JANDRA QUARRY EXTENSION

Environmental Impact Statement

For:
CSR CONSTRUCTION MATERIALS

October 1999
38070RP2

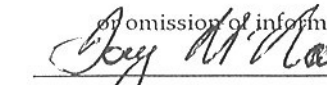
Report No. 38070RP2

This report was prepared in accordance with the scope of services set out in the contract between ERM Mitchell McCotter Pty Ltd ACN 002 773 248 (ERMMM) and CSR Construction Materials. To the best of our knowledge, the proposal presented herein accurately reflects the Client's intentions when the report was printed. However, the application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In preparing the report, ERMMM used data, surveys, analyses, designs, plans and other information provided by the individuals and organisations referenced herein. While checks were undertaken to ensure that such materials were the correct and current versions of the materials provided, except as otherwise stated, ERMMM did not independently verify the accuracy or completeness of these information sources.

Approved by:	*Tony McNamara*
Position:	Project Director
Signed:	
Date:	15/10/99

Prepared by:	*Murray Curtis*
Position:	Project Manager
Signed:	
Date:	14/10/99

ERM Mitchell McCotter Quality System

Form 2	Submission of environmental impact statement (EIS) prepared under the Environmental Planning and Assessment Act 1979 Section 78A(8)
EIS prepared by	
name	Tony McNamara
qualifications	BA, MELG Law, Dip Urb Studies, Grad Dip LG Mgt, LGTCP, FRAPI
address	C\- ERM Suite 3/146-148 Gordon Street Port Macquarie NSW 2444
in respect of	Jandra Quarry Extension
development application	
applicant name	CSR Limited
applicant address	Pitt Street TAREE NSW 2444
land to be developed:	Jandra Quarry
address	Pacific Highway Possum Brush
lot no, DP/MPS, vol/fol etc	Lots 2, 11, 12, 13, 14 & 15 DP 790056
proposed development	Expand and continue the operation of an existing 'State Significant' extractive industry to include: ❑ expanded operating hours; ❑ lift production levels to 250,000 tonnes per annum; ❑ expand extractable reserves to 16.5 million tonnes; ❑ installation of additional site facilities and processing plant; ❑ upgrade quarry access road intersection with Pacific Highway; and ❑ demolish existing dwellings on the quarry site.
environmental impact statement	❑ an environmental impact statement (EIS) is attached.
certificate	I certify that I have prepared the contents of this Statement and to the best of my knowledge: ❑ it is in accordance with clauses 54 and 55 of the Environmental Planning and Assessment Regulation 1994; and ❑ it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.
signature	
name	Tony McNamara
date	19/10/99

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EXECUTIVE SUMMARY

BACKGROUND

CSR owns and operates Jandra Quarry situated on 118 ha of freehold land located approximately 18 km south of Taree on the mid north coast of New South Wales. Consent for the operation of the quarry was initially granted to Jandra Blue Metal Quarry Pty Ltd on 16 September 1985 by the Land and Environment Court. The development application proposed to extract and process from the quarry approximately 50,000 tonnes of hardrock per annum within an area of approximately five hectares on the site.

In July 1991 approval was obtained from Greater Taree City Council for an increased production limit to 150,000 tonnes per annum and increased maximum permissible weekly removal rate to 10,000 tonnes to meet increased demand.

CSR Construction Materials Limited purchased Jandra in 1996 and commenced full-scale production in early 1997. The present operation crushes and screens material and provides a pre-coating facility for sealing aggregates. At the current extraction rate the remaining 560,000 tonnes of marketable rock within the existing consent will last just over four years. CSR is seeking approval to increase the quarry area to approximately 17.3 ha to allow extraction of sufficient rock that would secure the economic viability of its investment.

CSR also owns a river gravel extraction operation on the Manning River at Taree. This gravel extraction operation has been a significant supplier to the local concrete industry as well as to the Bulahdelah, Forster and Gloucester areas for over 30 years. However, only minimal reserves (under 6 months) remain in the current extraction lease with little prospect of extending to a new lease. Therefore, CSR propose to close the Manning River operation and move its production to Jandra. Due to CSR's loss of production in the Taree region from the closure of the Manning River operation it is proposed to increase the production level at Jandra to an average 250,000 tonnes per annum to cover CSR's existing and future demand for product to the construction market.

Geological investigation has shown that there are some 16.5 million tonnes of fresh rock (greywacke) available for extraction, with an additional 3.6 million tonnes of weathered rock suitable for blending in roadbase products. The resource is considered to be of high quality and relatively easy to extract and transport.

The consolidation of CSR's Jandra and Manning River operations will result in efficiency and operational advantages that will ensure the long-term viability of CSR's presence in the area. It is generally recognised that a hardrock quarry is a

more stable, less dynamic operation than river extraction, with greater control over impacts and mitigation measures. In addition, the closure of the Manning River operation will enable the release of land suitable for at least 80 residential lots in Taree West.

Approval to increase the existing quarry area would significantly expand reserves to allow planning for the company's future. In addition to market factors and the economical viability of CSR's current operations, the approval to continue extraction of the resource at Jandra Quarry will allow a regionally and state significant operation to continue well into the future.

Jandra Quarry is *Regionally Significant* as defined by the Department of Mineral Resources due to its supply into more than one local government area. The quarry currently supplies aggregate south beyond Bulahdelah in the Great Lakes local government area (LGA) and north into the Hastings LGA. The quarry is also listed as *Regionally Significant* by the North Coast Extractive Industries Standing Committee.

Under a direction of the Minister of Urban Affairs and Planning (gazetted on 3 September 1999) the proposal is a *State Significant* development as the quarry is *Regionally Significant*, has reserves of over five million tonnes and its production level will be over 200,000 tonnes per annum.

DESCRIPTION OF THE PROJECT

In this application CSR seeks to gain approval to:

- expand operating hours from 6.00 am to 6.00 p.m. Monday to Friday and 6.00 am to 3.00 p.m. Saturdays. Ancillary operations such as refuelling, servicing and maintaining plant will be undertaken between 6.00 am and 9.00 p.m. Monday to Saturday;
- expand the existing site facilities area;
- lift approved production levels from 150,000 tpa to an average 250,000 tpa;
- significantly expand reserves to allow planning for the company's future. This includes extraction down to RL 20 and will provide 16.5 million tonnes of fresh rock;
- remove the restrictions on blasting to enable the adoption of normal commercial blasting practices;
- relocation and upgrading of the existing pre-coating facility;
- locate on-site, from time to time on an as needed basis, a mobile pugmill and a mobile asphalt plant;

- construct a new weighbridge and office complex south-west of the current weighbridge;
- upgrade the intersection of the quarry access road and the Pacific Highway; and
- demolish the three existing dwellings located on the site.

There will be no change to the crushing and screening processing plant as with the extended hours it will be able to adequately process the required tonnage.

ENVIRONMENTAL ASSESSMENTS

A range of environmental studies were completed during the preparation of this environmental impact statement. These studies and their scope of work were defined by consultation with relevant government authorities, addressing the scale and nature of the proposed development and the environment of the area. These assessments included investigations of:

- compatibility with local, regional and state planning;
- the local and regional environmental setting;
- assessment of the quality of surface and groundwater and potential impacts of the project;
- assessment of air quality and likely impacts;
- assessment of likely noise and vibration impacts of the project;
- an assessment of the project on the landscape and visual characteristics of the area;
- interactions with terrestrial and aquatic ecology;
- an assessment of archaeology and heritage characteristics of the area and likely impacts;
- an assessment of the impacts of the project on roads and traffic;
- an assessment of bushfire threat and necessary mitigation measures;
- an assessment of the possible social and economic impacts of the proposal; and
- issues related to ecologically sustainable development.

The overall conclusions of the assessments were that the proposed development had no adverse environmental impacts, which could not be satisfactorily addressed with a series of recommended mitigation measures. The major impacts and mitigation measures are as follows:

MAJOR ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Mitigation Measures	Environmental Impacts
1. Revegetation of semi-cleared areas outside the proposed extraction site to provide an enhanced wildlife corridor.	1. Loss of 14.3 ha of forest vegetation.
2. Progressive revegetation of quarry benches, restricting excavations to north of the main east-west ridgeline through the site and a staged quarry plan to minimise additional visual impacts.	2. Increase in the visibility of the quarry, primarily from the Pacific Highway.
3. A letter of intent for a coexistence agreement has been signed by CSR and the property owners to the south to restrict activities on the adjoining land during blasting activities in the proposed eastern extension only.	3. Potential for safety concerns to users on a portion of the adjoining rural property to the south during blasting activities.
4. All quarry vehicular traffic to access the site via a single access road with direct access from an upgraded intersection with the Pacific Highway.	4. The removal of artefacts from five identified Aboriginal archaeological sites.

CONCLUSIONS

The justification for this project has been assessed against the criteria specified by the Department of Urban Affairs and Planning in their guidelines for extractive industries.

The predominant requirement is that the project complies with the principles of Ecologically Sustainable Development. The assessment demonstrates that the project complies with these principles.

Due to the fact that the proposal is the extension to an existing *State Significant* quarry that has direct access to the Pacific Highway, the overall finding of the EIS is that there would be no adverse impacts subject to implementation of the recommended mitigation measures. The environmental impact statement concludes that the project can proceed with the implementation of the identified measures.

JANDRA QUARRY
EXTENSION

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1 INTRODUCTION

Chapter 1

INTRODUCTION

1.1 BACKGROUND

On 16 September 1985 the Land and Environment Court granted development consent for the establishment of Jandra Blue Metal Quarry (referred to below as Jandra). This comprised a hardrock quarry and processing plant on Lot 6 in DP 255621, Parish of Beryan, County of Gloucester. The development application proposed to extract and process from the quarry approximately 50,000 tonnes of hardrock per annum within an area of approximately five hectares (ha) on the site.

In July 1991 approval was obtained from Greater Taree City Council (GTCC) for an increased production limit to 150,000 tonnes per annum (tpa) and increased maximum permissible weekly removal rate to 10,000 tonnes to meet increased demand. It was noted at this time that the description of Jandra was changed from Lot 6 in DP 255621 to Lot 14 in DP 790056 due to land resumption by the Roads and Traffic Authority (RTA).

CSR Construction Materials Limited (referred to below as CSR) purchased Jandra in 1996 and commenced full-scale production in early 1997. Following additional land acquisitions the existing site is now described as Lot 2, 11 ,12 ,13 ,14 and 15 in DP 790056. It is located approximately 18 km south of Taree on the mid north coast of New South Wales. The present operation crushes and screens material and provides a pre-coating facility for sealing aggregates. Regional and locational maps of existing quarry operations are shown in *Figure 1.1* and *Figure 1.2* respectively. An aerial photograph of the site is shown as *Figure 1.3*.

At the time of acquisition CSR calculated that reserves of legally extractable rock contained within the five ha approved area totalled 960,000 tonnes. Since then the company has extracted some 400,000 tonnes of material. At the current extraction rate the remaining 560,000 tonnes will last just over four years.

Geological investigations have shown a substantial available hardrock resource (greywacke) of at least 19 ha on the site. This is contained within a CSR owned area of 118 ha. The company is seeking approval to increase the quarry area to approximately 17.3 ha to allow extraction of sufficient rock that would secure the economic viability of its investment. It should be noted that the area subject to this proposal does not represent all the greywacke on CSR's land.

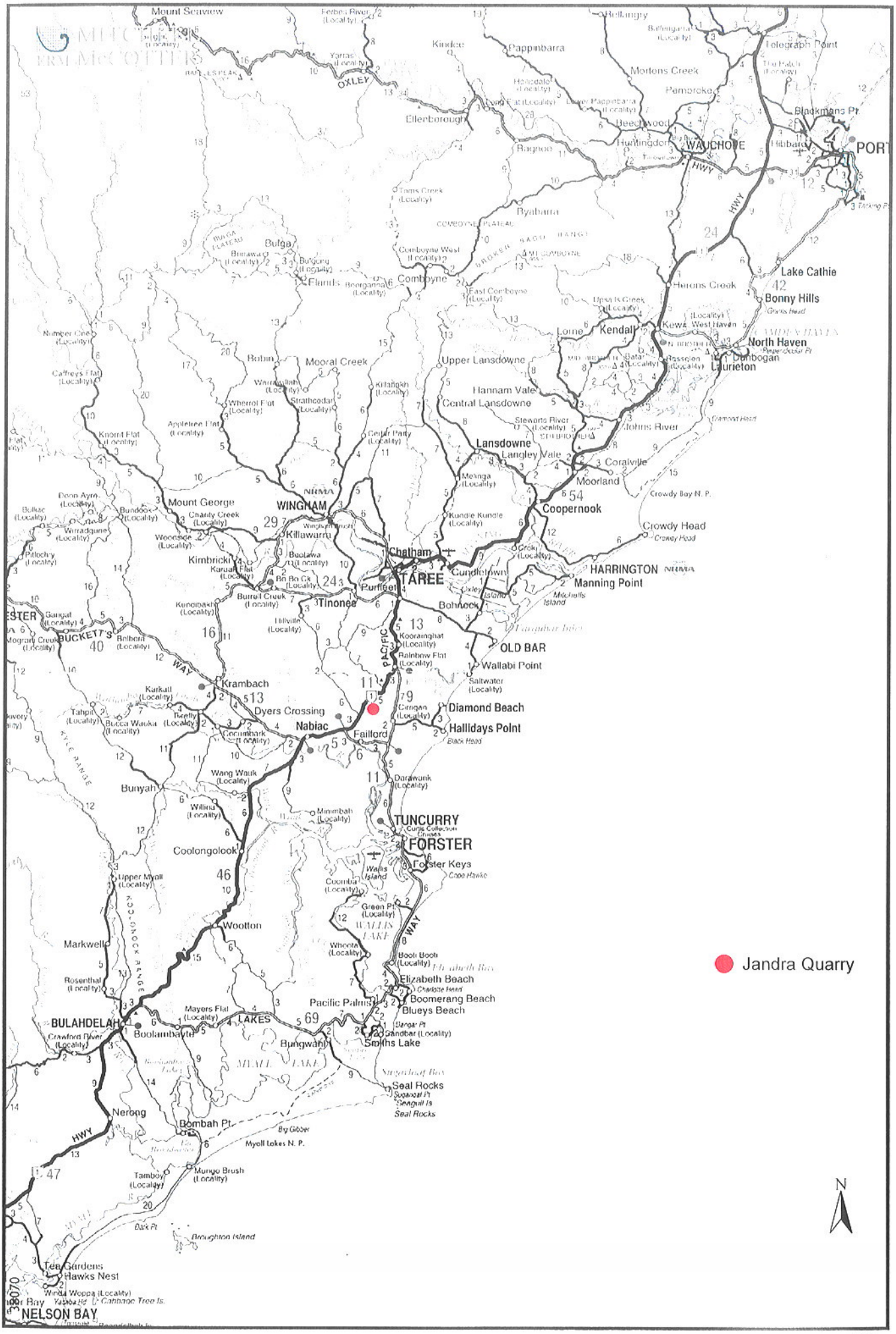

Figure 1.1 REGIONAL MAP OF EXISTING QUARRY OPERATIONS (Source: NRMA, 1995)

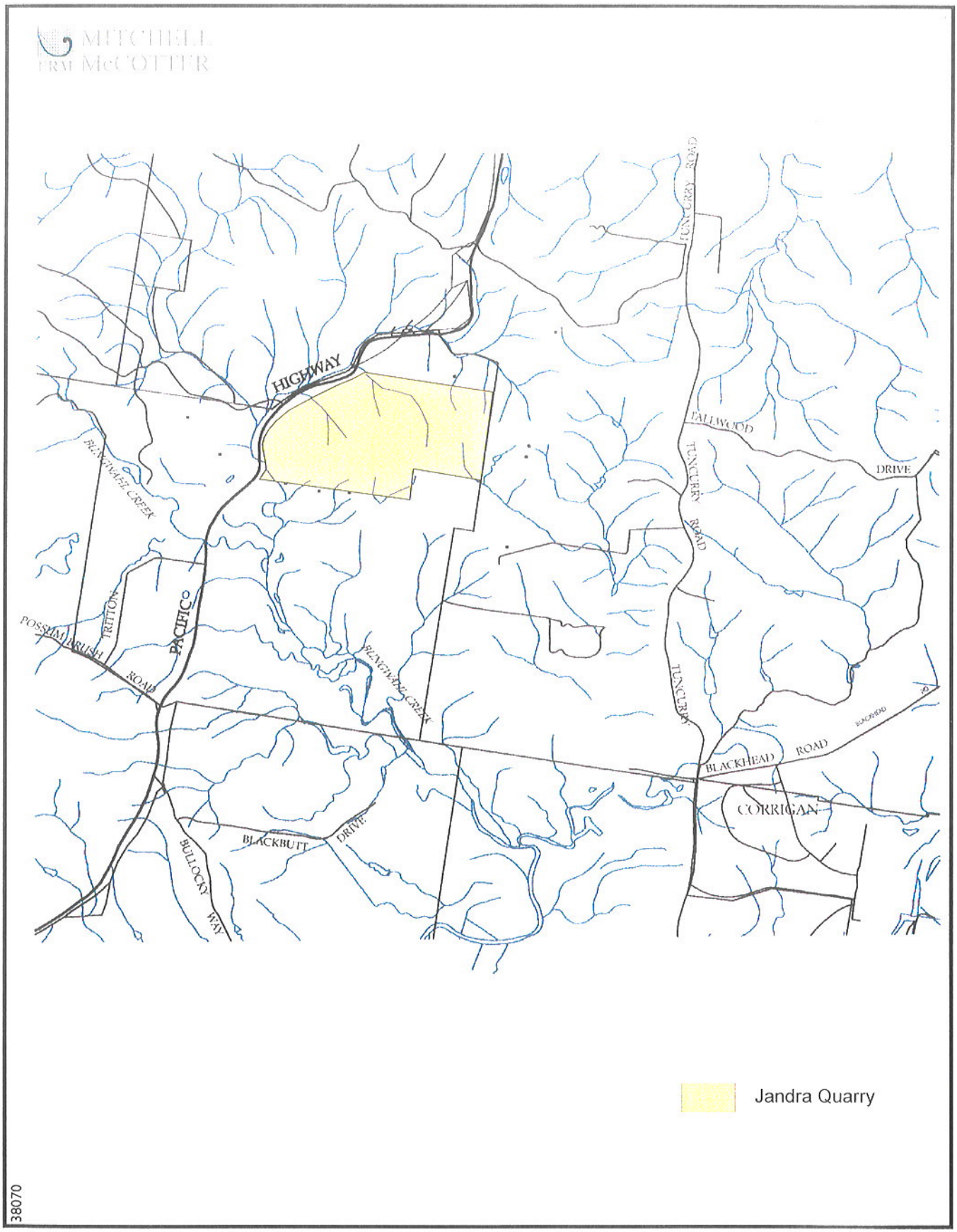

Figure 1.2 LOCATIONAL MAP OF EXISTING QUARRY OPERATIONS
(Source: CMA 1:25,000 Nabiac Topo Sheet)

MITCHELL
FRM McCOTTER

38070

Scale Approximately 1:10,400

Figure 1.3 AERIAL PHOTOGRAPH OF JANDRA QUARRY

Approval to increase the existing quarry area would significantly expand reserves to allow planning for the company's future. A four stage process is proposed involving extraction down to relative level (RL) 20 and providing 16.5 million tonnes of fresh rock.

The current approval will only enable operation of the quarry to continue for a further four years. This application seeks to allow the quarry to continue extraction of the available resource. This application proposes to alter CSR's current operating conditions that were established in the 1985 and 1991 approvals. Alterations include extended operating hours, increased production levels to an average 250,000 tpa and changes to noise and blasting conditions. The latter due to CSR's recent acquisition of a neighbouring property. The application also includes the installation of a mobile pugmill as well as a mobile asphalt plant which will be brought on-site on an as needed basis. In addition, CSR propose to construct a new weighbridge and associated office complex and upgrade the intersection of the quarry access road and the Pacific Highway. The proposal will also require the eventual demolition of three dwellings currently located on the site.

This Environmental Impact Statement (EIS) sets out CSR's proposed development on the Jandra site and provides an assessment of potential impacts in terms of physical, biological and human interactions with the existing environment. Environmental management procedures and mitigation measures that would minimise potential impacts are provided.

1.2 THE NEED FOR ADDITIONAL RESOURCE

Market information in the coastal region from Johns River to Bulahdelah has been collated by CSR. Demand for hardrock quarry products including roadbase, asphalt aggregate, spray-seal aggregate and concrete aggregate has been calculated as 640,000 tonnes per annum for the foreseeable future. Principal suppliers to this market are five hardrock (including Jandra), two river gravel and two shale quarries.

One of the river gravel quarries is CSR's Manning River operation located at Taree. This gravel extraction operation is a significant supplier to the local concrete industry as well as to the Bulahdelah, Forster and Gloucester areas. However, only minimal reserves (under 6 months) remain in the current extraction lease with little prospect of extending to a new lease. Therefore, CSR propose to close the Manning River operation and move its production to Jandra. The closure of the Manning River operation will enable the release of land suitable for at least 80 residential lots in Taree West.

