetic development.

The Badger Mining proposal is to recover an identified significant economic resource listed in the Sydney Regional Environmental Plan No. 9 for extractive industries. The intent and managed methodology proposed for this development satisfies and fully conforms to, the aims and objectives of this planning policy.

2.6 CONSULTATION AND ISSUES RAISED

During the preparation of this EIS and consultation with Planning NSW, a series of focussed activities targeted the relevant government authorities and sections of the local community that may have an interest in, or be impacted in some manner by, this proposal.

Planning NSW identified the Authorities it believed might have an interest in this proposal through the invitations that were issued for involvement in the Planning Focus Meeting chaired by Planning NSW on the site, in August 2001.

Community aspects and issues relating to the proposal were canvassed by the Community Consultation Survey that was conducted by consultants, Molino Stewart and reported in their Community Consultation Report dated November 2001 (**See Report 1 Technical Volume**).

2.6.1 Agency Consultation

Department of Urban Affairs and Planning (Planning NSW)

The Director General's requirements for the preparation of the EIS were issued in May 2001 and are contained in **Appendix A** of this volume.

National Parks and Wildlife Service

The Service indicated that an Archaeological Study was required for the site. This has been completed and agreement has been reached with the local Aboriginal Land Council for the fencing of the one site within the property where aboriginal artefacts were identified. The Archaeological Study Report is included in the Technical Appendices.

Department of Mineral Resources

The Department advised that the minerals on the site are classified as private and are vested in the current owners of the land. Accordingly, the mining of those minerals is not subject to a Mining Lease. The owners are however required to formally advise the Director General of the Department of Mineral

Resources of their intent to mine privately owned minerals, in conformance with Section 8 of the Mining Act 1992. This advice has been lodged and Departmental Reference TO2/0815 applies.

Department of Land and Water Conservation

The Department administers the Rivers and Foreshores Improvement Act 1948. This Act requires that approval be received from the Department for any works proposed to be carried out (removal of material) within 40 metres from the bank of any Protected Waters. Protected Waters are defined in the Act as follows. "***protected waters*** *means a river, lake into or from which a river flows, coastal lake or lagoon (including any permanent or temporary channel between a coastal lake or lagoon and the sea).*".

The proposed bridge and its approaches are within that 40 metre zone based on the banks of Oakey Creek; however Oakey Creek does not fall within the scope of the definition. Departmental approval is therefore not required for the proposed works.

The Department has reviewed the bridge design and has notified the applicant that the design in principal meets the Department's requirements. The letter also identifies a number of comments for consideration that have all been adopted by the applicant. A copy of the Department's letter is included in **Appendix B**.

Because of the Torrens Title in force at the time of the initial land grant, the bed and any waters of Oakey Creek are vested in the Crown and are not included in the area of either of the two parcels of land either side of the Creek. The Crown Lands Act 1989 requires that a licence be held to occupy Crown Lands. Consequently such a licence will be needed for the bridge to occupy space across the Creek. The Department has the responsibility of issuing these licences.

Roads and Traffic Authority

The Authority is required to approve the design and capability of the proposed new vehicular access between Elizabeth Drive and Lot 1. The new access arrangements and associated road interlying detail have been presented to and approved by the Department. Formal Approval will be issued when the Planning Approval is granted. A copy of the Department's letter is included in **Appendix B**.

NSW Fisheries

The proposed bridge works to cross Oakey Creek have been considered and accepted by NSW Fisheries as being acceptable and pose no threat of harm under any statute or Regulation it administers. See letter in **Appendix B** of this volume.

Other Organizations

The following organizations were also contacted but have no jurisdiction or raised no issues of concern.

- Commonwealth Department of Transport and Regional Services. As a neighbouring landowner the federal department DOTARS has identified that there is no concern within the department, arising from the proposed development. The written response is attached at **Appendix B** to this volume. As the owner of land involved in the

proposal, permission is required from the Department for the EIS to be lodged. The Department's approval is in conformance with its stated lack of concern at any aspect of the proposal. A copy of the submission to DOTARS is available to be viewed if required.

- NSW Agriculture – no response to Planning NSW and no aspect of the proposal poses any threat to the viability of any current or future agricultural pursuits in the area, or on the subject site after rehabilitation.

- Heritage Council – no response to Planning NSW and no aspect of the proposal poses any threat to any Heritage listed property or aspect of the area. Liverpool Council has advised that there is no heritage item on the subject site.

- Nepean-Hawkesbury Catchment Management Trust – no response to Planning NSW and the proposal poses no threat to any aspect of the management or viability of the catchment.

- Liverpool Council will be addressing the standard issues relating to health and building approvals associated with the proposal. Correspondence seeking clarification of the application of NSW planning law to Commonwealth owned land has received no response from Council. The proponent has however chosen to implement the proposal and operate the facility under full conformance with all relevant NSW legislation.

2.6.2 Community Consultation

Community consultation was undertaken during the preparation of this EIS to inform members of the local community of the proposal and to seek their feedback on it. This process has allowed for community concerns to be adequately addressed in the EIS.

All residents and owners of land within a one kilometre radius around the proposed quarry site were contacted either in person, by letter or by phone. Each residence was provided with a brochure, which gave an overview of the proposal. Additionally, the proposal was clearly explained verbally to all who could be contacted in person or via telephone.

A total of 30 separate properties fall within the one kilometre radius of the proposed site. Of those properties:

- 13 are owned by the Commonwealth of Australia and are leased by a total of 18 different tenants, of which 14 occupy dwellings; and

- A further 10 of the properties have dwellings on them, of which six are occupied by the owners.

Six property owners and 12 tenants were contacted personally and the rest were contacted by mail.

Lowrend Pty Ltd, which trades as Frank Belfiore Real Estate, was also visited as it is a tenant of one of the neighbouring properties and the manager of several other properties in the area that are owned by the Commonwealth. A presentation was also given to the Board of the Hubertus Club, a neighbouring commercial premises to the proposed development, on 16th October 2001. Their questions were answered and their comments noted.

The consultant's (Molino Stewart) report details the comments of each tenant and owner contacted. Comments made during the visitations ranged from strong support to strong opposition, but the majority of those who were spoken to made no comment or commitment either way.

Of the negative comments regarding the project, the majority of these were concerned about the potential for dust to have an impact on their business operations. The management of dust and all other issues potentially able to be generated from the proposal are all addressed in the relevant sections of this EIS. A copy of the Molino Stewart report is included in the Technical Appendices.

3 PROJECT DESCRIPTION

3.1 SITE ESTABLISHMENT

3.1.1 Initial Earthworks

The site establishment works will commence with the concurrent stripping of topsoil from the southern half of the site and the construction of earthen bunds along the western and northern boundaries of the site. Stripping will be carried out using elevating scrapers, which will carry the soil and grass cover to the bund wall sites. Silt control curtains will be established downhill of all disturbed surfaces from which there is potential for runoff during rainfall events, thus preventing any impact on the quality of water in Oakey Creek.

3.1.2 Bund Construction

Suitable material from which to construct the bunds will be imported onto the site. The stripped topsoil will be used as cover on the bunds. There is an estimated 100,000 tonnes of topsoil on site. If necessary, extra soil will be imported.

The bunds will be four metres high along the full length of the western boundary and 100 metres of the northern boundary, reducing to three metres at the eastern end of the northern boundary. Bund walls will be shaped with a dozer to banks of 2H:1V gradients, with a flat crest four metres wide. **(See Fig 3)** The flat crests will be wide enough to allow small vehicle traffic for maintenance to vegetation and the construction of an acoustic barrier, should this be warranted.

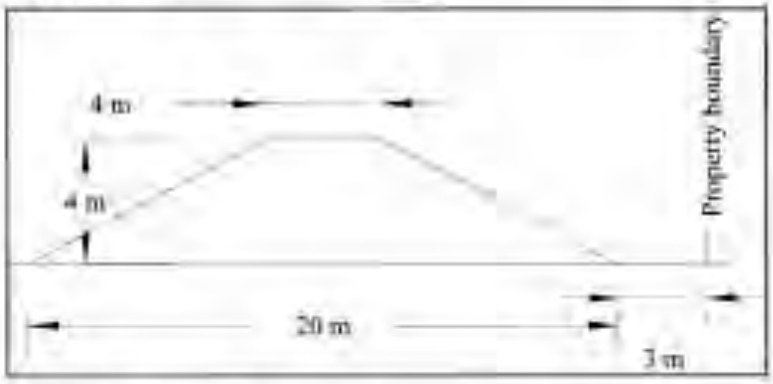


Figure 3: Typical Bund Cross Section

3.1.3 Site Landscaping

The bund walls and the riparian zone around Oakey Creek will be revegetated using seedlings and grasses that are native and suitable to the area as specified in the landscaping plan. **(See Report 2, Technical Volume)** A greenhouse and nursery will be established on site for the propagation of seedlings from local seed and locally generated stock and

storage and protection of appropriate tube stock during the initial landscaping period. This facility will be established as soon as development consent is obtained.

The landscaping plan includes regeneration of the riparian zone that will be centred on the drainage channel that is known as Oakey Creek, for the length of the eastern boundary of Lot 3. This regeneration work will include the implementation of a Bush Management Plan to nurture and strengthen the native flora populations and a Weed Management Plan that will eradicate and control weed infestation that has been identified on both Lot 3 and Lot 1 and the creek area. **(See Report 3, Technical Volume)**

The landscaping and planting activities will be carried out by a qualified gardener. A suitable employee has already been identified who has previous recent experience as a National Parks and Wildlife officer, experienced in the cultivation of native species and the propagation and maintenance of native vegetation environments.

The first priority for landscaping and planting will be to plant out the newly constructed bund walls on the northern and western boundaries, and revegetate the land surfaces affected by the road construction to stabilise the topsoil and prevent erosion.

The second priority will be the rehabilitation of the riparian zone along Oakey Creek, which will incorporate the implementation of the Bush Management Plan prepared for this proposal.

3.2 OPERATING THE QUARRY

3.2.1 Resource Definition

A series of drill cores will be taken across the site and a controlled firing routine carried out to identify the precise physical characteristics and position of the various layers of material within the deposit. This will allow the development of a tightly managed extraction plan and assist in the quantity surveying required to efficiently manage the operation.

Resource	Estimated Size of Reserve	
	Cubic Metres	Tonnes
Top Soil	60,000	100,000
Plastic Clay	600,000	1,200,000
Light Firing Claystone/shale	1,800,000	3,600,000
Dark Firing Claystone/shale	1,000,000	2,000,000
Sandstone	200,000	400,000
Total Deposit	3,660,000	7,300,000

Table 1: Estimated Deposit Reserves

Calculated reserves show 6,800,000 tonnes of plastic clay and dark and light firing claystone/shale. An estimated 400,000 tonnes of sandstone has been identified in lenticular deposits across the site. The lenticular sandstone that is recovered will be used locally or sold as it becomes available **(See Table 1)**

3.2.2 Resource Extraction

The proposal is to open the site for extraction in two stages, based on the northern and southern halves of Lot 3. **(See Fig 5)** The southern section will be opened first and the extraction developed along three or possibly four benches that step progressively to the west. **(See Figure 4)**. At a nominal 300,000 tonnes per annum extraction rate the life of the proposal is estimated at 20 to 22 years. The southern first stage deposit is expected to take around ten or eleven years to exhaust, with the second stage being opened and operated as needed to ensure continuity of supply.

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Figure 4: Quarry Development Outline

Figure 5: Bench Development Section.

The nature of the extracted material is such that there will be no requirement for onsite processing. The operation will be essentially a controlled "shovel and truck" activity.

Extraction of the deposit will proceed in strips advancing from east to west. The intention is to excavate sufficient area to be able to bench down at least 30 metres at the eastern edge of the quarry, grading the exposed surface at not less than 1% to the eastern boundary of the excavation. Stripping and excavation will commence simultaneously in three sections to create three benches aligned north to south.

The nature of the material being excavated and instantaneous demand for the different materials available will drive the operation on a daily basis.

The extraction of material will follow best practice methods of maximising resource recovery. Extraction of material will be carried out using hydraulic excavation and elevating scrapers in a well-managed and selective manner that will ensure that the quality of the product is maintained.

The establishment of three or four benches, in conjunction with the knowledge of the location of each layer of the deposit, will allow a selective yet progressive level in the south, west and north. The ability to extract from more than one location within the developed area at any one time will balance the relatively slower rate of extraction required to ensure and maintain

product purity, and allow the nominal annual rate of 300,000 tonnes to be maintained.

3.2.3 Void Drainage Controls

As extraction progresses a minimum 1% slope will be maintained to the east where interconnected drainage sumps in the descending quarry floor are to be maintained. Retained waters will accumulate from direct rainfall and will be used to irrigate the vegetation on the bund walls and available pasture on Lot 3 and Lot 1.

In the unexpected event of excessive salinity, the accumulated waters will be supplemented by the addition of potable water for the purpose of irrigation or if necessary, removed from the site by an appropriately licensed waste contractor.

3.2.4 Vegetation Management

A small number of trees will need to be removed as the quarry extraction area expands. The impact of this will be minimal because of the small number of trees involved, and it offset by the plantings of selected and approved species on the bund walls and the riparian zone around Oakey Creek.

4 SITE INFRASTRUCTURE

Site Facilities

The offices, workshop, amenities and manager's residence will be located in the existing buildings on Lot 1.

Smoke alarms and fire extinguishers will be installed in the administration buildings as per local Council and Australian Building Code guidelines. These extinguishers and alarms will be tested regularly in conformance to manufacturers specifications and the applicable Australian Standards.

Parking of staff cars will be on the existing sealed area adjacent to the buildings on Lot 1.

All workshop facilities required to house and conduct routine daily servicing of vehicles will be provided by the existing shed buildings on Lot 1.

The workshop will be used for the overnight garaging and routine maintenance to the oil, fuel and air filters fitted to the earthmoving equipment to be operated on the extraction site. All wastes produced from this activity will be placed in mechanically sound containers provided and emptied by appropriate waste contractors under contract to Badger Mining Company.

A demountable building will be positioned alongside the new road, some 150 metres south of the northern boundary. This building will be no more than 3 metres high and the location is at a lower RL than the existing buildings on Lot 1. The demountable would be used to house the scales and controls for the weighbridge.

A new above ground fuel tank will be installed for Badger Mining requirements, inside a sealed and bunded area constructed to conform to the relevant EPA requirements. All staff whose responsibilities will include operation of the refuelling facility will be trained in the safe operation of the refuelling equipment and appropriate emergency response procedures.

Water

Lot 1 buildings are supplied with town water through a reticulated network. No water services are required on Lot 3 for the excavation work.

Sewerage

Sewage is processed on site using an existing septic sewerage system. The existing system has been designed to handle a larger loading than will be created by Badger Mining requirements. The system will therefore be sufficient to cope with the anticipated number of staff on site and will be regularly maintained per the manufacturer's instructions by the land owner, to ensure efficient operation.

Electricity

The existing buildings on both Lot 3 and Lot 1 are supplied with Electricity from the Integral Energy overhead wire reticulation network. Electricity is not required within the excavation zone on Lot 3. The current supply of electricity to the buildings on Lot 1 is sufficient to meet the needs of the activities that are planned to occur within these buildings (administration and maintenance).

Telephone

Landline telephone services are available within the administration and maintenance buildings on Lot 1. Landline services are not required on Lot 3. The site currently has good mobile phone coverage from both the Telstra and Optus networks.

Personnel working within the excavation zone and on the rehabilitation of the vegetation on the site will be issued with personal short range communication devices as necessary, while they are on the site.

Gas

There is no natural gas supply to the site and gas is not required as part of the operation.

Fencing and security

Under the requirements of the Occupational Health & Safety Act 2000, the quarry site will need to be fenced to ensure security of the site and prevent unauthorised access. The quarry site on Lot 3 will be fenced with a 2 metre high cyclone wire and pipe frame fence that will encircle the extraction site outside the earth bund. This means that the fence will be erected on the edge of Lot 3 along the western, northern, and southern boundaries. Along the eastern boundary the fence line will be at the western edge of the riparian zone. Lockable gates will be installed in the fence line across the access road leading over the bridge onto Lot 1. There will be no fences erected anywhere on Lot 1 in relation to the roadway or the weighbridge.

Vehicular access off Elizabeth Drive will be restricted by the installation of pipe boom gates at the boundary and the erection of signs carrying the information, **Private Property** and **No Unauthorised Access Permitted**.

Waste Disposal

Rubbish collection from Lot 3 will continue to be the domestic service to the private house that will be excluded from the development. Rubbish generation from the offices and workshops on Lot 1 will be limited to domestic waste only from the lunch room and offices. The number of persons working on the site will be not more than 12 to 15 at any one time and this will be adequately catered for by the existing domestic collection servicing Lot 1.

The commercial wastes generated from the workshops will be limited to replacement fuel filters and air filters from the earth moving equipment on a quarterly basis. With no more than six units at most to be serviced, the quantities will not be significant and will be adequately catered for in the existing rubbish collection service. Licensed waste contractors will be used for removal of oil filters and oily wastes as required.

Wherever possible, appropriate materials will be sorted and sent for recycling using existing Council recycling services.

4.1 EMPLOYEES AND HOURS OF OPERATION

Stage 1 Years 1 to 10

A total of eight employees are expected to be located at the quarry site in extraction activities. Up to five employees are expected to be housed in the administration buildings on Lot 1. There will also be a revegetation contractor operating in the grounds around the excavation site on an as needed basis.

Stage 2 Years 11 to Completion

A further three employees will be expected to work within the excavation site on rehabilitation placement during years 11 onwards as part of the second stage of operation. This will still retain the workforce well within the limits of the infrastructure.

Operating Hours

The quarry will operate from 0700 to 1700 Monday to Friday, excluding Public Holidays.

4.2 FILLING THE VOID

4.2.1 Material Description

The void created by the removal of the clay/shale deposit will be back filled and rehabilitated with selected inert material. Only materials which satisfy the criteria for Class 2 inert waste contained in *Table 1, page 16 of the NSW EPA Environmental Guideline: Assessment, Classification & Management of Liquid & Non-Liquid Wastes*, and qualified by the definition of a *Class 2 Inert Waste Landfill, Section 3.2.3, page 9, of the NSW EPA Environmental Guideline: Solid Waste Landfills*, will be used to refill and rehabilitate the site.

4.2.2 Material Sourcing

Rehabilitation material will be sourced from the existing industrial demolition work conducted by Mr L Harpley Jnr., and virgin excavated natural material (VENM) sourced from various government or private civil construction works such as road tunnels, rail excavations and the like. Some building excavation sites may also yield suitable material that complies with the EPA criteria.

4.2.3 Material Placement

The material will be placed and consolidated to ensure stable placement at a density that matches the surrounding strata. This will ensure that the ground water environment is not affected.

Material placed into the void will be managed by the same computer program that will be used to manage the selective extraction of the clay/shale deposit. This will provide ongoing records of the source, volume and final location of all materials placed on the site.

Placement, spreading and compacting will be under the direct management control of the Mine Manager.

4.2.4 Material Transport

All materials selected and approved for use in rehabilitation of the voids will be transported to the site using similar vehicles and under the same management controls as those applied to the transport of product from the site.

4.2.5 Rehabilitation Time Table

Theoretically, backfilling may proceed at placement rates equivalent to the rate of excavation. However, the reality of using selected material sourced from managed operations and major civil construction sites operating on a project basis, in a time frame ten years into the future, does not allow accurate planning now. **(See Table 2)**

The need to provide suitable compaction to the materials as they are placed will also necessitate a slower rate of return, to allow for the compaction process and the related testing to ensure a high quality rehabilitation is maintained. On this basis it is estimated that up to 150,000 tonnes per annum can be expected to enter the site. At this rate of placement the rehabilitation process would need to proceed for 35 to 40 years to be completed.

Year 1-10	Rehabilitation restricted to boundary bunds
Year 11-20	Stage 1 extraction complete and rehabilitation commences with selected material & VENM
Year 21- on	Completion of void rehabilitation and completion of surface contour rehabilitation.

Table 2: Rehabilitation Time Table

4.3 TRANSPORT

At a nominal 32 tonnes per vehicle, this will equate to 20 vehicles per day transporting wastes, or 40 vehicle movements over a daily ten hour period.

4.3.1 Site Access

The existing entrance to Lot 1 will be preserved in its current condition as the residential and administrative entrance to the property. Modifications to Elizabeth Drive to provide safe access into and out of Lot 1 have been designed to conform to the requirements and guidelines of the NSW Road and Traffic Authority.

The chosen location provides clear vision for 400 metres in both directions and the interchange design provides safe turning access for traffic entering the site from east or west and similarly for traffic leaving the site to the east or west. The NSW Roads and Traffic Authority (RTA) have approved the design of the road access off Elizabeth Drive and the associated road line marking patterns, subject to final design approval from the Authority's Project Design Services section. Refer to the RTA letter at **Appendix B** to this document. This review will be part of the formal RTA assessment of the EIS after referral by Planning NSW.

The road will run south from the boundary with Elizabeth Drive, from a point on the boundary west of the existing road access to Lot 1. The road will continue west of the existing buildings on Lot 1 to a point where it can turn east and provide access to the existing sheds on Lot 1. The road will also turn west and connect to a concrete bridge to span the bed of Oakey Creek between Lot 1 and Lot 3. **(See Fig. 6)**.

