

# ENVIRONMENTAL IMPACT STATEMENT

for DIXON SAND  
at MAROOTA

## Volume 1

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# **EXTRACTION, REHABILITATION AND PROCESSING OF CONSTRUCTION SANDS, LOTS 196 AND 29, DP 752025 NORTH MAROOTA, NSW**

## ***VOLUME 1:*** ***ENVIRONMENTAL IMPACT STATEMENT*** *For* **DIXON SAND (PENRITH) PTY LTD**

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**FORM 2****SUBMISSION OF ENVIRONMENTAL IMPACT  
STATEMENT (EIS)**

Prepared under the Environmental Planning and Assessment Act  
1979 – Section 78A (8)

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**Development  
Application**

Applicant Name:

DIXON SAND (PENRITH) PTY LIMITED ACN 002 278 686

Applicant Address:

PO Box 148  
Penrith NSW 2751

Address of Development:

Lots 29 &amp; 196, DP 752025 North Maroota NSW

Proposal:

Extraction, Rehabilitation and Processing of Construction Sands.

**CERTIFICATE**

Signature



I certify that I have prepared the contents of this Statement and to  
the best of my knowledge

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

Stephen Smith  
June 1, 1999



## ***Volume 1***

### **EXTRACTION AND PROCESSING OF CONSTRUCTION SANDS**

**LOTS 196 and 29, DP 752025  
NORTH MAROOTA OPERATION, NSW**

### ***ENVIRONMENTAL IMPACT STATEMENT***

***June 1999***

***FOR***

### **DIXON SAND (PENRITH) PTY LTD**

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Permission is acknowledged from the Central Mapping Authority, NSW to reproduce the maps used as the bases for various figures.

The assistance of Lyall & Macoun Consulting Engineers in the preparation of the Draft Document.



## ***Preface***

*This Environmental Impact Statement has been prepared and presented to review the completion of sand extraction and the rehabilitation of the existing site, comprising Lots 196 and 29, DP 752025, Old Northern Road, Maroota.*

*Extraction of sand from Lot 196 was commenced by the company Etra Pty Ltd, operating as PF Formation, in the early 1980s.*

*In 1992 Dixon Sand (Penrith) Pty Ltd took over the operating rights. Dixon Sand continued operations until December 18, 1998, under a consent that was issued in November 1993.*

*That consent lapsed on December 1, 1998. An application to extend the consent for a 12 month period was rejected by Council in October 1998.*

*Following a Class 4 hearing in the Land and Environment Court, which was commenced by Council in July 1998, the Court ordered that*

*"Dixon Sand abstain from using the land being Lots 196 and 29 for the purpose s of an extractive industry and sand mining (except for works of remediation or restoration) until such time as a development consent permitting any such use is granted".*



## Proposal Descriptive Summary

<b>Proposal:</b>	Extraction and processing of sand Designated Development
<b>Proponent:</b>	Dixon Sand (Penrith) Pty Ltd
<b>Property Owner:</b>	Manaldo Pty Ltd and Estate of the late C Gouskos
<b>Consent Authority:</b>	Baulkham Hills Shire Council
<b>Property Details:</b>	Lots 196 and 29, DP 752025 Old Northern Road, Maroota
<hr/>	
<b>Zoning:</b>	Rural 1(b)
<b>Development Type:</b>	Extractive Industries/Quarries
<b>Form of Development Assessment:</b>	Designated Development Local Development Integrated Development
<b>Other Approvals and Licences:</b>	Pollution Control Approval and Licence – Pollution Control Act, 1970 Water Licence – Water Act, 1912 Permit – Rivers and Foreshores Improvement Act, 1948 Consent – Roads Act, 1995
<b>Relevant Planning Instruments:</b>	SREP No. 9, Extractive Industry (No. 2) SREP No. 20, Hawkesbury-Nepean River (No. 2 – 1997) Baulkham Hills Local Environmental Plan, 1991 Development Control Plan, No. 500 (Extractive Industries)
<hr/>	
<b>Construction Period:</b>	Approximately 3 months
<b>Extraction Period:</b>	Up to 10 years
<b>Processing Period:</b>	35 years, to process sand from future anticipated to be approved sites, adjoining Lot 29.
<b>Product Sales</b>	Up to 60 truck loads per day, ie 60 laden trucks leaving the site each day.
<b>Product Types:</b>	Mortar, concrete and miscellaneous sands
<b>Workforce:</b>	Up to 15
<b>Operating Hours</b>	6 am to 6 pm Monday to Saturday, inclusive



**NOTE:**

1. The extraction and rehabilitation period is anticipated to take up to 10 years and this will be dependent upon market demand. The sand processing period sought is 35 years to allow the company to seek Approval for extractive operations on Lots 1 and 2, DP 547255. It is proposed to seek approval for these two lots that are located immediately to the East of lot 29 ( the subject of this EIS). This application for approval will occur within the next twelve months and be the subject of a further EIS. The use of the processing plant for the 25 years additional to the extraction on Lots 29 and 196 is subject to the "to be sought approval" for Lots 1 and 2.