This proposed closure of the Manning River operation has been prompted by concerns that applications for the extension of the existing extraction lease may have difficulty meeting DLWC and NSW Fisheries approval requirements. In addition, consolidation of CSR's Jandra and Manning River operations will result in efficiency and operational advantages that will ensure the long-term viability of CSR's presence in the area. It is generally recognised that a hardrock quarry is a more stable, less dynamic operation than river extraction, with greater control over impacts and mitigation measures.

Geological investigation has shown that there are some 16.5 million tonnes of fresh rock available for extraction, with an additional 3.6 million tonnes of weathered rock suitable for blending in roadbase products. The resource is considered to be of high quality and relatively easy to extract and transport. It would significantly contribute to meeting current and future demand with the proposed increase in annual production covering the loss of production from the closure of the Manning River operation.

In addition to market factors and the economical viability of CSR's current operations, the Jandra quarry represents a resource of state and regional significance.

Jandra Quarry is *Regionally Significant* as defined by the Department of Mineral Resources due to its supply into more than one local government area. The quarry currently supplies aggregate south beyond Bulahdelah in the Great Lakes local government area (LGA) and north into the Hastings LGA. The quarry is also listed as *Regionally Significant* by the North Coast Extractive Industries Standing Committee (DUAP, 1999)

Under a direction of the Minister of Urban Affairs and Planning (gazetted on 3 September 1999) the proposal is a *State Significant* development as the quarry is *Regionally Significant*, has reserves of over five million tonnes and its production level will be over 200,000 tpa.

Approval to continue to extract this resource will allow a regionally and state significant operation to continue operation.

1.3 PURPOSE OF THIS EIS

This EIS has been prepared for CSR as owner of the Jandra Quarry to accompany a development application to the Department of Urban Affairs and Planning (DUAP) to extend quarry operations, to alter operating conditions, to locate a mobile pugmill and a mobile asphalt plant on-site from time to time, to construct a new weighbridge and associated office complex and to upgrade the intersection of the quarry access

road and the Pacific Highway. The application will result in revised operating conditions including extension to operating hours, increased production levels and changes to noise and blasting conditions to enable the adoption of normal commercial blasting practices. Extension of quarry operations will not involve any changes in the operation of the processing plant.

1.4 OBJECTIVES OF THE PROPOSAL

The objectives of the proposal are:

- to significantly extend an existing approved quarry operation;
- to alter current operating conditions to accommodate a higher production rate and introduce new site practices;
- to supply high quality hardrock material to meet local and regional market requirements;
- to conform with the requirements of relevant statutory authorities in the development and operation of the quarry; and
- to progressively rehabilitate the quarry with suitable revegetation strategies.

1.5 CONSULTATION WITH REGULATORY AUTHORITIES AND THE COMMUNITY

1.5.1 Consultation with Regulatory Authorities

The consultation process with government departments included a Planning Focus Meeting, letters to the departments requesting input, telephone discussions and meetings with various authority representatives.

i. Planning Focus Meeting

A Planning Focus Meeting was held on 30 November 1998 at the quarry to discuss the project with all relevant government authorities and to obtain their input into the study. Authorities represented at the meeting included:

- Greater Taree City Council (GTCC);
- NSW Environmental Protection Authority (EPA); and
- NSW Department of Mineral Resources (DMR).

Government authorities that were invited to the meeting but did not attend included:

- Department of Urban affairs and Planning (DUAP);
- Department of Land and Water Conservation (DLWC);
- National Parks and Wildlife Service (NPWS);
- NSW Fisheries;
- Roads and Traffic Authority (RTA); and
- NorthPower.

The authority representatives that attended the Planning Focus Meeting advised that written responses from the relevant authorities would detail specific issues identified during the meeting.

ii. Director General's Requirements

In accordance with the requirements of Clause 85 of the Environmental Planning and Assessment Regulation 1994 (EP&A Regulation), the Director General of the Department of Urban Affairs and Planning (DUAP) was consulted to determine key issues to be addressed in the EIS. The Director General issued her requirements on 24 December 1998. A copy of the Director-General's requirements is provided as *Appendix A*.

Those requirements specify that the EIS is to conform with Clauses 54 and 55 of the EP&A Regulation, together with an additional key issue being the *"examination of the proposal in relation to Hunter Regional Environmental Plan"*. This particular issue is discussed in Section 2.3.1 of this EIS. The Director also refers to the Department's document *"EIS Guideline for Extractive Industries - Quarries"*.

As the proposal is an "integrated development" under the Environmental Planning and Assessment Act 1979 (EP&A Act), DUAP also sought EIS requirements from relevant agencies providing general terms of approval before determination. These are set out in *Appendix A*.

iii. Government Authorities Contact

During preparation of the EIS various statutory authorities with responsibilities for land use or environmental matters were requested to provide information regarding issues to be addressed in the preparation of the EIS. Responses were received from:

- Greater Taree City Council;
- Environment Protection Authority;
- Roads and Traffic Authority;
- NSW Department of Mineral Resources;
- NSW National Parks and Wildlife Service;
- Department of Land and Water Conservation; and
- NSW Fisheries.

The issues detailed by the government authorities are summarised in *Table 1.1* below. A copy of the responses received from the authorities is provided in *Appendix B*.

Table 1.1 GOVERNMENT AUTHORITY CONSULTATION

Authority	Issue Précis	EIS Reference
GTCC	❑ visual impact;	Section 6.2
	❑ site rehabilitation; and	Section 3.11
	❑ land use impacts on residents to the south.	Section 3.6, 4.4 & 6.1
EPA	❑ noise, blasting and dust impacts;	Sections 6.1 & 4.4
	❑ asphalt plant air emissions;	Section 4.4
	❑ sediment controls;	Section 3.10
	❑ additional processing plant; and	Section 3.7
	❑ pollution control licence.	Section 1.6
RTA	❑ access road intersection; and	Section 6.6
	❑ traffic noise.	Section 6.1
DMR	❑ resource and market assessment.	Sections 3.1 to 3.4
NPWS	❑ areas of native vegetation;	Chapter 5
	❑ areas of potential significance for native fauna; and	Chapter 5
	❑ areas of archaeological potential.	Section 6.5
DLWC	❑ stormwater management plan;	Section 3.10
	❑ impacts on surface water quality;	Section 4.3
	❑ describe and identify impacts on the groundwater regime;	Section 4.3
	❑ soil erosion, sedimentation and land degradation issues; and	Sections 3.10, 4.2 & 4.3
	❑ permit required under the Rivers and Foreshores Improvement Act	Section 1.6
NSW Fisheries	❑ fish habitat protection; and	Section 5.6
	❑ downstream water quality	Section 4.3

1.5.2 *Consultation with the Community*

The community consultation program undertaken by CSR as part of the EIS process has included a newsletter and meetings and discussions with nearby landholders.

The newsletter (*Appendix C*) was distributed to nearby residents via meetings, or mail providing information on current operation of the quarry, the proposed development, likely impacts and details of the EIS process. The purpose of the

newsletter and meetings was to advise interested people of the proposed expansion of quarrying activities and to seek comments on issues to be addressed in the EIS.

A summary of issues raised by nearby residents following discussions with CSR is given in *Table 1.2*.

Table 1.2 COMMUNITY CONSULTATION

Landholder	Issue Précis	EIS Reference
D & R Loveday	❑ no issues raised.	-
C Jones	❑ visual impacts; and	Section 6.2
	❑ noise impacts.	Section 6.1
J Stennett	❑ no issues raised.	-
M & M Mowbray	❑ visual impacts; and	Section 6.2
	❑ noise and blasting impacts.	Section 6.1
R Middleton	❑ visual impacts; and	Section 6.2
	❑ noise impacts.	Section 6.1
YALA	❑ coexistence agreement in train	Section 3.12
G Dubos	❑ advised will discuss on quarry visit	-
P & L Groves	❑ vibration; and	Section 6.1
	❑ visual	Section 6.2
J Smith	❑ request to mail newsletter	-
H Barnes and L Pykett	❑ request to mail newsletter	-

1.6 APPROVALS REQUIRED

The development is permissible with the consent of Greater Taree City Council. It is also a *designated development* as defined in Schedule 3 of the EP&A Regulation. Consequently, an EIS must accompany the development application.

This EIS has been prepared in accordance with Clauses 54 and 55 of the EP&A Regulation and the Director General's requirements.

The proposal is also an *integrated development* under the EP&A Act. This means the proposal requires development consent and also at least one approval, permit, licence, authority or consent under other associated legislation, set out in Clause 91(1) of the EP&A Act.

Additional environmental approvals may be needed under other legislation as follows.

i. Protection of the Environment (Operations) Act 1997

The Protection of the Environment (Operations) Act 1997 (PoEO Act) was introduced on 1st July 1999. It repeals the Clean Air Act 1961, the Clean Waters Act 1970, the Pollution Control Act 1970, the Noise Control Act 1975 and the Environmental Offences and Penalties Act 1989. These Acts and the major regulatory and enforcement provisions of the Waste Minimisation and Management Act 1995 have effectively been consolidated by the PoEO Act. The Minister for the Environment has redeveloped the majority of regulations under the pollution control acts and additional regulations have been introduced.

The quarry currently holds a pollution control licence (No. 002796) issued under the Pollution Control Act 1970 which includes specific licence conditions in regard to noise and blasting controls, water management and air pollution management.

The PoEO Act replaced existing approvals and licensing requirements with a single schedule of activities requiring an environmental protection licence that will regulate all forms of pollution. Previous requirements for a separate pollution control approval and license under each Act has been replaced with an integrated system of licensing.

An environmental protection licence is required for the following activities in relation to the proposed development at Jandra Quarry:

- asphalt plant with an intended production capacity of more than 150 tonnes per day or 30,000 tonnes per annum;
- crushing grinding or separation works that process rock with an intended processing capacity of more than 150 tonnes per day or 30,000 tonnes per annum; and
- extractive industry that extracts more than 30,000 cubic metres of rock per annum.

The EPA advise that the quarry will continue to be licensed under the PoEO Act and that the existing pollution control licence conditions will apply to the expanded quarry. The licence will be varied to regulate the asphalt plant operations.

ii. Rivers and Foreshores Improvement Act 1948

A permit is required for the proposed quarry extension under the Rivers and Foreshores Improvement Act 1948 as the quarry operation will require excavation within 40 metres of ephemeral creeks, being minor tributaries of Bungwahl and Talawahl creeks.

iii. Roads Act 1993

Approval will be required under the Roads Act for the proposed intersection upgrade works at the intersection of the quarry access road and the Pacific Highway.

JANDRA QUARRY
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2 PLANNING CONTEXT

Chapter 2

PLANNING CONTEXT

2.1 OVERVIEW

This section deals with the details of the relevant planning legislation and regulations applying to the project.

The relevant planning legislation is the EP&A Act. The subordinate legislation derived from the EP&A Act includes:

- the Greater Taree Local Environment Plan 1995;
- the Hunter Regional Environmental Plan 1988;
- the Hunter Urban Settlement Strategy;
- State Environmental Planning Policy No 11 - Traffic Generating Developments; and
- State Environmental Planning Policy No 44 - Koala Habitat Protection.

The Threatened Species Conservation Act 1995 (TSC Act) is relevant to this development. Furthermore, relevance of the Native Vegetation Conservation Act 1997 (NVC Act) has been considered (see section 2.2.3) following the repeal of SEPP 46 - Protection and Management of Native Vegetation.

2.2 STATE PLANNING

2.2.1 *State Significant Development*

State Significant development is defined by Section 76A(7) of the Environmental Planning and Assessment Act 1979. Development can be declared to be State Significant by a number of different methods detailed under that Section. Sub-section(b)(iii) includes *development that is declared by the Minister, by notice in the Gazette, to be State significant development.*

Government Gazette No 8315 of 3 September 1999 contained a declaration by the Minister for Urban Affairs and Planning making a number of classes of development State Significant including :

"An extractive industry, if in the opinion of the consent authority:

1. *the resource has been identified as being of State or regional significance in a strategic plan adopted by the Director-General; or*

2. *the total resource (the subject of the development application) is greater than 5 million tonnes; or*

3. *the proposed extraction rate is greater than 200,000 tonnes per annum; or*

4. *the project is to be located in an "environmentally sensitive area of State significance."*

In regard to the above criteria, the Jandra quarry has been identified as a regionally significant resource in a document entitled *Extractive Industries and Minerals on the North Coast* prepared by the North Coast Extractive Industries Standing Committee and the Department of Urban Affairs and Planning. The quarry is not included in a strategic plan at this point of time however it is likely that this will occur when the North Coast planning Strategy is extended to include the Greater Taree City area, following the recommendations of the Standing Committee.

Criteria 2 and 3 do apply to the Jandra Quarry extension proposal and accordingly the development application is State Significant development.

Pursuant to Section 76A(9) the Minister is the consent authority.

2.2.2 *Integrated Development*

The proposal is an 'integrated development', a concept introduced by the EP&A Act. Integrated development is development that requires development consent and also at least one approval, permit, licence, authority or consent from the relevant approval body under specific clauses in associated legislation set out in Clause 91(1) of the Act.

Integrated development may be a local development or State Significant development. The development application made for an integrated development must be forwarded by the consent authority or minister to the authority required to give approval under the other legislation (the 'approval body'). The approval process that follows is detailed in the Environmental Planning and Assessment Amendment Act 1997.

For this proposal, DUAP has sought the requirements of DLWC and EPA. EIS requirements from these relevant agencies provide general terms of approval before determination.

2.2.3 *Designated Development*

Under Clause 53C of the Environmental Planning and Assessment Regulation 1994, development described in Schedule 3 to the Regulation is declared to be designated development for the purposes of the Act. Section 78A of the Act specifies that an application for designated development must be accompanied by an environmental impact statement.

This proposal fits the definition of extractive industry under Schedule 3 which states:

"Extractive industries that obtain extractive materials by methods including excavating, dredging, tunnelling or quarrying or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating and:

(1) obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per annum; or

(2) disturb or will disturb a total surface area of more than 2 hectares of land by:

- *(a) clearing or excavating; or*
- *(b) constructing dams, ponds, drains, roads or conveyances; or*
- *(c) storing or depositing over burden, extractive material or tailings; or*

(3) are located:

- *(a) in or within 40 metres of a natural waterbody wetlands or an environmentally sensitive area; or*
- *(b) within 200 metres of a coastline; or*
- *(c) in an area of:*
  - *(i) contaminated soil; or*
  - *(ii) acid sulphate soil: or*
- *(d) on land that slopes at more than 18 degrees to the horizontal; or*

(e) *if involving blasting, within:*

(i) *1,000 metres of a residential zone; or*

(ii) *500 metres of a dwelling not associated with the development; or*

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

2.2.4 *State Environmental Planning Policies*

i. State Environmental Planning Policy 11 - Traffic Generating Developments (SEPP 11)

SEPP 11 makes provisions for the referral of certain classes of development to the relevant traffic authority. The policy requires that applications for development consent for activities specified in Schedule 1, which includes extractive industries, be referred to the traffic authority.

GTCC, as the consent authority, advises that an extractive industry with daily production exceeding 1,000 tonnes must be referred to the Regional Traffic Committee. The proposed development has a potential daily production in excess of 1,000 tonnes. In addition, the proposed development includes intersection upgrade works within the Pacific Highway road reserve. Therefore referral of the development application to the Regional Traffic Committee is likely.

ii. State Environmental Planning Policy 44 - Koala Habitat Protection (SEPP 44)

SEPP 44 came into force on 13 February 1995 and is required to be considered under Section 79(C) of the EP&A Act. It aims to:

> *"encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline."*

This policy has application to this land in that it is intended to lodge a development application for the development of an extractive industry and the land has an area of greater than one hectare. The SEPP sets out the procedure to be followed in assessing the value of the land as koala habitat. Under the policy if the land is identified as potential koala habitat then a further assessment is carried out to determine whether the land constitutes core koala habitat and if so a further procedure needs to be addressed to determine whether development consent can be granted in relation to core koala habitat.

The results of the detailed assessment under SEPP 44 is discussed in *Appendix J* and Section 5.4 of the EIS. It has been determined that the land is not core koala habitat and therefore the policy will not prevent the proposed development from proceeding.

2.2.5 *Other Approvals*

i. Native Vegetation Conservation Act 1997 (NVC Act)

The NVC Act came into force on 1 January 1998 and repeals SEPP 46 - Protection and Management of Native Vegetation. The objects of this Act are:

- to provide for the conservation and management of native vegetation on a regional basis;
- to encourage and promote native vegetation management in the social, economic and environmental interests of the State;
- to protect native vegetation of high conservation value;
- to improve the condition of existing native vegetation;
- to encourage the revegetation of land;
- to prevent the inappropriate clearing of vegetation; and
- to promote the significance of native vegetation.

in accordance with the principles of ecologically sustainable development.

(Note: the principles of ecologically sustainable development are discussed in Section 8.4.4.)

According to clause 12(f) of the NVC Act, clearing that is excluded from the Act is "*any development that is, or that is part of designated development within the meaning of the EP&A Act*". Proposed extension of the quarry is a designated development as described above. Therefore, the NVC Act does not apply.

ii. Protection of Environment (Operations) Act 1997

The PoEO Act came into force in NSW on 1st July 1999. This Act requires an environmental protection license for scheduled developments and activities to be issued by the EPA as described in Section 1.6.

iii. Rivers and Foreshores Improvement Act 1948

Information from DLWC (provided in *Appendix B)* indicates that a permit is required under the Rivers and Foreshores Improvement Act 1948 for the Jandra Quarry Extension.

iv. Roads Act 1993

Approval from the RTA is required for intersection upgrade works proposed within the Pacific Highway road reserve.

2.3 REGIONAL PLANNING

2.3.1 Hunter Regional Environmental Plan No. 1, 1989 (HREP)

The HREP provides both a policy framework and a strategy for development in the Hunter Region over a 20 year period. The Hunter Region incorporates most of the catchments of the Hunter and Manning rivers and the coastal waterways of the Myall, Wallis Lake, Port Stephens and Lake Macquarie areas.

The HREP planning strategies concerning mineral resources and extractive materials state that consent authorities should:

- manage mineral resources and extractive materials to ensure that adverse impacts on the environment and population are minimised;
- ensure that development proposals for land containing mineral resources and extractive materials are reviewed in relation to the potential problems of rendering those resources unavailable; and
- ensure that the impacts associated with the transportation of mineral resources and extractive materials will be minimised.

Clause 41(1) of the HREP lists matters for consideration by a consent authority when dealing with a development application for an extractive industry. The relevant matters are as follows:

(a) should consider the conservation value of the land concerned and apply conditions which are relevant to the appropriate post-mining or extraction land uses.

Comment : An ecological assessment of the land has been undertaken as part of this EIS. It is proposed to maintain and enhance habitat corridors on the site in locations

not utilised for extraction. Quarry benches will be progressively revegetated and other cleared area used for quarry operations will be rehabilitated such that the site can once again function as a sustainable ecosystem which reflects the natural ecology of the area. The post extraction use of the land is not fully assessed in this EIS. However, it is anticipated the likely best use of the remaining void would be for landfill.

(c) should consult with officers of the department of Mineral Resources, and of the Department of Agriculture, to determine appropriate post-mining or extraction land uses;

Comment : Consultation has occurred with Department of Mineral Resources officers but not with Department of Agriculture officers. The land is unsuitable for agriculture and consultation with Department of Agriculture is not considered necessary. The life of the extractive resource is expected to be a minimum of 66 years and the resultant void will be in the order of 1 to 2 million cubic metres. Post extraction uses are seen as being limited to landfill at this stage.

(d) should ensure the progressive rehabilitation of mined or extracted areas;

Progressive rehabilitation is planned for the upper benched areas, primarily to improve the visual impact of the site and stabilise disturbed areas. The balance of the site will be involved with extraction, processing or stockpiling for the life of the quarry and progressive rehabilitation will not be feasible.

(e) should minimise the likelihood and extent of a final void and the impact of any final void, or facilitate other appropriate options for the use of any final void;

As described above, a final void is an outcome of the proposed operation. The void area is planned to be limited to within various ridgelines to limit visual impact. A landfill is likely to be the best use of the void in the future.

(f) should minimise any adverse effect of the proposed development on groundwater and surface water quality and flow characteristics.

Section 4.3.3 of the EIS identifies that the quarry operation will not impact on groundwater. A strategy for managing surface water is contained in section 3.10.

(g) should consider any likely impacts on air quality and the acoustical environment

Air quality and acoustics are dealt with in Sections 4.4 and 6.1 respectively of this EIS.

(h) should be satisfied that an environmentally acceptable mode of transport is available;

Transport is addressed in section 6.6 of this EIS.

(l) should have regard to any relevant Total Catchment Management strategies.

The Jandra Quarry is within the catchment of Bungwahl Creek, Wallamba River and Wallis Lake. DLWC and Great Lakes Council are in the process of developing a catchment management plan for Wallis Lake and a river care plan for the Wallamba River. There are no existing total catchment management strategies for these waterbodies relevant to the proposal.

The HREP seeks to ensure that suitable land is provided in an efficient and economic manner to cater for the growth of the Hunter Region. The priority of the government is to establish a secure resource base for the continuing development of infrastructure to service new growth areas. The proposal is consistent with these long-term goals as it will contribute to the supply of materials necessary for the development of infrastructure in the Taree and surrounding areas.

2.3.2 *Hunter Coastal Urban Settlement Strategy (HCUSS)*

The HCUSS has been prepared to ensure that urban growth in the Hunter coastal area is planned and managed in a responsible manner which is environmentally and economically acceptable to the community.