The access road across Lot 1 will be bitumen sealed, and managed and maintained as a clean surface area. The sub-grade construction of the road will ensure there is no impedance to surface flow on or off Lot 1 during rainfall events. The Landscape Plan prepared for the proposal includes the revegetation of areas disturbed for the construction of the road.

Figure 6: Lot 1 Access Road Concept

4.3.2 Oakey Creek Bridge

The bridge over Oakey Creek has been located to provide the shortest practical distance to be spanned and have no unacceptable impact on the flora and fauna of Oakey Creek, in conformance to the requirements of the NSW Department of Land and Water Conservation (DLWC).

The bridge location has been matched to the narrowest portion of the predicted 100 year flood inundation contours on Oakey Creek and will marry into the slope of the land on Lot 1 and ramp down onto Lot 3. **(See Fig 7 & Fig 8)**

The bridge has been designed by G J McDonald & Associates P/L and the location and design has been approved by DLWC.

The bridge design incorporates a minimum 1% slope onto Lot 3 to ensure that all drainage from the bridge flows into the workings for containment and reuse. The road formation and approaches to the bridge will incorporate super elevation, bunding and drainage as required to prevent surface water from Lot 1, and from the roadway flooding into the quarry workings. All surface water from Lot 1 and from the roadway will be classified clean water from clean areas that will be allowed to continue draining to Oakey Creek.

A copy of the bridge Design and related Geo-Tech report is in the Technical Appendices. **See Report 4 Technical Volume**

Figure 7: Bridge Location Looking East From Lot 3.

Figure 8: Bridge Location Looking West From Lot 1

4.3.3 Product Loading Area

Excavated materials will be loaded into product delivery vehicles at a dedicated loading area using an elevating conveyor and physical separation between the product handling area and the sealed transport road.

The daily product stockpiles and conveyor loading point will be below ground level on the north eastern corner of stage 1. The loading conveyor will be driven by a small diesel engine installed at the base of the conveyor in the product handling area, and the head drum positioned to overhang the truck loading point and discharge chute elevated and

All product will be removed from site as soon as possible after extraction so that large scale stockpiling will not be required. The nature of the selective removal techniques required to ensure product quality and regular transporting will exclude the need for large static stockpiles. All extracted material will be loaded through this managed process ensuring that transport vehicles will leave the site travelling on clean sealed surfaces at all times.

4.3.4 Product Transport

Because the production material will be travelling to current markets at three locations east of the site, product vehicles will travel east from the site along Elizabeth Drive and return to the site travelling west along Elizabeth Drive.

However, because the site is adjacent to Elizabeth Drive and close to the Northern Road and the M4, ready access to all potential markets is available along established heavy vehicle traffic routes.

Earth moving equipment extracting the deposit will operate inside the extraction except when travelling to and from the extraction area for required servicing. These vehicles will not be operating on the transport road while transport vehicles are present under normal conditions.

4.4 SITE WATER MANAGEMENT

4.4.1 Water Usage and Available Supply

Water usage on site will only be required for irrigation of the boundary bunds and the riparian zone along Oakey Creek, and dust suppression (where necessary) on the short haul roads required in the excavation.

While there will be some water sourced from rainfall accumulated in the excavation, local rainfall is so low that it is anticipated that there will be a need to also source water from the reticulated service available on Lot 1.

No water will be sourced from Oakey Creek or from the associated online dam, for any purpose related to the operation of the clay/shale extraction.

4.4.2 Surface Water Management

The excavation site (Lot 3) will be prepared for extraction in two sections, the southern half being the first. The immediate boundaries of the working area for stage one will be treated with a combination of mounded earth berms along the edge of the excavation and grassed swale drains along the side of the boundary bunds. These will prevent surface water from undisturbed areas of the site flowing into the working area and direct any uncontaminated rainfall runoff to the undisturbed section of the site. Surface water from the sealed loading area will drain into the excavation.

In stage two: year 11 and onwards, effectively the whole site inside the boundary will be excavated and all direct rainfall will be contained in the excavation. Swale drains will be maintained along the inside of the earthen

bunds to collect clean rainfall runoff that may occur from the bunds and direct it to discharge to Oakey Creek.

Lot 1 will be affected for a short period by the construction of the road from Elizabeth Drive to Oakey Creek. Standard erosion control barriers will be implemented during the construction period and the landscaping plan prepared for the site includes detail for the regeneration of the areas disturbed during the road works.

4.4.3 Excavation Surface Waters

All rainwaters falling into the working area will be contained within the workings and be irrigated onto the boundary bunds and riparian zones. During stage 1 (years 1 to 10) there will be an anticipated average 1,284 cubic metres per week to be irrigated onto the 3.466 hectares combined surface area of the bund and riparian zones. This amounts to 36.5 mm per week that is well within the combined capability of the vegetation to absorb and the effects of evaporation, and means there will be no excess runoff during normal rain events.

In the event of abnormal weather patterns any excess water contained in the excavation can be irrigated over the 48 hectares of pasture on Lot 1.

During stage 2 of the excavation when the full site is excavated, the potential quantity of rainfall that will accumulate on an average week will be 2,528 cubic metres, amounting to an average of 73 mm per week to be irrigated onto the bunds, riparian zone and the pastures of Lot 1. At an average of 10mm per day the quantity is still well within the absorption capability of the vegetation and the effects of evaporation in the area.

On the basis of 50mm of rainfall occurring during any single event, a storage capacity of 3.5 megalitres will be required to satisfy storm event management issues raised by the EPA. This volume of 3,500 cubic metres can be readily accommodated in the bottom of the excavation.

As the first stage rehabilitation is completed a further 8 hectares of pasture will be available for irrigation of any accumulated water. After rehabilitation of the site is completed, the entire site will have returned to a natural grassed surface producing uncontaminated runoff.

The quality of any water that may be leaving the site will always be that of fresh rainwater.

4.4.4 Groundwater Management

Some groundwater has been identified at various depths in bore holes on the site, demonstrating a hydraulic gradient ranging from 1 in 40 in the south west to 1 in 80 in the north east of the site. This is typical of similar studies conducted in the region and is at the root of the poor quality of groundwater in the region. The dense nature of the deposit, having permeability coefficients ranging from 2×10^{-5} m/s at medium depth down to 6×10^{-10} m/s at the deeper levels, ensures low permeability and long residence times of any water that has penetrated to depth.

Penetration into the deposit is also severely restricted by the ironstone hardpan layer approximately one metre below the surface that restricts penetration and promotes all flows to near or on the surface. This means that any water accumulation at depth would be limited to bedrock unit horizons and may result in some minor seepage during excavation.

On the basis of the permeability of the deposit and low rates of penetration and accumulation, total inflow from subsurface water into an excavation assuming a boundary length of 300 metres and a depth of 25 metres below current ground level, would be expected to be substantially less than 5 cubic metres per day, or 0.67 litres per m^2 per day. This quantity of water is insignificant and can be expected to be substantially lost to evaporation. Any that accumulates during cooler weather will flow to the drainage sumps and be used for the suppression of dust within the quarry.

In the absence therefore of any groundwater of any consequence or concern, it is assessed that no specific groundwater management or controls are required beyond the general requirements of containment and managed dispersal of any waters that accumulate in the excavation.

4.5 SITE REHABILITATION

4.5.1 Long term rehabilitation

Following the deposit of the rehabilitation material into the void, a bulldozer and possibly a grader will be required to spread the minimum of 300mm of topsoil that is to be spread across the entire site to ensure good pasture regeneration. This will create an improved situation compared to the current surface condition, particularly where the surface has been eroded and compacted by many years of contact with hoofed animals.

Landscaping will be implemented in conformance to the landscape plan and the intended final use of the site after rehabilitation. When final contours have been returned to those existing at the start of the development, identified by the site survey plans already prepared, the land will be able to be returned to its current use of grazing and corralling horses but with a significantly better agricultural potential than is currently the case.

The project will not affect the use options of the land in either the short or long term. The agricultural possibilities will be considerably enhanced by the replacement of the existing deposit with selected rehabilitation material and the minimum 300mm top soil cover. The range of available alternate uses given possible zoning changes in the future is unaffected.

However, because of the time lag between commencement of extraction and the availability of the void for receipt of rehabilitation material, there is obvious uncertainty surrounding the tonnages, source and specific nature of the materials that will be available at the time. It is therefore proposed to seek a separate approval for the rehabilitation phase of the project, closer to the time when rehabilitation can commence.

This will allow the projected impacts and required management controls for the rehabilitation works to be more effectively defined.

5 EXISTING ENVIRONMENT

5.1 LAND USE

5.1.1 Zoning

The project site lies within an area zoned Rural 1A under Liverpool Council Local Environmental Plan 1997 and the proposed extractive industry is permissible with consent.

5.1.2 Land use and ownership

The project site is located in rural landholdings that are substantially used for grazing, predominantly horse grazing. Horse training activity is also prevalent in the area along with market gardens, poultry and some historical turf farming.

The development of the clay/shale extraction facility on Lot 3 and the transport road on Lot 1 will have no impact on adjoining properties. Fig 9 provides a summary of local land uses identified on the immediate neighbouring properties. The green shaded properties identify those adjoining properties that are owned by the Commonwealth and would be involved in the development of an airport in the area. **(See Fig 9)**

The two properties adjoining Lot 3 on the western boundary and the one property adjoining Lot 3 on the northern boundary are privately owned. The northern property and northern of the two western properties contain residential dwellings and the southern of the two western properties contains the Hubertus Country Club which incorporates a commercial licensed club and licensed shooting range.

There is a single dwelling situated on Lot 3 which has been excluded from consideration because it is owned and occupied by the proponent.

All the Commonwealth owned land surrounding the site is currently being used for the agricultural/grazing purposes that are common in the area.

5.2 CLIMATE

The climate in the site locality is temperate with warm to hot summers, and cold to mild winters. low rainfall falling on average on seven days per month and is described in the Bureau of Meteorology publication "Climate Survey Sydney Region 5 New South Wales" for stations at Bringelly, Liverpool and Campbelltown.

5.2.1 Temperature

The temperature ranges from an annual maximum mean of 23 degrees C in February to an annual minimum mean of 10.5 degrees C in July.

5.2.2 Rainfall

The average monthly rainfall ranges from 80mm in January to 42 mm in August with an annual average of only 760 mm which falls on an average of 82 days per year.

Figure 9: Local Land Use Patterns

5.2.3 Humidity

The humidity in the area has an annual average of 72% at 0900 and 52 % at 1500.

5.2.4 Wind

South east and north east winds are predominant in the summer months and westerly in the winter.

5.3 GEOLOGY

5.3.1 Regional Geology

The Luddenham Area lies within the central part of the Sydney sedimentary basin. This basin is a large depression that began to form in the early Permian times and gradually filled with a variety of sedimentary strata, including a thick sequence of coal measures. The Hawkesbury Sandstone is a widespread and continuous sheet of sandstone that was deposited in Triassic times. This originally horizontal expanse of sandy sediments continued to form a shallow central depression that filled with mainly fine grained sediments forming a series of shaly and silty strata named the Wianamatta group; it includes the Ashfield Shales and Bringelly Shale.

5.3.2 Site Description

Geological information has been sourced from the Brinks 1992 report on ten fully cored drill holes on Lot 3 that were split and fired in the Zaculba tunnel kiln and returned to the casing for comparison to the natural material. This process identified the site as containing more than 50% light firing material. Subsequent investigations by the then NSW Department of Minerals and Energy, now NSW Department of Mineral Resources, have resulted in the site being listed in SREP8 (2) Extractive Industry as a Schedule 1 site that should be exploited, given planning and environmental aspects are properly addressed.

The surface of the site area lies approximately 80 metres above sea level and from reports prepared by the NSW Geological Survey it was deduced that Wianamatta group sedimentary strata below the site are about 120 metres thick. As the combined thickness of the Ashfield Shale and Minchinbury Sandstone is some 60 metres thick, the Bringelly Shale is about 60 metres thick. Hence drilling associated with this investigation did not penetrate the lower 30 metres of Bringelly Shale. Drilling was generally discontinued when the core indicated increasingly coarse and hard strata.

The strata intersected in the ten fully cored holes consists of interbedded and interbanded arenaceous and argillaceous shales, carbonaceous claystones, siltstones and sandstones. Lithological boundaries between the various litho types are usually diffuse and gradational, except in the case of the sandstone which generally occurs in distinct bands with sharply defined upper and lower boundaries. Shales, claystones and siltstones may grade into each other in thin repetitious bands forming laminates or may form layers several metres thick. The original Brinks Bore Logs and bore location diagram can be seen at **Report 5 Technical Volume.**

The strata within the subject area (Lot 3) have a near horizontal attitude and are covered by a weathered profile of varying thickness and composition. For example, the south western part of the area (DDH 5) is capped by a sandstone bed of several metres thickness. Its weathered profile is relatively thin and consists of mainly silty to sandy clay containing numerous laterite nodules in the upper section. In contrast, the eastern part (DDH 8,9,10) is devoid of the sandstone cap and its upper part consists of a relatively thick plastic, slightly silty clay. The flat topography and proximity of the creek also would have an effect on the development of the thicker weathered profile of the eastern part of the land.

Graphic sections are shown on the logs of the several boreholes and it is obvious that claystone/shale is the predominant lithotype, followed by siltstone/shale and clay with sandstone forming only a minor proportion. No sandstone was intersected in DDH 7, indicating its discontinuous, lenticular nature. (Brinks 1992)

5.3.3 Reserves

Reserves calculations were based on the following parameters:

- Total surface area of 180,000m^2
- Extraction base level R.L. = 50m
- Boundary buffer zones – 20m wide along fences, 30 m from the creek bank along eastern boundary
- Batters and benches - 30° batter in clay, 70° in shale etc.
- Average estimated bulk density of 2 tonnes/m^3.

Basically three categories of material are considered:

- topsoil – 0.4m thick
- clay and extremely weathered shale – 4.0m thick
- claystone, shale, siltstone, sandstone – 24m thick

Calculated reserves are:

Topsoil	60,000 m3 (100,000 t)
Clay	600,000m3 (1,200,000 t)
Claystone, shale, siltstone, sandstone	3,000,000m3 (6,000,000 t)

The top soil is generally a silty, clayey loam, capable of supporting vigorous vegetation growth.

The quality of the clay varies in colour, plasticity and laterite/limonitic nodule content. The several types of clay can be classified during extraction and stockpiling according to specific end uses. The following table **(Table 3)** identifies the distribution and combined thicknesses of the several categories of material to each of the ten drill holes.

It is anticipated that about half of the siltstone will be included with the dark firing shale and the remainder with the sandstone. More precise delineations of fired colour materials can be made when all the cores have been fired in a tunnel kiln at appropriate temperatures. However, preliminary results indicate

that at least 50% of the available reserves will be light firing. Hence an estimate of the reserves of the various materials is shown in the **Table 4.**

Drill Hole No.	Clay % in core	Claystone/ Shale % in core	Siltstone % in core	Sandstone % in core
1	7.9	88.5	5.6	-
2	13.8	64.5	20.6	1.0
3	26.6	71.7	1.7	-
4	8.0	79.8	6.4	5.1
5	5.6	59.9	28.7	5.8
6	14.3	75.5	5.7	4.4
7	8.8	57.5	31.0	2.8
8	13.2	62.9	19.5	4.5
9	16.6	56.7	23.8	1.0
10	16.9	60.3	20.9	1.9
Mean Values	13.4	67.5	16.4	1.9

Table 3: Material Thickness (%) Distribution

Top Soil	60,000 m3 = 100,000 t
Plastic Clay	600,000 m3 = 1,200,000 t
Light firing claystone/shale	1,800,000 m3 = 3,600,000 t
Dark firing claystone/shale	1,000,000 m3 = 2,000,000 t
Sandstone (construction material)	200,000 m3 = 400,000 t

Table 4: Estimates of Reserves

5.4 SOILS

The soils on the site are defined as being dark topsoils or the A horizon of the weathered profile. Topsoils intersected in the drill holes and observed in numerous exposures consist of fine grained silty, clayey loams, generally rich in laterite nodules, as well as haematite. These soils are generally hard setting, brown to dark grey, and usually about 0.3m thick. They grade into stiff sandy clays which generally change to recognisable weathered strata.

Although a significant part of the surface area is in a denuded state, caused by overgrazing and tramping on the horse yards, only limited shallow surficial erosion is evident. The creek along the eastern boundary consists of a series of disconnected channels and depressions which are on a relatively stable and stationary position. The edges of the online dam in the north east part of the site again show no sign of undue erosion.

The soils of the site are not prone to erosion and are resistant to degradation by water and wind because of the relatively high clay content and the presence of haematite and laterite nodules. When the soils are protected with a cover of grass vegetation they are virtually immune to erosion, especially in this low relief topographic setting.

5.5 HYDROLOGY AND WATER QUALITY

5.5.1 Introduction

A hydrogeological assessment of the site was conducted by D J Douglas & Partners and reported in November 1993 for a proposed quarry on Lot 3 that was expected to be developed post extraction as an inert (non-putrescible) waste landfill site. The assessment details surface and groundwater quality and chemistry in the area and is summarised below. **See Report 7 Technical Volume**

5.5.2 Surface Drainage

The site is essentially a flat block that has a gently sloping characteristic from the south western corner to the north eastern corner in a continuous smooth gradient falling only 10 metres across a distance of 500 metres from the western boundary to the eastern. There are no distinct channels of flow lines evident with the predominant surface flow exiting the site at a point approximately 20 metres west of the boundary junction with Oakey Creek in the north east corner of the site.

Rainfall naturally gravitates in a sheet flow in the direction of the slope to accumulate in the north east corner and thence flow into Oakey Creek down stream of the online dam.

5.5.3 Water Quality

Surface water quality is reasonable for water that flows across the surface during rainfall events and accumulates in the depression before flowing into Oakey Creek. Water only flows in Oakey Creek as a direct result of prolonged rainfall in the upper catchment and it diminishes and stops as the immediate flow passes. Any water that flows in the Creek or is part of the ground water of the site has an elevated salt content that increases with increased contact with the soils, and is generally not fit for agriculture or stock. Ground water quality deteriorates because of the long detention time in contact with the subsoils and the lack of any diluting infiltration, while the creek water deteriorates, even though it is a surface flow, because of the low volumes, very low flow rate and extended exposure to the sides and bed of the creek.

Water was sampled from the drill holes during the geological exploration and from the dam and the creek and analysed by the Australian Government Analytical Laboratories (AGAL). The water was analysed by Standard Methods APHA 16th Edition and Hardness and Alkalinity expressed as $CaCO_3$. The water was also compared against a well known water quality standard, being groundwater from the Hawkesbury sandstone, which is considered to be of "mineral water" quality. The results displayed in **Tables 5 and 6** demonstrate that the ground water quality on the site is highly saline and generally not fit for agriculture or stock.

5.5.4 Groundwater

The groundwater on the site is low in volume and because of the long residence times in the strata and the lack of any penetrating infiltration below the ironstone hard pan dissolves salts out of the strata in high proportion to its volume, deteriorating in the process. Analysis of this water is reported in **Table 6**.

Luddenham Water		Hawkesbury Sandstone Water
PH	Neutral to alkaline	Neutral to acidic
Chloride	Very high	Very low
Conductivity	Very high	Very low
Hardness	Very high	Very low
Dissolved Solids	Very high	Very low

Table 5: Lot 3 Comparison of Water Quality

The quality of the waters sampled from Oakey Creek and the online dam are also reported for comparison.

	Lot 3, 274 Adams Road Luddenham							Hawkesbury Sandstone				
Sample No s	Creek	Dam	DDH5	DDH6	DDH7	DDH8	DDH9	A	B	C	D	E
Alkalinity	27	39	1000	960	830	600	520	3.3	0	2.2	5.4	13
Chloride	3800	165	6800	7300	12000	12000	8000	12.8	6.5	9.6	18.1	18.1
Colour	25	17.5	1	10	0	1	1	1	5	50	8	35
Conductivity µS/cm	12000	610	28000	22000	35000	28000	24000	78	148	50	93	100
Fluoride	<0.02	<0.02	<0.02	<0.02	0.8	0.12	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Hardness (Ca)	12	14	680	200	640	0	220	7.9	38.7	0	7.0	9.0
Hardness (Mg)	1300	67	4100	3800	6300	4400	3600	18.9	14.0	7.9	14.9	14.6
Hardness (Total)	1400	80	4800	3900	7000	4400	3800	26.8	52.7	7.9	21.9	24.6
Nitrate as N	0.04	0.22	0.28	1.1	0.37	0.35	<0.05	0.1	0.6	1.0	0.6	1.4
PH	6.5	5.6	7.1	7.8	7.0	7.6	7.0	6.2	5.0	5.0	6.0	5.6
Phosphate as PO4	<0.02	<0.7	0.18	0.15	0.07	<0.02	0.35	0.36	0.18	0.63	0.09	2.16
Total Dissolved Solids	7700	390	18000	14000	22000	180000	16000	50	93	32	60	64
Turbidity NTU	1.4	0.42	1.2	16	3.5	1.4	1.4	1.8	40	98	18	40

Table 6: Lot 3 Water Quality Analysis and Comparison

Notes:
1. All results are expressed in milligrams/litre unless otherwise stated.
2. Hardness and Alkalinity are expressed as $CaCO^3$
3. Methods: APHA 16th Edition 1y Australian Government Analytical Laboratory

5.6 FLORA AND FAUNA

A Flora and Fauna Study of the site was conducted in the third quarter of 2001 by consultant Dr Stephen Ambrose of Ambrose Ecological Services. The flora and fauna issues relating to the proposal were identified by reviewing relevant literature and databases, conducting a field surveys and consultation with representatives of stakeholder groups. **See Report 6 Technical Volume.**

5.6.1 Flora Surveys

Literature and Database Review

Literature relevant to the study area, in particular environmental reports produced by consultants and Liverpool Shire Council, was reviewed to find out what terrestrial and aquatic habitats and communities, and flora and fauna species of conservation significance, had been reported within the locality. The following databases were accessed for this information:

- NPWS Wildlife Atlas Database;
- NSW Field Ornithologist's Club Atlas Database;
- Birds Australia Atlas Database (1977-81) and 1998 onwards);
- EPBC database;
- NPWS Rare or Threatened Plants of Australia (RoTAP) Database; and
- Australian Museum specimen collection database (fauna species only).