The extraction on these future proposed Lots is not part of this current Development Application or EIS.

- ♦ Lot 1 DP 547255 is owned by an associate company of Dixon Sand
- ♦ Lot 2 DP 547255 is owned by T & M Toahok, who have given permission to Dixon Sand to apply for an approval to extract sand.

The two lots , ie 1 and 2, contain approximately 4 million tonne of white sand that would be processed in the existing plant owned by Dixon Sand. Access to lot 29 from theses future proposed Lots will be direct through Lot 29. This access will also be the subject of the proposed Application for Consent and attached EIS.

2. The truck movements from the site each day are proposed at 60 laden trucks per day. Two of the trucks arriving at the site each day will be laden with sand to blend with those extracted on site. This is detailed at Section 2.1.2 page 2.3. These two vehicles will be sourced from outside Maroota and contain concrete sand for blending with local product extracted as part of this proposal.



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## **CHAPTER 12 – EVALUATION OF THE PROPOSAL**

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## EXECUTIVE SUMMARY

### Introduction

Southern Environmental Pty Ltd have prepared this Environmental Impact Statement to accompany a Development Application by Dixon Sand (Penrith) Pty Ltd (the "proponent Company") to Baulkham Hills Shire Council.

This Development Application seeks approval to complete the extraction and processing of sand on Lots 196 and 29, DP 752025, in the area known as North Maroota NSW. The land which incorporates this proposal is zoned Rural 1(b) and is owned by Manaldo Pty Ltd and the Estate of the late C. Gouskos. The proposal also includes the complete rehabilitation of the site, to allow its progressive transfer to other non extractive industry operations.

The site is shown on **Figure 1.2 – Projected Site Area** - and the area defined as North Maroota is also detailed at **Figure 1.1 – Locality plans**. **Plate 1.1 – North Maroota Area** indicates the area and surrounding development.

Maroota is located approximately 25 km north of Dural and some 50 km north-west of the Sydney Central Business District. The nearest shopping centre is located approximately 8 km North at Wisemans Ferry on the Hawkesbury River.

### Background

The site is located approximately 600 m to the west of Old Northern Road and 600m North of the intersection with the Wisemans Ferry Road. Access from the Old Northern Road is via an existing Crown reserve road. The site has been utilized for sand extraction since the early 1980s. It has been operated consecutively by two companies, the most recent being the Proponent Company ( from 1992 to 1998). The site is located within the Shire of Baulkham Hills.

The Sydney sand market currently consumes approximately 7 million tonnes per year and is in a situation of extreme under-supply. The volume of imported sand from outside the region is increasing as the resources within the Sydney region become depleted or exhausted. It has been forecast that within the next 10 years there will need to be major new supply sources established within this region or the imports from areas in excess of 100 km distant will need to increase substantially.

Maroota has been identified as a major supply source for the future. It is a large deposit in excess of 100 million tonnes. It is located within 50 km of the Sydney Central Business District and has already been scheduled under SREP No. 9. Current total supply from the Maroota area is approximately 0.5 million tonnes annually.



Most of the Maroota area, including North Maroota, is designated under Sydney Regional Environmental Plan (SREP) No. 9, Extractive Industries. The extent of the SREP No. 9 area is shown in **Figure 1.3 – SREP No. 9 –Maroota**. Extractive operations are what is known as Designated Development, requiring the preparation of an EIS (Ref. Environmental Planning And Assessment Regulation Schedule 3 ). Additionally the development site is located within the Hawkesbury River corridor and the development must therefore take account of the requirements of SREP No. 20, Hawkesbury-Nepean River (No. 2 – 1997).

The SREP No. 9, clauses (2) and (11), require for the Maroota area that a Development Control Plan be prepared addressing a series of planning and environmental management issues. That plan was completed and released by Baulkham Hills Shire Council in December 1997. This is Development Control Plan No. 500, Extractive Industries and has been utilized as the principal reference and standard in the preparation of this EIS.

The requirements for approvals and licences from Statutory Authorities (other than Council ) to be identified and verified is detailed, since July 1, 1998, by the amended Environmental Planning and Assessment Act. This is known as Integrated Development. This identification is undertaken in the body of the EIS.

Various State Government authorities, specialist consultants, the Baulkham Hills Shire Council, the Local Aboriginal Land Council and various land owners within the North Maroota area have been consulted and involved, to varying degrees, in the development and preparation of this EIS as well as the design of various aspects of the proposal.