The HCUSS requires councils to protect mineral resources and extractive materials, which are important for construction/building purposes and for future urban expansion.

The extraction of mineral resources and extractive materials should only occur after detailed environmental assessment has been undertaken.

GTCC has recognised that the extractive materials in the Jandra Quarry locality require protection from impacts of inappropriate development. Provisions for the protection of these resources are included in Greater Taree Development Control Plan 1995 which is discussed further in Section 2.4.2.

2.4 LOCAL PLANNING

2.4.1 *Greater Taree Local Environmental Plan 1995*

The site owned by CSR is described as Lot 2, 11, 12, 13, 14 and 15 in DP 790056. The subject site and its surrounds are zoned *Rural 1(a)* under the provisions of the Greater Taree Local Environmental Plan 1995 (LEP 1995). This zone generally

encourages the agricultural use of land and extractive industries are permitted with the consent of Council.

Under LEP 1995, the Council must consider a number of issues when assessing development applications for extractive industries. These issues are:

- rehabilitation of land;
- removal of waste material and refuse;
- secure public safety in the surrounding area; and
- protection of the amenity of the locality.

2.4.2 *Greater Taree Development Control Plan 1995*

Greater Taree Development Control Plan 1995 (DCP 1995) aims to achieve consistent control of development on land that is covered by the provisions of LEP 1995. It contains specific requirements related to various types and locations of proposed development.

DCP 1995 identifies a buffer area which surrounds Jandra Quarry. The DCP states that for a development application for land within the buffer area, Council shall consider:

- the environmental conditions within the buffer area and any hazards likely to be encountered by the proposed development;
- the likely risks to persons proposing to reside or be employed in the proposed development;
- the nature and intensity of the proposed development; and
- the likely influence of the proposed development on the continued operation or potential future of any development or activity within the buffer area.

The purpose of the buffer area is to provide protection of the extractive resources that exist in the Jandra Quarry locality by ensuring that land use conflicts do not occur as a result of new development.

2.5 OTHER GUIDELINES AND POLICIES

A number of guidelines and policies apply to development of sensitive lands on or near the coast including the *Coastline Management Manual, Floodplain Development Manual, Estuary Management Manual* and *Guidelines on Public Works Requirements for Sand and Gravel Proposals In or Near Estuaries.* Due to the nature and location of the proposed development, these guidelines and policies are not directly relevant to the proposal.

Relevant guidelines and policies referred to by government authorities consulted as part of the EIS process are as follows:

- EIS Guidelines for Extractive Industries - Quarries (DUAP);
- EIS Guidelines for Bitumen Plants (DUAP);
- Fish Habitat Protection Plan 1, March 1985 (NSW Fisheries);
- Environmental Noise Control Manual 1994 (EPA);
- Draft Stationary Noise Source Policy 1998 (EPA);
- Planning for Bushfire Protection (Department of Bushfire Services); and
- The Australian International Council on Monuments and Sites (ICOMOS) Charter for the Conservation of Places of Cultural Significance; The Burra Charter and its associated guidelines (NPWS).

JANDRA QUARRY
EXTENSION

CSR

ERM

ENVIRONMENTAL
RESOURCE
MANAGEMENT

3 THE PROPOSED DEVELOPMENT

Chapter 3

THE PROPOSED DEVELOPMENT

3.1 GEOLOGICAL INVESTIGATION

3.1.1 Introduction

CSR purchased the site in May 1996 with initial production runs commencing in November 1996. The quarry reached full-scale production in early 1997. At the time of purchase the site had been subject to two development approval determinations, in 1985 and again in 1991 when the production limit was increased from 50,000 tpa to 150,000 tpa. Attention was focused on the geology of the approximately five hectares currently approved for extraction.

During the pre-acquisition stage CSR realised that the area had considerably more potential, and this was the basis for acquisition.

At the time of purchase the company acquired approximately 109 ha, and now, due to further acquisition, it owns around 118 ha. Property details are provided in *Table 3.1* and *Figure 3.1*.

Table 3.1 PROPERTY DETAILS

Lot	DP	Parish	Size in Hectares
Lot 2	DP790056 (255621)	Parish of Beryan	9.734 ha
Lot 11	DP790056	Parish of Beryan	11.62 ha
Lot 12	DP790056	Parish of Beryan	9.52 ha
Lot 13	DP790056	Parish of Beryan	7.01 ha
Lot 14	DP790056	Parish of Beryan	40.51 ha
Lot 15	DP790056	Parish of Beryan	40.20 ha
Total			**118.59 ha**

All land is in the county of Gloucester and within the Greater Taree local government area.

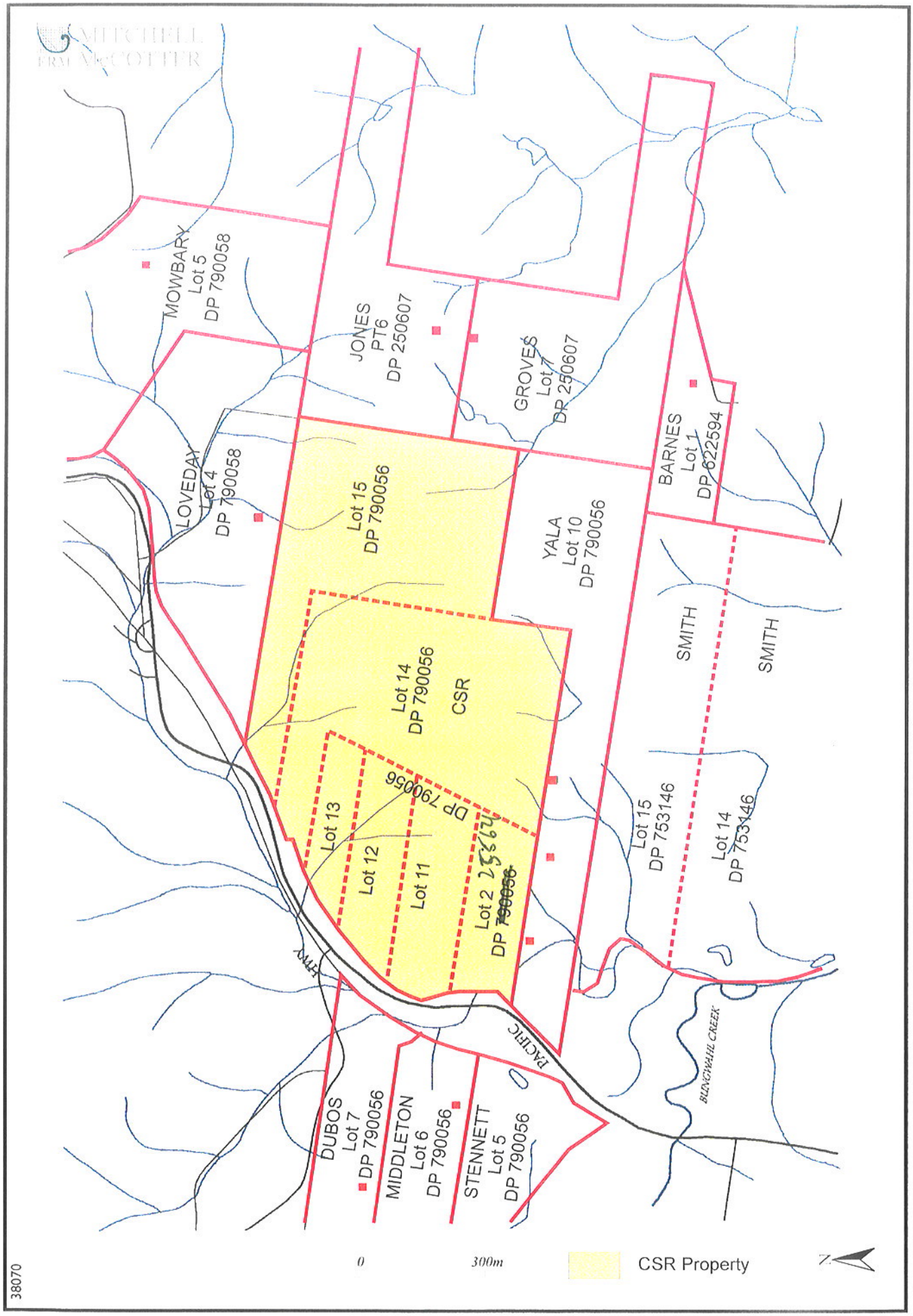

Figure 3.1 PROPERTY DETAILS OF SITE AND NEIGHBOURS

In 1997, CSR subjected its 109 ha property to an intensive geological investigation. This included commissioning aerial photographs and enlargements, preparing detailed topographic maps from the photos, geological mapping, trenching, percussion drilling, diamond drilling, product quality testing and reserve calculations. This work is covered in detail in "*Jandra Hard Rock Quarry Geological Investigation*" (Stenhouse, 1997) which is provided in *Appendix D*.

Since Stenhouse (1997), CSR purchased an adjoining property (Lot 12). The purchase of Lot 12 has allowed final quarry planning to consider land further east than the footprint investigated in 1997.

3.1.2 Site Geology

The area is underlain by an undifferentiated sequence of Devonian sediments that is approximately 345 to 395 million years old. The sequence consists of interbedded mudstone, sandstone, conglomerate, tuff and chert, with local greywacke beds. Site geology is shown in *Figure* 3.2.

A major greywacke bed is present in the quarry area. This bed is up to 190 m thick and has an east west strike (about 250° magnetic) and dips to the north at between 45° and 50°. Mapping has shown the bed to be fully continuous over a strike length of at least 1,000 m, with little apparent reduction in thickness. Diamond drilling has confirmed that there is at least 30 m of greywacke below the current floor of the quarry.

Physically the greywacke bed is a very hard durable dark grey rock with little apparent differentiation across the bed. Scattered throughout the bed are relict brachiopod shells and clasts of granitic material up to 10 cm in diameter.

No structural analysis has been carried out, but wedge type failures are evident in the upper weathered benches.

3.2 ROCK AND PRODUCT QUALITY

The quarry under CSR ownership has now been in full production for just over two years, producing a full range of products, but concentrating on concrete aggregates, asphalt and sealing aggregates. Aggregate from this quarry has been used in concrete for the Taree By-pass. Other products produced by the quarry include aggregates for drainage medium and pipe bedding material, crusher dust used for fill material under concrete slabs and pavers, ballast for RSA railway line maintenance, rip rap for riverbank protection and gabion rock for erosion protection mattresses. *Table* 3.2 gives a summary of product quality.

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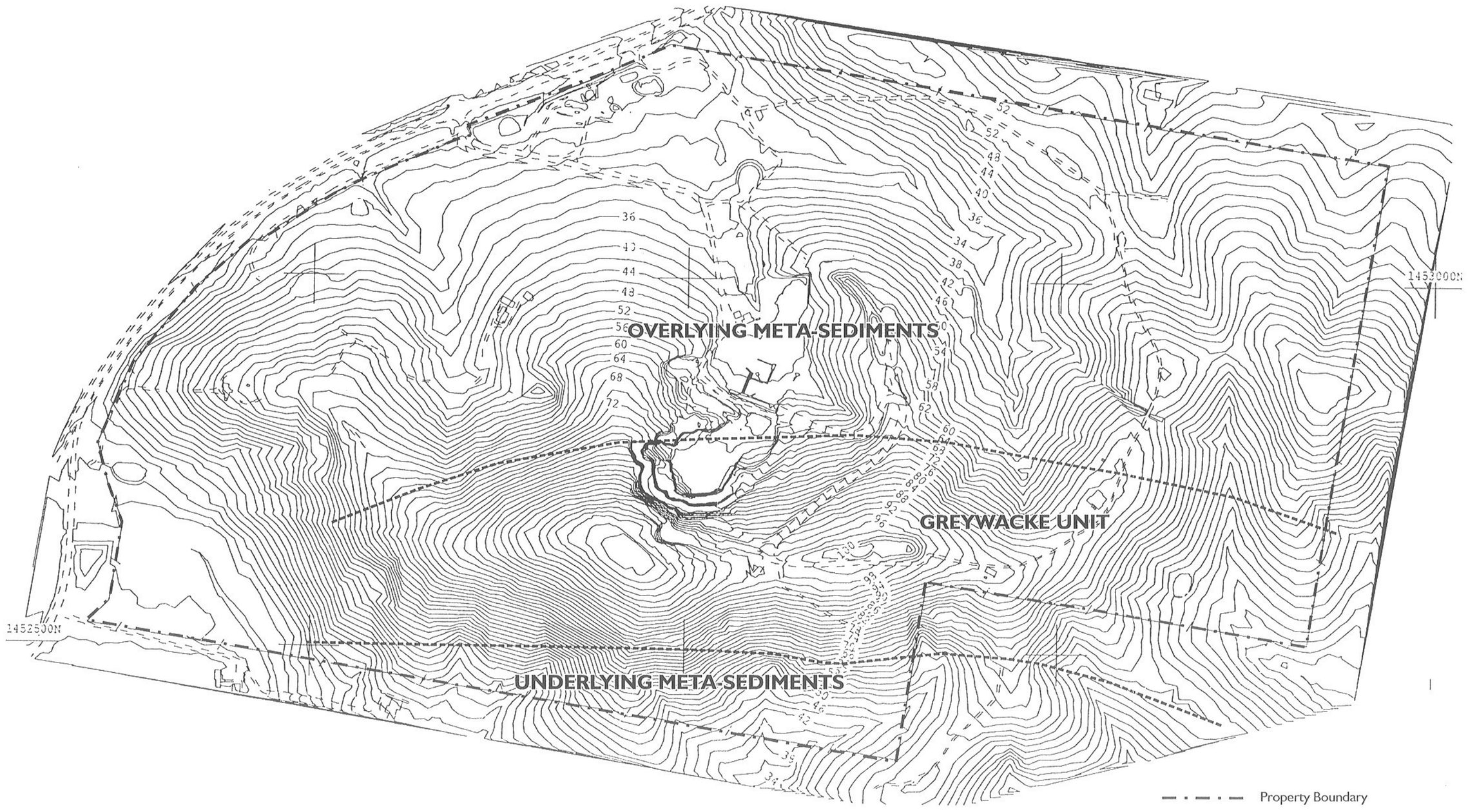

38070

Figure 3.2 SITE GEOLOGY

0 500m

N

Table 3.2 JANDRA PRODUCT QUALITY SUMMARY

Test	Range [1]
Bulk Density (SSD)	2.65 tonnes per cubic metre
Stripping Test (pre-coated)	Nil Strip
Polished Aggregate Friction Value	50 – 53
Water Absorption	0.4 – 1.0 percent
Dry Strength	397 - 415
Wet Strength	345 - 415
Wet/Dry Strength Variation	0 - 13 percent

Notes: 1. Data from December 1996 to August 1999

Petrographic work, as reported by Stenhouse (1997), show the greywacke to be hard, non-porous and durable. It has approximately 25 percent free silica, much as a product of de-vitrification of glass shards, and is predicted to have a mild or slow potential for alkali-silica reactivity. As such, concrete designs contain measures to counteract this.

The very low wet/dry variation of 0 - 13 percent indicates a high durability. This, combined with its high polished aggregate friction value (PAFV) means that the product is of premium quality suitable for all uses. The company has found the material suitable for use as aggregates for concrete production.

Stenhouse (1997) also identifies the overlying sediments as having a value for blending into road gravel products, stating *"The overlying meta-sedimentary unit is considered suitable for blending in road-base materials to improve plasticity and workability. Materials testing of this rock is required to determine the optimum blending ratios for varying product types."*

3.3 RESOURCE QUANTITY

3.3.1 Preamble

Extraction is currently approved within a small area of about five ha. This is contained with a CSR owned area of 118 ha, of which at least 19 ha is underlain by greywacke. The company is not seeking approval to extract all the greywacke on its land, however as the following section shows, there is a considerable volume of rock available within the area subject to this application.

3.3.2 *Available Rock Volumes*

i. Reserves

According to the original EIS for the quarry site (Davies, 1984) the approved extraction area had reserves totalling 493,000 m^3 of processable rock. At the time of acquisition, CSR calculated that the reserves (legally extractable rock) contained within the approved area totalled 960,000 tonnes. Since then the company has extracted some 400,000 tonnes of material. Of this about 90,000 tonnes of weathered rock (overburden) has been placed in stockpiles, shaped and revegetated.

At the current extraction rate the remaining 560,000 tonnes will last just over four years.

ii. Additional Resources Being Requested

The company is seeking approval to extract sufficient rock to secure the economic viability of its investment of $5.6 million, and protect the existing jobs of two permanent and four casual workers at Jandra and five permanent and four truck drivers from the Manning River operation.

In assessing the volume of resource available, the company has placed the following constraints upon itself:

- only extract north of the southern ridgeline. This will avoid any visual impact upon residents to the south of the site;
- not to quarry east of the eastern most north south ridge at about (6453100N, 249100E). This will help protect residents to the east of the quarry from any major visual impact;
- not to quarry any closer than 400 m from the Pacific Highway. This will avoid the possibility of having to disrupt traffic during blasting; and
- deepening the quarry floor with two additional 15 m high benches. This would take the final RL to 20.

Within these constraints it has been calculated in the "*Jandra Quarry Quarry Development Plans*" (CSR, 1999) that there are an additional 16.5 million tonnes of rock available for extraction (see *Appendix E*). It is proposed to extract this resource in four stages which are described in Section 3.6. The volumes of each stage are summarised in *Table 3.3*.

Table 3.3 AVAILABLE RESOURCE OF GREYWACKE WITHIN PROPOSED QUARRY EXTENSION

Stage	Overburden	Weathered Rock		Fresh Rock	
	000 m^3	000 m^3	000 Tonnes @ 2.51/m^3	000 m^3	000 Tonnes @ 2.65/m^3
1	61.9	619.3	1,548.2	1,685.8	4,467.4
2	44.2	489.1	1,222.7	1,640.8	4,348.0
3	34.5	300.7	751.7	1,371.6	3,634.6
4	4.5	45.1	112.7	1,537.6	4,074.6
Total	145.1	1,454.2	3,635.3	6,235.8	16,524.6

NOTE: *Calculated using Surpac Mine Planning Software.*
Stenhouse 1997 calculated extractable resources of just 8.88 million tonnes. The additional tonnage is due mainly to the recent (1999) acquisition of Lot 12 from Mr Ralph Williams, adopting a larger footprint for the quarry, and taking the quarry floor to RL 20.
Weathered rock may or may not be converted into product. Its use depends on road base and fill markets.
At the expanded production rate being asked for this equates to over 50 years quarry life.

3.4 RESOURCE SIGNIFICANCE

3.4.1 Significance Test

The quarry supplies aggregate south beyond Bulahdelah and north into Hastings shire. Using the definition adopted by DMR, it is *Regionally Significant* as it supplies into more than one shire area. The quarry is also listed as *Regionally Significant* by the North Coast Extractive Industries Standing Committee (DUAP, 1999).

Similarly, under a Ministerial Direction on State Significance, this site is of *State Significance* as its reserves are over five million tonnes and its production level will be over 200,000 tpa.

3.4.2 The Market and Current Suppliers

The company has been in operation in Taree for over 15 years and at Jandra for over two years. In both instances existing operations were purchased. The market information presented in this section is based on CSR's extensive experience in the market place, however, it should be regarded as a best estimate only.

Company officers have been seeking market information in the coastal region from Johns River in the north to Bulahdelah in the south. In this region the main markets

for hardrock quarry products are roadbase, asphalt aggregate, spray-seal aggregate and concrete aggregate. This market has been calculated as an estimated average of 640,000 tpa for the foreseeable future, and it is shown as product type in *Table 3.4*.

Table 3.4 MARKET BY PRODUCT TYPE, JOHNS RIVER TO BULAHDELAH

Product	Tonnes per Annum
Road Base/Scalps	300,000
Asphalt & Sealing Aggregates	80,000
Concrete Aggregates	190,000
Other	70,000
TOTAL	640,000

Supplying this market are five hardrock, two river gravel and two shale quarries. These are detailed in *Table 3.5* and shown in *Figure 3.3*. In addition, future production levels are likely to be higher due to the significant demand for extractive materials in the region resulting from potential overlapping of six major upgrades of the Pacific Highway to be undertaken over the next five years, being the sections:

- Karuah to Bulahdelah;
- Coolongolook to Wang Wauk;
- Bundacree Creek to Possum Brush;
- Cundletown to Coopernook;
- Coopernook By-pass; and
- Coopernook to Mooreland.