Field Survey

A flora survey of the study area was undertaken and the entire study area was traversed to identify species present and to ascertain the vegetation communities present. The Study Reports are included in the Technical Appendices.

5.6.2 Flora Survey Findings

Vegetation Communities

Most of the subject land has been cleared for farming activities. There are four remnant vegetation communities remaining on site, all of which currently exist as isolated and highly degraded remnants. These communities are:

- Grey Box Open Forest

This community occurs within some stockyards adjacent to the house and sheds. It is highly altered and consists of a grove of Grey Box (Eucalyptus moluccana) trees that has no understorey. The bases of the trees are wrapped with corrugated iron to a height of 3 metres to prevent horses from chewing the bark. Ground cover is absent due to constant trampling and browsing by horses.

- River She-oak Open Forest

This community forms the riparian vegetation along Oakey Creek, and was also found in areas adjacent to the western-most dam and as two small groves in an open pasture field. It is highly degraded and disturbed from past clearing, weed infestation, grazing and the dumping of rubbish.

The canopy reaches to a height of 15m with a percentage cover of 60-70%. The dominant canopy species is River She-oak (Casuarina cunninghamiana) with the occasional Forest Red Gum (Eucalyptus tereticornis).

The understorey in this community reaches a height of 2 m and is sparse while the ground layer reaches to a height of 1 m and is sparse to dense. This vegetative layer consists of Snow-in-summer (Melaleuca linearifolia) and African Olive (Olea europa Africana).

The ground layer is largely absent along the riverbanks and dams, but present further away from them. Where present, it is dense and less than one metre tall. This layer consists of Centella Asiatic, Einadia polygonoides, Love Creeper (Glycine tabacina) and the weeds Juncus acutus, Juncus bufonius, Chloris gayana, Crofton Weed (Ageratina adenophora), Fireweed (Senecio madagascarensis), Pepper Tree (Schinus areira), Common Couch (Cynodon dactylon), Cobler's Peg (Bidens pilosa) Wandering Jew (Tradescantia albiflora) and Common Sowthistle (Sonchus olaraceus).

- Broad-leaved Apple Woodland

This community is located in a small rise on the western bank of the dam in the centre of the trotting track. It is very disturbed and weed-infested. The canopy trees appear to have been planted.

The dominant canopy species is Broad-leaved Apple (Angophora subvelutina) and reaches to a height of 10 m, with a 25% cover.

The understorey reaches a height of 3 metres and is sparse. The layer consists of Sydney Golden Wattle (Acacia decurrens) and Juncus acutus.

The ground layer is sparse to dense and reaches to 1 m in height. Ground layer species include Einadia polygonides and the weeds Chloris gayana, Crofton Weed, Kikuyu (Pennisetum clandestinum), Fireweed, Common Couch (Cynodon dactylon), Cobler's Peg and Common Sowthistle.

- Grassland

This community forms the ground cover throughout most of the subject site, and reaches to a height of 1 m, with a percentage cover of between 10-90%. It consists of common grasses and weeds including Common Couch, Kikuyu, Chloris gayana, Crofton Weed, Fireweed, Cobler's Peg, Conyza bonariensis, Spear Thistle, Blackberry, Purple Top (Verbena bonariensis) and Common Sowthistle. Occasional specimens of Silky Oak (Grevillea robusta) occur within the stockyards.

Species, Including Rare or Threatened Flora Species

Twenty-nine plant species were recorded in the subject site. Fifteen of these species (c. 52%) are weeds or exotic plant species.

No threatened or regionally significant plant species were recorded in the subject site by the present or previous studies, nor are they likely to occur on the site.

However, special provision has been made in the landscaping program for the provision of assistance to appropriate organisation(s) to assist in the

improvement and regeneration of local threatened flora species such as Pultenea Parviflora. By providing development and nursery facilities where regeneration of the plant can be conducted and the seedlings used as a foundation for re-establishing the species in the local community.

NB Pultenea Parviflora is not located on Lot 3 or Lot 1 as both sites have been significantly and continuously affected and degraded by European agricultural pursuits since the arrival of European settlers in the region, specifically since the formal granting of the land to John Blaxland in 1813. The proponents however are local people and have a vested interest in the locality, having lived there for more than thirty years themselves, and are happy to assist in the regeneration of native flora whenever possible.

5.6.3 Fauna Habitat Assessment

Fauna habitats in the study area reflect the vegetation communities present and their structure. Each habitat was assessed, based on the vegetation communities, their structure and suitability for native wildlife. Opportunistic sightings of all fauna species during the field investigations were noted. Habitats were assessed by considering the criteria described below.

Fauna habitats in the study area are provided by the vegetation and other features such as rock platforms, soil type and the availability of water. Fauna habitats were assessed by documenting the following criteria:

- Mammals: Extent of ground cover, shrub layer and tree canopy; hollow-bearing trees; substrate type (for burrowing etc); evidence such as droppings, diggings, footprints, scratches on trees, nests, burrow paths and runways.
- Birds: structural features such as the extent and nature of the canopy, understorey and ground strata and flowering characteristics, bird species.
- Reptiles: cover, shelter, suitable substrate, basking and breeding sites
- Amphibians: Reptiles and frogs sought in likely sheltering places.
- Invertebrates: logs and other debris, leaf and bark accumulations around bases of trees, grass clumps, loose soil for burrowing.
- Wildlife importance of native vegetation remnants, the creek systems and
- Corridor: riparian vegetation as movement corridors for fauna, especially birds,
- Values: aquatic fauna, mammals (e.g. micro chiropteran bats) & amphibians.

5.6.4 Fauna Survey

A fauna survey was undertaken by consultants to provide information on the fauna habitats and species of the study area. Information collected was used in conjunction with previous surveys and records in determining fauna use of the study area and, in particular, its use or potential use by threatened species.

Point call bird censuses and incidental sightings were used to determine faunal assemblages in addition to fauna habitat assessment. These techniques are described in greater detail below:

- Bird Surveys

All bird species that were observed or heard during the survey were noted. Bird point counts were taken at various locations throughout the study area where all birds seen or heard over a 20 minute period were recorded. Owl presence was investigated at night by playing the calls of owls that could potentially occur in the study area and subsequently searching for owls that may be responding to these calls. Records of bird sightings from previous studies in the study area supplemented the records collected during the consultant's 2001 survey.

- Reptiles and Amphibians

Species were searched for in fallen logs, suitable rock basking substrates, underneath other fallen material and along creek banks. At night time, responses to playback recordings, together with spotlighting, helped identify frog species that occurred on the subject site.

- Mammals

As the site is highly unlikely to provide habitat for native ground dwelling or arboreal mammals, no trapping surveys were undertaken. Opportunistic observations were recorded if mammals were seen at night during spotlighting surveys and during the day when searching for other fauna.

- Invertebrates: the Cumberland Land Snail (Meridolum corneovirens)

Searches for the Cumberland Land Snail were conducted by traversing the whole site on foot. The snails were searched for under grass clumps, among leaf and bark accumulations under the bases of trees, under logs and other natural debris, and under building material stored on site.

5.6.5 Fauna Detected on Site

The subject site is highly unlikely to provide habitat for native ground dwelling or arboreal mammals because of the extent that it has been modified by human influences. Therefore no trapping was undertaken during the 2001 survey.

5.7 POTENTIAL USE OF NEARBY LAND FOR BADGERYS CREEK AIRPORT

Since the early to mid 1980s, the Badgerys Creek area has been nominated as the most likely site for a second Sydney Airport. A number of reports have been produced on the site including a "Summary Of The Environmental Impact Statement For The Proposed Second Sydney Airport". Although the title of the above report uses the word "Proposed", there has been no government decision to proceed with the airport.

Nevertheless, because the lands identified for the airport are close to the proposed quarry site and the airport could be such a large and important project, the implications of the quarry proposal on the airport have been

ascertained. Information from the EIS Summary has been used to assess the implications and these are discussed in **Chapter 6.7**.

5.8 NOISE

The current acoustic environment of the site has been categorised following site measurements as having a typicall quiet semi rural acoustic environment modified by its proximity to a significant arterial feeder roadway, Elizabeth Drive, and the regular use of the airspace above the site by small aircraft for routine training purposes.

This is typified by the traces generated from the data that show a bottoming out of sound levels around 0400 each morning with a clearly defined and symmetrical increase during daylight hours brought on significantly by the high traffic flows on Elizabeth Drive to a maximum level around 1500 to 1600 in the afternoon followed by an equally symmetrical decrease back to the 0400 low point again.

The date gatherad demonstrates that this pattern is remarkably symmetrical over successive days repeating the pattern of a low range between 35 dB(A) and 38 dB(A) Leq and high range between 54 dB(A) and 61 dB(A) with occasional peaks to 65 dB(A) Leq. During the night time hours between 2200 and 0700 the L90 level follows the Leq level with a regular consistency. During the daytime hours however the L90 levels often drop again while the L10 and Leq levels remain high. This is consistent with an environment that is affected by repeating patterns of sustained sound generation interspersed with periods of relative quietness.

Such patterns are typical of exposure to the high level traffic patterns of 4887 AWT and 5248 AWT that have significantly higher hourly counts between 0500 and 1700 weekdays, that have been recorded by the traffic counts on Elizabeth Drive. The regular patterns of overflight during daylight hours by small aircraft doing circuit training and aerobatic manoeuvres, will also contribute to this situation and may well be the source of the occasional peak above the standard variation of the trace pattern **(See Fig 10)**.

The basic acoustic environment of the site between the hours of 0700 hrs and 1700 hrs varies between 45 and 55 dB(A) Leq with episodes to 60 dB(A) and beyond. Statistical processing of the data identifies the Rated Background Level as 35 dB(A) and the Amenity level as 50 dB(A). The recommended LAeq Noise Level from Table 2.1 Amenity Criteria in the EPA INP is 50 dB(A) acceptable level and 55 dB(A) Recommended Maximum.

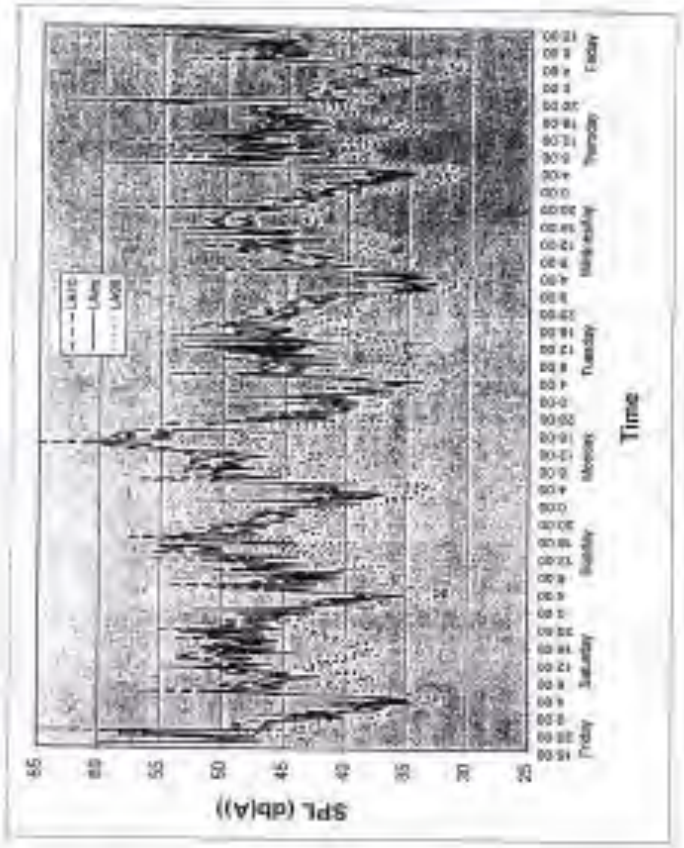

Figure 1 Environmental noise levels for the period 8 to 15 October 1999

Figure 10: Lot 3 Noise Monitoring Data Trace.

5.9 TRAFFIC IMPACTS

Elizabeth Drive Luddenham is the main east west arterial feeder road in the district, other than the freeway, several kilometres north. Existing traffic counts on Elizabeth Drive show a daily average between 4886 and 5248 Mondays to Fridays, with the highest flows between 0500 and 1700 daily and the peak at over 660 vehicles per hour. **(See Fig 11 & Fig 12)**

Flow is cyclic within the constant and consistent pattern of the traffic flow indicated by the counts, which includes intermittent short periods of light flow. Short delays may be experienced at intersections and entrances when attempting to access the roadway during the peak periods of 0700 for east bound traffic and 1700 for westbound traffic.

Elizabeth Drive has a continuous straight line alignment rising consistently at 2.8% between Oakey Creek and the ridge line crest approximately 900 metres west. The access into Lot 1, 2420 Elizabeth Drive is located app 520 metres west of the crest.

The road is currently one lane sealed bitumen in each direction with ample space within the road reserve to more than double the sealed road surface if required.

Adams Road is a local road connecting the village of Luddenham to Elizabeth Drive at a point 50 metres east of Cosgrove Creek and approximately 200 metres west of Oakey Creek.

Traffic counts on Adams Road are not known but it provides access to a number of properties including commercial (Hubertus Club) agricultural and domestic and to other small local roads between Luddenham village and Elizabeth Drive.

The intersection of Adams Road and Elizabeth drive has restricted views because of the trees around the bridge at Cosgrove Creek. There is also a major intersection with Luddenham Road and Elizabeth Drive app 100 metres west of Cosgrove Creek. The road between Cosgrove Creek and the Luddenham Road intersection deviates to the north as it travels west from Cosgrove Creek, blocking any view of the Luddenham Road intersection from vehicles waiting to access Elizabeth Drive from Adams Road, to travel east. **(See Fig 13)**

The current operations of the produce and horse selling business being conducted on Lot 3 Adams Road produces between 30 and 40 vehicle movements each day along Adams Road.

HOURLY TRAFFIC VOLUMES SAMPLE Week 21, Year 1999 (commencing Monday 24/05/99)

ELIZABETH DRIVE MTR535 Kemps Creek-at South Creek Bridge

Station 64.237 E

HOUR (starting)	MON (17/05)	TUE (18/05)	WED (19/05)	THU (20/05)	FRI (21/05)	SAT (22/05)	SUN (23/05)	WEEKDAYS TOTAL	WEEKDAYS MEAN	WEEKDAYS %	WEEKEND (+HOLIDAYS) TOTAL	WEEKEND (+HOLIDAYS) MEAN	WEEKEND (+HOLIDAYS) %	WHOLE WEEK TOTAL	WHOLE WEEK MEAN	WHOLE WEEK %
0	9	19	16	23	16	36	25	110	22	0.45	61	31	0.95	171	24	0.63
1	6	18	12	30	22	19	25	80	16	0.33	44	22	0.69	124	18	0.46
2	13	17	9	20	23	8	16	82	16	0.34	26	13	0.41	108	15	0.39
3	28	28	30	45	45	24	23	199	32	0.65	47	24	0.73	204	29	0.87
4	61	52	61	58	64	31	13	294	59	1.20	44	22	0.69	338	48	1.18
5	237	203	246	251	240	107	20	1210	242	4.96	127	64	1.99	1351	193	4.74
6	486	470	477	502	449	175	37	2398	480	9.81	212	106	3.31	2610	373	9.16
7	662	643	646	652	631	186	57	3224	645	13.24	275	138	4.29	3509	501	11.36
8	466	630	615	620	601	235	110	2552	606	10.38	315	158	4.92	2947	421	9.23
9	238	310	305	291	321	218	154	1565	301	6.16	372	186	5.81	1977	288	6.84
10	247	242	261	252	240	250	229	1248	250	5.11	479	240	7.48	1727	247	5.80
11	234	252	231	240	277	219	244	1274	255	5.21	463	232	7.23	1737	248	5.83
12	233	237	256	251	259	248	235	1235	247	5.05	483	242	7.54	1718	245	5.57
13	240	254	300	273	291	278	229	1366	272	5.56	507	254	7.91	1885	266	6.28
14	304	262	286	292	320	244	245	1464	293	5.99	489	245	7.63	1953	279	6.33
15	270	280	277	292	320	240	281	1439	288	5.89	525	263	8.19	1964	281	6.37
16	249	309	272	309	291	205	287	1591	278	5.69	502	251	7.84	1893	270	6.14
17	292	286	257	283	248	238	357	1373	274	5.62	495	248	7.73	1867	267	6.05
18	143	151	136	142	149	152	172	899	180	2.86	304	152	4.74	1003	143	3.25
19	61	79	78	65	102	60	101	386	65	1.65	160	80	2.01	578	83	1.87
20	42	53	48	64	69	56	70	335	62	1.26	145	73	2.26	453	65	1.47
21	43	47	69	46	68	78	66	291	58	1.05	153	67	2.09	388	55	1.25
22	33	69	60	44	63	65	27	240	48	0.86	112	56	1.75	352	50	1.14
23	23	25	38	28	41	44	22	153	31	0.55	68	33	1.03	218	31	0.71
DAY TOT	4707	4835	4895	4988	5041	3618	3501	24434	4887	100	6407	3204	100	30841	4406	100
MAX	662	643	646	652	631	278	247	AWT = 4887			AWE = 3204			ADT = 4406		

Figure 11: Elizabeth Drive Traffic Counts (East)

HOURLY TRAFFIC VOLUME SAMPLE: Week(1, 1998 (Commencing Monday 24/05/98)
ELIZABETH DRIVE MR535 Kemps Creek at South Creek bridge

Station No. 94 537 W

HOUR (starts)	MON 24-May	TUE 25-May	WED 26-May	THU 27-May	FRI 28-May	SAT 29-May	SUN 30-May	WEEKDAYS: TOTAL	WEEKDAYS: MEAN	WEEKDAYS: %	WEEKEND+HOLIDAYS: TOTAL	WEEKEND+HOLIDAYS: MEAN	WEEKEND+HOLIDAYS: %	WHOLE WEEK: TOTAL	WHOLE WEEK: MEAN	WHOLE WEEK: %
0	12	14	19	13	22	39	66	93	17	0.32	105	53	1.51	208	30	0.66
1	14	9	7	17	17	37	29	84	13	0.24	66	33	0.94	150	19	0.36
2	8	19	5	14	33	22	22	61	12	0.23	44	22	0.64	105	15	0.32
3	5	16	19	37	21	13	10	92	18	0.35	25	13	0.36	117	17	0.35
4	13	19	29	25	22	34	8	118	24	0.46	32	16	0.46	150	21	0.45
5	91	97	104	120	104	63	30	516	103	1.97	93	47	1.35	609	87	1.84
6	215	219	217	244	223	116	45	1120	223	4.34	161	81	2.33	1289	184	3.92
7	232	240	283	279	280	122	118	1394	279	4.03	280	140	4.14	1680	228	4.77
8	270	259	283	253	274	196	190	1344	269	5.12	382	191	5.53	1726	247	5.21
9	302	287	315	302	290	288	194	1485	297	5.86	482	226	6.54	1936	277	5.85
10	260	306	333	270	269	271	223	1399	280	5.33	494	247	7.15	1893	270	5.71
11	273	245	285	277	276	220	297	1358	272	5.18	517	259	7.48	1875	268	5.66
12	247	235	286	240	282	315	233	1343	269	5.12	608	304	8.80	1951	279	5.89
13	268	294	286	261	331	293	274	1489	298	5.56	569	285	8.23	2058	293	6.12
14	366	360	330	311	376	294	236	1837	367	7.00	522	261	7.55	2359	337	7.12
15	490	485	471	449	516	289	203	2411	482	9.18	542	271	7.84	2953	422	8.91
16	585	536	589	592	604	274	207	2909	581.7	11.15	481	241	6.96	3407	487	10.29
17	604	625	607	624	580	292	215	3047	609.4	11.61	552	251	7.30	3599	507	10.71
18	318	368	410	337	386	181	135	1911	382	6.30	296	148	4.29	2707	301	6.36
19	188	176	182	176	260	171	95	872	174	5.02	259	130	2.99	1018	164	3.25
20	99	117	99	127	159	69	74	631	126	2.02	142	71	2.05	673	96	2.03
21	77	86	51	91	90	72	69	395	79	1.61	141	71	2.04	536	77	1.62
22	72	78	85	72	77	69	47	382	76	1.46	110	55	1.66	492	71	1.56
23	46	46	53	52	73	76	30	272	54	1.04	108	54	1.56	380	54	1.15
DAY TOT	5048	5151	5299	5086	5447	3771	3119	25241	5048.19	100	6910	3455	100	32151	4736	100
MAX	606	620	636	624	604	315	297	AWT = 5048			AWE = 3455			ADT = 4736		

Figure 12: Elizabeth Drive Traffic Counts (West)

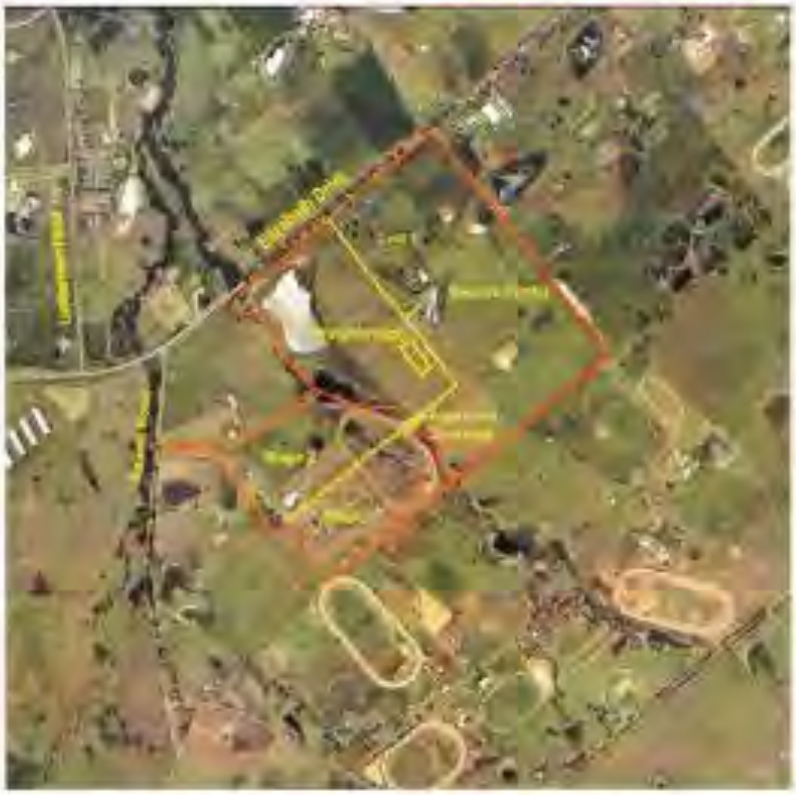

Figure 13: Relative Positions of Roads Around The Site

5.10 AIR QUALITY

Air quality in the locality is generally good and typical of a rural agricultural area. Predominant activity is grazing horses, poultry farms and market gardening. All market gardening conducted in the local area is green house based so there is no ploughing or similar traditional agricultural activities that are recognised to have the potential to raise or generate dust.