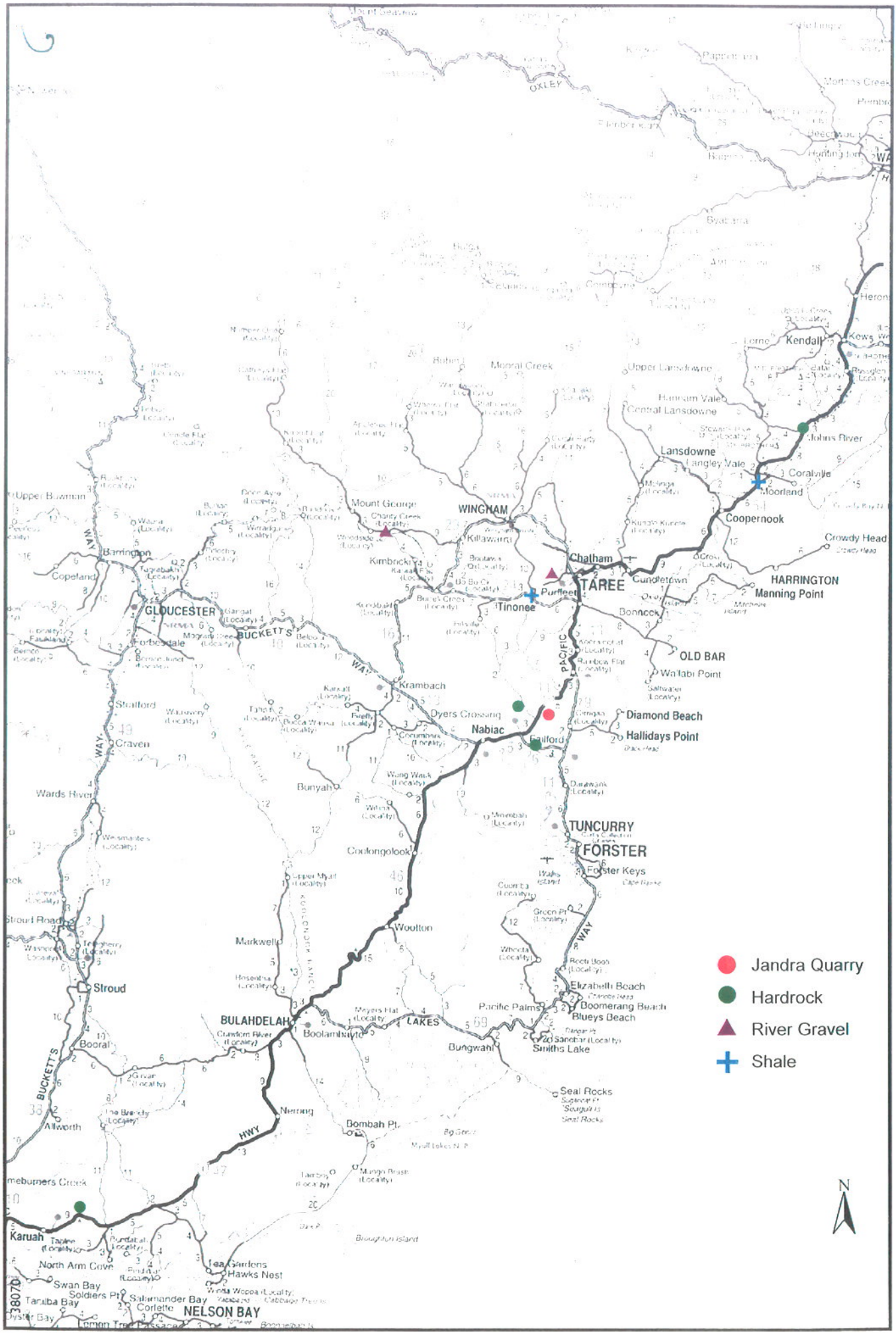

Figure 3.3 MARKET SUPPLIERS

Table 3.5 ESTIMATED PRODUCTION LEVELS OF RELEVANT QUARRIES

Quarry	Location	Type	Est. 1999 Production (tonnes)	Est. 2000 Production (tonnes)
CSR	Jandra	Hardrock - Greywacke	130,000	220,000
CSR	Taree	River Gravel	90,000	Nil
Boral	Johns River and Seaham	Hardrock - Quartz Microdiorite/Monzodiorite	90,000 [1]	90,000 [1]
Pacific Blue Metal	Possum Brush	Hardrock - Greywacke & Meta-sediments	155,000	155,000
Great Lakes Aggregates	Failford	Hardrock - greywacke & Meta-sediments	55,000	55,000
Midcoast Earthmoving	Tinonee	Shale	35,000	35,000
Scadden's	Moorland	Shale	15,000	15,000
Mountain Industries	Karuah	Hardrock	40,000 [1]	40,000 [1]
Wingham Sand & Gravel	Charity Creek	River Gravel	30,000	30,000
TOTAL			640,000	640,000

Notes: 1. Production for supply in the area between Johns River and Bulahdelah only.

CSR's Manning River gravel operation located at Taree is a significant supplier to the local concrete industry as well as to the Bulahdelah, Forster and Gloucester areas. However, only minimal reserves (under 6 months) remain in the current extraction lease with little prospect of extending to a new lease. Therefore CSR propose to close the Manning River operation and move its production to Jandra. This will include replacing coarse river sand with processed crusher dust for a significant part of the fine aggregate used in concrete. The closure of the Manning River operation will enable the release of land suitable for at least 80 residential lots in Taree West.

It is generally recognised that a hardrock quarry is a more stable less dynamic operation than river extraction, with greater control over impacts and mitigation measures.

3.4.3 *Resource Significance*

That this is a resource of state, regional and company significance cannot be argued. Its significance lies in:

- the large volume available in an environmentally acceptable operation (over 16 million tonnes);
- direct access to the Pacific Highway without disadvantaging people living along its access route;
- the premium quality of its product;
- CSR investment of $5.6 million and its future provision of up to 11 full-time and 2 casual direct jobs and several others (e.g. truck drivers) indirectly; and
- the ability to serve markets up to 100 km away using the main Pacific Highway.

In conclusion it can be said that the company owns 118 ha of land on which a properly executed geological investigation has shown that there are some 16.5 million tonnes of fresh rock available for extraction, with an additional 3.6 million tonnes of weathered rock suitable for roadbase products.

Approval to extract this resource will allow a regionally and state significant operation to continue operating that otherwise would see the operation close down in about four years time.

3.5 AN OVERVIEW OF THE DEVELOPMENT PROPOSAL

CSR owns and operates a quarry situated on 118 ha of freehold land. A plan of the proposed quarry layout is shown in *Figure 3.4*. Current approvals allow for an extraction rate of 150,000 tpa, place some stringent controls on operating hours and blasting, and give reserves of around 560,000 tonnes. This equates to about four years life. The present operation crushes and screens the material and provides a pre-coating facility for sealing aggregates.

In this application CSR seeks to gain approval to:

- expand operating hours from 6.00 am to 6.00 p.m. Monday to Friday and 6.00 am to 3.00 p.m. Saturdays. Ancillary operations such as refuelling, servicing and maintaining plant will be undertaken between 6.00 am and 9.00 p.m. Monday to Saturday;

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Sealed Access Road

Pacific Highway

1453000N

1452500N

Property Boundary

Existing Extent of Quarry

Proposed Extent of Quarry

Proposed Site Facilities Area

Internal Roads

Residences / Buildings associated with Quarry

Sediment Ponds

Clean Water Ponds

Secondary Stockpile Area

Explosive Magazine Store

Topsoil Overburden Stockpile Area

Power Line Route

38070

0 500m

N

Figure 3.4 PROPOSED QUARRY LAYOUT

- lift approved production levels from 150,000 tpa to an average 250,000 tpa;
- significantly expand reserves to allow planning for the company's future. This includes extraction down to RL 20 and will provide 16.5 million tonnes of fresh rock;
- expand the existing site facilities area;
- remove the restrictions on blasting to enable the adoption of normal commercial blasting practices;
- relocation and upgrading of the existing pre-coating facility;
- locate on-site, from time to time on an as needed basis, a mobile pugmill and a mobile asphalt plant;
- construct a new weighbridge and office complex south-west of the current weighbridge;
- upgrade the intersection of the quarry access road and the Pacific Highway; and
- eventually demolish the three existing dwellings located on the site.

There will be no change to the crushing and screening processing plant as with the extended hours it will be able to adequately process the required tonnage. The proposed site facility layout is shown in *Figure 3.5*.

Steps necessary to achieve these aims are detailed in the following sections.

3.6 QUARRY DEVELOPMENT

The main haul roads to the upper benches have been established on the eastern side of the existing quarry. To avoid disrupting these for as long as possible it is proposed to initially quarry to the west.

Existing benches have been developed at 12 m heights and it is proposed to continue with 12 m separation down to RL 50. From this level it is proposed to develop two 15 m high benches. Using the following criteria, a four stage development schedule has been developed.

- terminal bench width of half the face height;
- final face angle of 75°;

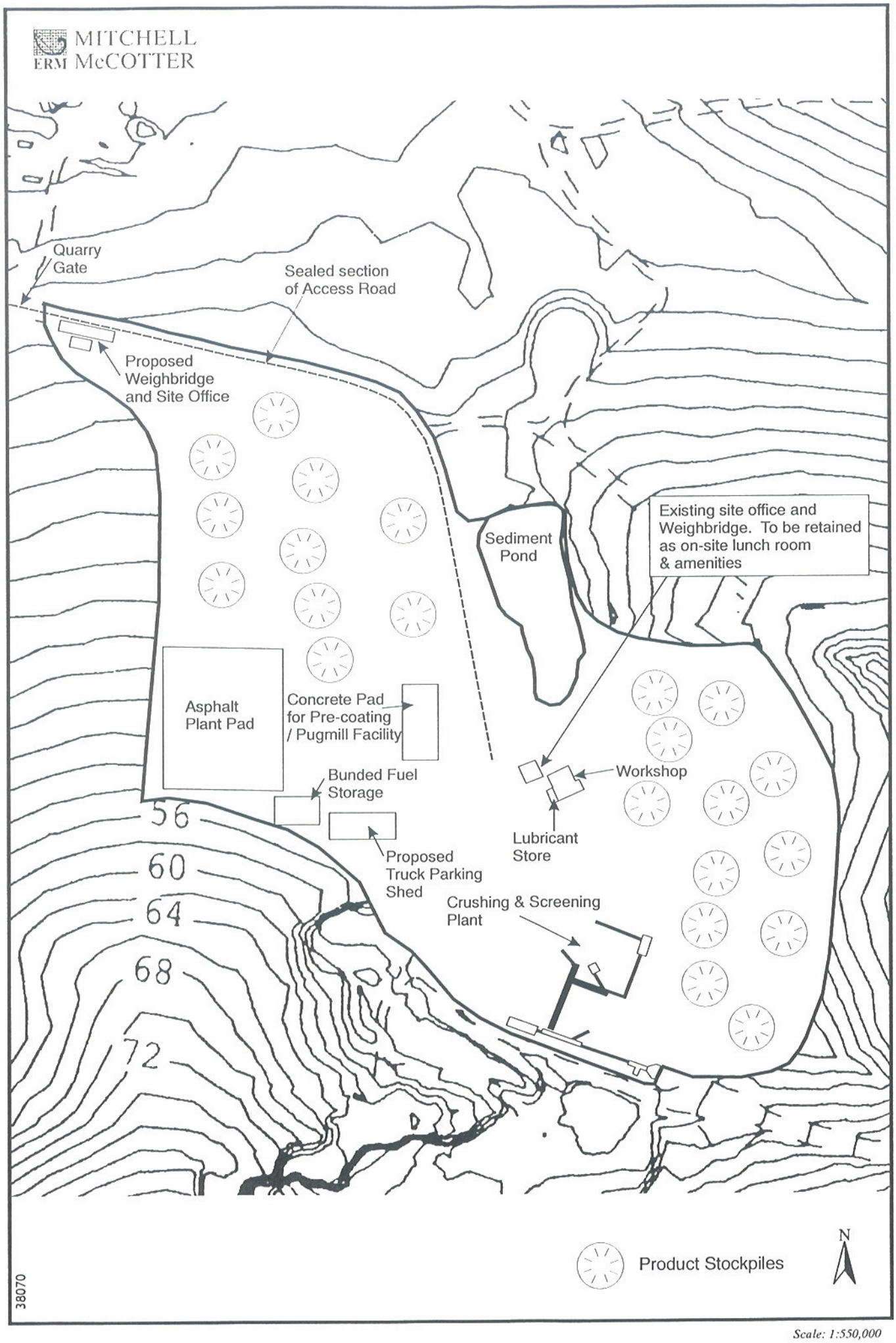

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Figure 3.5 SITE FACILITIES AREA

- haul roads 15 m wide and at 1:10 grade;
- rock density of 2.65 tonnes per cubic metre;
- topsoil one metre thick
- weathered rock 10 m thick; and
- quarry floor level sloped at one percent to a drainage sump.

3.6.1 Stage 1.

This stage involves expanding the quarry to the west as shown in *Figure 3.6.*

Where possible, the first action will be to develop an excavated slot along the southern rim of the quarry through the topsoil and weathered rock, leaving the final south face at a stable angle suitable for plant growth, and replanting. When the active quarry face extends south to meet this revegetated slot, much of the final visual impact will be mitigated. Where the development of the slot is not possible due to the location of the existing southern quarry face, revegetation will be commenced as soon as possible following completion of the final southern face.

At the same time a sump will be dug into the floor of the quarry to trap all runoff from disturbed areas. This will be enlarged from time to time to meet sediment control specifications from time to time as the quarry void increases.

Benches will be developed at RL 50, 62, 74, 84 and 96. It has been calculated that this development will generate 61,900 m^3 of overburden, 619,300 m^3 (1.55 million tonnes) of weathered rock and 1,685,800 m^3 (4.47 million tonnes) of fresh rock (see *Appendix E).* It is expected that most of the weathered rock will be processed and sold as road base type product.

As terminal faces are developed on the southern and western limits overburden and topsoil will be placed on the benches and rehabilitated. The proposed method as described in Section 3.11 was used successfully by CSR at its Ferntree Gully Quarry in Melbourne.

The prior rehabilitation of the top 10 m of overburden and the weathered rock along the southern slot and the retention of vegetation above the northern rim of the quarry will assist in significantly reducing visual impact when the site is viewed from the north. In fact, remediation of the currently exposed face is now in progress and will reduce the current visual impact as vegetation becomes established.

MITCHELL
ERM McCOTTER

RL 50

OGN

14530

14525

38070

Figure 3.6 STAGE 1 DEVELOPMENT

0 500m

N

3.6.2 *Stage 2*

This stage involves the easterly development of the RL 50, 62, 74, 86 and 98 faces half way to the proposed eastern limit of the quarry and developing a new bench to RL 35 in the latter part, as shown in *Figure 3.7*.

Again, a preliminary slot will be cut along the southern rim to enable rehabilitation of the top bench in weathered rock before it is exposed to view from the north. Terminal faces on the southern rim, not needed for access or the haul road, will be rehabilitated.

This stage will yield some 44,200 m^3 of overburden, 489,100 m^3 of weathered rock (1.22 million tonnes) and 1,640,800 m^3 of fresh rock (4.35 million tonnes).

Visual impact will again be diminished by a combination of prior rehabilitation of the weathered rock face and the screening affect of the vegetation to be retained on the northern rim of the quarry.

Early in Stage 2 the existing haul roads will need to be relocated, and it is proposed that access from the RL 50 bench to the higher benches will be via a ramp developed along the northern and eastern faces. The higher sections of this ramp will be live and will have to be relocated from time to time.

All run off from the disturbed area will be gathered either on the RL 35 level, or in a sump below RL 35. After settling all water will be pumped out into the existing water management system.

Towards the end of this stage operations will get very close to the south-east corner of the CSR property. A formal legal agreement between CSR and the owners of the adjoining property (YALA) restricting activities on the adjoining land during blasting in the proposed eastern extension only is currently being negotiated. A non-binding letter of intent has been signed by both parties to indicate the intention to enter into a formal coexistence agreement. A copy of this letter is provided as *Appendix F*.

3.6.3 *Stage 3*

This stage sees the continued development east of the RL 35, 50, 62, 74 and 98 benches to their most eastern limit (as shown in *Figure 3.8*). At no stage will the most eastern ridge of the site be breached. Towards the end of this stage a section of the new bench at RL 20 may be developed.

Again the weathered rock profile along the southern rim will be rehabilitated, and after development visible terminal faces will be rehabilitated.

MITCHELL
ERM McCOTTER

RL35

1453

1452

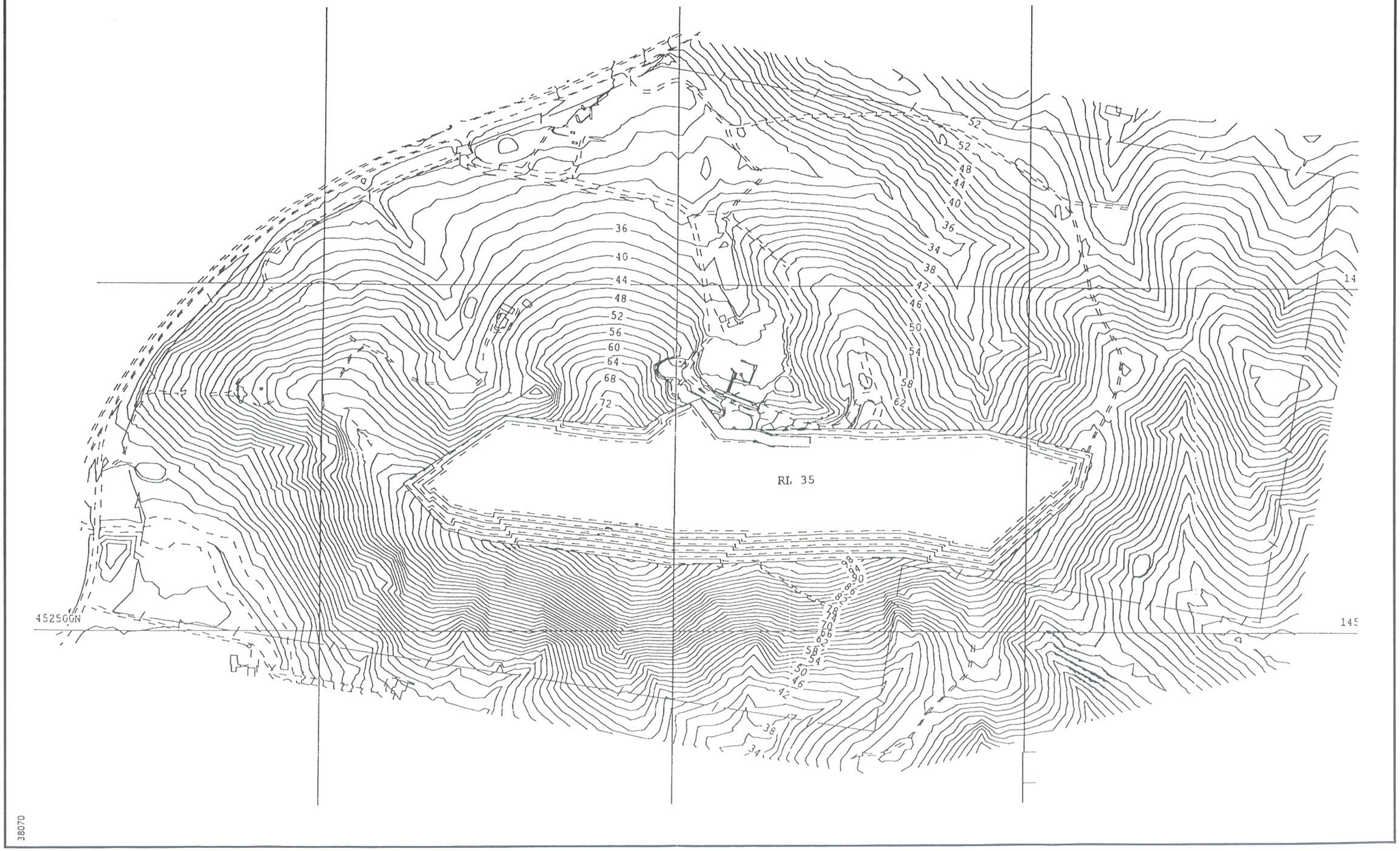
38070

0 500m

N

Figure 3.7 STAGE 2 DEVELOPMENT

MITCHELL
ERM McCOTTER



38070

0 500m N

Figure 3.8 STAGE 3 DEVELOPMENT

During this stage the operation will extract 34,500 m^3 of overburden, 300,700 m^3 of weathered rock (751,700 tonnes) and 1,371,600 m^3 of fresh rock (3.6 million tonnes).

Completion of this stage will represent the end of any disturbance of the site, the quarry having practically reached its final rim position.

3.6.4 Stage 4

In this stage (shown in *Figure 3.9)* effort is concentrated on removing the bottom RL 20 bench, and some peripheral clean up. It will release 4,500 m^3 of overburden, 45,000 m^3 of weathered rock (112,700 tonnes) and 1,537,600 m^3 of fresh rock (4.1 million tonnes).

Other than maintenance of existing rehabilitation there will be little rehabilitation.

At the end of this stage the floor will be approximately 750 metres long and 100 metres wide. Below RL 20 there is the potential to yield in excess of 2.5 million tonnes of fresh rock. Approval for extraction of this additional resource is not part of this application.

3.7 QUARRY OPERATION

Essentially the quarry will be operated in a similar fashion to the current practices. Significant variations will occur in blast design and operating hours, but as the company has recently purchased the property of its nearest neighbour, Mr Ralph Williams, the potential impact of these changes have been greatly reduced.

3.7.1 Site Preparation

Site preparation includes:

- the installation of drainage systems, sedimentation dams and geofabric filter fencing;
- clearing of existing vegetation;
- removal and stockpiling of overburden; and
- construction of hardstand areas for site facilities and stockpiling.