Similarly all poultry activity is conducted in closed sheds thereby having no potential to generate dust.

The horse grazing and spelling activities are passive by nature and the clayey consistency of the local soils prevents or inhibits dust generation from this source.

There are no sources of dust identified any where in the area that would compromise the local air quality.

Discussion with the Environment Protection Authority has identified that the Authority collects dust data from a location at Bringelly and a second at St Mary's that are both in the same air shed as the project site. This data is however limited to PM_{10} only, and does not include TSP. This information has no direct relevance to the project site in respect to any consideration of

identifying the level of dust normally present in the project area. Modelling practice however has developed the ability to use typical levels as the basis for extrapolating reasonable assumed levels in an area in which no direct sampling has been conducted.

This approach, used by Holmes Air Sciences (**See Technical Report 12**) for the purpose of modelling the affect of the proposal on the local air quality, has provided the following estimates for the background concentrations at the nearest residences.

- Annual average TSP of 45 $\mu g/m^3$,
- Annual average PM_{10} of 18 $\mu g/m^3$,
- Annual average dust deposition of 2 g/m^2/month.

Discussion of the potential for dust generation from the project is included at **Section 6.10 AIR QUALITY**.

5.11 SITE AESTHETICS

The site is essentially a flat sloping grassy area having accumulation of trees along the creek that is the eastern boundary and in a location centred on the western boundary. A small stand of Casuarina is near the creek in the north east of the site. The site is not readily seen from Elizabeth Drive because of the tress growing along the road side and Creek line, and cannot be seen from Adams Road because of the ridge line that runs along the western boundary.

The site can be seen from the south in **Fig 14** showing the tree lined Oakey Creek and the stand of gums in the west. Both these stands of trees are outside the extraction area and will consequently not be affected.

Figure 14: Lot 3 Current Visual Aspects

5.12 HERITAGE

5.12.1 Aboriginal

Two archaeological assessments of the proposed site have been carried out by Umwelt (Australia) Pty Limited, Environmental and Catchment Consultants. **See Report 8 Technical Volume**

The initial assessment occurred in 1991. It identified an area of Aboriginal cultural significance within the metre riparian zone on the western side of Oakey Creek. A second study, in consultation with the Gandangara Local Aboriginal Land Council (LALC), was completed in September 2000.

In 1991, Aboriginal archaeological material was observed around the margin of a dam that had been excavated for prior agricultural uses on the site in the 1930's in the floodplain of Oakey Creek and less than 20 metres from the creek bank. Water levels in the dam are highly variable, and the artefacts were observed on a surface exposed by low water levels. Some 22 pieces of flaked stone were observed, scattered across an area of 140 square metres within the dam. None of the artefacts could be considered to be in situ. The artefacts, which included flakes, flaked pieces and two cores, were considered to be the remnants of a former site that had been largely destroyed by previous earthworks. A small area of relatively intact floodplain surface remained between the dam margin and the bank of Oakey Creek, but it was considered that there was low potential for further in situ archaeological material to remain.

During the site inspection on 15 June 2000, the area of the Aboriginal site was readily located and it is considered that the condition of the site has not deteriorated significantly since 1991.

The site has been assessed as having moderately low scientific significance, but is valued by the local Aboriginal community, and it is the view of the Gandangara LALC that the site has cultural value and should be conserved in situ. The proponent has advised that conservation of the site is feasible and achievable within the current quarry plan for the property. The method and management of this protection has been agreed between the applicant and the LALC.

The conservation of the site will be supported by the preparation of conservation protocols that are to be observed by all employees and contractors. These are outlined below:

- The location of the site should be recorded accurately using a GPS system, and marked on all plans and design drawings for the quarry and any subsequent uses of the property, as an area that is not to be disturbed;
- The site should be fenced. A fence consisting of star pickets and wire will be adequate, supplemented by additional coloured flagging during the construction of the bund wall, to enhance its visibility to the operators of heavy earthmoving equipment. The fenced area should commence 3 metres from the current low bank at the northeast edge of the dam, and include the remnant of the floodplain of Oakey Creek.
- A protocol for the protection of the Aboriginal site should be included in the Environmental Management Plan for the quarry and any

subsequent uses of the site. This protocol should include, but not be limited to, the following:

- All permanent staff at the quarry to be given basic training in the cultural value of Aboriginal sites and the requirements of the National Parks and Wildlife Act in relation to Aboriginal sites. It is suggested that this training could be provided by the Gandangara LALC;
- All contractors (and their machinery operators) are to be made aware that the Aboriginal site is not to be disturbed by their activities, and of the consequences of destroying a known site;
- No stormwater or other discharges from the quarry are to be directed across the site;
- Measures are to be put in place to prevent sedimentation across the site from runoff from quarry earthworks; and
- The Gandangara LALC and NPWS must be contacted immediately if the site is inadvertently damaged or destroyed during the operation of the quarry, or by other means.

Provision will be made for ongoing access to the archaeological site by members of the Gandangara Local Aboriginal Land Council. This access is to allow educational and cultural activities and monitoring of the condition of the site. The Land Council will contact the quarry manager prior to visiting the site, and all visitors to the site under this arrangement will advise the quarry office on arrival and departure.

No further archaeological investigation of the site relating to aboriginal heritage is required prior to the development proceeding.

5.12.2 European Heritage

The site was originally part of a larger parcel of land that was granted to John Blaxland by Governor L Macquarie in 1813. The available history identifies that the land has been used consistently for grazing and significantly in more recent times for a dairy business. It has also been used for the training, spelling and agistment of horses, the current usage of the site, and to a small degree in latter years, an attempt at turf farming. This exercise was not profitable because of the scarcity of top soil and the lack of any suitable ground water on the site. The turf farming was abandoned accordingly.

The only buildings on the site are a three bedroom cottage, a produce store and stables. The produce store and the stables were constructed by the present owners after the land was purchased in 1966, and the cottage was built in 1975. Aerial photographs taken between 1955 and 1972, held by Liverpool Council, show lot 3 to be a grassy plain sparsely dotted with single trees and the grove of Grey Box that is now part of the stockyards south of the cottage on the western boundary, and no development or construction of any nature.

As a consequence, there is no concern that any aspect of the site may attract consideration of relevance to any aspect of European heritage. This is born out by the detail of the Section 149 Certificate issued by Liverpool Council dated 17 January 2003, in Item 2 (h) **Environmental Heritage** which states, "*An item of Environmental Heritage is not situated on the land.*" This determination has been made by Liverpool Council having regard to the Liverpool Planning Scheme Ordinance 1977, Heritage Local Environmental

Plan No. 252 under the EPA Act 1979 and Certified 16 June 1993, and Liverpool Local Environmental Plan 1997. **See Report 9 Technical Volume**

6 ENVIRONMENTAL IMPACTS

6.1 LAND USE

The project will have no unacceptable impact on any adjoining properties. The potential impacts from such a development are Air, Noise and aesthetic or visual aspects.

An assessment of the Air impact through the dispersion and deposition of dust from the operation, on any sensitive or nearby receptor has shown that no aspect of any part of the proposed development will cause an impact that threatens or exceeds the relevant air quality goal at the nearest, and by extension any of the nearby receptors.

An assessment of the Noise impact of the proposal has demonstrated that there will be no unacceptable impact on any of the nearby residences or other receptors during the operational phases of the proposal. Some noise impact is possible during the early stages of the site development while the boundary bunds are constructed, and this can be managed in conformance with the EPA's Industrial Noise Policy by adjusting times of operation near the residences and negotiation with the residents as to the optimal times for such work to be carried out. Such an undertaking is an integral part of the proposal. This situation will only last for the initial two or three weeks of the development until the bunds have been adequately established.

The visual impacts that might be generated from the proposal have been mitigated by the proponents undertaking to construct 3 metre high landscaped earthen bunds between nearby receptors and the site. These bunds will be maintained throughout the life of the project.

All adjoining properties in the south and east are owned by the Commonwealth and would be involved in the development of an airport in the area. Because of this they are currently being used predominantly for grazing and this will be unaffected by the operation of the quarry.

The Hubertus Club is a licensed club and shooting range and its predominant operation is in the evenings. The Badgar Mining Company operations will occur only between 0700 and 1700 Mondays to Fridays, excluding Public Holidays. The operation of the quarry will have no impact on the activities of the club or its members and the air and noise assessments have demonstrated that it will be similarly unaffected by noise or air impacts from the proposal.

The quarry site will be returned to its current contours and improved productivity capability after rehabilitation better and will be suitable for grazing land, horse training activities or turf farming etc.

6.2 CLIMATE

Given the relatively small scale of the project and it physical context, and the complete absence of industrial discharges, there will be no impact on climate in either local or regional context.

6.3 GEOLOGY

The site comprises a very small portion of the Bringelly Shales geological formation that extends over at least 200 square kilometres. The proposed extraction will affect only a small fraction of the volume contained within the formation and will therefore essentially bring about no change in the geology.

6.4 SOILS

The soils of the site are not prone to erosion because of the relatively high clay content and the presence of haematite and laterite nodules. When the soils are protected with a cover of grass vegetation they are virtually immune to erosion, especially in this low relief topographic setting. This inherent resistance to erosion will assist substantially in achieving the required management of soils during the extraction, and rehabilitation of the site.

6.5 HYDROLOGY AND WATER QUALITY

6.5.1 Hydrology

The hydrology of the area will be unaffected by the proposed operation because the entire catchment of the site is 0.2% of the total catchment of Oakey Creek. As Oakey Creek is at the upper end of the catchment and is an ephemeral drainage line there is no regular flow in the creek to be affected. Hydrological impact will therefore be a reduction of 0.2% of a small quantity of storm event run off. Runoff flows from the boundary bunds and riparian zone will be unaffected throughout the life of the proposal.

The total area of the extraction will not exceed 16 ha or 0.2% of the total 402 hectare area of the Oakey Creek catchment. The ultimate total removal of the surface of Lot 3 from the catchment will therefore have a negligible effect on the (hydrology) volume and quality of water flowing in Oakey Creek following rainfall events.

The surface runoff from the 49 hectares of Lot 1 will be totally unaffected, as will the runoff from the property adjoining the northern boundary of Lot 3. On this basis, the removal of all runoff from Lot 3 will have no appreciable effect on the quality of flows that normally occur in Oakey Creek.

6.5.2 Surface Water

Surface waters from undisturbed areas of the site will continue to flow to Oakey Creek as uncontaminated stormwater.

All surface water collected within the working area of the excavation site will be retained and used for irrigation of the bund wall and riparian zone vegetation, and dust control spraying if required. The 42 hectares of Lot 1 is also available for irrigation if required.

6.5.3 Groundwater

There is effectively no ground water on the site to cause any concern or need for management. The hydro-geological studies conducted on the site (**Report 5 Technical Volume**) have confirmed historical observations of the geological formation that there is limited water able to penetrate or infiltrate the strata. Consequently there are no aquifers of water resource bearing potential existing beneath the site or within its immediate locality.

The study also identifies that the excavation of the deposit would produce a groundwater sink that had the potential to induce groundwater flow into the site. This groundwater regime will revert to equilibrium upon filling the void with inert waste.

The permeability of the strata and the bore hole tests have shown that seepage from the walls of the excavation can be expected to be significantly less than 0.67 litre per square metre per day. This small quantity will produce no concerns of management in the day to day operations of the quarry.

There will be no concern of leachate impacting ground waters because:

- Leachate is not generated from inert materials, and
- The density of the deposit is such as to significantly limit any potential for moisture to permeate the material at the base of the site or the excavation walls.

6.5.4 Site Water Summary

The operation of the quarry will produce no contaminated water able to affect the quality of any surface or subsurface water in the area.

The operation of the quarry will neither draw water from nor discharge water to Oakey Creek. The water quality of Oakey Creek will therefore be unaffected by any aspect of the quarry operation.

Potable water is available to the site as required.

6.5.5 Flooding

A flood study has been conducted on the site by Brink & Associates, Report 00262-F. **See Report 10 Technical Volume**

The study has looked at the 100 ARI and PMFsituations and demonstrated that the maximum assessable flood level able to be projected for Oakey Creek with any accuracy is 61.03 metres RL. The report concludes that:

- The development will cause less than 3.0% change in peak discharge flows from the base of the Oakey Creek catchment.
- Flood modelling indicates the 1 in 100 year flood level will impact the north east corner of the site. This area is the riparian zone immediately west of the existing online dam and is not associated with the proposed extraction area.
- Computations show that the derived surface water levels from all ARI events up to 1 in 100 will not adversely impact on the proposed extraction pit.
- The modelling suggests that as the north eastern corner of the site may be impacted by the 1 in 10 ARI and above, the majority of flow in Oakey Creek downstream of the online dam is derived from overland flow from Subcatchment N, which is the land north of Lot 3.

Apart from identifying that the proposal will not be adversely affected by flood events this detail reinforces the fact that the proposal will not significantly affect the flows in Oakey Creek.

6.5.6 Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan conforming with the Managing Urban Stormwater Soils and Construction Manual, 3rd Edition August 1998, produced by NSW Department of Housing, will be prepared prior to work commencing and all works carried out in accordance with it. This plan will compliment the control measures included in the road design drawings.

The techniques to be employed will include but not be limited to:

- Limit to clearing stages only;
- Limit the time during which unprotected bunded areas are exposed to wind and rain;
- Contain all surface runoff generated within the excavation site and disturbed areas;
- Reduce runoff velocities by minimising the length of flow paths, constructing channels with gentle gradients and providing rough linings to the steeper channels;
- Apply temporary vegetation or mulch to all disturbed areas, including soil stockpiles if such areas are to be exposed for 14 days or more;
- Stabilise all bunded areas immediately with grasses, hydro mulch or similar and maintain the bunds with permanent vegetation;
- Trap sediment as close to the source as possible;
- Locate sediment traps and filters below all disturbed areas to intercept and retain sediment laden runoff;
- Create and maintain surface water containment capability for all water that falls within the excavation.

The natural erosion resistant characteristics of the soils will assist in minimisation of any erosion potential on disturbed areas of the site.

6.6 FLORA AND FAUNA

No threatened or regionally significant plant species were recorded in the subject site by the present or previous studies, nor are they likely to occur on the site. **See Report 7 Technical Volume**

However, special provision has been made in the landscaping program for the provision of assistance to appropriate organisation(s) to assist in the improvement and regeneration of local threatened flora species such as Pultenea Parviflora, by providing development and nursery facilities where regeneration of the plant can be conducted and the seedlings used as a foundation for re-establishing the species in the local community.

NB Pultenea Parviflora is not located on Lot 3 or Lot 1 as both sites have been significantly and continuously affected and degraded by European agricultural pursuits since the arrival of European settlers in the region, specifically since the grating of the land to John Blaxland in 1813. The

proponents however are local people and have a vested interest in the locality, having lived there for more than thirty years themselves, and are happy to assist in the regeneration of native flora whenever possible.

6.6.1 Assessment of Conservation Value

Having regards to the limited faunal movement corridors, the degraded nature of the study area and the impacts associated with grazing, clearing and weed infestation, the subject site has relatively low conservation value for plant species generally and non-flying animals. However, the River She-oak Open Forest has moderate conservation value in that it is likely to be a wildlife corridor, especially for use by birds, through the subject site.

6.6.2 Potential Impacts - Loss of Fauna and Flora Habitat

All vegetation remnants that will be cleared as part of this proposal have highly altered and disturbed structures. None of the plant or animal species recorded on the subject site were identified as rare or threatened.

6.6.3 Investigation of the Need for a Species Impact Statement

The Eight-Part Test of Significance is a standard set of questions devised by the Scientific Committee established under the Threatened Species Conservation Act 1995.

The results of an Eight-Part Test help determine the nature and significance of impacts of the proposed development or activity on threatened species, populations or ecological communities, or their habitats, and whether the preparation of a Species Impact Statement is required.

Due to the degraded habitat on the subject site, the highly altered state of the native vegetation, habitat clearance, weed infestation and associated dumping of rubbish, the subject site is highly unlikely to provide habitat for threatened species. However, it may provide marginal habitat for the following three species. An Eight-Part Test was applied to each species and the results of each test is as follows:

- **The Green and Golden Bell Frog** (*Litoria aurea*)

No populations of the Green and Golden Bell Frog were detected on site. The potential habitat on site is degraded and will not be affected by the proposed development. Rehabilitation measures are likely to increase the quality of potential habitat on site. Therefore, a Species Impact Statement is not required for this species.

- **The Glossy Black-Cockatoo** (*Calyptorhynchus lathami*)

There is not likely to be any significant impacts of the proposed development on the status of the Glossy Black-Cockatoo. This is because the species is relatively mobile and, although potential habitat is present within the study area, this habitat will not be removed or modified. The proposed Bushland Management Plan is likely to improve the quality of habitat on the subject site that may be used by Glossy Black-Cockatoos. Therefore, a Species Impact Statement is not required for this species.

- **The Cumberland Land Snail** (*Meridolem corneovirens*)

No postulations of Meridolem corneovirens were detected on site. The potential habitat on site is degraded and only a small proportion of habitat (Grey Box woodland in the north-west corner of the site) will be cleared by the proposed development. Rehabilitation measures are likely to increase the amount and quality of potential habitat on site. Therefore, a Species Impact Statement is not required for this species.

6.6.4 Disturbance Impacts

Increased noise, human activity and lighting in and around the dwellings, especially during the construction periods, are unlikely to disturb any native fauna because of the significant intrusion of human activity on the site for more than 100 years. Because the site has been actively used for agricultural and animal husbandry pursuits continuously in that time, changing the activity to the proposed excavation will not introduce any significantly new activity to the area.

Wildlife in the vicinity of the subject site is already well habituated to such disturbances because the site is subject to and surrounded by traffic activity and rural development. Therefore, the potential disturbance impacts on native fauna are considered to be negligible.

6.6.5 Birds, pests and litter

Consultation about this project has identified the above the issues of birds, pests and litter as major concerns in the minds of some local residents. The major reason for the concern has been the perception that the site would operate as a traditional landfill once the clay/shale has been extracted, and thereby attract large numbers of scavenger birds and pests, and would be subject to wind-blown and scattered litter.

The void at the site will be filled with material that satisfies the criteria of Inert Waste Class 2 as defined by the NSW EPA Waste Guidelines. Such waste, as its name implies, does not attract birds or pests and does not create litter. Putrescible waste will not be allowed to be dumped at the site. There will be none of the flocks of scavenger species habitually noted at sites where a putrescible rubbish dump is being operated.