MITCHELL
ERM McCOTTER

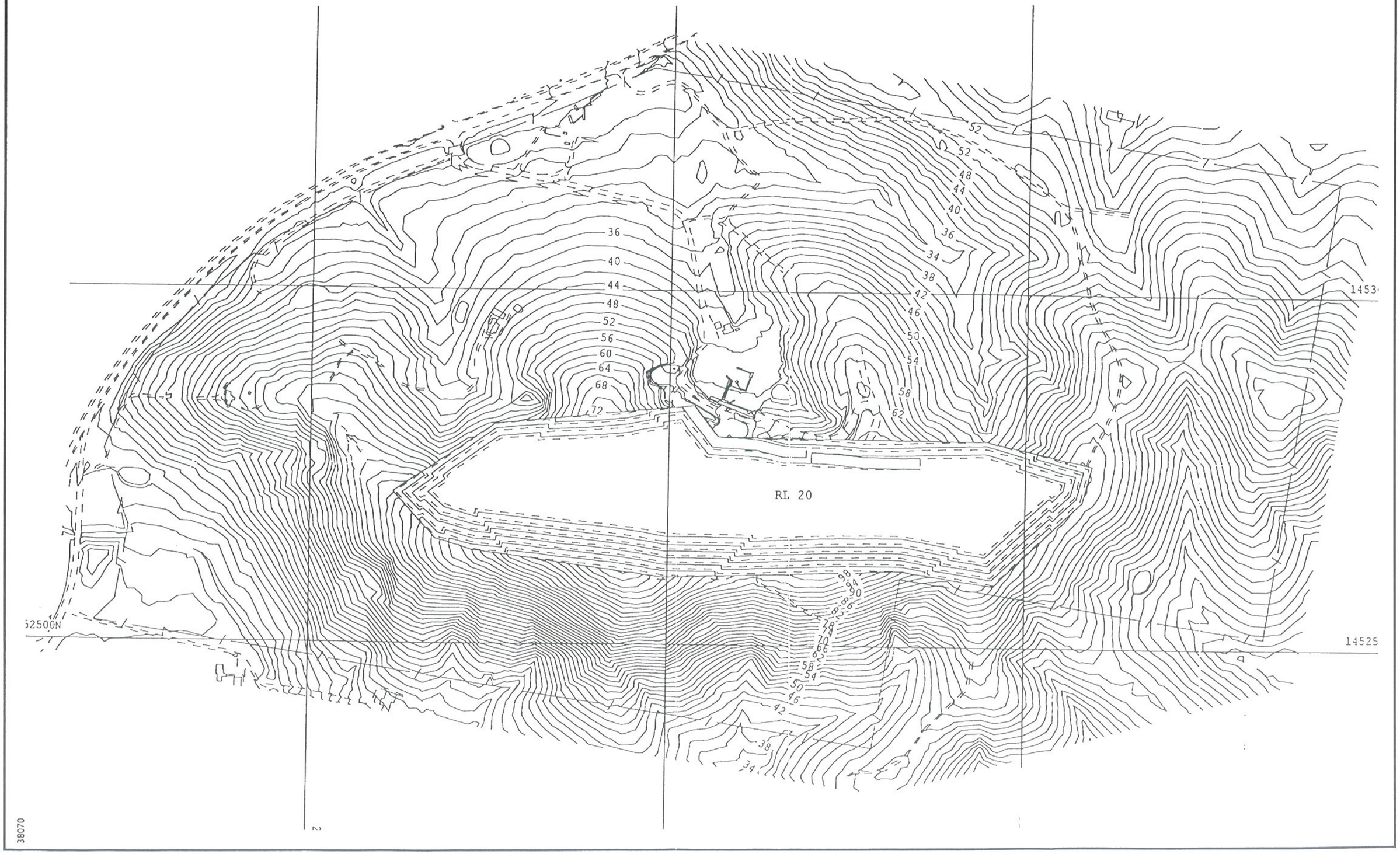


Figure 3.9 STAGE 4 DEVELOPMENT

i. Site Drainage

Extraction of material from the quarry extension will progress from the existing quarry pit into new extraction areas. Similarly, the extension of the site facilities area will progress from the existing area. This will ensure that drainage of newly disturbed areas will always be directed back to sedimentation dams in order to contain sediment and to prevent this material from entering existing watercourses.

At times during the expansion it will be necessary to separate runoff flows with runoff from undisturbed vegetated areas being directed to existing watercourses. Water control structures will be constructed and these will include diversion banks. Geofabric filter fences and hay bales will be installed prior to vegetation clearing and construction of diversion bunds in order to trap any water-borne silt. The diversion bunds will then be stabilised using fast growing grasses.

ii. Vegetation Clearing

Vegetation will be cleared progressively as the quarry develops. Clearing is generally undertaken using a Dozer (D8 or equivalent). Loggable timber will be sold to a mill. Wherever possible, selected foliage and branches from cleared vegetation will be placed immediately on rehabilitation areas. When no rehabilitation areas are available, it will be windrowed at the periphery of the quarry areas, outside of the area to be extracted and adjacent to future rehabilitation areas.

Natural vegetation buffers will be retained, adjacent to the extraction area. Such buffers will be left:

- between the southern extent of the quarry and the southern property boundary;
- between the eastern extent of the quarry and the eastern property boundary (this area to be revegetated to provide a wildlife corridor);
- the western extent of the quarry and the western property boundary; and
- between the northern extent of quarry and site facility disturbance and the northern property boundary.

iii. Removal and Stockpiling of Overburden

Quarry overburden comprises topsoil and underlying weathered rock profiles that are unsuitable as a blending agent in road pavement.

Topsoil will be stripped using a dozer on more gentle slopes and a hydraulic excavator on steeper sections. Where possible, stripped topsoil will be immediately re-spread on rehabilitation areas to optimise regeneration of naturally occurring seed stock.

Where immediate re-spreading is not possible, topsoil will be stockpiled in the overburden stockpile area. Topsoil stockpiles will be constructed 1.5 metres high with 1 (vertical) : 3 (horizontal) batters and will be vegetated to protect the material which will be used in subsequent rehabilitation programs. When possible, topsoil stockpiles will also be protected by windrowed vegetation.

Weathered rock excavated as overburden will also be stockpiled in the overburden stockpile area. This material will be used for a wide range of purposes including bunding, road repairs, upgrading of drainage works, revegetation areas and sedimentation dam construction.

Sediment control for the overburden the overburden stockpile area will include the use of geofabric filter fences.

iv. Hardstand Areas

Hardstand areas include:

- the existing site facilities area and its proposed extension;
- explosives magazine storage area;
- secondary stockpile area; and
- overburden stockpile area.

With the exception of the extension to the site facilities area, the hardstand areas already exist as a component of the existing quarry operation. Works required to complete the extended hardstand area include:

- cut and fill to approximately RL 43 the extension to the site facilities area. This level will allow the extended site facilities area to drain to the existing sedimentation dam;
- installation of central and peripheral drainage systems (flowing to the sedimentation dam) to control disturbed area runoff;
- rehabilitation and revegetation of any externally draining peripheral batters; and

- placement and compaction of ripped and/or crushed rock on all product storage and vehicle turn-around areas to prevent product contamination and to support trucks, moveable plant and proposed concrete pads for the weighbridge and office and for the pre-coating and pugmill plant.

3.7.2 *Blasting*

The current practice is to use Orica Quarry Services with a "Rock on Ground" contract under which environmental performance is guaranteed. This practice will continue, at least until CSR has adequately demonstrated that the revised drill hole parameters can be easily managed. Part of the contract is to monitor the overpressure and ground vibration of each blast.

It is proposed that a typical blast in fresh rock would have the following parameters, for a 12 m high bench.

Table 3.6 TYPICAL BLAST DESIGN

Parameter	Specification
Hole Diameter	89 mm
Burden	3.2m
Spacing	3.7m
Hole Depth	13 m
Hole Angle	10°
Stemming	3 m
No. of Holes	54
Subdrill	0.9 m
Density of Wet Product	1.2 g/cm^3
Density of Dry Product	1.1 g/cm^3
Charge per Hole	75 kg

As the holes would be initiated using the proven non-electric method, the Maximum Instantaneous Charge (MIC) would typically be 75 kilograms, as each hole will be initiated separately. The actual blast design used will be determined on a blast by blast basis to ensure that EPA criteria will be met at all nearby residences.

A blast of these typical parameters would release approximately 20,000 tonnes and there would be a need for 12 to 14 blasts a year which is just over one per month.

However, it is anticipated that not all blasts will be that large and there will be two blasts a month on average.

In weathered rock the burden and spacing would be increased giving fewer holes. For the bottom two 15 metre faces, the MIC would typically increase to 97 kilograms. Details are given in *Appendix G*, a copy of a communication from Orica Quarry Services.

These parameters have been used in assessing the likely impact of blasting as reported in Section 6.1.

The proposed quarry plans indicate that potential blast locations cover an estimated area 900 m by 250 m. At any one location the distance between the blast site and the nearest residence vary between 300 m to 900 m. With significant variations in distances to receptors it is extremely inefficient to limit blasts to a specific MIC. It is CSR's intention to monitor numerous blasts at multiple locations to gather data sufficient for confident impact predictions. The design of blasts will then be optimised to limit the possibility of EPA criteria exceedences when blast locations are closer to residences and preferred blast designs can be used for blast locations with adequate distances to residences.

CSR has developed a specific set of standard procedures to control blasting at Jandra, and this is reproduced in *Appendix H*. These procedures are amended by CSR to reflect best management practices as they arise. It should be noted that there will be no secondary blasting.

Blasting will conform to current EPA guidelines. As a dust control measure, the shot rock will be well watered down before loading out is commenced.

An explosives magazine store is located to the east of the site facilities area. CSR hold a Licence for the Keeping of Dangerous Goods (No. 35/025571) for the store.

3.7.3 Raw Materials Processing

Current mobile equipment used to load and haul shot rock is a Caterpillar 980C loader, a Hitachi EX 300-2 excavator, Komatsu HD352 35 tonne dump truck and an 18 tonne Volvo dump truck. As the haul distance increases it is likely a second 30-35 tonne rigid dump truck will be brought into service to replace the 18 tonne Volvo dump truck.

The shot rock will be loaded into the dump trucks and transported to the processing plant and after being deposited into the hopper will pass through the following equipment for processing:

- Primary feeder 46 inch by 16 inch;
- Primary crusher Kueken 42 inch by 30 inch double toggle crusher;
- Screen No 1 20 foot by 6 foot Austral;
- Secondary crusher 1,200 autocone Pegson;
- Screen No 2 16 foot by 6 foot Allis Chalmers triple deck;
- Tertiary Crusher 3 foot short head Symons;
- Barmac 990 rotor;
- Screen No 3 16 foot by five foot triple deck Jaques; and
- Screen No 4 16 foot by 5 foot triple deck Jaques.

In the plant, dust extraction and control is effected by:

- two DCE Vokes Dust extraction units;
- one Hosokawa Mikropul Dust extraction unit;
- misting sprays at primary boot and product discharge points; and
- all screens having dust covers and are sealed.

The crushing and screening plant is electrically powered.

After the final products exit the plant from screens three and four they are transported to their stockpiles by one of the two sales front-end loaders (CAT 960C or equivalent). The water cannon on the 10,000 litre capacity water truck is used to spray the stockpiles (as well as haul roads and other unpaved manoeuvring areas), before products are loaded out. This dust control measure in the stockpile area is part of the dust management plan.

A secondary stockpile area is located adjacent to the Pacific Highway. This area is screened from the highway by a revegetated earth bund. Stockpiles in this area are kept to heights such that they are unable to be sighted by highway traffic users.

After load-out into road trucks all products are weighed over the on-site weighbridge before being dispatched to their respective markets.

The existing pre-coating area will be relocated to the expanded site facilities area where a concrete pad will be constructed to contain the pre-coating plant. The pre-

coating process involves a feed hopper loading aggregate into a mixing chute where pre-coat is added. The coated aggregate is then discharged into two product bins. The pre-coat storage tank will be stored in the bunded fuel storage area. The current annual production of approximately 6,000 tonnes of pre-coated product is expected to remain at similar levels in the future.

It is proposed to periodically bring a mobile pugmill onto site as required by contracts for road base. The pugmill will be located on the concrete pad used for pre-coating. A pugmill is used either to add water in a controlled way so that road base can be delivered at Optimum Moisture Content or to add a stabiliser such as lime or cement to the product (see *Figure 3.10*). Water will be sourced from one of the sediment control dams. The mobile pugmill will include a lime or cement filler silo. The filler silo will have an appropriate filter bag system to control air discharge.

3.7.4 On-Site Facilities

The present weighbridge is of insufficient length and split weighing is required. It is planned that when CSR's Manning River site is closed the full sized weighbridge (20 m x 3 m) will be relocated to Jandra. It will be located on-site closer to the highway than the existing weighbridge. A new office will also be installed, relieving the current office and toilet block for use as a lunchroom, training room/crib room, locker room and amenities. The new office will be located adjacent to the new weighbridge, and will incorporate a managers office, weighbridge office, kitchen, toilet and effluent treatment system. The new office will have dimensions of approximately 8 m x 7 m, a conceptual design of which is shown in *Figure 3.11*.

The existing workshop includes facilities for all mechanical work and welding, grease and oil changes and general maintenance. All oil is stored in a bunded lubricant store and averages 900 litres.

A new storage shed will be constructed in the expanded site facilities area to house up to four quarry trucks. The shed will have dimensions of approximately 6 m x 15 m.

Diesel is contained in a 40,000 litre above ground tank, which will be relocated to a fully bunded storage area within the expanded site facilities area.

3.7.5 Workforce

The proposed workforce is set out in *Table 3.7*.

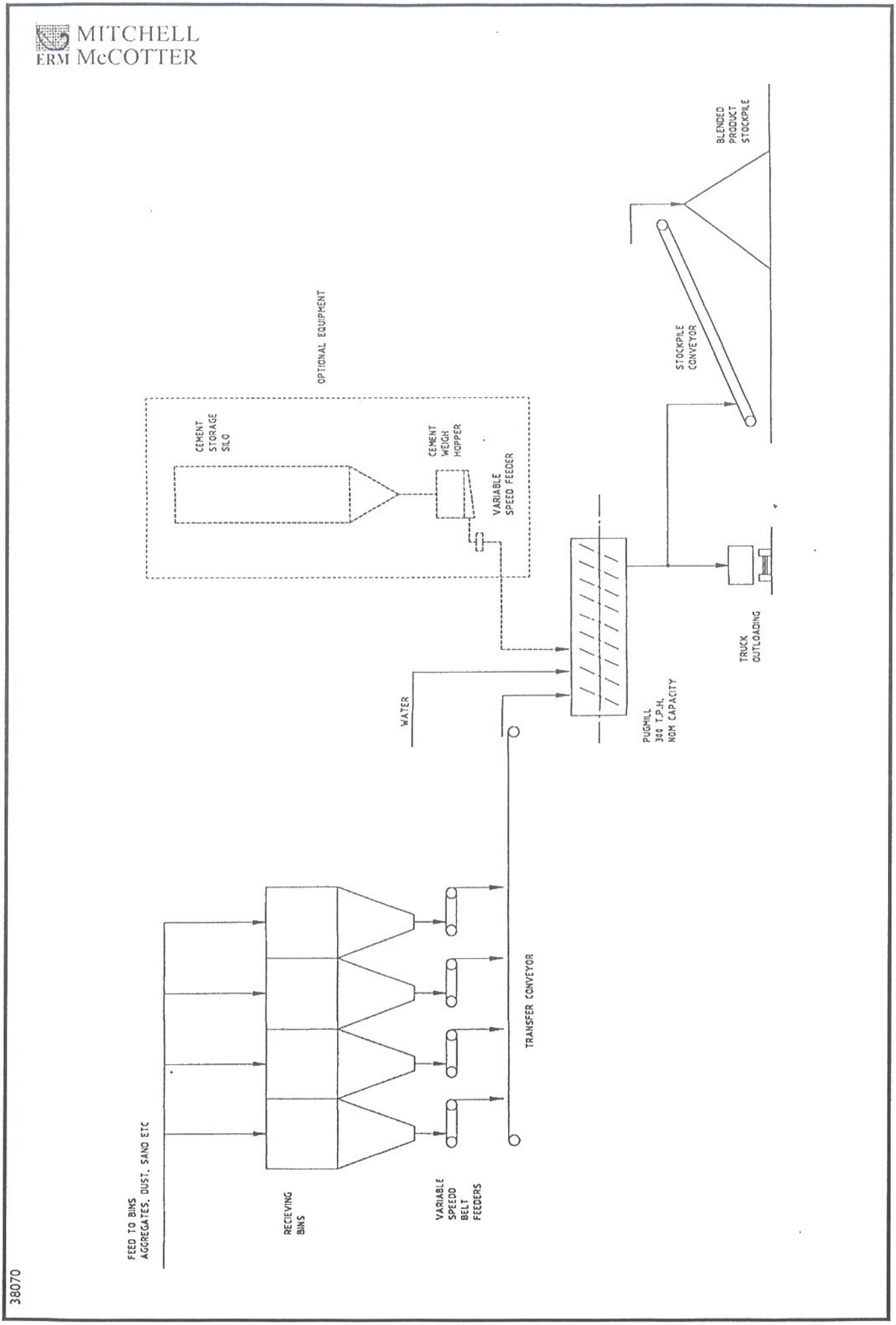


Figure 3.10 SCHEMATIC FLOW DIAGRAM FOR MOBILE PUGMILL BLENDING PLANT

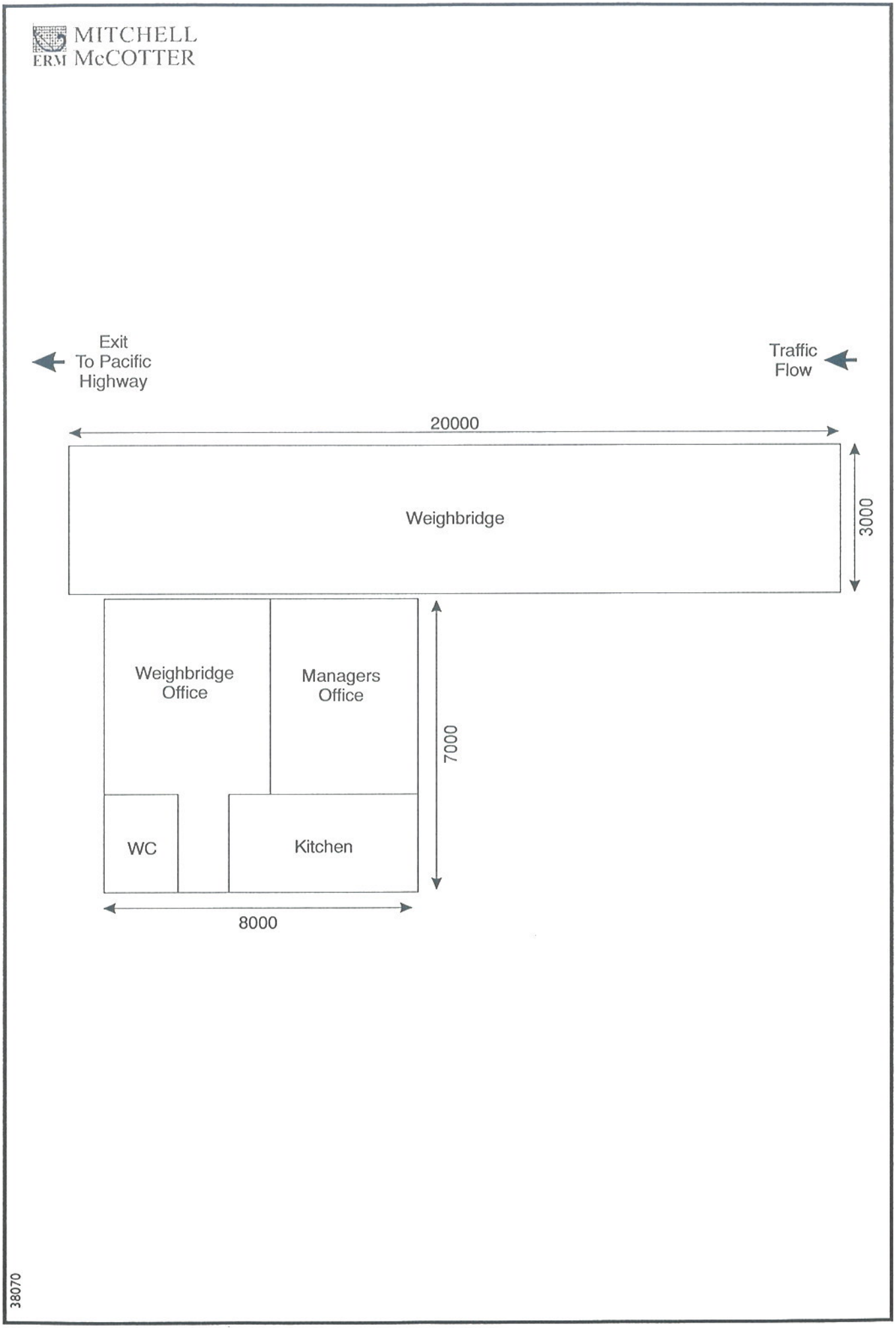


Figure 3.11 CONCEPTUAL PLAN OF PROPOSED WEIGHBRIDGE AND SITE OFFICE

Table 3.7 PROPOSED WORKFORCE

Employee	Number Required
Quarry Manager	1
Weighbridge Operator/Dispatcher	1
Yardman/Water Cart Operator	1
Processing Plant Operator	1
Sales Loader Operator	1
Dump Truck Operator	1
Face Loader/Excavator Operator	1
Truck Drivers	4
TOTAL	11

During increased production periods one additional casual dump truck operator and one additional face loader/excavator operator are likely to be employed. As indicated in *Table 3.7*, the company will be positioning four aggregate trucks and drivers at the quarry.