The site boundaries will be landscaped and rehabilitated as natural bushland as part of the initial and ongoing management of the project. The new and improved vegetation will encourage local wildlife, including birds, to return to a significantly improved habitat.

6.6.6 Biodiversity

The proposed development is likely to result in increased biodiversity, because of the improved habitat that will result from the ongoing landscaping and ultimate rehabilitation works.

6.6.7 Provision of Compensatory Habitat

It is not necessary for the Applicant to provide compensatory habitat. This is because of the relatively small size of the land to be cleared or modified, the likelihood of negligible impacts on biodiversity, and the variable conservation

status of habitats in the study area. **(See Report 7 Technical Volume** Ambacol Report of Dr Stephen Ambrose.)

6.6.8 Bushfire Control

The Fire Control Officer of Liverpool City Council has advised that the site is in an area where grass fires occur from time to time, often lit by the burning out of stolen cars. The Council does not have any records of past fires or maps indicating the general directional paths or extent of fire events.

Discussion with the District Fire Control office at Liverpool in June 2002 identified that neither Lot 3 nor Lot 1 are considered to constitute any level of bush fire risk and are not listed on any register or plan of bush fire prone areas.

The site consists predominantly of gently sloping grassland with the only areas of vegetation being located within the riparian zone around Oakey Creek, and a small stand of gum trees against the western boundary behind the house on Lot 3. The entire area of the house and the adjacent horse yards will be outside the precincts of the quarry. It is therefore considered to be of low bush fire risk. Lot 3 will be excavated as the quarry is developed and areas not directly involved in the excavation will be maintained. Lot 1 will be used for the agistment of horses and other animals in the same manner as it is currently being used.

Additional vegetation will be cultivated using selected and approved species along the earthen bunding to be constructed in the north and west of the site. This area and the riparian zone will be maintained free of weeds and excessive ground fuel by the implementation of the Bush Management Plan that forms part of this EIS.

The employment of good site management including preventing the accumulation of excessive fuel loads from grassland and vegetation will ensure that no bush fire risk develops on the site.

6.6.9 Bushland Management Plan

A Bushland Management Plan (BMP) and Landscape Plan have been prepared for the subject site in relation to the proposed development. **(See Reports 2 & 3 Technical Appendices)** As part of these plans it is proposed to create a buffer zone on the Lot 3 side of Oakey Creek to protect the aquatic environment and its riparian vegetation. It is also proposed to plant local native flora species along the northern and western bunds of the site to help create a wildlife corridor through the site that may link up with the existing corridor along Oakey Creek.

The BMP and Landscape plans list tree, understorey and ground cover species that are considered to be suitable rehabilitation species. In compiling this list, species were chosen that represented the native vegetation that probably originally occurred on the subject site.

Key recommendations outlined in the BMP include:

- Sediment Controls. Avoid the runoff of sediment, stormwater, effluent and other nutrients into the creeks and streams in the construction and post-construction periods. This will help protect the aquatic ecosystems in the study area and, especially potential habitat of the threatened frog species. Sediment and water runoff can be avoided

during the construction period by placing sediment traps in appropriate locations.

- Protection of Riparian Vegetation. The retention of all native vegetation within the buffer zone on the Lot 3 side of Oakey Creek. This will allow birds and arboreal mammals to use this part of the subject site for foraging, roosting, breeding and as a corridor with minimal disruption from the development.

- Habitat Rehabilitation. The planting of local native flora species along the northern and western bunds of the proposed shale/clay extraction pit to help create a wildlife corridor through the subject site that links up with the existing corridor along Oakey Creek.

- Rehabilitation of the vegetation corridor along Oakey Creek, especially the restoration of the understorey and ground vegetation corridor. Plant species to be used for rehabilitation of the subject site should be endemic to the site, preferably germinated from locally collected seed, particularly those species that will be used to create or rehabilitate the understorey. This is because those plants that have adapted to the local environmental conditions (e.g. soil and rainfall conditions) have the best chance of survival. They are also the species that are most likely to attract native fauna back to the area.

- A weed control program to clear weed infestations in the riparian corridor and Lot 1, to reduce the risk of weeds invading the landscaped bunds.

- Vegetation that is removed is to be retained for use as native mulch using logs for habitat features and seed-bearing species for brush matting.

Implementation of the BMP will ensure that the proposed development will not further degrade, but rather enhance, the condition of the native fauna and flora species and their habitats, particularly along Oakey Creek.

6.7 INTERACTION OF QUARRY WITH POTENTIAL AIRPORT AT BADGERYS CREEK

6.7.1 Runway Options and Proximity to Site

The document "Summary Of The Environmental Impact Statement For The Proposed Second Sydney Airport At Badgerys Creek" refers to three options for the location of runways, namely Options A, B and C.

The runway would be in the order of 380 metres from Lot 3 in Option A and in the order of 790 metres from Lot 3 in Option B. For Option C the runways have north south alignment and the second runway threshold is depicted as being in the order of 380 metres south of the boundary of Lot 3 and is aligned approximately on the east west centreline of Lot 3.

Further estimates of runway location were also taken from the Department's Second Sydney Airport Planning and Design Summary Report (December 1997) Master Plans Chapter 2, Figures 2.1 and 2.5 which depict the Badgerys Creek Option A Master Plan and Badgerys Creek Option B Master

Plan respectively. From this source the edge of the second runway would be in the order of 300 metres from the south east corner of Lot 3 under option A. This distance has therefore been used as the basis of the Obstacle Limitation Surfaces (OLS) assessment following in this proposal.

6.7.2 Obstacle Limitation Surfaces

The proposed activity to be conducted on Lot 1 by Badger Mining Company will be utilising the current buildings. There are no plans to erect new buildings or increase the height of any existing buildings, other than the location of a demountable building alongside the new road, some 150 metres south of the northern boundary. These buildings are no more than 3 metres high and the location is at a lower RL that the existing buildings. The demountable would be used to house tire scales and controls for the weighbridge.

Outside of the trees associated with the existing houses and sheds on Lot 1 the only trees on the site are along the creek line. The existing trees growing along both sides of Oakey Creek will be left untouched and will be supplemented with suitable species approved by the DLWC. These tree species will be compatible with the existing growth and the maximum height of trees in the creek will not change.

On Lot 3 the activity of Badger Mining Company will be to remove the existing large produce and stable complex and excavate the deposit. At the conclusion of extraction the land will be backfilled and returned to the existing surface level contours.

The existing trees in the horse yards on the western boundary of the property will be retained without change. The earth bunds to be constructed along the western and northern boundaries of Lot 3 will be planted with appropriate species as specified in the landscape plan.

These trees will be at least 700 metres away from the location of the second runway Options A and in the order of 110 metres away in Option B. The existing trees on the site are and will remain the tallest objects on the site. Estimates have placed all trees on the site at less than 16 metres from the ground to the tip. None of the species that are proposed to be planted on the bunds will exceed this height at full development.

In the event of runways being installed and operated on the Proposed Sydney West Airport Site the Obstacle Limitation Surfaces criterion would apply with the following projected results.

Obstacle Limitation Surfaces (Airport Option A)

The Badger Mining Site (Lot 3) is located adjacent to and west of the boundary of Property No.1 (Lot 1). This boundary is denoted by Oakey Creek, which has an elevation of 62m AHD at the junction of the southeast corner of Lot 3 and the southwest corner of Lot 1, identified for the purposes of this submission as the Reference Point. From this reference point the Lot 3 land rises to the west along the southern boundary to 74m AHD, 442 metres west of the creek and marking the southwest corner of the Lot 3 property. The northeast corner of the Badger Mining Company site is marked on Oakey Creek approximately 444 metres north northwest of the Reference Point. From the corner the boundary of the land rises from a level of 60m AHD to a peak of 70m AHD at a distance of 347 metres from Oakey Creek. See Figs 3 & 4.

From the drawings available the northern edge of the western runway (240) in airport layout Option A is estimated to be located 300 metres southeast from the boundary at the Reference Point. On the basis of the defined runway Strip being 120 metres centred on the relevant runway, the ground level edge of the Transitional Slope and the defined Runway Strip would be located 270 metres inside the airport land from the Reference Point.

Given the slope requirement of the Transitional Slope from the Runway Strip at 1V to 7H the slope surface on 14.3% would pass 44.7 metres above the Reference Point and 113 metres above the high point in the northwest corner of the property at the junction with the access road off Adams Road. Similarly, the shortest distance between the southwest corner of Lot 3 and the second runway position would be 509 metres. The OLS plane at this point will pass 60 metres above ground level.

Again from the information available, the northern corner of the threshold of the runway (240) is estimated to be located 40 metres south of the southeast corner of the property identified as Lot No. 1. The runway strip ground level boundary would therefore be located up to 40 metres inside the southeast corner of the property. With the inner Approach OLS rising from this point at 2% for a required 900 metres, the ground below that surface will be on the adjoining parcel of land in the east. As the only activity that will ever take place in that part of the property is the grazing of livestock by Mr Harpley, there can be no concern for the activities of Badger Mining Company having any impact at all.

Obstacle Limitation Surface (Airport Option B)

Under the conditions of Option B being progressed the north western runway would be located an estimated 420 metres further away from the subject lands. This would have the effect of increasing the height of differential in each case in the order of 60 metres. The clearance above Oakey Creek would therefore increase to 104.7 metres, and above the south western boundary corner of the Badger Mining Company property to 173 metres. In the case of Property No.1, the Runway Strip ground level boundary would move to approximately 340 metres south of the southern boundary and the height differential above the nominated location would increase in the order of 100 metres.

Obstacle Limitation Surfaces (Airport Option C)

Under the conditions of Option C the Badger Mining Company land (Lot 2) is identified as land that would be proposed to be acquired as part of the increased land acquirement processes and this discussion may well become unnecessary. On the basis of the information available however the only portion of the western runway and associated support systems proposed for this option that would impinge on, or pass north of the southern boundary of Lot 3 is a portion of the approach light pattern. The clear indication is that that pattern would also in fact be required to be installed on or west of the western boundary of Lot 2, on land currently owned by the Hubertus Country Club. This lighting could therefore be established in conjunction with the development of the airport without any impact from the proposed development of the quarry, which could continue to operate without impact on any airport option.

Additionally, the time frame required to enable an airport to be developed on the land, should such a decision be taken by government during the current decade, will be sufficient to allow Badger Mining Company to develop, exploit

and rehabilitate the site before any potential conflict with an airport in the region could develop. This will be even more likely when the time required for any airport option operating on the site to develop to the point of requiring the second runway to be built is taken into account.

The recent release of a large potion of land in the Bringelly region for residential development will be only one of a number of issues that will require reassessment under an EIS process at the time of any decision to proceed with an airport being taken. The time required for this process to unfold is even more favourable to Badger Mining Company.

Conclusion

In conclusion, there is no aspect of the proposal that causes any non-compliance with Obstacle Limitation Surface Requirements associated with runway options A, B or C as defined in the Second Sydney Airport Planning and Design Summary, December 1997. **(See Fig 15 and Fig 16)**

6.7.3 Airport Design Implications

It is our assessment that the proposal provides no unacceptable implications for the proposed airport design options other than the location of the approach light pattern for the second runway on Option C. This is not considered significant at this stage on the basis that in order to exercise Option C as currently defined, Lot 3 and many other adjoining lots west of Lot 3 would need to be acquired for the airport.

6.7.4 Implications for Possible Rail Link North of the Airport Site

The proposal does not have any significant implications for any rail link that may be proposed for construction north of the airport site. The location of the rail line in the Master Plan outlined for Option A and Option B is indicative only and can be moved at will, as has been done in the Master Plan for Option C. The operation of the proposed development on Lot 3 will in turn provide an opportune and appropriate disposal site for the spoil produced by the development of the airport rail link, should it become reality.

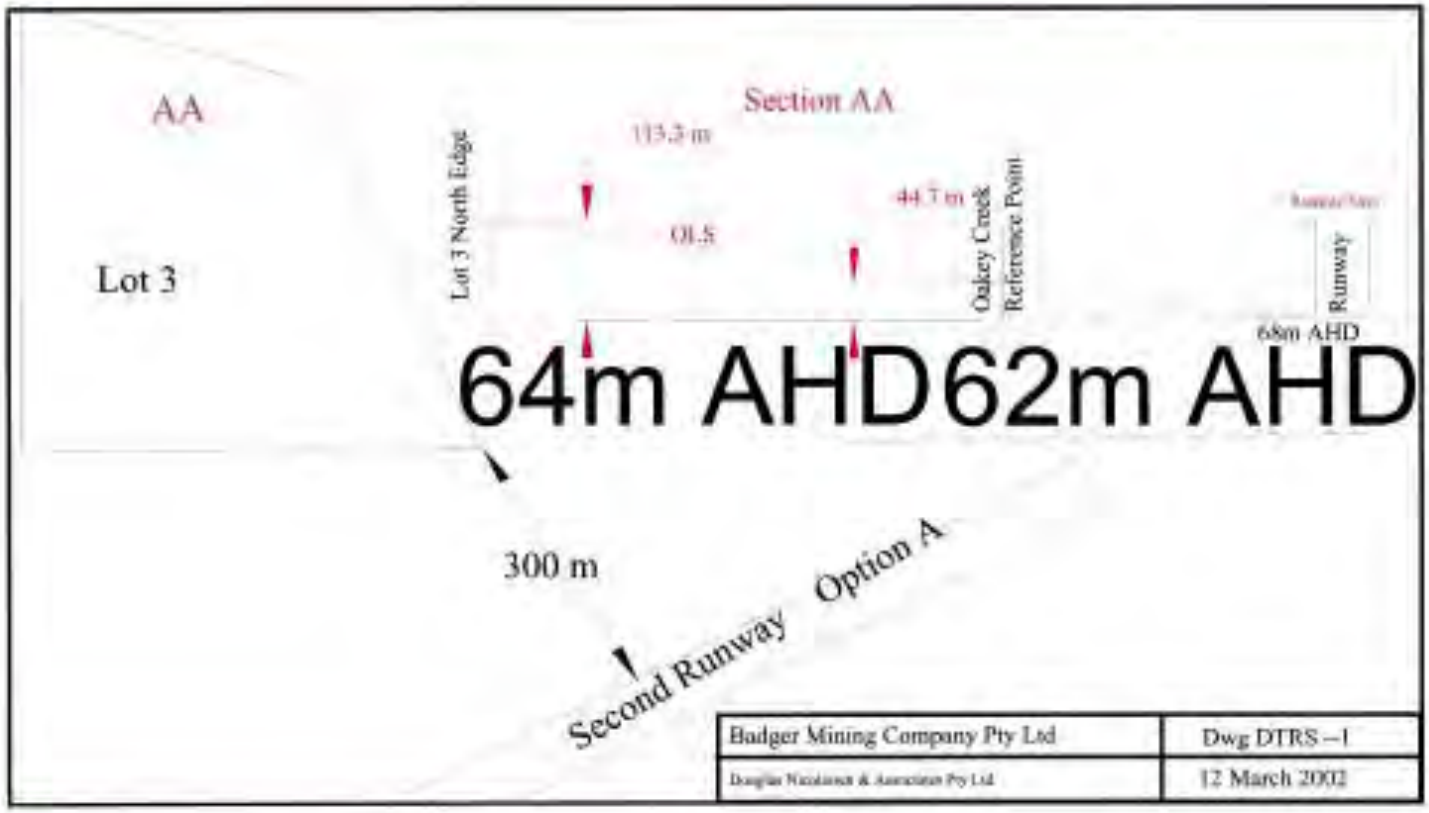
AA
Section AA
113.3 m
44.7 m
OLS
Lot 3 North Edge
Oakey Creek Reference Point
Runway
68m AHD
Lot 3
64m AHD
62m AHD
300 m
Second Runway Option A
Badger Mining Company Pty Ltd
Dwg DTRS –1
12 March 2002

Figure 15: Runway Intrusion Planes Section AA

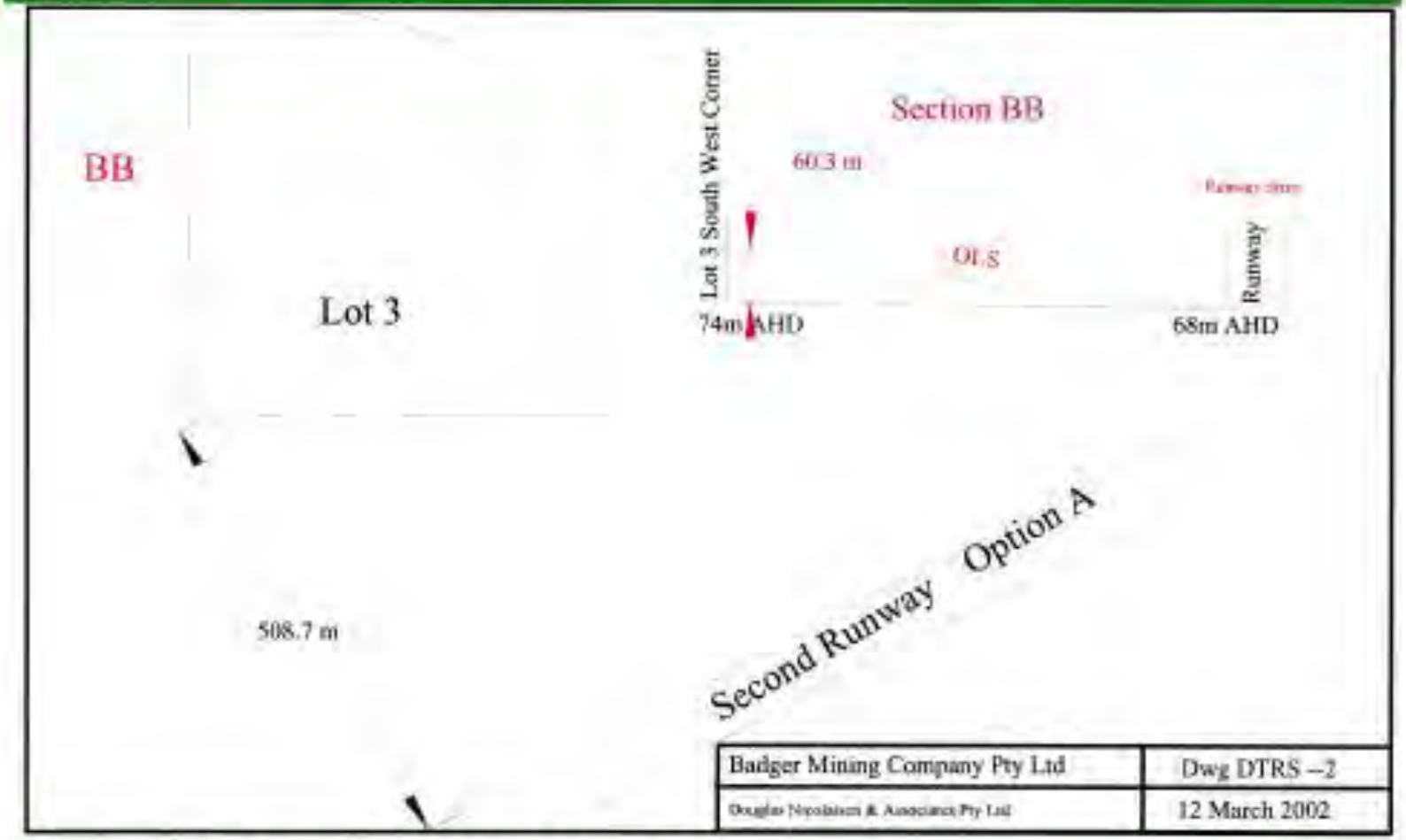

Figure 16: Runway Intrusion Planes Section BB

6.8 NOISE

An acoustic report has been prepared to assess the impact of the proposal on adjacent sensitive receptors. **(See Report 11 Technical Volume)**

6.8.1 Potentially Affected Locations

There are two locations of concern in assessing the potential impact of sound levels produced by the establishment and operation of the project. These are two residential dwellings located west and north of Lot 3 respectively.

The western house is situated approximately 80 metres west of the common boundary with Lot 3 and 136 metres south of the north west corner of Lot 3. The residence is also located at an RL that is between 6 and 8 metres below the RL of the common boundary because of the fall of the land.

The northern house is situated approximately 6 metres north of the common boundary of the access road to Lot 3 and 37 metres from the north west corner of Lot 3. The house is situated at a RL that is app 1 to 2 metres below the RL of the boundary of Lot 3 as distinct from the access road to the site.

6.8.2 Exposure to Sound levels (Establishment)

The technical report that provides the acoustic assessment of his project is BMC-04122002.1, dated 30 January 2003, which supersedes BMC-04122002, dated 5 December 2002.

There will be some exposure to sound levels for each of these houses during the initial establishment phase while the boundary bund is being constructed. The minimum distance between each of these residences and the working equipment while constructing the bund will be 140 metres for the western residence and 86 metres for the northern residence. The potential exposure to these sound levels will also be attenuated to some extent by the relatively lower base level on which they are constructed. The projected sound levels of the bulldozer are listed in **Table 7**.

Table 7: Bulldozer Sound Levels projected at Residences.

ITEM	Plant Item			West Residence		North Residence	
	SWL	Metres	Leq	Metres	Leq	Metres	Leq
Bull Dozer	69.2	21	65.1	21	140	86	55.65
Road Transport	85	50	85	50	140	86	56.65

While the bulldozers are operating to construct the bunds there will also be intermittent truck movements bringing material for the bunds to the area. These vehicles will be travelling at not more than 10 kph and may add 2 dB(A) to the localised sound levels giving a resultant 53 and 57 dB(A) respectively at the residences. In practical terms however their sound levels can be expected to not be audible above the sound level of the bulldozer.

There will also be some shielding effect for the western house provided by the existing residence, garage and associated sheds that are constructed on Lot 3 near the common boundary at that point. These structures will be outside (west of) the bund providing further separation and physical screening of the western dwelling from the plant and equipment. The combined effect of the barrier thus provided can reduce the sound levels by as much as 15 dB(A) reducing the potential impact on the western residence to 38 dB(A) or less. This level is 12 dB below the Amenity level of 50 dB(A) and does not exceed the intrusive value of RBL + 5dB(A) of 40 dB(A).

No such existing barrier sits between the site and the northern residence. The residence will therefore experience a potential level of up to 55 dB(A) for short periods while work on the bund proceeds, at the minimum distance from the residence. As the work passes this point the sound level will reduce at 6 dB(A) per doubling of distance increase. The situation is further enhanced by the fact that the residence is not normally occupied during the day, and an agreement is available between the residents and the proponent to operate in the close vicinity during the middle of the day and/or while the house is not occupied.

6.8.3 Exposure to Sound levels (Operation)

The following aspects will positively affect the extent to which the sound levels of the proposed operation may impact either of the residences:

- The physical separation of the nearby residences from the site per se and the various working areas on Lot 3;
- The 4 metre high earth bund on the western and northern boundaries adjoining the adjacent residential properties;
- The natural fall of the land to the east and west of the western boundary, and
- The operational controls that will be exercised over all aspects of the site's operations.

These two residences are the only buildings that are likely to be affected. The projected sound levels at the residences resulting from the stage 1 and stage 2 development are listed in **Table 8 and Table 9**.

The nature of the project being to quarry clay/shale from the side of a sloping site, cutting into the side of the hill, will ensure that the residences are well protected from acoustic impact. The initial area of extraction, and the permanent loading station for the excavation are located in the south east

ITEM	Plant Items				West Residence				North Residence			
	L10	Metres	Leq	Metres	Metres	LAeq	Barrier Effect	Final LAeq	Metres	LAeq	Barrier Effect	Final LAeq
Hydraulic Excavator	68.5	30	65.3	30	492	41.00	11	30.00	474	41.33	11	30.33
Articulated dump truck (Hitachi B30D & AH300D)	68	30	65	30	492	40.70	11	29.70	474	41.03	11	30.03
Bull Dozer	68.5	21	65.3	21	492	37.91	11	26.91	474	38.23	11	27.23
Bucket Loader							11	-11.00	474		11	-11.00
Elevating scraper	67.5	21	66.1	30	492	41.80	11	30.80	474	42.13	11	31.13
Conveying system (Hydraulic drive) 25kw diesel engine			66	1	492	32.16	11	21.16	474	32.48	11	21.48
Road transport (30 tonne capacity)	65	30	65	30	492	40.70	11	29.70	474	41.03	11	30.03

Table 8: Projected Sound Levels To Residences in Stage 1 Development

ITEM	Plant Items				West Residence				North Residence			
	L10	Metres	Leq	Metres	Metres	LAeq	Barrier Effect	Final LAeq	Metres	LAeq	Barrier Effect	Final LAeq
Hydraulic Excavator	68.5	30	65.3	30	170	50.23	15	35.23	110	54.01	15	39.01
Articulated dump truck (Hitachi B30D & AH300D)	68	30	65	30	170	49.93	15	34.93	110	53.71	15	38.71
Bull Dozer	68.5	21	65.3	21	170	47.14	15	32.14	110	50.92	15	35.92
Bucket Loader					170		15	-15.00	110		15	-15.00
Elevating scraper	67.5	21	66.1	30	170	51.03	15	36.03	110	54.81	15	39.81
Conveying system (Hydraulic drive) 25kw diesel engine			86	1	170	41.39	15	26.39	110	45.17	15	30.17
Road transport (30 tonne capacity)	65	30	65	30	170	49.93	15	34.93	110	53.71	15	38.71

Table 9: Projected Sound Levels To Residences Stage 2 Development.

corner of the site at distances of 492 metres and 474 metres respectively from the western and northern houses. As the excavation moves west into the side of the hill these horizontal distances from working areas will change to 160 and 330 metres respectively. They will also be progressively dropping below ground level, behind the 4 metre high bund. Under these circumstances both of the residences will be beyond any possibility of influence during stage 1.

Once the establishment is complete and extraction begins, distance and barrier effect attenuation will reduce the sound levels of the machines by a minimum of 11 to 15 dB(A) based on the 1k centre band frequency. As the extraction continues and the working level drops below the natural ground levels at distances up to 500 metres horizontal from the dwellings, the sound of the machinery will be reduced to inaudible levels completely screened by the earth.

During the operation of stage 2 the distances will be in the order of 170 metres and 110 metres respectively but these will be well below the level of the four metre bunds and the sound levels in Table 7 will apply.

During the operating stage of the project therefore, the sound levels expected to be experienced at the residences will be at or below the intrusion level with the exception of a 4 dB(A) exceedence of this level for a short period while the Stage 2 extraction activity is located at ground level. This work will drop further below ground level with each day's operations with consequent reduction in sound levels experienced. All levels are well below the amenity level of 50 dB(A) and as all activity is restricted to day time the projection is that the operational sound levels will have no effect on either residence.

The residence on the proponents land, and on the adjoining land in the east, Lot 1 Elizabeth Drive, are not considered by this assessment because they are owned by the proponent.

6.8.4 Product Transport Activities.

Transport vehicles carrying the extracted material off site will all travel to and from the excavation via a dedicated sealed road from the product loading across Oakey Creek and across Lot 1, to access Elizabeth drive 170 metres east of Oakey Creek and at least 800 metres from either of the dwellings.

Traffic control, speed control and properly maintained vehicles, allied to the separation distance from the dwellings, ensures that there will be impact of material transport sound levels on either residence.

The product loading conveyor system will be powered by a 25 kw diesel engine installed at the base of the gantry well below local surface level inside the excavation, with silent hydraulic power being piped to the drive head drum.

The acoustic assessment of the proposal has determined that the operation will not cause or contribute to unwarranted or unacceptable sound levels in the locality of the operation.

6.8.5 Sound Level Monitoring

Acoustic monitoring of the site will be conducted at least twice each year in the first two years to ensure that sound levels from the site conform to relevant guidelines and appropriate statutory limits. Progressive monitoring will continue at a frequency determined by the results of the first series of test monitoring. It is expected that annual testing of normal operations is all that will be required.

Monitoring will also be conducted as each major stage of the project is commenced to ensure that no offensive noise levels are generated by the project.

6.8.6 Acoustic Management

The best form of management able to be applied to the situation will be cooperation between the proponent and the residents, to coordinate the potentially loudest sections of the initial establishment work to the middle of the day and to periods when the residents are away from their homes.

Maintenance of plant and equipment, landscaping and development of sustainable relationships with all neighbours, will ensure there is no unacceptable acoustical impact from the project.

6.9 TRAFFIC IMPACTS

This section addresses traffic impacts of the proposal in terms of the advice received from RTA, all information that that Department considers relevant. In conjunction with the development of a proposed intersection in consultation with relevant officers of the RTA and the relevant detail provided in Sections 3.5 and 4.9 above, this section satisfies the Aims & Objectives of SEPP 11 – 1985, Traffic Generating Developments.

6.9.1 Site Access

The proposed means of vehicular access to the site is via a new sealed road accessing Elizabeth Drive through a new intersection to be constructed 20 metres south of the existing access to Lot 1 DP 741238, and then traversing south on Lot 1 until it turns west across Oakey Creek, accessing Lot 3 approximately midway along its eastern boundary. **(See Fig 13 Section 4.9)**

6.9.2 Intersection Design

The design of the proposed intersection with Elizabeth Drive has been submitted to RTA and has been modified to adopt recommendations made by that Department. RTA has advised that the intersection design is acceptable subject to its submission to the Authority's Project Design Services section. This submission is a component of the Authority's process after the EIS is formally referred to it by Planning NSW. A copy of the modified design is included in the EIS Technical Reports Dwg 01038/R08 Rev C. A copy is on file at RTA ref CAC02/3908

6.9.3 Daily and Peak Traffic Movements

Vehicle movements generated by the development will be as summarised below:

- Between 6 and 8 private vehicles entering the site before 0700 and leaving the site after 1700, Monday to Fridays.
- Up to 80 product vehicle movements per day over a ten hour period between 0700 and 1700 Monday to Friday, public holidays excepted. This product traffic will be expected for the twenty year life of the project. All product traffic will travel east to brick companies at Badgerys Creek, Cecil Park and Horsley Park and empty vehicles will return travelling west.
- Up to 40 rehabilitation material vehicle movements per day over a ten hour period between 0700 and 1700 Monday to Friday, public holidays excepted. This traffic will be expected from the eleventh year of the project until rehabilitation has been completed and, depending on the sources of the material at the time, may approach the site from the east or the west.
- The removal of 30 to 40 vehicle movements per day currently accessing the produce and horse spelling business operating on Lot 3 Adams Road. The majority of these vehicles use Elizabeth drive in approaching and leaving the site.

This level of vehicular traffic generated by the development amounts to an extra 8 vehicle movements on average being added to the existing traffic flows each hour during the first ten years of the project. The traffic flows, that currently exist on Elizabeth Drive during the same ten hour period, range from 472 in an hour to a maximum of 931 total movements in an hour period.

The increase in traffic movements directly attributable to product traffic will be 0.8% during the peak hours of 0700 and 1700 and 1.7% during the lower flows of the 1100 and 1200 time periods. These figures do not take into account the reduction of 30 to 40 movements that will be removed when the existing business closes concurrently with the commencement of the development.

When the product flow is added to by the rehabilitation material traffic the daily increase caused by the development will be an average of 12 vehicles per hour producing an increase over current traffic figures of 1.3% during the peak periods and 2.8% during the lower flow periods.

When these figures are compared to the directional flow, the increase over existing figures for product traffic will be 0.4% and 0.8% respectively, and for the combined product and rehabilitation traffic from year 11 onwards, 0.8% and 1.3% respectively. It is also expected however that during the ten years prior to the rehabilitation traffic starting, the traffic on Elizabeth Drive that is not associated with the development will have increased to the point where the impact of the project traffic be significantly less.

6.9.4 Truck Impact on Residential Areas

The operation of transport vehicles carting product from the site will have no demonstrable effect on residential areas. From the time the vehicles leave the site until they reach their destination they will be travelling on Elizabeth Drive and associated main roads. The vehicles will not be travelling through any residential areas. Where there are residences near to Elizabeth Drive

and other roads, the effect of the vehicle movements produced by this development will be insignificant within the existing traffic flows.

Traffic transporting rehabilitation material to the site from year 11 onwards can not be accurately identified as to route at this time because the sources can not be known. Other than to state that the final approach to the site will be along Elizabeth Drive, it can only be stated that major roads will always be used as a matter of preference. Accordingly, the impact of traffic generated by this development will be negligible within the existing traffic streams.

6.9.5 Anticipated Routes

All product will travel east from the site along Elizabeth Drive and Wallgrove Road to the markets at Badgerys Creek, Cecil Park and Horsley Park. There is no traffic generated from this development that will be travelling through the metropolitan network other than as required to reach these sites. This will require a short distance of 2.6 km along Martin Road Badgerys Creek and approximately 200 metres along Cecil Road at Cecil Park.

Rehabilitation material will preferentially travel by major roads wherever possible. Subsidiary roads and residential areas will only be accessed where it is necessary to access the source of material.

6.9.6 Local Traffic Management Plan

It is not considered necessary to prepare a local traffic management plan because:

- The total use of arterial roads for the access of our markets, all of which are situated within a 13 kilometre radius from the site, with a road distance of 17 km to the farthest location;
- The very low traffic flows that will be generated by the development relative to the existing traffic flows on the arterial roads; and
- The average flow of only 1.3 vehicles per hour to each of the customer sites.

6.9.7 Assessed Increase in toxicity Levels

There will be no product generated on the site that contains any aspect of toxicity.

There will be no material sourced for rehabilitation that contains any aspect of toxicity.

It is therefore assessed that there will be no potential for any increase in toxicity levels of loads transported on the roads and consequently no incident management strategy or plan is required.

6.10 AIR QUALITY

6.10.1 Dust Potential

The project of excavating clay/shale from Lot 3 would have the potential to generate dust if the material being excavated has the propensity to generate fine dust during the process, **and** the activity is not adequately and appropriately managed.

The soils that are the clay/shale deposit on the project site are described by geotechnical consultants as being of low erosion potential because of their relatively high clay content and the presence of haematite and laterite nodules. This material is defined as forming the B and C horizons of the site in the geological sense as dense, heavy clays with no agricultural value.

The extraction of the deposit will provide plastic bonding clays for the manufacture of bricks. This class of soils with their inherent moisture levels and characteristic plasticity consequently also have a low potential for dust generation.

This dust free characteristic is evidenced by the many years of operating vehicles on the large exposed areas of clay/shale that currently exist on Lot 3, in the conduct of the current horse grazing and produce store without the generation of visible dust or deposited dust. The exposed surfaces of the excavation will not therefore be expected to generate dust from the extraction activity, wind action or vehicular movement.

The excavation and transport of the extracted material, and in stage 7 (year 11+) the transport and placement of rehabilitation material into the void, are the only activities to be conducted on the site. Hence the only potential existing for any air impact is from dust generated from the materials being transported within the site and the exhaust emissions of the vehicles involved.

There is a potential for some dust generation during establishment works of the earthen bunds around the site and the rehabilitation period commencing in year 11, because of the need to import material for these purposes. This can all be controlled however by the well managed use of water sprays and the other management strategies listed below. These phases of the operation will have the potential to affect the three identified sensitive locations within range of the project.

Two residences located in the west and north adjacent properties respectively, and a commercial operation, the Hubertus Club located in the south west corner adjacent land, are the only locations likely to be impacted by the project. The management strategies detailed below will ensure that there is no unacceptable impact of dust from the project relevant to any National or NSW Goals, on any of the identified properties.

6.10.2 Dust Management Strategies

The following management strategies will ensure all possible control is exercised over potential dust generation from the project.

- Onsite haul roads will be short and exist only within the excavation.
- The inherent moisture levels and mechanical characteristics of the material (dense plastic) are expected to produce a compacted, flexible and dust free surface. However, in the unlikely event that dust generation from these short haul roads should occur, it will be controlled by effective and efficient use of water sprays.
- Water sprays will be utilised on sections of haul road that exhibit tendency to allow dust generation.
- The transport road off the site from the loading area to Elizabeth Drive will be fully sealed and maintained in a clean condition at all times.
- Transport trucks will be loaded in a sealed loading area and will not be allowed on unsealed roads within the excavation.

- The sealed loading area will be maintained in a clean condition at all times.
- The excavation site will be bounded in the west and the north by a 4 metre high earth bund. The bund will be landscaped with trees, shrubs and groundcovers appropriate to the area.
- The excavation site is bounded in the east by the landscaped strip centred on Oakey Creek. This strip will be enhanced by appropriate species of trees, shrubs and groundcovers appropriate to the area.
- The remaining (south) side will be planted with appropriate species in conformance with the landscaping plan prepared for the project.
- The bund and the foliage will provide significant levels of wind protection, allied to the protection provided because the excavation will also be progressively dropping to 30 metres below the site surface level.
- Vehicles traveling inside the excavation will be limited to 15 kph maximum.
- Rehabilitation material will be watered as part of the compaction process and dust generation will thereby be negated.

During the operational stages of the project, the established bund and associated landscaping allied with the relatively remote location of the source of any dust well below ground level will ensure no impact on either of the identified locations.

During stage 2 of the project the selected rehabilitation material will be placed and compacted. Water sprays are traditionally required to assist proper compaction densities being achieved, so the dust generating potential for this material is also removed. Through the entire process of rehabilitation the boundary bund and established trees and shrubs will inhibit wind intrusion and dust generation.

6.10.3 Dust Monitoring

A program of regular dust monitoring is to be implemented around the perimeter of the site in locations relevant to identified sensitive receptors and prevailing wind directions. This monitoring is expected to consist of monthly deposit gauges and a less frequent span of PM_{10} monitoring should it be deemed warranted.

6.10.4 Project Dust Generating Potential

As a new project there is no existing dust data collected from existing activities conducted on the site. Modeling of the air quality impact of the proposed development has been conducted by Holmes Air Sciences and the report is included in (**Technical Report 12)** of this document.

Each of the operations involved in the operation of the proposed shale/clay quarry have been analysed and appropriate fractions of fine, inhalable and coarse particles determined for use in the dispersion modeling. The operations that apply to each phase and operational combination of plant and equipment have been combined with emission factors developed locally and in the USA, to estimate the maximum level of dust likely to be caused by each operation. Also fed into the model were relevant quantities of dust

control using watering carts on unsealed roads and good management practice.

Dust concentration and deposition rates have been predicted in the vicinity of the project area for both stages of the project. As expected, predicted dust concentrations and deposition generated by stage 2 operations are slightly higher than those projected for Stage 1, because of the rehabilitation works being conducted in the stage 1 excavation while extraction continues on stage 2. The modelling predictions however indicate that air quality goals would not be threatened or exceeded at the nearest residence as a result of the combined activities of extraction and rehabilitation during stage 2 of the project. Results are displayed in **Table 10.**

	Prediction at most affected residence	Assumed background level	Project plus existing	Relevant air quality goal
Stage 1				
Maximum 24-hour PM_{10} ($\mu g/m^3$)	13	-	13	50
Annual PM_{10} ($\mu g/m^3$)	1.3	18	19.3	30
Annual TSP ($\mu g/m^3$)	2.1	45	47.1	90
Annual dust deposition (g/m²/month)	0.3	2	2.3	4
Stage 2				
Maximum 24-hour PM_{10} ($\mu g/m^3$)	44	-	44	50
Annual PM_{10} ($\mu g/m^3$)	5.4	18	23.4	30
Annual TSP ($\mu g/m^3$)	9.5	45	54.5	90
Annual dust deposition (g/m²/month)	1.1	2	3.1	4

Table 10: Summary of Dust Dispersion Predictions

The results of the computer dispersion modeling clearly indicate that dispersion of dust from the operations of the quarry and the resultant off-site dust deposition levels at all nearby receptors as a result of the quarry operations, would be below all relevant air quality goals for all stages of the development. This assessment presents the 'worst case' scenarios of each aspect of the operation with minimum separation distances between the operations and the residences. This ensures that the normal operations will produce a lower level of deposition than the predicted 'worst case' modelling results.

Watering unsealed traffic areas, low speed restrictions and daily awareness of meteorological conditions will ensure no unacceptable off-site impact.

6.10.5 Environmental Impact of Emissions

The low propensity for dust to be generated, the management strategies and close supervision of all activities, and the maintenance of all plant, equipment and vehicles to ensure emission standards are conformed with at all times, will ensure that there is no unacceptable discharges to atmosphere from any aspect of the project.

With no emissions producing impacts that do not conform with the goals for dust and exhaust emissions, there can be no adverse effect on any aspect of the environment from this proposal, of the site.

6.10.6 Vehicle Emissions

All earthmoving and transport vehicles will be fuelled by diesel and will be fully maintained free from continuous visible emissions. Air and fuel filters will be maintained to manufactures recommendations. Vehicle emissions will therefore be small and well within acceptable limits.

6.10.7 Odour

There will be no odour generated on the site during either the quarry extraction or the rehabilitation operation. The quarried material is inert and does not emit any odour. The site will be rehabilitated with materials selected to satisfy the EPA's Inert Waste Class 2 classification that do not contain putrescible or industrial waste material and do not emit any odour.

6.10.8 Greenhouse Gas Implications

The only aspect of the proposal that carries any implications for green house emissions is the use of diesel fuel that will be consumed in the progress of the project. This fuel will be used by earth moving equipment and transport vehicles in the extraction and transport of the product to the markets, and the transport and placement of rehabilitation material into the consequent void.

Three aspects of greenhouse gases consideration have been assessed in relation to this project.

- The type of greenhouse gases to be emitted:

  The only greenhouse gases to be emitted by this project will be CO_2 and NOx from the combustion of diesel fuel.

- The alternative options for the chosen fuel source:

  There are no practical alternative options to diesel fuel readily available for the applications required for the proposal.

- Justification for the choice of the chosen fuel:

  The justification for the choice of fuel is the lack of any commercially viable and readily available alternatives.

Traffic contributions from the project will cause less than 1% increase in the current level of traffic movements in the area, of which a significant proportion are diesel fuelled. The same concept of insignificant change in the broader

concept of industry and diesel fuelled transport operating in the local air shed also applies to this project.

Overall, the project has minimal implications for greenhouse considerations. Participation in the Greenhouse Challenge run from the Australian Greenhouse Office is a possibility once the project has become operational.