A significant number of local people will also be indirectly employed as drivers and maintenance contractors as well as through service industries (fuel, spare parts, etc.).

3.7.6 *Operating Hours*

Quarrying in the proposed expansion will occur between 6.00 am and 6.00 p.m. Monday to Friday and 6.00 am to 3.00 p.m. Saturdays. Ancillary operations such as refuelling, servicing and maintaining plant will be undertaken between 6.00 am and 9.00 p.m. Monday to Saturday. Whenever possible blasting will be restricted to between 9.00 am and 5.00 p.m. Monday to Friday and 9.00 am to 3.00 p.m. Saturday.

In order to supply specific contracts, operations outside normal hours may be required. In such circumstances agreement in writing by Council will be obtained prior to proceeding with such operations.

3.7.7 *Waste Management*

Small quantities of waste will be generated throughout the quarry's operational life. These include:

- domestic type refuse and workshop wastes that will be stored in approved containers and transported regularly to an approved waste disposal area; and

- sullage wastes and septic wastes from staff amenities will be discharged into the approved effluent disposal system;

3.7.8 Services

i. Power

The quarry is currently connected to the local electricity grid. Electric powered water pumps are used to provide water to the water cart.

NorthPower has visited the site to be briefed on the proposed expansion and hence identify an alternate route for the powerline servicing the quarry. The route as advised by NorthPower (A Penfold) is shown on *Figure 3.4*.

ii. Water

Potable water demands will be provided by a roof collection system from the site facility buildings and/or imported. Non-potable water uses will be provided by a system of on-site sedimentation dams.

iii. Telephone

Telephone services are available to the quarry site.

iv. Sewage

Quarry personnel will generate small volumes of domestic sewage. These will be treated and disposed on-site through an approved effluent treatment system.

3.7.9 Energy Demand

The quarry is a net consumer of energy. The company recognises the need to conserve energy in all aspects of the operation. Currently the operation uses 10,000 to 20,000 litres of diesel per month depending on production. According to records from Advance Energy (February 1999) electricity usage for the month was 11,497 kilowatt hours. As production increases, so the energy requirements will rise proportionally.

Additional diesel (8 litres per tonne of product) and electricity will be consumed when the asphalt plant is in operation.

All available measures to reduce energy usage will be utilised.

3.8 ASPHALT PLANT

It is proposed that a mobile asphalt plant capable of producing around 100 - 200 tonnes per hour will be located on-site on an as needed basis. The mobile plant would operate under a current production license with the EPA. An area 60 metres by 50 metres will be prepared for the plant components in the expanded site facilities area south-east of the existing weighbridge complex. The plant will be located in a position that is not visible from neighbouring properties or the Pacific Highway. With the nearest residence some 600 m from the site it is unlikely that the asphalt plant will be audible over the general quarry operation.

The asphalt plant will combine crushed stone that is produced on-site, with bitumen to produce asphalt. For the process, deliveries of bitumen, lime and sand will be made to the site via tankers and tip trucks. Hydrated lime or fly ash will be stored in a silo and used as filler. In addition, small quantities of toluene and methylated spirits will be used in routine laboratory testing. Front-end loaders will be used to transport materials around the site. The plant will comprise the following components:

- dryer drum unit, incorporating wet scrubber;
- filler silo;
- bitumen tank;
- hot storage trailer unit;
- cold feed trailer unit; and
- control room and portable laboratory.

Figure 3.12 shows the components and typical layout of the asphalt plant.

Minimum staff required to operate the plant will include one plant operator, one loader operator and one laboratory technician. In addition, there will be two management staff associated with the plant as well as the asphalt laying crew.

In the process, aggregates are fed into the plant. As they pass through the dryer where all moisture is driven off, the aggregates are mixed with a filler and hot bitumen to form asphalt, which then must be transported by truck to the required construction sites and laid before it gets too cold. The filler acts as a void filler,

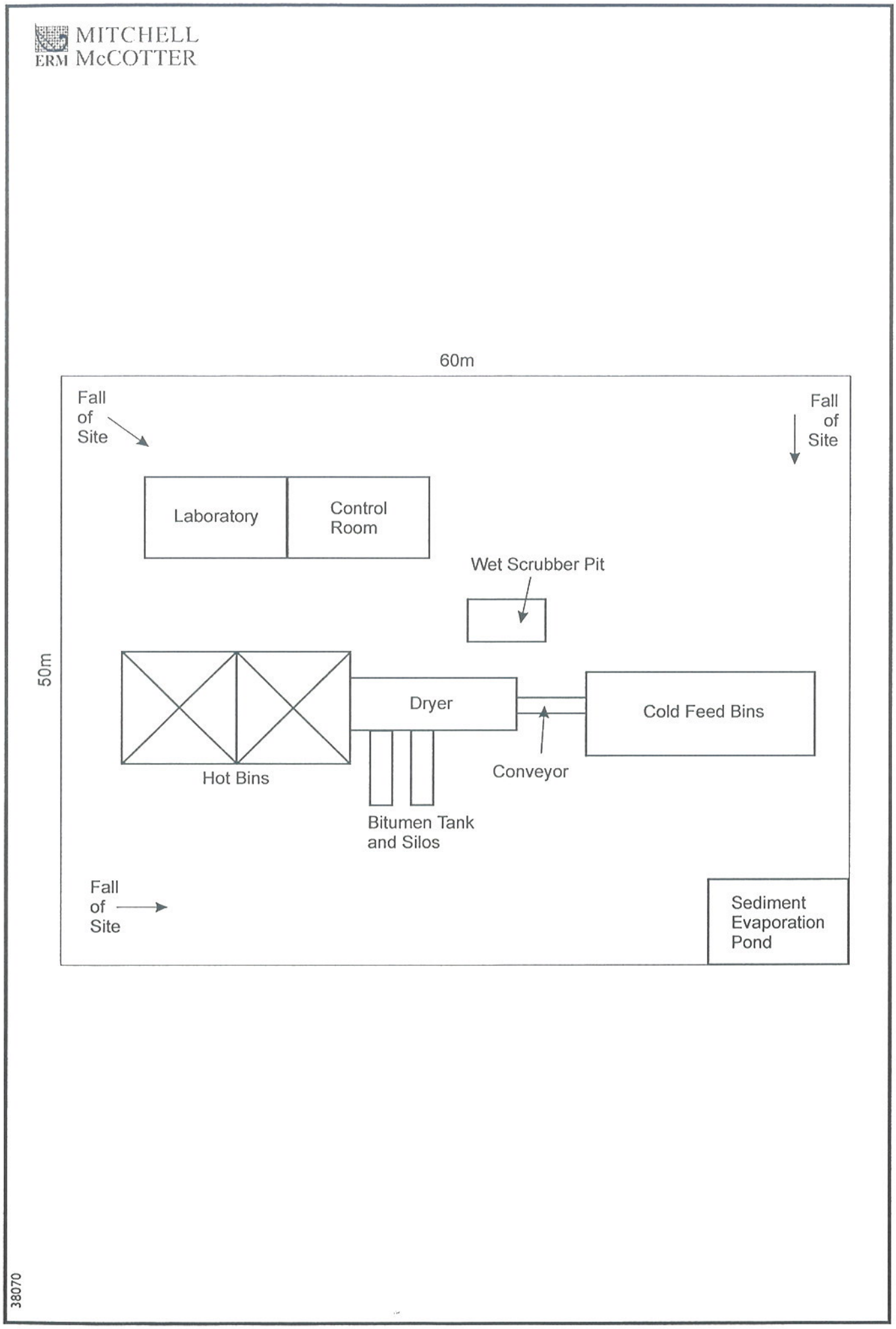


Figure 3.12 CONCEPT LAYOUT OF ASPHALT PLANT SHOWING MAJOR COMPONENTS

replacing bitumen and creating a product less likely to flow or bleed. In properly fitted trucks asphalt can be transported for over 100 kilometres.

The asphalt plant will be powered using on-site electricity rather than diesel fuelled generators. This will significantly reduce potential noise generation of the plant.

The asphalt plant stack will be fitted with a wet scrubber flow meter with an audible and visual alarm. The filler silo will have an appropriate filter bag system to control air discharge (i.e. a reverse pulse silo filling filter or equivalent). Either lime or flyash will be used as the filler. Depending on prevailing wind conditions, odours emitted from bitumen storage facilities will be adequately dispersed within a 100 metre radius of the source.

Water quality controls will include bunding of liquid storages. A wet scrubber in-ground lined interceptor pit will be constructed to trap scrubber particulate and recycle water back through the plant. Solids from the pit will be bioremediated in a clay lined cell which will be constructed as required within the site facilities area. The water recycling pit will have a minimum capacity to serve daily usage.

3.9 TRANSPORT

The quarry access road has no shared access with the public and links directly to the Pacific Highway. The markets for quarry products are located both north and south of the quarry site. Generally, traffic volumes have been split 60 percent to the south and 40 percent to the north. This split is likely to change to 50/50 once CSR's Manning River operation closes.

Road transport is the most economic and practical means by which transport requirements can be met due to the accessibility of the Pacific Highway.

3.10 SOIL AND WATER MANAGEMENT

3.10.1 Introduction

A soil and water management plan for the quarry was developed to:

- ensure adequate water supplies under most climatic conditions, and
- safeguard the integrity of downstream watercourses.

The following sections assess water management controls, erosion and sediment controls, water requirements and available water sources.

3.10.2 *Water Management Controls*

To manage the various water flows within and around the quarry, it is proposed to segregate flows of differing quality and preferentially use poorer quality water first. Water flows include runoff from undisturbed areas, the quarry, haul roads and the site facilities area.

i. Clean Water Diversion

Runoff from undisturbed areas above the quarry, site facilities area and stockpile areas will be diverted around working areas. Vegetated diversion banks will be used to divert runoff to a stable downstream location. Catchments above the working areas are generally small and diversion drains will be sized for storms with a duration equal to the catchments time of concentration and an average recurrence interval of 20 years.

ii. Groundwater

Diamond drilling into the floor of the quarry has shown the greywacke to be massive with a very low to zero porosity. No groundwater was recorded during geological investigations. Any groundwater is likely to be located in fractured material above the basement rock. This groundwater would have limited flow potential. It would dissipate quickly following blasts as it would originate from subsurface flows following recent rainfall events rather than from interception of the watertable. As the catchment is limited to the ridge to be quarried, any significant groundwater inflow to the quarry pit is expected to be negligible. Geological drilling and local experience at nearby quarries indicate that the sedimentary sequence containing the greywacke does not contain good aquifers.

iii. Storage and Sediment Control Dams

Three dams will be constructed or reconstructed to provide water supply and sediment controls for the quarry. Water from the dams will be used for dust suppression, additions to products and vehicle washing. Water will preferentially be used from the these dams before clean water dams located elsewhere on CSR's property. If these four dams have insufficient supplies then water will be pumped from the clean water dams. Further details on the sediment dams are provided in section 3.10.3.

iv. Fuel Oil Storage Area

The bunded fuel oil storage area will be bunded in accordance with Australian Standard AS1940 (Storage and Handling of Flammable and Combustible Liquids). The bund area will be covered to prevent the entry of rainfall and will have a volume of at least 110 per cent of the fuel tank volume. Its floor will be sloped to a sump with a gate valve outlet. Any fuel oil collected in the sump will be removed by an approved contractor.

3.10.3 Erosion and Sediment Controls

Erosion and sediment control will be achieved in three ways:

- collection and treatment of stormwater flows from disturbed areas;
- temporary and permanent rehabilitation of disturbed areas of high erosion potential; and
- control of soil erosion at source using suitable control measures.

The potential for erosion and sediment movement will be highest during development operations when topsoil and overburden are being stripped and stockpiled. However, there will be ongoing potential for sediment movement from the quarry working benches.

To control erosion and sediment movement the following measures will be used:

- preparation of an erosion and sediment control plan for the site will be included in the quarry environmental management plan. This will entail design and description of all erosion and sediment control structures, both temporary and permanent;
- use of sedimentation control dams;
- minimisation of disturbed areas. Quarry and ancillary area boundaries will be marked and no activity permitted outside designated areas;
- diversion of clean water from undisturbed areas around working areas;
- the installation of temporary erosion and sediment controls, such as geofabric filter devices, prior to commencement of topsoil and overburden removal;
- sequential clearing and rehabilitation of the quarry as extraction of the hardrock material proceeds; and

- the regular maintenance of erosion and sediment control structures, particularly after rainfall, to ensure their efficiency.

The quarry operation will involve the construction/enlargement of four permanent sediment control dams at the quarry site:

- one dam will be relocated and resized within the main quarry pit;
- the existing primary sediment dam for the site facilities area will be resized to cater for any projected increase in sediment loading;
- one additional dam will be constructed downstream of the proposed extension to the site facilities area; and
- one dam will be constructed downstream of the secondary stockpile area.

The proposed locations of the permanent sediment control dams is shown on *Figure* 3.4.

The dam to be located in the quarry pit will be a combined sedimentation pond and de-watering sump. The area of the quarry will gradually increase as the working face extends to the north. This dam will be progressively enlarged to ensure it has the capacity to control sediment from the maximum extent of the then current quarry operations.

The function of the dams is to catch all stormwater runoff from the disturbed areas and to minimise the concentration of fines in overflow waters.

i. Design Criteria

The design criteria for the dams are based on the procedure detailed in Chapter 6 of *Managing Urban Stormwater - Soils and Construction*, NSW Department of Housing (1998). The dams were sized based on a conservative assumption that all disturbed areas consist of Type D soils, which have more than 33% of soil material finer than 0.02 mm and more than 10 percent dispersible materials (see soil test results provided in *Appendix I*).

The design of the sediment dams provides sufficient storage capacity for quarry operational water demands including dust suppression, process needs and rehabilitation requirements. The EPA generally require the design of the sediment dams to caters for the 1 in 10 year average recurrence interval (ARI), 2 hour storm and/or provide 500m^3 of storage per hectare of catchment. Further discussions with the EPA's Technical Officer indicated that the EPA considered the NSW Department of Housing's *Managing Urban Stormwater - Soils and Construction* (1998) to be the

most recent applicable reference for sediment dam design (Shane Trengrove, pers. comm.)

Design aspects of the sedimentation ponds are discussed below.

ii. Volume Requirements

The volumetric requirements of the sediment basins were determined by following the procedures detailed in *Managing Urban Stormwater* (Dept. of Housing, 1998) for Type D soils. Parameters used in the calculations include:

- C_V - Volumetric Runoff Coefficient = 0.9
- 5-day total rainfall depth not exceeded in 80% of rainfall events = 41.1 mm
- Sediment Storage Zone Volume = 50% x Settling Zone Volume

The design characteristics of the dams are shown in *Table 3.8* below.

Table 3.8 PERMANENT SEDIMENT DAMS

Dam	Catchment Area (ha)	Minimum Volume (ML)	Runoff Storage per Hectare (m^3)	Peak Flow Retention (hours) 10 year ARI	20 year ARI
Quarry Area					
- Existing	4.7	2.6	553	0.8	0.7
- Stage 1	9.2	5.1	554	0.9	0.8
- Stage 2	13.0	7.2	554	1.0	0.8
- Stage 3	17.1	9.5	556	1.0	0.9
- Final Stage	17.6	9.8	557	1.0	0.9
Facilities Area	6.7	3.7	552	0.8	0.7
Secondary Stockpile Area	2.4	1.3	540	0.7	0.6

The calculated volumes for the sediment dams exceed the storage volume per hectare design criteria specified above. As a guide to their flow retention capacity the retention time for peak flows from storms with average recurrence intervals of 10 and 20 years is also provided. The dams will provide a minimum retention time of between 0.6 and 1.0 hour.

iii. Sedimentation Pond Management

Water from the sedimentation ponds will be utilised to satisfy non-potable quarry water demands as required. Water from the ponds will be pumped out by an electrically powered pump to the site facilities area and used for dust suppression, material processing and rehabilitation works. Excess water from the quarry pit sediment dam/sump will be pumped to the watercourse downstream of the site facilities area.

The pump inlet will be located on a floating pontoon at the end of the pond furthest from the inflow area to ensure bottom sediments are not disturbed or entrained during pumping. As an additional measure, a geofabric covered screen cage will be constructed around the pump inlet to filter out sediments coarser than 0.02 millimetres. This screen will be inspected quarterly and cleaned or replaced if necessary.

Soil test results indicate the soils in the vicinity of the quarry have a dispersion percentage ranging from 15 to 67 percent. These results indicate there is a potential for fine dispersible soils being suspended in water. Flocculation may therefore be required to settle out the suspended solids. Should water quality monitoring of the

dam identify that total suspended solids are in excess of 50 mg/L, an artificial flocculation program would be carried out in accordance with the guidelines shown in Department of Housing (1998).

3.10.4 Water Demands

Water will be required in the following areas:

i. Employee Use

Water will be required for toilet and hand basin use with smaller quantities being used for personal consumption. An average of 100 litres per person per working day has been assumed for design purposes. A workforce of 11 permanent staff and two additional truck drivers will have an annual demand of 0.25 megalitres.

ii. Process Water

Water is used in the processing plant for dust suppression. It is applied in the form of fine mist sprays. For the water balance model, it is assumed for that water is applied at a rate of 1.5 percent by weight of product throughput.

iii. Dust Suppression

Water will be required for dust suppression on internal access roads and haul roads within the quarry. The volume will vary with each stage of quarry development and the prevailing weather conditions. Demand has been conservatively estimated assuming the requirements will be 150 per cent of the pan evaporation rate per unit area.

iv. Product Moisture

Certain types of material such as road bases and other road pavement materials are required to have a moisture content of around seven percent. Quarried material is basically dry and water will be added to these products during processing. It was assumed that 25 per cent of annual production will require the addition of water.

v. Truck Washing Facilities

Mobile plant used in quarry operations will need to be cleaned as part of general maintenance and prior to servicing. Water used in vehicle washing will be treated to

remove coarse grit and oil before being recycled back into the quarry water system by discharging to the process area sediment dam. A nominal allowance of 10,000 litres a month was made to allow for water lost through evaporation and vehicle wetting.

A summary of annual water demands for key quarry intervals is shown in *Table 3.9*.

Table 3.9 ANNUAL WATER DEMANDS (MEGALITRES)

Water Use	Stage 1	Stage 2	Stage 3	Stage 4
Production (tonnes)	250,000	250,000	250,000	250,000
Potable Use	0.25	0.25	0.25	0.25
Dust Suppression	16.5	20.8	25.2	25.2
Process Water	3.7	3.7	3.7	3.7
Product Moisture	4.4	4.4	4.4	4.4
Truck Washing	0.1	0.1	0.1	0.1

3.10.5 Water Supply

Water of different qualities can be used to meet quarry demands. Drinkable quality water (potable) will be used for domestic and employee uses while poorer quality water (non-potable) will be used for all other purposes.

i. Potable Water

Potable water will be sourced from a roof collection system attached to the office and workshop buildings. During dry periods water will be brought onto site from a commercial supplier.

ii. Non-Potable Water

Non-potable demands will be supplied from on-site storages, both sedimentation and clean water dams. These will serve all non-potable water requirements for the site. Water from the storages will be pumped using an electrical pump mounted on a floating pontoon to prevent entrainment of settled sediment.

3.10.6 Water Balance Model

i. Methodology

A water balance model was used to compare quarry water demands with the volume of water which would be generated within the site. The objective of the model was to determine the magnitude of either water surplus or deficit at various stages of development under different climatic conditions.

A computer model was developed to simulate the water cycle of the quarry. Water requirements were based on the demands discussed above. Water supply was determined from rainfall runoff into the four sediment control dams.

The model assessed monthly and annual water balances for dry, average and wet rainfall years. Dry, average and wet years were defined as follows:

- dry year, an annual rainfall with a probability of exceedance greater than 90 per cent;
- average year, an annual rainfall having a probability of exceedance greater than 50 per cent; and
- wet year, an annual rainfall having a probability of exceedance greater than ten per cent.

Analysis of available rainfall records at Taree show that a dry year has an annual rainfall of 750 mm, an average year 1,132 mm and a wet year 1,699 mm. To simulate real rainfall conditions years with annual rainfalls close to the statistical requirement were used. Representative years were 1936 (annual rainfall 751.4 mm), 1981 (annual rainfall 1,148.7 mm) and 1962 (annual rainfall 1,692.4 mm) respectively.

Evaporation rates are relatively constant under different climatic conditions and average evaporation data were used.

To enable assessment of the quarry's water balance at various stages of development the model was run under the following conditions:

- at stages 1, 2, 3 and 4;
- for each year under the three rainfall conditions; and
- at the start of each year the dams were 50 per cent full.

ii. Results

The model was used to prepare estimates of:

- monthly and annual runoff from the dam catchments;
- monthly and annual demands;
- any overflows from the dams; and
- any deficits in the quarry's water supply.

Appendix J contains an example of the model results for Stage 1 of the quarry production while *Table 3.10* summarises the results for all years and climatic conditions considered.

Table 3.10 QUARRY WATER BALANCE (MEGALITRES)

Stage	Annual		Annual		Peak Monthly	
	Demand	Runoff	Deficit	Discharge	Deficit	Overflow
Stage 1 - Dry	29.8	44.7	0.0	14.9	0.0	5.2
- Average	29.8	68.4	0.0	38.5	0.0	14.1
- Wet	29.8	100.7	0.0	70.9	0.0	24.5
Stage 2 - Dry	35.2	51.3	0.0	17.7	0.0	6.2
- Average	35.2	78.3	0.0	45.6	0.0	16.7
- Wet	35.2	115.4	0.0	83.9	0.0	29.0
Stage 3 - Dry	40.7	62.0	0.0	23.0	0.0	7.6
- Average	40.7	94.8	0.0	56.6	0.0	20.2
- Wet	40.7	139.7	0.0	102.7	0.0	35.0
Stage 4 - Dry	40.8	63.3	0.0	24.1	0.0	7.8
- Average	40.8	96.8	0.0	58.5	0.0	20.7
- Wet	40.8	142.7	0.0	105.5	0.0	35.8

The water balance model demonstrates that the system of dams is capable of satisfying the quarry's water demands under the climatic conditions considered. Overflows will occur from the site under dry, average and wet rainfall conditions.

3.11 LANDSCAPE AND REHABILITATION

There are two primary aims of the landscape and rehabilitation plan. Initially the plan will be introduced to stabilise disturbed areas, mitigate any loss of visual amenity as a result of quarry operations and enhance the wildlife corridor to the east of the quarry pit. The landscape and rehabilitation plan will also outline the revegetation of quarry operations including the site facility area and stockpile areas.

The quarry area will be progressively rehabilitated to produce a stable landform which is compatible with the surrounding area. Topsoil and weathered overburden will be stockpiled and placed progressively on completed quarry areas with the revegetation program to establish endemic plant communities.

Landscaping and rehabilitation of the proposed expansion will be undertaken as described below, however this only provides an outline of the rehabilitation process.

A detailed landscape and rehabilitation plan will be included in the quarry environmental management plan. *Figure 3.13* shows the principle areas that will be rehabilitated during the life of the quarry.

3.11.1 Landform Design

Landform design will be a result of the quarry extraction design which includes

- terminal bench width of half the height; and
- final face angle of 75°.

The resulting quarry void will have the following physical dimensions:

- quarry rim approximately 1,000 m x 500 m;
- benches developed at 12 metre heights to RL 50;
- benches developed at 15 m heights from RL 50 to RL 20; and
- quarry floor approximately 750 m x 100 m.

3.11.2 Topsoil Management

Although topsoil resources in the quarry area have good rehabilitation properties and have low to moderate erosion potential, the use of stockpiled weathered overburden may be necessary to supplement the limited topsoil stocks for rehabilitation activities. Weathered overburden has been used successfully as suitable material for revegetation of quarry sites (EPA, 1995). This material potentially requires additional treatment to increase organic matter content and nutrient status. Whenever necessary, topsoil products will be imported to supplement site topsoil and overburden in order to ensure ongoing success of the rehabilitation program.

3.11.3 Revegetation

The aim of the revegetation program at Jandra Quarry is to rehabilitate the quarry site with indigenous species to conform with existing vegetation. As the quarry is to be sequentially developed, the immediate objectives will be:

- to minimise visual impact;
- to control runoff and therefore prevent erosion and siltation; and

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Revegetated wildlife corridors

Revegetated benches - stage 1

Revegetated benches - stage 2

Revegetated benches - stage 3

Revegetated stockpile and overburden areas

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Figure 3.13 REHABILITATION PLAN

- to re-establish native flora for the above listed reasons as well as to provide habitat for native fauna and flora species. This point incorporates the revegetation of the semi-cleared remnant of vegetation to the east of the study area, as well as the provision of aquatic vegetation and sheltering resources surrounding dams on-site to act as compensatory habitat for amphibian species (refer to *Appendix L* and the EMP for further details).

The adopted revegetation programs include consideration of site preparation, plant species and maintenance. Species planted will be endemic with seed and other propagation material to be collected from surrounding undisturbed areas. This will ensure that the genetic variability of the site is maintained. Ideal planting time is March to September and preferably after good rain.

The main structures that will require revegetation include:

- temporary and permanent bunds
- overburden stockpiles;
- haul roads;
- site facility and stockpile areas; and
- quarry benches.

i. Revegetation of Bunds and Overburden Stockpiles

As the bunds and overburden stockpiles will consist of excavated fill material covered with re-spread topsoil, the final structure should not be heavily compacted. Hence, decompaction in the form of deep ripping, should not be a prerequisite for planting. Care should be taken to avoid compaction of the bunds during their construction. Keeping heavy vehicles off bunds (as much as possible) during construction, should help reduce compaction. Generally, the less the compaction of soil, the better the water penetration and plant growth (easier root penetration). As soon as they are formed, temporary bunds and overburden stockpiles will be planted with quick growing native grasses. Permanent bunds such as the visual bund currently shielding the secondary stockpile area from Pacific Highway traffic will be grassed and planted with trees.

ii. Revegetation of Haul Roads and Hardstand Areas

Revegetation of haul roads and hardstand areas will be required at the end of the quarrying operations. The areas will initially be deep ripped to aid in water ingress

and retention of the final landscape. Overburden material previously stockpiled will then be spread over the areas to provide a suitable deep bed for revegetation. Topsoil will be spread on the overburden and planted out with grasses and saplings of endemic trees and shrubs. Additional local seed will also be thrown over the topsoil to aid in regeneration of native species.

iii. Revegetation of Quarry Benches

Rehabilitation of the quarry benches will be undertaken progressively. Those benches above the self draining elevation (approximately RL 50) will be revegetated. Benches of the lower quarry void will be stabilised.

Generally, site preparation and planting details for bunds and hardstand areas apply to benches. Variations to these details where applicable to the rehabilitation of benches are outlined below.

Benches should slope backwards towards the upright face. The base rock on all benches should be partially fractured to facilitate root development and the subsequent stability of taller trees. Care must be taken when depositing topsoil in benches to avoid undue compaction. Immediately behind the rim of the quarry disturbed areas will be grassed by hand casting. A schematic representation of quarry bench rehabilitation is shown in *Figure 3.14*.

3.11.4 End Land Use

Once extraction has been completed, the quarry will be rehabilitated using the methods described above. Benches of the lower quarry void will be stabilised. Rehabilitation of the upper quarry area will provide similar vegetation communities and fauna habitats, as previously occurred over the site. The establishment of a dense shrub understorey in the site facilities area will be planned to function as a sustainable ecosystem which reflects the natural ecology of the area.

A final void in the order of 1 to 2 million cubic metres is an outcome of the proposed operation. As the life of the extractive resource is expected to be a minimum of 66 years and there is further potential to expand the operation within the greywacke resource, a detailed evaluation of end land use has not been undertaken. However, post extraction uses are seen as being limited to landfill at this stage.

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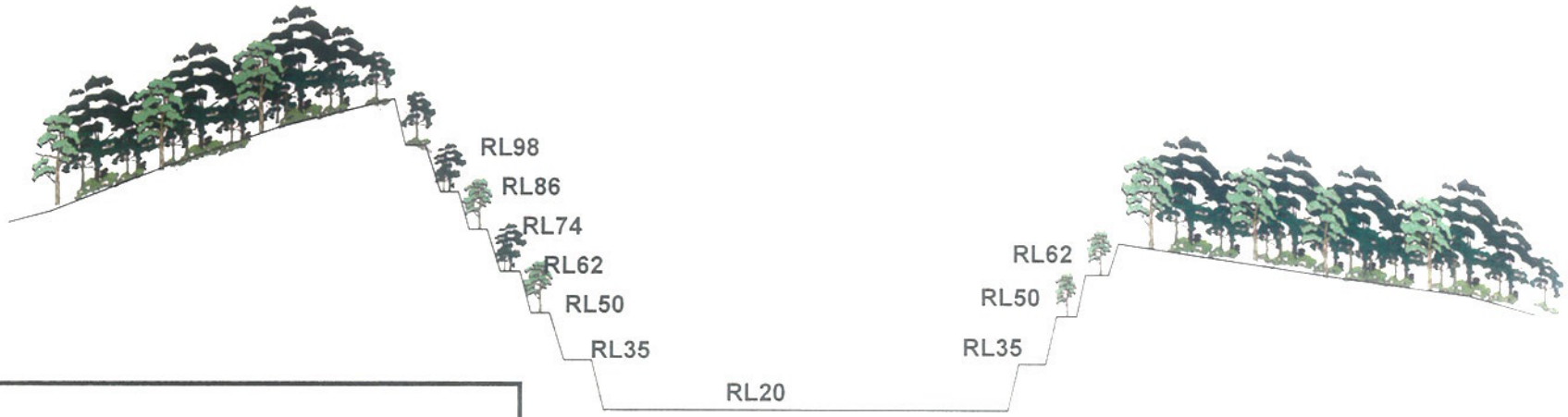

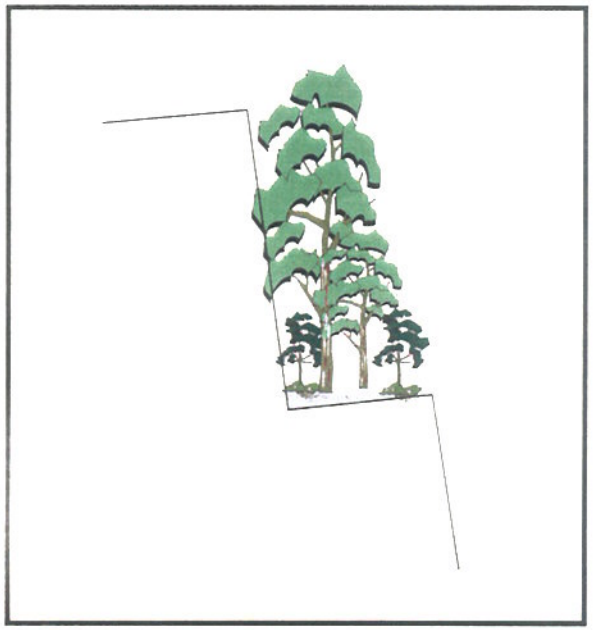

Figure 3.14 CONCEPTUAL ELEVATION VIEW OF QUARRY BENCH REHABILITATION

3.12 SAFETY AND HEALTH

3.12.1 Quarry Operations

CSR places a great emphasis on safety and has a comprehensive safety program that applies to all sites and involves risk management, measuring safety performance, safety communication, compliance audits, safety training and a shared responsibility for safety and health in the workplace for managers and CSR staff. A safety manual will be prepared for operation of the extended quarry and updated as required. This will include provisions on all aspects of CSR's operations including site induction processes, staff health and safety training, incident reporting and management procedures and drilling and blasting procedures.

The following safety factors will be continued during the operation of the quarry:

- visitors to the quarry will be required to participate in a site safety induction;
- employees will receive safety inductions, ongoing job training and work instructions;
- a safety fence will be installed along the ridge top to prevent access to the top of the quarry faces;
- safety signs will be displayed where required providing instructions to staff on safety procedures. These will also indicate the requirement for personal protective equipment in specific site areas;
- handrails and proper stairways are currently in position at the plant. These will be fully maintained for the life of the plant;
- traffic management procedures have been set out in the Safety Manual and visually displayed on site. These include marked lanes and signage where vehicles use is permitted, associated pedestrian areas and areas of restricted access;
- safety aspects of blasting will be set out in the Safety Manual. These will include requirements for notifying site personnel and neighbouring sites, and emergency response procedures; and
- rock being quarried has approximately 25 percent free silica. Testing of dust generated during crushing has shown that constant exposure to high dust levels could cause silicosis. Current dust control measures are keeping the exposure of site personnel to below the level where there is a potential for the disease to develop. Efforts to reduce the already acceptable dust exposure

levels, in the form of greater water application via fine misting sprays, dust extraction and other engineering controls are continually in progress.

3.12.2 *Neighbouring Properties*

The proposed eastern extension of the quarry excavation will finish close to the southern property boundary. The neighbouring property to the south, Lot 10 DP790056, is owned by Youth Care and Life Style Centre Incorporated (YALA).

As shown in *Figures 3.7, 3.8* and *3.9*, quarry operations will occur close to the southern boundary at various times during Stages 2, 3 and 4. The quarry excavation will be closest at RL 86 and will finish approximately 15 metres from the boundary in the area near where the boundary steps to the south. A safety fence will be erected along the top of the quarry excavation in this area.

YALA currently have development approval to commence youth care and life style programs similar to their operation at Delhuntie Park at Trafalgar East in Victoria. These activities include outdoor adventure and personal development programs which are to be conducted at various locations on the YALA property including the area close to the step in the southern boundary of the property with CSR.

The close proximity of the CSR's proposed quarry operations to the proposed YALA activities during Stages 2, 3 and 4 requires a formal agreement that will allow both operations to coexist without compromising safety.

To this effect, the formulation of a formal coexistence agreement between CSR and YALA is currently in progress. Progress to date is as follows:

- a site meeting was held at Jandra Quarry in July 1998 between CSR and YALA representative to discuss:
  - CSR's proposed quarry expansion;
  - YALA's planned development of a youth care and life style centre;
  - CSR's requirements for a 'zone of exclusion' that would ensure the safety of persons when blasting within the proposed eastern extension of the quarry in the vicinity of the step in the southern boundary;
  - YALA's requirements relating to proposed youth care and life style centre activities, particularly those within the proposed 'zone of exclusion; and

- the way forward - the process for formulating a formal coexistence agreement;

- a representative from CSR visited the existing youth care and life style centre operation in Victoria to assist in understanding YALA's requirements for consideration in the proposed agreement

- a draft of the proposed formal agreement has been completed by CSR and is currently being considered by YALA; and

- a non-binding letter of intent has been signed by both parties to indicate the intention to enter into a formal coexistence agreement. A copy of this letter is provided as *Appendix F*.

JANDRA QUARRY

EXTENSION

CSR

4 INTERACTIONS WITH THE PHYSICAL ENVIRONMENT

Chapter 4

INTERACTIONS WITH THE PHYSICAL ENVIRONMENT

4.1 CLIMATE

Meteorological data has been compiled from the nearest official meteorological station at Taree, approximately 18 kilometres from the study area. The Taree district is located in the sub-humid temperature zone where the climate is influenced by topography, latitude, the local differences in altitude, the proximity of the ocean and the effect the ocean has on temperature and precipitation patterns.

4.1.1 Rainfall and Evaporation

Mean annual rainfall of the area is 1,183.9 millimetres. Rainfall is seasonally distributed with a late summer/early autumn peak. February and March are the two wettest months, with a mean monthly rainfall of 138.4 and 149.3 millimetres respectively. Rainfall is least from July to September with the lowest mean monthly rainfall being 36.5 millimetres in August. In winter the westerly influences bring most of the rain. The annual rainfall distribution characteristics are illustrated in *Figure 4.1*.

Mean daily pan evaporation rates range from 1.8 to 2.8 millimetres per day during the winter months, increasing to between 5.3 and 6.2 millimetres in summer.

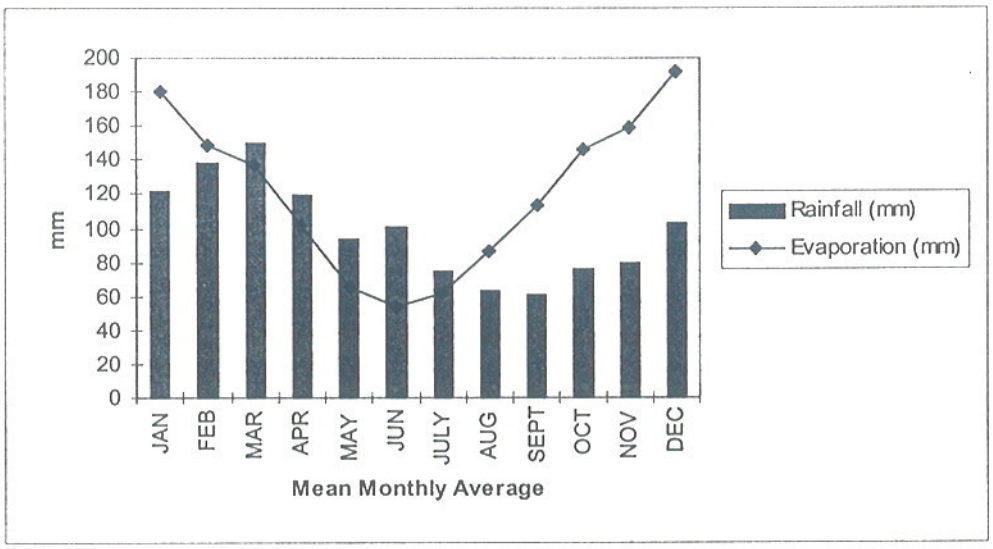

Figure 4.1 ANNUAL RAINFALL DISTRIBUTION

4.1.2 *Temperature*

Figure 4.2 shows the mean daily temperatures recorded at Taree. The highest temperatures are reached in December, January and February, when the mean maximum temperatures are 28.3°C, 28.8°C and 28.4°C respectively, while the mean minimum temperatures of these months is approximately 17°C. The lowest maximum temperatures are recorded during July, with the mean being 18.3°C, while the lowest mean minimum temperature is recorded in July when it reaches only 5.8°C.

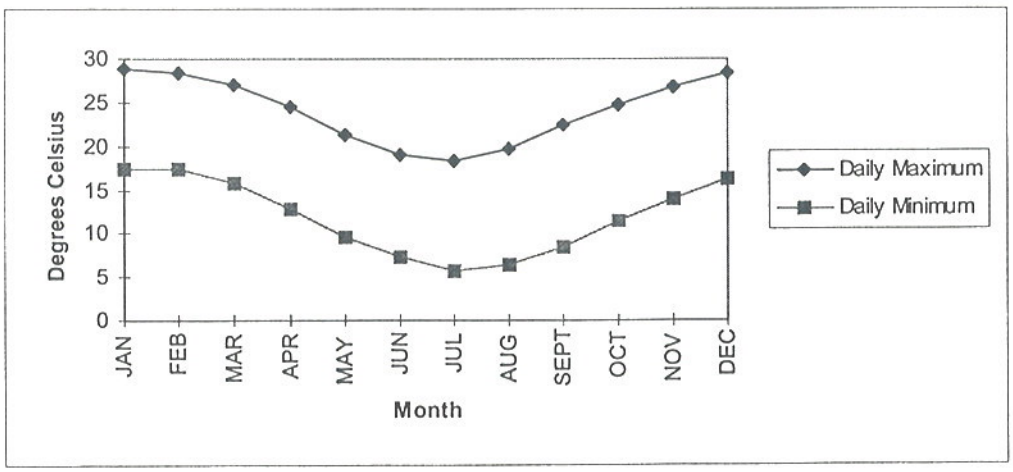

Figure 4.2 MEAN DAILY TEMPERATURE

4.1.3 Wind

Wind patterns vary with the time of day as well as seasonally. During summer, morning winds are erratic, however they generally originate in the west, with the wind speed typically being less than 10 metres per second, as well as sea breezes from the north-east, again being less than 10 metres per second. In the afternoon, the winds are predominantly sea breezes from the south-east and are typically less than 10 metres per second.

During autumn, morning offshore winds are typically less than 15 metres per second from the west. In the afternoon, south-westerly winds prevail and rarely exceed 15 metres per second.

In winter, offshore westerly winds predominate in the morning. Wind speed generally reaches a maximum of 18 metres per second. In the afternoon, the winds are predominantly offshore and are generally less than 18 metres per second.

In spring, morning offshore winds are typically less than 10 metres per second from the west. In the afternoon the winds are predominately sea breezes from the south-east and are typically less than 10 metres per second.

4.2 SOILS, LANDFORM AND EROSION

4.2.1 Topography and Landform

The study area can be divided into two main topographic units being the gently undulating and the steep hilly terrain. The slopes range from four degrees on the lower elevations to approximately 45 degrees on the upper slopes (see *Figure 4.3*).

To the north and west, the landscape displays similar topographical features as the study area. These areas are moderately to heavily timbered. To the south and east, the foothills give way to gently undulating coastal plains. These plains have been extensively cleared and are predominantly utilised for cattle grazing. Only small remnants of native forest remain.

The elevation of the study area varies from 20 metres AHD at its lowest point to 115 metres AHD at its highest. A secondary peak (100 metres AHD) occurs approximately 350 metres east of the site's highest point. Between the spurs that extend northward from these two high points lies the existing quarry pit.