6.11 VISUAL IMPACT

The quarrying will commence from the south eastern segment of the site during stage 1, which is on the low side of the site approximately 20 metres below the top of the landscaped bund wall on the western and north western boundaries. The excavation work will therefore be hidden from view of all residents adjoining the northern and western boundaries by the bund walls and the natural slope of the site. **See Fig 17 and Fig 18.**

Figure 17: Comparative View From Northern Residence Towards Lot 3.

Figure 18: Comparative View From Western Residence Towards Lot 3

Observers on the southern boundary will be screened by the landscape planting and those on the eastern boundary by the tree line along Oakey Creek.

Excavation activity will be hidden from the view of persons on Elizabeth Drive by the landscaped bund wall on the northern boundary and by the existing growth of trees around the online dam, the banks of Oakey Creek and the existing roadside planting on Elizabeth Drive. The expanded planting in the

riparian zone centred on Oakey Creek will provide further cover to any view of the operations from Elizabeth drive or any where east of the site.

The area behind the Hubertus Club is already partly screened by a high earthen bund constructed by the club in the south west corner of the common boundary as a shooting butt. The construction of the boundary bund will however completely obscure any view of extraction operations from that property, as shown in **Fig 19**.

Figure 19: Comparative View From Rear of Hubertus Club Towards Lot 3

Screening bunds will not be required along the southern boundary because there is no residential development within view of the proposed development. This boundary will however be planted in conformance with the landscape plan prepared for this proposal. No bunds are proposed for the boundary of Lot 1 because it is under the management and control of the proponent and the creek line is heavily planted with existing trees.

Because operation of the quarry will be limited to between the hours of 0700 and 1700 there is no requirement for any lighting on the quarry site. There can therefore be no impact of illumination on either of the residences or the Hubertus Club.

6.12 SOCIAL IMPACT ASSESSMENT

The entire work force is expected to be up to 12 people under normal operating conditions, with a possible increase to a maximum of 15 people.

It is likely that some employees will buy petrol, food, drinks etc from the nearest shops, which are at Luddenham or Kemps Creek depending on the direction of approach. This would be beneficial to local businesses. Other business locations that may benefit from increased trade generated by the project include Bonnyrigg Heights.

In operation, Badger Mining would be likely to preferentially source needs from local suppliers wherever possible.

The production of the quarry will also ensure an ongoing supply of light coloured bricks for the expanding Sydney domestic and commercial building markets.

The proposal will exert no negative impacts on the local community in terms of producing an unacceptable demand on any services. There will be a positive impact on the social aspects of the local community in terms of the involvement of Badger Mining Company in the regeneration of threatened flora species, and the associated reduction and control of controlled weeds on the two properties involved in the proposal.

The Community Consultation report prepared by Molino Stewart (Report 1 Technical Volume) identified no aspect of the proposal that would generate any significant impact on any social aspect of any community in the region.

6.13 INFRASTRUCTURE

The project has no major infrastructure requirements and will therefore not affect existing or require additional public infrastructure. The only call on existing infrastructure that will be made by the project will be the regular collection of wastes. Small quantities of paper waste will be generated from the administration office and small quantities of waste solids and waste oils will be generated from the workshop servicing activities.

The workshop waste removal requirements will be dealt with through specific contract and will therefore have no impact on existing infrastructure.

The administration waste will be small from approximately 5 people and will be adequately handled by the existing collection service to Lot 1.

6.14 ENERGY CONSERVATION

The site will only operate within daylight hours thus negating the use of electricity for lighting within the excavation area.

All water that is collected within the excavation sea will be recycled for use on the vegetation planted on the boundary bund walls, the riparian zone and on the pastures within Lot 1. Water will be pumped from the pit collector onto the various areas of the site by a skid mounted diesel or diesel electric pump unit feeding a multifunction reticulation system.

All diesel fueled plant and equipment on the site will be serviced and kept in a well maintained and efficient operating condition.

6.15 APPLICATION OF ESD PRINCIPLES

Precautionary Principle

This principle means that where 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. The design and implementation of the management plan for this project will ensure no unacceptable environmental impact. There is no aspect of the proposal that would be likely to cause or contribute to any significant, serious or irreversible environmental damage.

Conservation of Biological Diversity

Conserving biological diversity means ensuring that there is a wide range of plant and animal species; variation within each of those species (a diverse gene pool); and variety of ecosystems supporting those species. The implementation of this project has been based on a comprehensive Flora and Fauna Survey and management plan, and a related Bush Management plan to ensure biodiversity habitat on the site is enhanced.

Internalisation of Environmental Costs

This means improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and

services. This project has been designed on the basis of environmental responsibility in each step of the resource recovery and rehabilitation. Environmental monitoring and management is in integral part of the economic planning for the project.

Inter-generational equity

Inter-generational equity is a principle of ESD that states that future generations of human beings should be provided with at least the same economic, social and ecological opportunities as the generation making decisions today. This project will return the land from which the identified resource is realised, to a state of potential agricultural production several steps higher than currently exists on the land.

The land is currently devoid of top soil on the majority of the site surface as a result of many years of use for horse spelling and yarding. The rehabilitated site will have a minimum of 300 mm of top soil across the entire area, providing a far more productive capability for future generations than is now available.

7 SUMMARY OF MITIGATION MEASURES

The following is a summary of the mitigation measures proposed for this project.

Environmental management plan

The site will be operated under the control of an environmental management plan that has the goal of ensuring that all aspects of the site's operations conform to the highest practicable environmental management standards. The plan will incorporate all the mitigation measures referred to below.

Environmental monitoring program

This will include:

- Air quality measured monthly by dust deposition gauges on or near the boundaries of the excavation.
- Sound levels measured annually on or near the boundary of Lot 3 at relevant locations near to potentially effected residences.
- Sound levels measured on or near the boundary during the initial stages of each new phase of the development on or near the surface of Lot 3.

Landscape plan

Landscaping management and site maintenance will be carried out in conformance to the Landscape plan prepared for the project. **(See Report 2 Technical Volume)**

Bush Management Plan

Vegetation on site will be managed in accordance with the Bush Management Plan prepared for the project. **(See Report 3 Technical Volume)**

Protocol for the protection of the Aboriginal heritage site

A star picket and wire fence is to be erected around the identified artefact location and suitable signage attached. The artefact site is located ten metres from the banks of Oakey Creek and is within the riparian zone, well outside the boundary of the planned excavation. Access to the site by interested parties will be provided after appropriate arrangements are made with the quarry management. The site is outside the effective working area of the quarry and will also be outside the security fence to be erected around the excavation.

Erosion and Sediment Control Plan

The landscaping plan and road designs all include relevant erosion control plans conforming with the *Managing Urban Stormwater Soils and Construction Manual 3rd Edition August 1998*, produced by NSW Department of Housing.

Bund walls for noise attenuation and visual screening purposes

The site will be completely surrounded by landscaping and in the west and north by 4 metre high earth bunds. This boundary treatment will prevent any visual line of site into the workings from any local roads or adjoining properties.

8 ALTERNATIVES CONSIDERED

8.1 DO NOTHING

The consequences of not proceeding with the development would be the denial of 6 million tonnes of brick making materials to the local and Sydney markets.

There is no alternative to the proposal if the recommendation of the Department of Mineral Resources to exploit this unique resource in an acceptable manner, is to be realised. **See SREP No. 9, Extractive Industry (No.2).**

8.2 SOURCES OF INERT WASTE

It is the proponent's declared intention to rehabilitate the site using selected material that conforms to the EPA's Inert Waste Class 2 classification. There will be two sources for the selected material. First will be the material sourced by the proponent from current commercial activities unrelated to Badger Mining, which will be sorted and processed as required at existing remote locations. Selected and approved material from this process will then be transported directly to the site in vehicles specifically contracted for the purpose.

The second source will be specific civil contractors that are producing large quantities of virgin excavated material and have a need for it to be stored or disposed away from its initial extraction site. Such material would be considered, and if satisfying the proponent's strict criteria, would be placed on the site at Lot 3 under strict contractual controls. The terms of such a contract would include ad hoc inspections by the proponent and/or their representatives, to ensure the proper and effective management of material that was being delivered to the site at Lot 3. Contractual controls will provide appropriate safeguards and cater for the removal and proper disposal off site, of any material found to have been transported to the site contrary to the strict controls set by the proponent.

The exclusive use of such materials to effect the rehabilitation prevents the generation of any unacceptable environmental impacts or effects that would then need to be managed.

8.3 ALTERNATIVE REHABILITATION PROCESSES

There are no alternative rehabilitation methods considered.

9 JUSTIFICATION OF THE PROPOSAL

It is considered that the project is justified for the reasons outlined below.

9.1.1 Meeting an Existing Need

There is a short supply of high quality light firing clays and shales in the Sydney region that can be redressed in part by the extraction of the deposit at Lot 3. More than 50% of the deposit has been clearly identified by the Department of Mineral Resources as light firing material and the remainder is dark firing with small amounts of interspersed sandstone. The physical nature of the deposit is laminar with clear definition between the several layers. This unique characteristic allows for careful extraction that will preserve the quality and value of the various available material types to customers and ultimately NSW.

The site is within twelve kilometres of three major brick manufacturing companies (PGH, Boral and Austral), all of which have confirmed in writing their interest in negotiating long term contracts with Badger Mining Pty Ltd for the purchase of the full range of material available from the site, when development consent is obtained. Bowral Brickworks Pty Ltd, a subsidiary of Austral have provided verbal intentions to negotiate for the purchase of any dark firing clays that are not wanted by any of the abovementioned brick manufacturers. This ensures all grades of clay/shale have identified markets.

This site will supply these companies with high quality uncontaminated material for bricks for the Sydney markets and beyond. The clays from this deposit will provide the companies with brick colours that span the colour spectrum of the market. Tests by the Department of Mineral Resources have demonstrated that the colour variation of the final product can be expanded further by careful control of the firing temperature.

9.1.2 Meeting Future Markets

There is continued growth in the Sydney housing market with an additional 130,000 home sites expected to be built by 2016. Of these, 58,600 home sites have recently been identified as investigation areas in the Bringelly, Marsden Park, Glenmore Park Stage 2, Harrington Park Stage 2, Edmonson Park Composite, Alex Avenue and Schofield Aerodrome areas, all closely located to the major brick manufacturing companies. **(See Table 11)**

Nine other areas have also been identified as release areas for investigation of their need for release as housing. At this stage neither services nor the required rezoning has been completed for these land areas that collectively provide an estimated 29,600 further new home sites. These are also situated in the immediate regions of the quarry at Riverstone, Second Ponds Creek, Belmoral Road, Menangle Park, Spring Farm, Elderslie, Yarrunga, Hoxton Park and Glenfield Road. **(See Table 12)**

Collectively these areas account for 89,400 of the reported 130,000 new home sites that will be required in the Sydney West regions over the next 15 to 15 years. **(See Fig 20)**

The quarry could provide much needed inputs to the bricks that will be required to complete the projected number of new homes.

Location	Area Type	Houses
Bringelly	Investigation	30,000
Edmondson Park Composite	Investigation	12,000
Harrington Park Stage 2	Investigation	1,000
Marsden Park	Investigation	10,000 +
Alex Avenue	Investigation	4,000
Glenmore Park Stage 2	Investigation	1,600
Schofield Aerodrome	Investigation	1,200

Table 11: New Home Areas Under Investigation
Source: Department of Urban Affairs and Planning Web Site.

Location	Area Type	Houses
Riverstone	Release *	7,500
Second Ponds Creek	Release	5,500
Belmoral Road	Release	4,000
Menangle Park	Release	3,200
Spring Farm	Release	3,000
Elderdale	Release	2,000
Yarrunga	Release	1,600
Hoxton Park	Release	1,600
Glenfield Road	Release	1,000

Table 12: Release New Home Areas -- Services and Rezoning Not Yet Completed.
Source: Department of Urban Affairs and Planning Web Site

9.1.3 Utilising a Valuable Resource

The Department of Mineral Resources has classified the brick making material on this site as being of State Significance because more than 50% of the deposit has been identified as being uncontaminated light firing shales and clays and the site is capable of more than 200,000 tonnes per annum production.

The site is listed in Schedule 1, Division 1 of Sydney Regional Environmental Plan No. 9 – Extractive Industry (No. 2) 1995 No. 574. (SREP9(2)) Division 1 lists Clay/Shale Extraction Areas of Regional Significance. The proposed development also qualifies as State Significant Development.

The Departmental Geological Survey Report: GS 1993/304, dated April 1993, Departmental File No. M84/3814 provides full detail of the resource.

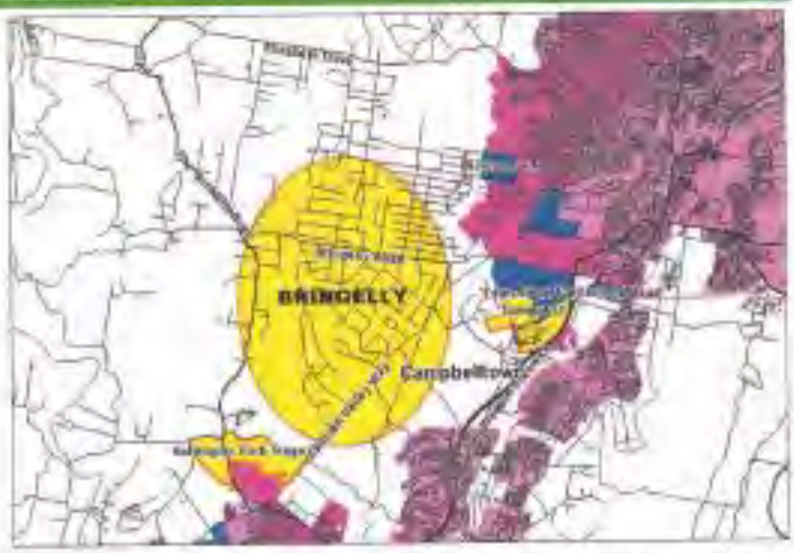

Figure 20: Proposed New Home Site Locations in the Quarry Region
Source: Department of Urban Affairs and Planning Web Site

9.1.4 Economic and Social Benefits

The consent and consequent operation of this project will provide economic benefit to a range of individuals involved in the management and implementation of the project, as well as to the business and community sectors involved in the transportation of the product, manufacture of the bricks and the ultimate distribution, use and enjoyment of the structures they form.

9.1.5 Acceptable Environmental Impacts

The environmental management control measures proposed for this extractive industry will ensure that all potential impacts on air quality, noise, visual and water qualities, and any other impacts on the site, will be minimal and well within acceptable limits.

10 REFERENCES

Environment Planning and Assessment Act 1979

Environment Protection and Biodiversity Conservation Act 1999

Protection of the Environment Operations Act 1998

Rivers And Foreshores Improvement Act 1948.

Crown Lands Act 1989.

Mining Act 1992.

Roads Act 1993

Occupational Health & Safety Act 2000

National Parks and Wildlife Act 1974

Fisheries Act 1935

Sydney Regional Environmental Plan No. 9 Extractive Industry (No.2) Gazetted 17 October 1986.

Industrial Noise Policy EPA NSW January 2000

Environmental Guidelines: Assessment, Classification & Management of Liquid and Non-Liquid Wastes EPA NSW May 1999

The Austral Brick Company Pty Limited, EIS for Clay/Shale Extraction proposal Lot 2, DP120573, Horsley Park: R W Corkery & Co. Pty Limited August 2002.

11 APPENDICES

11.1 APPENDIX A

Director General's Requirements
NSW Department of Urban Affairs and Planning

Rec'd 22/05/01

Department of
Urban Affairs and Planning

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

Phone: (02) 9391 2354
Fax/Info: (02) 9391 2111

Mr Douglas Nicholaisen,
Douglas Nicholaisen & Associates Pty Ltd
1 Belvedere Avenue,
FIGTREE NSW 2525

Dear Mr Nicholaisen,

**PROPOSED CLAY/SHALE EXTRACTION AND INERT CLASS 2 LANDFILL
LOTS 1 DP 741238 AND 3 DP 623799 (275 ADAMS ROAD), LUDDENHAM
– BADGER MINING COMPANY PTY LTD**
Our reference: S01/02045

I refer to your Form A dated 23 November 2000 requesting the Director-General's requirements for the preparation of an Environmental Impact Statement (EIS) for the above-mentioned development and participation in the planning focus meeting on 11 April 2001. Attachment No. 1 outlines the statutory matters that must be included in any EIS under clauses 71 and 72 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation). Under clause 73(1) of the Regulation, the Director-General requires the EIS to address the 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(6) of the Regulation requires you to consult further with the Director-General prior to lodging the application.

SPECIFIC ISSUES

Project Components

- The extent of the development must be fully detailed in the EIS including stockpiles (location and size), work areas, internal haul roads, and all activities associated with the site.

Clay/Shale Extraction

- Anticipated annual production, intended primary and secondary markets, and likely operational life.
- Proposed extraction methods and provision of a comprehensive staging plan and timeframes.
- Proposed extraction techniques and measures to ensure separation of the various materials and clay/shale of differing fired-colour.
- Quantities of overburden and other waste rock materials, and the proposed use/management of these materials.

Landfill

- Anticipated annual volumes and types of landfill materials and area from which materials will be sourced.
- Details of staging and life of the landfill.
- Any proposals for recycling or on-site processing and stockpiling.

Planning

- Identify the land use zoning of the site and the immediate vicinity.

- Consideration of relevant Environmental Planning Instruments, particularly Liverpool and Penrith Local Environmental Plans, Sydney Regional Environmental Plan (SREP) No 9(2) – Extractive Industries, SREP 11 Traffic Generating Development, and SREP No 20 – Hawkesbury-Nepean River, (particularly Clauses 5 and 6, "Shaping Western Sydney" – initiatives for extraction (pp 10-11)

Air Quality

- Identification of any sensitive locations likely to be affected by activities at the site, such as residential and rural residential properties which could be affected by air impacts.
- Description of the existing ambient air quality.
- Identification of all activities likely to generate air impacts or have the potential to cause harmful effects on the environment including health and amenity, and all related environmental issues. The assessment should address the construction phase, material handling storage and the quarry site, landfill disposal and internal haul roads.
- Identification of all air pollutants likely to be generated, including but not necessarily restricted to odour, dust, dust deposition, total suspended particulates, and PM10.
- Determination of the effects of pollutant concentrations on the environment, including human health and amenity, with reference to relevant National and NSW goals.
- Predict air quality impacts.
- a greenhouse gas assessment, incorporating the following;
  - (i) a discussion of the types of greenhouse gases being emitted
  - (ii) a discussion of the alternative options considered for:
    - the chosen fuel source, and
    - the technology adopted to reduce greenhouse gas emissions;
  - (iii) justification for the chosen fuel source and technology in terms of greenhouse gas emissions.

Water Quality

- A comprehensive assessment of the impact of the proposed development on surface and groundwater resources.
- Details of measures to ensure maintenance of environmental flows in Oaky Creek;
- Description of the existing water environment, including rainfall, hydrological catchment, surface drainage characteristics, sensitivity of the surface water and groundwater resource, value of the water resources and any existing environmental impacts on groundwater and surrounding surface waters.
- The condition of any natural waterbodies and levels of appropriate water quality parameters which could be impacted by the development.
- Details of potential water discharge from any part of the development, including management practices to be adopted in an attempt to achieve nil discharge and to maintain environmental flows in Oaky Creek.
- Details of waste water management and stormwater management for all components of the development.
- Provide details of proposed drainage works and soil conservation strategies and erosion and sediment control strategies to reduce the risk of soil erosion associated with the proposal, including details of an erosion and sediment control plan.
- Details of potential impacts on water quality, during the construction and operational phases, including any proposed mitigation, monitoring and management measures), including contingency plans for the disposal/use of saline groundwater unsuitable for use in irrigation.

Noise and Vibration

- Details should be provided on the expected impacts as a result of construction noise, eg, bund wall construction.
- Inclusion of a construction noise management protocol.
- Description of the development and its operation identifying all noise sources from the development.
- Specify operational hours for all activities.
- Identify any noise sensitive locations likely to be affected by the activities on the site.
- Assessment of noise impacts in accordance with the EPA "*Industrial Noise Policy*".
- A blasting assessment to assess any impacts on nearest affected residences including the identification of measures to prevent impacts.
- Any noise impacts as a result of traffic noise generated by the quarrying and landfill operations must be assessed in accordance with the EPA "*Environmental Criteria for Road Traffic Noise*"

Transport and Access

- An assessment of traffic impacts including cumulative impacts, particularly in the event of development of the Badgerys Creek airport, including the extent to which any additional traffic may impact on the safety and efficiency of the road network, especially on major intersections and the efficiency of traffic movement on the local and regional road network;
- Consideration of the need to prepare a local traffic management plan, if appropriate;
- Details of the anticipated route of trucks on local road network;
- An assessment of any road infrastructure upgrades/modifications required to support the development;
- Details of proposed access to the site and alternative arrangements in the event that direct access to Elizabeth Drive is not available, including an assessment of the impacts of use of the alternative access route.

Adjoining Land Uses

- Assessment of the impact of the development on adjoining residences and the Hibernian Club, and proposed amelioration measures to mitigate impacts, including any proposed acquisition proposals.
- An assessment of any decline in future agricultural productivity or potential opportunities for the site.
- Provide details of the interrelationship of the proposal with existing development and existing approved development consents.
- An assessment of the impact of the development on the proposed Badgery's Creek airport in the event that the airport is constructed.