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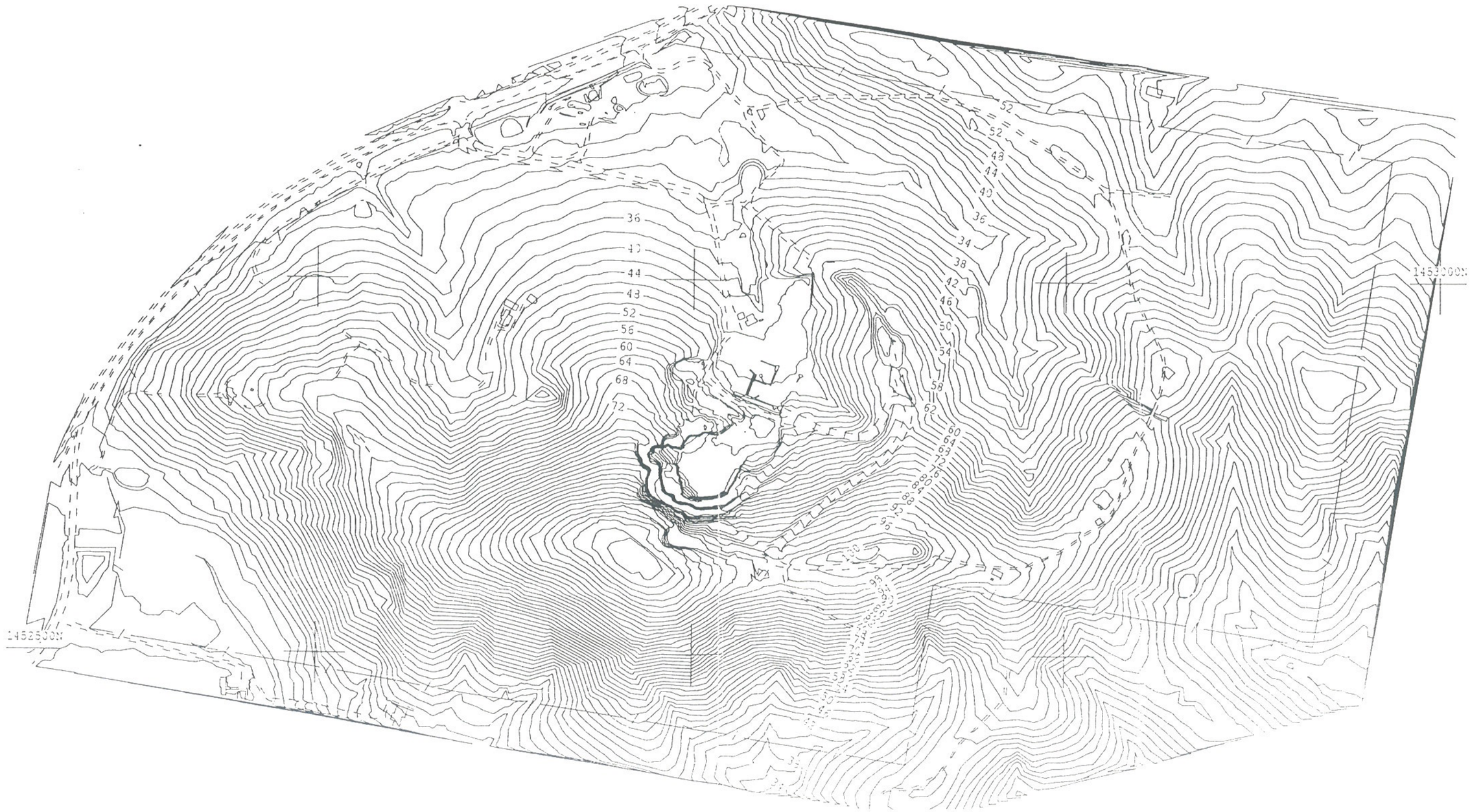

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Figure 4.3 EXISTING SITE TOPOGRAPHY

4.2.2 *Soils*

Soil parameters that are relevant to the proposal include:

- suitability for rehabilitation - not all soil material is suitable for rehabilitating disturbed areas. The suitability of the available soils for this purpose has been assessed by both field and laboratory analysis; and

- erosion potential - the implications of exposing the soil to erosive forces have been examined. This has been determined from observations in the field and following laboratory analysis.

Site assessment was undertaken during which existing cuttings were inspected and the profiles from three soil bores were examined (see *Figure 4.4*). Soil samples from two soil horizons in each bore hole were collected and taken for analysis. (total of six samples). The soil overlying the study area was found to have a moderate erosion potential, being mildly to moderately dispersive. Generally, consideration must be given to erosion control over the site. The analysis also indicates the soils have good rehabilitation potential. The results of the laboratory analysis are contained in *Appendix I.*

Generally, the topsoil layers were found to be suitable for rehabilitation. The topsoil can be used for revegetation purposes subject to the following factors:

- *depth of stripping*: generally only the surface soil to a maximum depth of 60 centimetres (and even less at certain sites) is suitable for direct transfer to rehabilitation areas. Soil below this depth is less suitable due to high rock content and may require additional treatment to increase its organic matter content and nutrient status prior to supplementing the topsoil stocks; and

- *stockpiling*: the structure of strippable topsoil material, while good in a natural state, is often dependent on the existing root mass holding the solum together. Therefore, it will be necessary for this organic matter to be retained within the soil during the stripping operation and for stockpiled materials to be sown with suitable cover crops to reduce the leaching of nutrients, and to enhance the retention of organic matter and the subsequent binding effect of the root mass.

4.2.3 *Contamination Potential*

Potential contamination sources from quarry activities include fuel, chemical and lubricant storages, fuel or oil spillage, pre-coated and asphalt raw materials and products and the asphalt plant wet scrubber water and collected particulate. All these sources will be located within contained hardstand areas.

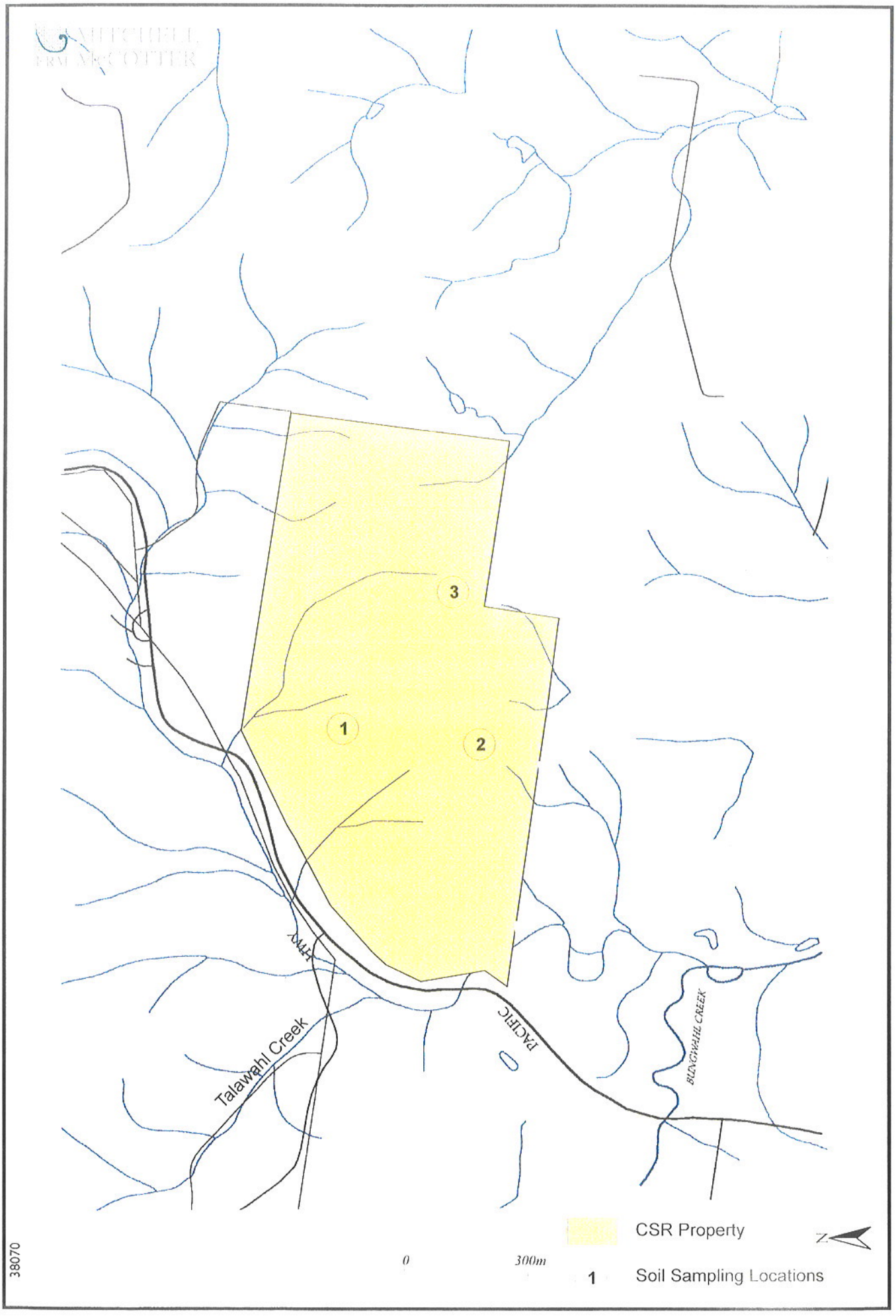

Figure 4.4 SOIL SAMPLING LOCATIONS

Many of the mitigation measures for protection of surface water quality detailed in Section 4.3.3 below are also applicable for the prevention of soil contamination. In addition, solids from the wet scrubber interceptor pit will be bioremediated on-site in a clay-lined area. Remediated solids will be tested prior to disposal to ensure they meet specific criteria for the intended disposal method. Applicable criteria include:

- disposal at solid waste landfill - Environmental Guidelines Assessment, Classification and Management of Non-Liquid Wastes (EPA, 1997); and
- incorporation into quarry overburden stockpiles - Guidelines for the NSW Site Auditor Scheme (EPA, 1998).

4.3 SURFACE AND GROUNDWATER

4.3.1 Surface Waters

i. Catchment Description

The existing quarry and site facilities area is located at the head of a minor creek line that flows northward crossing the Pacific Highway before joining a creek that flows south-west to Talawahl Creek. The catchment upstream of the confluence of the two streams has an area of approximately 48 hectares. Talahwahl Creek flows to Bungwahl Creek and thence to the Wallamba River. The existing operation includes a disturbed area of approximately 7.5 ha including the existing 3 ha quarry pit.

The proposed extension increases the disturbed areas primarily within the same creek catchment currently affected by the operation. The quarry extension will result in minor disturbances to ridgetops above minor creek lines to the west and south of the site. The upper most section of another minor creek line will be impacted during the eastern most extension of the quarry. This latter creek has two small instream dams and joins the creek line that originates in the existing quarry area prior to the Pacific Highway crossing. The proposed extension will result in a total area disturbed of approximately 23.8 ha, including the 17.3 ha quarry pit, 4.6 ha site facilities area, 0.7 ha secondary stockpile area and approximately 1.2 ha of access and haul roads etc.

The surface water drainage system is shown in *Figure 4.5*.

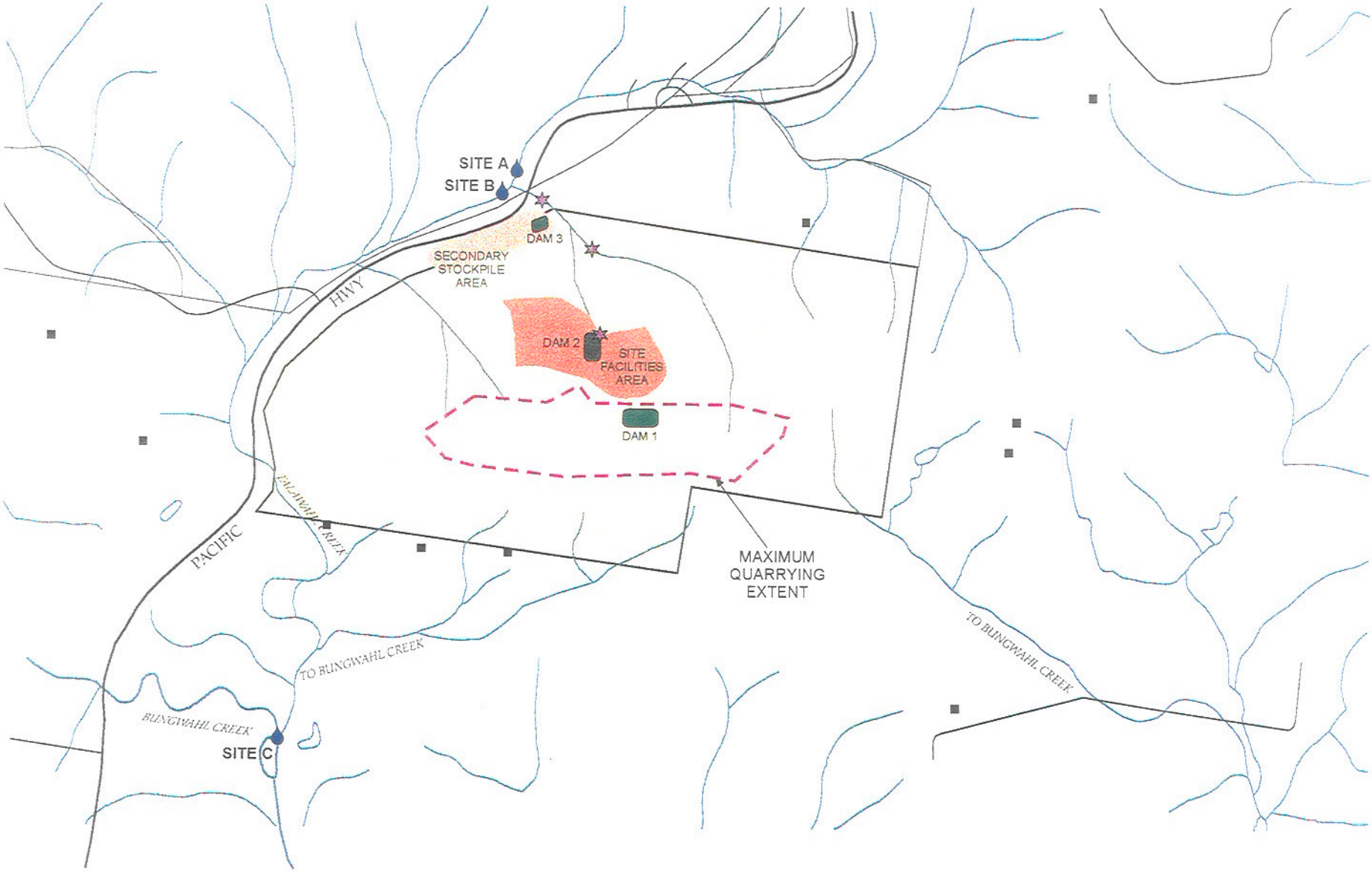

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Figure 4.5 WATER QUALITY MONITORING AND SEDIMENT DAM LOCATIONS

ii. Surface Water Quality

No detailed data is available describing water quality in the surrounding creeks of the local catchment. During the EIS investigations water samples were obtained at three locations, as shown in *Figure 4.5* and described below:

- minor creek west of the Pacific Highway, upstream of its confluence with the quarry sourced creek line (Site A);
- minor creek west of the Pacific Highway downstream of its confluence with the quarry sourced creek line (Site B); and
- at the confluence of Talawahl Creek and Bungwahl Creek (Site C).

Two sample sets were collected representing the catchment in a wet and dry state. The samples were collected in relatively high and moderate to low flow conditions respectively. The results of the water quality analysis is summarised in *Table 4.1.*

Table 4.1 RESULTS OF WATER QUALITY ANALYSIS

	Wet Catchment			Dry Catchment		
Sample	Site A	Site B	Site C	Site A	Site B	Site C
pH	6.9	6.9	6.9	6.6	6.4	6.7
Dissolved Oxygen (mg/L)	3.0	5.4	5.9	5.8	5.0	8.4
Salinity1 (uS/cm)	266	375	303	1,275	1,859	873
Suspended Solids (mg/L)	5.0	8.0	2.0	14.0	3.0	5.0
Oils/Grease (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Notes: 1. Salinity is measured as electrical conductivity in units of micro-siemens per centimetre.

The water quality results indicate the creek water sampled was of good quality. The results indicate there was no noticeable effect of the quarry on the samples collected. Low dissolved oxygen levels may be attributed to the samples being collected early in the morning when diurnal oxygen levels are at their lowest.

Water quality analysis has also been carried out at various locations around the existing quarry. Samples were collected during various catchment conditions over the period 1997 - 1998. A summary of the results are given in *Table 4.2* below.

Table 4.2 QUARRY WATER MONITORING RESULTS

Measurement Locations	pH			Non-Filterable Residue (mg/L)		
	Min	Max	Average	Min	Max	Average
Site Facilities Dam	6.6	8.2	7.2	20.8	144	81.1
Clean Water Dam	6.1	7.0	6.6	15.8	67.0	38.2
Downstream Creek at Property Boundary	6.6	7.4	7.0	19.4	59.0	37.2

The results show that pH is within the range recommended for fresh waters (6.5 to 9.0), based on the ANZECC (1992) *Water Quality Guidelines for Fresh and Marine Aquatic Ecosystems.* The non-filterable residue (NFR or suspended solids) values average between 37 and 81 mg/L, compared with the ANZECC (1992) criteria of 50 mg/L for suspended solids in fresh aquatic ecosystems. The results indicate that significant peaks in the NFR values are experienced in the site facilities sediment control dam and that specific sedimentation management measures such as hand casting of flocculent will be required. Nevertheless, the results for the creek at the property boundary downstream of the sediment dams indicate that generally the NFR levels are within the ANZECC criteria.

4.3.2 *Groundwater*

The existing quarry is not subject to groundwater inflow and no groundwater was recorded during geological investigations. Any groundwater is likely to be located in fractured material above the basement rock. This groundwater would have limited flow potential as it would originate from subsurface flows following recent rainfall events rather than from interception of the watertable. As the catchment is limited to the ridge to be quarried groundwater inflow is expected to be negligible.

4.3.3 *Impacts*

i. Surface Waters

Potential impacts of the proposed development on surface waters are degradation of water quality in downstream watercourses and/or variation to the volume of water discharged from the site.

Currently, no process wastewater is generated by the quarry. The only potential change to downstream water quality would be generated by sediments or hydrocarbons leaving the site. Without adequate control, sediments have the

potential to increase turbidity in downstream waters, thereby increasing sedimentation. Hydrocarbons are located as point sources (e.g. fuel storage) and can be easily contained using appropriate mitigation measures.

Existing sediment and erosion control measures at the quarry have shown to be generally effective in controlling sediment movement. All runoff from disturbed area due to the proposed expansion will be directed to the existing and proposed additional sediment controls. Provided the capacity of the sediment controls is not exceeded, they are regularly monitored to identify if flocculation is required and they are maintained in correct operating order, the proposed extension will not have a significant effect on water quality in downstream watercourses.

The quarry is located in the upper catchment of a minor creek and as such flow volumes at the site provide only a minor contribution to the flows in Talawahl and Bungwahl creeks. The proposed extension will result in changes to the volume of runoff leaving the site as water collected in sedimentation dams will be used on-site for dust mitigation and to increase product moisture levels. However, the system of sedimentation dams has been designed such that even in dry years (an annual rainfall year with a probability of exceedance greater than 90 percent) there will be overflows into the downstream watercourses (see Section 3.10.6).

ii. Groundwater

The only potential effect on regional groundwaters would be a loss of groundwater input from rainwater infiltration. Quarry operations would not prevent such infiltration occurring although there may be a decrease in the infiltration rate due to increased runoff from working areas of the quarry.

Currently any intercepted subsurface flows are directed into the existing sedimentation ponds that overflow into the creek downstream. This will continue for the proposed expansion, however, once the quarry becomes non self draining, ie. floor level below RL 50, any excess subsurface flows above quarry demands will be collected in a sump and pumped into the downstream watercourse.

There will be no significant effects on regional groundwaters as a result of quarry operations.

iii. Asphalt Plant, Pugmill and Pre-coating Operations

The operation of an asphalt plant, pugmill and pre-coating plant has the potential to degrade surface water quality. Sources of potential contaminated runoff from the asphalt plant sites include:

- movement of processed material within the stockpile area;
- asphalt or hotmix spills;
- spill/leakage of admixture (lime, cement, flyash); and
- fuel or oil spills.

It is standard practice for these types of processes to prepare specific areas to a suitable standard to mitigate against the potential for soils and water contamination. In the case of the asphalt plant it will be situated on a specially constructed hardstand pad raised slightly above the surrounding site facilities area. The raised pad will ensure that runoff from surrounding areas is diverted around the asphalt area. A small sediment/evaporation pond lined or constructed with impervious soils will be constructed to collect and treat runoff from the pad. Secondary containment is provided by the site facilities sediment dam.

The pugmill and pre-coating plant will be located on a concrete pad also within the expanded site facilities area. Runoff around and from the pad will be managed as for the asphalt plant. In addition, runoff from the pre-coating area will be directed through a grease trap as 'pre-coat' floats on water.

Through appropriate site preparation and implementation of relevant mitigation measures detailed below the operation of the asphalt plant, pugmill and pre-coating facility will not significantly impact on downstream water courses.

4.3.4 *Mitigation Measures*

i. General Quarry Activity

A soil and water management plan incorporating the measures detailed in Section 3.10 will be included in the quarry environmental management plan. The soil and water management plan will address the following principles:

- the use of sediment control dams;
- minimisation of disturbed areas. Quarry and ancillary area boundaries will be marked and no activity permitted outside designated areas;
- diversion of clean water from undisturbed areas around working areas;
- the installation of temporary erosion and sediment controls, such as geofabric filter devices, prior to commencement of topsoil and overburden removal;