Aboriginal and European Heritage

- Details of heritage issues. The EIS should identify proposed mitigation and management measures to be adopted in regard to the preservation of any heritage items.
- Provide an Aboriginal heritage assessment which conforms to the National Parks and Wildlife Service Guideline and include an assessment of potential impacts of the quarry site and haul roads on areas of cultural and/or archaeological sensitivity, including Aboriginal sites, and detail proposed mitigative and management measures.
- Identify and map Aboriginal sites which will be affected by the proposal and for which Section 90 consent will be sought under the National Parks and Wildlife Act, 1974.

Flora and Fauna

- Impact on flora and fauna at all sites of the proposal, particularly critical habitats, threatened species (including fish 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 ii);
  - 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);
  - vi) provide details of an proposed native vegetation clearance and consultation with the Department of Land and Water Conservation (DLWC) undertaken;
  - vii) provide details of any proposed mitigative strategies, including revegetation/rehabilitation works (including details on the possibility of endemic seed or vegetative material collection) and the provision of compensatory habitat.
- Assess the potential for the development to impact on aquatic flora and fauna species in Oaky Creek.

Visual Assessment

- Details of the visual impact of all components of the proposal, including the impact of any lighting, and any proposed management measures to be adopted to limit visual effect. The visual analysis should be supported by appropriate photomontages and visual analysis diagrams/plans;
- Visual impact of the proposed quarry and haul road to surrounding main roads and residential areas.

- Full details of proposed acoustic/visual bunds including elevation plans (to scale) of all soil mound/acoustic fences.

Landscaping, Rehabilitation and End Use

- Preparation of a Landscape Plan (to scale). The plan is to include a maintenance program detailing establishment and retention of the vegetation planted.
- Proposed rehabilitation procedures and staging of rehabilitation during and after completion of extraction and landfill operations.
- Proposed end use for the site or options for end use.
- Preparation of a revegetation plan that includes details of surface preparation, topsoil management, seed species and maintenance program.

Resource Issues

- The geology and size of the resource. The size of the clay/shale resource should be given in tonnes, and the parameters used to obtain this figure, such as volume and relative density factor(s) should be provided. Plans and cross-sections showing the geology of the resource, its extent, and the area proposed for extraction. Relevant supporting documentation should be appended or referenced.
- Characteristics of the material to be produced including ceramic properties such as plasticity, drying characteristics (eg. dry green strength, linear drying shrinkage), and firing characteristics (eg. shrinkage, water absorption, fired colour). Predicted volumes of each resource type (eg. red-firing, cream-firing, sandstone, etc should be defined.

Justification and Alternatives

- Alternative sources of clay/shale including the availability of these sources and alternative materials.
- Justification of the proposal in terms of local and regional context.

Social Impacts

Provision of a Social Impact Assessment report prepared by a suitably qualified and experienced professional.

Other

- Details of potential bushfire risk and management.
- Weed management, including a program to control the spread of weeds, including aquatic weeds.

General

The Director-General also requires the following for all State Significant Development Applications:

- The applicant shall nominate a contact person (and telephone number) who will be made available to answer public enquiries about the proposal.
- The applicant shall consult with the community who are likely to be affected by the proposal. A report on who was consulted must be submitted with the DA, describing how the affected community was identified, consultation methods, and key issues raised by the community. This will enable the Department to assess if the approach taken was appropriate.
- The applicant shall consult with the local Council and advise the Department on the most appropriate measures circulating in the area affected by the proposal.
- In additional to exhibition and sale copies of the Environmental Impact Statement (EIS) a copy of the EIS in electronic form (floppy disks) should also be lodged with the Department's project officer nominated below.

Attachment No 1 outlines the statutory matters that must be included in any EIS under Clauses 72 of the Regulations 2000.

The Department's EIS guidelines 'Extractive Industry Guideline' and 'Landfilling' should also be consulted in the preparation of the EIS. The Guidelines are available for purchase from the Department's Information Centre, 1 Farrer Place, Sydney or by calling (02) 9931 2222.

The EIS should also address the detailed requirements of the integrated approval bodies; the Department of Land and Water Conservation (DLWC), Roads and Traffic Authority (RTA), and Environment Protection Authority (see attached letters).

Development Applications (DAs) are "integrated development" where certain licences or approvals are required from bodies other than the consent authority. You identified the above licences or approvals that you may need if you are granted development consent. If further integrated approvals are identified before the Development Application is lodged, you must conduct your own consultation with the relevant agencies to identify their requirements for the EIS.

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

You should consult with both Liverpool and Penrith City Council and take into account any comments the Councils 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 Commonwealth Department of Transport and Regional Services, DLWC, EPA, Department of Mineral Resources, NPWS, NSW Agriculture, NSW Fisheries, Heritage Council, Nepean-Hawkesbury Catchment Management Trust and the relevant Local Aboriginal Land Council. Copies of letters received from agencies following the Planning Focus meeting are attached.

Under the Commonwealth *Environment Protection Biodiversity Conservation Act (EPBC Act) 1999* approval of the Commonwealth Minister for the Environment is required for actions that may have a significant impact on matters of National Environmental Significance, except in circumstances which are set out in the EPBC Act. Approval from the Commonwealth is in addition to any approvals under NSW legislation. If you need approval under the Commonwealth Act, your EIS will be expected to assess the impacts on these matters.

Please contact Val Smith on (02) 9391 2384 if you require any further information regarding the Director-General's requirements for the EIS. For more information on the process for State Significant Development, please refer to the Department's Web site (www.duap.nsw.gov.au – look under "*Assessing Development Proposals*").

Yours sincerely

17/8/01

Derek Mullins
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

please number
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Our ref: PSY/02045
Your ref:

23 April 2003

Mr Roger Rich
Badger Mining Company Pty Ltd
PO Box 1443
MACQUARIE CENTRE NSW 2113

Dear Mr Rich

Badger Mining EIS for Development of Clay/Shale Quarry, 275 Adams Road, Luddenham

Thankyou for your letter and accompanying draft Environmental Impact Statement (EIS) that you submitted to PlanningNSW on 9 April 2003 in response to the 29 issues discussed with you at the meeting held on 10 January 2003. PlanningNSW has reviewed the draft EIS and considers that it has addressed most of the Director-General requirements with the exception of potential impacts relating to planning, air quality, water quality and adjoining land uses. The actions required to address the Director-General requirements are listed below. A number of minor issues have also been identified and are listed as actions below, however these could be addressed during the development application (DA) assessment process. The environmental impacts associated with the disposal of inert waste have not been adequately assessed and it is suggested that an additional Ministerial approval is sought at a later stage in relation to this matter.

Landfilling
It is understood that Badger Mining Company Pty Ltd (BMC) anticipate that 150,000 tonnes per annum of Class 2 inert Waste will be sourced from the existing industrial demolition work conducted by the owner (Mr L Harpley) and various other civil construction projects. Landfilling will commence 10 years into the project and continue for a further 35 to 40 years.

Due to the uncertainty surrounding the tonnage, source and nature of the waste, coupled with the delay in commencing landfill operations, BMC should seek further approval from the Minister at a later date to commence landfill operations.

Planning
BMC should address the aims and objectives of the Penrith Local Environmental Plans and the "Shaping Western Sydney" – Initiatives for Extraction (pp10 -11) in the EIS.

Air Quality
The draft EIS utilises data from the Austral Brick company operations, without consideration for the proposed landfill activities, to infer the likely air quality impacts associated with annual average dust deposition rates at sensitive receptors. The draft EIS does not detail whether the particulate matter suppression methods will be undertaken in a manner that is consistent with the activities at Austral Bricks. The draft EIS does not provide site specific predictions of annual average dust deposition rates and concentrations of TSP and PM_{10} and 24 hour average PM_{10} at sensitive receptors that consider all particulate matter generating activities that are likely to occur on the site.

To address these concerns, BMC should address the following matters in an air quality impact assessment supporting the EIS:

Planning NSW is committed to
Working with you to
Build communities

- Identify all nearby sensitive receptors likely to be affected by potential particulate matter generating activities that will occur on the site;
- Identify all potential particulate matter generating activities that will occur on the site;
- Identify all particulate matter suppression methods that will be used on the site;
- Conduct a quantitative air quality impact assessment in accordance with NSW EPA, 2001, Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW. The air quality impact assessment must provide site specific predictions of annual average dust deposition rates and concentrations of TSP and PM_{10} and 24 hour average PM_{10} at sensitive receptors for all particulate matter generating activities that are likely to occur on the site.

Water Quality
The draft EIS includes an assessment of surface water and groundwater impacts. It is understood that BMC is confident that discharges to water will not be required, and therefore information on potential impacts to surface water quality have not been provided.

BMC should provide details of potential impacts from the disposal/use of saline groundwater that is unsuitable for irrigation in the EIS.

Adjoining Land Uses
In addition to potential noise and visual impacts, BMC should provide an assessment of the potential impacts of the development on all nearby sensitive receptors and the Hibernian Club. Proposed measures to mitigate or manage these impacts either through management practices, environmental controls, negotiated agreements and/or property acquisition should also be provided in the EIS.

Conclusion
Although PlanningNSW has conducted a preliminary review of the draft EIS we have not assessed the adequacy of the additional information provided nor have we identified all outstanding issues that may be required to be addressed once a DA and EIS are lodged. Nevertheless, prior to lodging a DA and EIS with PlanningNSW, you will need to address all matters relating to landfilling, planning, air quality, water quality and adjoining land uses that are detailed above.

If you need to discuss this matter in further detail, please don't hesitate to contact Nick Agapides on 9762 8154.

Yours sincerely

25/4/03

Nick Agapides
Manager, Mining and Extractive Industries

11.2 APPENDIX B

Letters of Authorities

NSW Department of Fisheries
Commonwealth Department of Transport and Regional Services
NSW Department of Land & Water Conservation
NSW Roads and Traffic Authority

NSW Fisheries

Our Ref: LP2-10-2153

8 August 2002

Douglas Nicolaisen
Environmental Manager
Douglas Nicolaisen and Associates Pty Ltd
1 Belwarra Avenue
Figtree NSW 2525

Attn: Douglas Nicolaisen

PROPOSAL: **Bridge**
ADDRESS: **Lot 3, 247 Adams Road, Luddenham**

Officers of NSW Fisheries have reviewed the above proposal and have no objections to the the proposed development providing the following conditions are meet:

1) **Environmental safeguards** (silt curtains, booms etc.) are to be utilised during construction of the proposed works to ensure there is no escape of turbid plumes into the aquatic environment. Turbid plumes caused by run off, pile driving etc. have the potential to smoother aquatic vegetation and have a deleterious effect on benthic organisms.

2) All other relevant authorities have no objections to this proposal.

N.B. It is an offence to *dredge/reclaim in any waters and/or to affect marine vegetation* without permits from NSW Fisheries. Penalties of up to $55,000 for an individual and/or up to $110,000 for a company or LGA can apply plus full site remediation costs.

For any further information please telephone me on 02 9482 9403.

Yours sincerely

BRIAN HILL
CONSERVATION MANAGER

HEAD OFFICE
[illegible]

DOTARS

Mr Douglas Nicolaisen & Associates Pty Ltd
1 Belwarra Avenue
FIGTREE NSW 2525

Dear Mr Nicolaisen

On behalf of the Commonwealth, I confirm that we have no objections to your proceeding with the proposed clay mine on the site at Lot 3 Adams Road, Luddenham.

Yours sincerely

Bill Hatossy
Assistant Director
Operations

5 December 2002

GPO Box 594 Canberra ACT 2601 • Telephone: 02 6274 7111 • Facsimile: 02 6257 2505 • Website: www.dotars.gov.au • ABN: 86 267 354 017

LAND & WATER CONSERVATION

Contact
Phone
Fax
e-mail

Our Ref: 0418146

Douglas Nicolaisen & Associates Pty Ltd
1 Balwarra Avenue
FIGTREE NSW 2525

Attention: Douglas Nicholaisen

18 July 2002

Dear Mr Nicholaisen

Re: Proposed construction of a bridge – Oaky Creek - 275 Adam Road, Luddenham

I refer to your letter dated 20 June 2002 and revised plans regarding the proposed construction of a bridge at 275 Adam Road, Luddenham. The revised plans submitted to the Department of Land and Water Conservation (the Department) for review are as follows:

- Plan No's 01038 Face Sheet, Sheets 2,3,5,7b and 12 all Revision C, and Sheet 7 Revision B by G J Ryan & Associates P/L;
- Drawing No. 01125S Sheets 1 to 6 (inclusive) by G J McDonald & Associates P/L dated April 2002.

The design of the crossing, as shown in the submitted plans, in principal meets the Department's requirements, however some minor change of the bridge design and plans are required. The following comments are provided for your consideration:

1. The bridge centre line grates **must** extend to the outer edge of the culverts.

2. A scale bar **must** be shown on all plans.

3. It is noted the proposed bridge utilises three sided boxed culverts on the bridge approaches. The Department recommends the use of these three sided boxed culverts, however in this instance four sided may also be used provided:
   - the base of the culvert is buried a minimum depth of 300mm;
   - the distance between the ground surface and the base of the roof of the culvert is maintained at a minimum height of 900mm; and
   - the ground surface within the culvert is rough containing organic litter, in addition to the 300mm of soil.

4. Road drainage outlets may require scour protection, depending on the velocity of flow thought the outlet and the susceptibility of the soil to erosion.

5. This proposal may require an approval from NSW Fisheries under Section 201 of the Fisheries Management Act, 1994. It is recommended advice is sought from NSW

Fisheries, contact Brian Hill, Fisheries Conservation Officer, on telephone (02) 9492 9403.

These comments relate to the submitted bridge design plans only. The Department will require a Soil and Water Management Plan and a Vegetation Management Plan to be submitted prior to the issue of a Part 3A Permit under the Rivers and Foreshores Improvement Act, 1948.

In regard to flooding issues, any documentation submitted for an Environmental Impact Statement regarding the proposed bridge will need to further address the following:

- Consider the impact of larger floods up to the PMF on the proposal. This is mainly an evacuation issue. Is the bridge also needed for flood evacuation purposes? A flood evacuation plan should be prepared, if there is any risk to life in the area during major flooding. The Department suggests extending the existing flood study to include the PMF.
- Quantify any afflux caused by the bridge, preferably by flood modelling. Consideration would need to be given to mitigating the impact of the afflux, should it adversely affect existing properties.
- Consider the PMF in regard to the performance of any embankment or spillway for the dams. This needs to be considered in terms of managing the downstream risk to life and property.
- Address why the flood study has not incorporated calibration of the hydrologic and hydraulic models to local flood data. The choice of the selected model parameters should be clearly justified.

Yours sincerely

Ann Harvey-Sharrock
Natural Resource Officer (Rivers and Estuaries)
Sydney/South Coast Region

Our Reference: CA03/0906
Telephone: (02) 8814-2012
Facsimile: (02) 8814-2107

Roads and Traffic Authority
www.rta.nsw.gov.au
ABN 64 480 155 255
Sydney Client Services
Development Assessment Unit
51 Rookwood Road
Bicktown NSW 2148
Telephone (02) 9831 6914
Facsimile (02) 9831 0107
PO Box 518
Bicktown NSW 2148
DX 8120 Bicktown

26th June 2002

Gl Ryans & Associates Pty Ltd
PO Box 288
North Richmond
NSW 2754

Attention: Mr Garry Ryan

Dear Sir,

Pre-Development Application Response:
Proposed Intersection for Clay Mine Access Road –
Elizabeth Drive, Luddenham.

I refer to your letter dated 23rd May 2002 to the Roads and Traffic Authority (RTA) regarding access arrangements to the above-mentioned property. The Roads and Traffic Authority (RTA) offers the following comments in response to your letter:

1. Council and applicant is advised that in 1956 a strip of land was resumed and vested in the RTA along the road front of the subject property, as shown by the blue colour on the attached plan.

   The RTA has no further proposal that requires any part of the subject property for road purposes.

   Therefore there are no objections to the development proposal on property grounds.

2. The RTA raises no objections to the revised concept design for the intersection of Elizabeth Drive and the access road to the Clay Mine subject to submission of a final detailed design for approval by the Authority's Project Design Services section at Parramatta.

3. All road pavement is to be constructed to RTA standards and shoulders at the intersection are to be sealed to RTA requirements.

4. Further consideration to the access arrangements will be given on supply of a traffic impact study.

5. Sight distances to comply with RTA standards.

6. All linemarking and signposting to be to RTA standards.

7. Street lighting and/or appropriate delineation and signposting to be provided to highlight the intersection outside daylight hours.

8. All road works, regulatory signposting and linemarking associated with the development will be carried out at no cost to the Authority.

It is emphasised that the comments provided above are informal and of a Pre-DA nature, they are not to be interpreted as binding upon the RTA and may change following formal assessment of a submitted Development Application from the appropriate consent authority.

Please address all further inquiries regarding this application to the Development Assessment Unit, RTA Transport Planning, PO Box 558, Blacktown, NSW, 2148 on (02) 8814-2012.

Yours sincerely

Charles Wiafe
Landuse Development Manager
Sydney Client Services

11.3 APPENDIX C

Letters of Expressions of Interest

The Austral Brick Company Pty Ltd

CSR PGH

Boral Bricks

AUSTRAL

Build a better home

Mr. Joseph Murphy
Badger Mining Pty Ltd
275 Adams Road
Luddenham , NSW
2745

September 9 ,2002

Dear Sir

RE : Clay / Shale Pit @ 275 Adams Road , Luddenham

Following inspection of your fired core , Austral would like to express interest in pursuing supply of selectively mined cream burning shale from your proposed quarry at Adams Road.

Austral mine some similar material from our own sites but we would be interested , subject to satisfactory negotiation of a supply agreement , in procuring up to 50, 000 Tonnes per year to augment this. This would be dependant on agreeing on a quality control methodology that allowed us to pre-approve stockpiles set aside for us.

Austral would need to be satisfied that the quarry had obtained all the necessary statutory approvals and that the quarry was being run in accordance with these requirements.

Please contact me on 0410422310 when you have the necessary approvals and the pit has been developed ready for extraction.

Yours Faithfully

G. Ackers

Grant Ackers
Austral Brick Technical Manager

THE AUSTRAL BRICK COMPANY PTY LIMITED
Wallgrove Road Horsley Park NSW 2164; PO Box 6550 Wetherill Park NSW 1851
Telephone: +61 2 9830 7700 Fax: Head Office +61 2 9831 2383; Fax: Sales +61 2 9831 3771
Internet Address: http://www.australbrick.com.au E.Mail Address: info@australbrick.com.au

CSR
PGH
NATURAL CLAY | BRICKS | PAVERS

10 September 2002

Mr. Douglas Nicolaisen
Badger Mining Pty. Limited
275 Adams Road
LUDDENHAM, NSW 2745

Reference: Badger Mining Pty. Ltd. 275 Adams Road, Luddenham
Proposed Clay/Shale Pit

Dear Mr. Nicolaisen,

I confirm our conversations and subsequent inspection of the fired cores on the Badger Mining Pty. Ltd. premises at Adams Road, Luddenham on 4th August 2000.

CSR PGH has an interest in obtaining selectively mined clay and shale to our brick plants, from the Badger Mining property at Luddenham.

The CSR PGH Cecil Park site currently uses between 150,000 to 200,000 tonnes annually of shale similar to that found in your proposed quarry. This includes materials with fired colours such as Cream, Off Cream and Red/Apricot. These were all evident in the fired cores.

If a Supply Agreement is to be established between our companies, it would be subject to agreed terms on price and specifications on quality requirements.

The quarry would have to be fully approved and activities conducted according to the relevant regulatory requirements.

If you have any questions regarding this matter, please do not hesitate to contact me on (02) 9826 3915.

Yours faithfully

Lee Annett
Technical Manager
CSR PGH Clay Bricks and Pavers

LOT 1 CECIL RD CECIL PARK NSW 2171 AUSTRALIA TEL 02 9826 3700 FAX 02 9826 1201
CSR LIMITED ABN 90 000 001 276 www.pghclay.com.au

Boral Bricks

BORAL BRICKS PTY LTD
239 Martin Road
Badgerys Creek NSW 2171
Telephone (02) 4774 7131
Facsimile (02) 4774 6803

September 10th 2002

Mr. Roger Rich
Badger Mining Company Pty Ltd
275 Adams Road,
Luddenham NSW 2745

Dear Mr. Rich,

Re: Badger Mining Company - 275 Adams Road Luddenham Proposed Clay/Shale Pit

I would like to confirm our conversation on material from Badger Mining Company premises at Adams Road Luddenham on August 4th 2000.

Boral Clay Bricks has an interest in securing a long term agreement with your company to supply light burning Clay and Shale for our Brick Plants, from the Badger Mining property.

Boral currently uses between 150,000 to 200,000 tonnes annually, of shale similar to that found in your proposed quarry. This includes materials with fired colours such as Cream and Off Cream.

If a supply agreement is to be established between our companies it would be subject to agreed terms on price and specifications on quality requirements.

The Quarry would have to be fully approved and activities conducted according to the relevant regulatory requirements.

If you have any questions regarding this matter, please do not hesitate to contact me.

Yours sincerely

Des North
Operations Manager NSW
Phone: 02 4774 7109
Mobile: 0401 895 411