## ***Development Objectives***

The proposed development objectives are:

- ◆ To re-establish extractive operations on the site and meet the requirements of the building industry in Sydney's Metropolitan Area.
- ◆ To complete extraction of the remaining sand resource on the site.
- ◆ To complete the site's rehabilitation.
- ◆ To achieve a satisfactory high level standard for responsible planning and long term environmental management for the Maroota area and set an exemplary level of environmental achievement for the Sand Extraction Industry.
- ◆ To implement the first stages of a strategic plan of the proponent Company in becoming a major supplier for a range of sand products to the Sydney construction and building industry.



## **The Applicant**

The Applicant is Dixon Sands (Penrith) Pty Ltd, a wholly owned Australian family company that has been in sand quarrying since 1953. The Company has operated at the Maroota site from 1992 until 1998. They also operate an additional sand mining operation at Agnes Banks.

## **Proposed Development**

Dixon Sand Pty. Ltd. propose to carry out quarrying sand at the site and to process this into mortar and concrete sand. The Company will also produce small quantities of other speciality sands as required by the market.

The proposed site contains an estimated 1.7 million tonnes of in situ sand reserves.

The proposal that this EIS describes and reviews with respect to its Environmental Impact is as follows:

- ◆ The extraction of the remaining sands on the site described as Lots 196 and 29 of DP 752025, within the constraints of appropriate Legislation and Environmental Controls.
- ◆ Completion of the rehabilitation of the whole site, including those areas where rehabilitation was commenced under the previous consent.
- ◆ Operation of those facilities and areas constructed as part of the previous consent, that is tailings storage, water storage, drainage and the works and processing equipment.
- ◆ Rehabilitation of the nine areas that form the whole site in an orderly and progressive manner
- ◆ Processing and stockpiling sand at the sand processing plant.
- ◆ Loading of processed sands into customers' trucks and allow those trucks to exit the site in a controlled manner.
- ◆ Extension of the workshop area, including additional drainage provisions.
- ◆ Construction and commissioning of the additional parts of the sand processing plant.
- ◆ Placing a site identification sign at the intersection of the private access road and Old Northern Road.
- ◆ Construction of topsoil and overburden bunds, for the control of visual and noise effects.
- ◆ Provision of additional plantings of all external site boundary areas.
- ◆ Establishment of a native species propagation nursery at the site, including rehabilitation trials.
- ◆ Development of the site's erosion and sediment controls, structures and land forms in an ongoing manner to keep pace with the extraction process..
- ◆ Re-establishment of the original creek line and riparian native vegetation, including providing for direct discharge to the creek line downstream.



- ◆ Operation of the facilities from 6 am to 6 pm, Monday to Saturday, exclusive of public holidays. Access to the site is proposed to be from 5.30 am to allow empty trucks to log in and prepare for loading by one front end loader. No truck would be permitted to access the site before 5.30 am and no truck would be permitted to exit the site before 6 am.

Extraction of sand will be limited by the following three constraints:

- ◆ A maximum depth of excavation of 15.24 m from the original natural surface, as required by the land title.
- ◆ The provision of setbacks from all property boundaries not involving other extractive industries, as specified by The Baulkham Hills Shire Council Development Control Plan 500 (DCP 500), with the exception of the Western boundary.
- ◆ The requirement of The Department of Land And Water Conservation (DLWC) to not intersect the long term wet weather water table of the shallow aquifer

### ***Assessment of Environmental Effects of Principal Activities***

The preferred format detailed by DCP 500 with respect to the content and structure of Extractive Industry Environmental Impact Assessments is the separate assessment of environmental impacts and identification of mitigation measures for:

- ◆ clearing works
- ◆ extraction
- ◆ rehabilitation

There are no clearing works associated with this proposal. Chapters 7 and 8 separately provide assessments for extraction and rehabilitation and have found as follows:

#### ***Extraction***

An assessment of the potential environmental impacts during the extraction works, in accordance with the requirements of the DCP 500, have been carried out in terms of:

- ◆ Water management
- ◆ Noise management
- ◆ Transport management
- ◆ Air quality management
- ◆ Wastes management
- ◆ Protection of environmentally sensitive areas
- ◆ Risk management
- ◆ Miscellaneous Issues

In respect to water, noise, transport and flora and fauna, separate reviews by specialist consultants have been carried out and are detailed in **VOLUME 2** of this document.



The finding of this Environmental Impact Assessment for the extraction works is that the works can be carried out satisfactorily and managed under the terms of an environment management system that sets in place requirements for checking, monitoring, reviewing and reporting. This management system relies upon the mitigation measures that form the core of the proposal.

### ***Rehabilitation***

The most significant aspect of this proposal is the rehabilitation of existing and proposed areas of operation. This situation arises as the extraction proposed is for the completion of approximately the last 30% of the extractive resources on the site and the rehabilitation is for the whole site (excluding those areas proposed to be left as buffer or undisturbed). Some rehabilitation works have been successfully carried out to-date. This proposal is to co-ordinate the planning for all of the site and to integrate the rehabilitation with extractive operations. Surface and groundwater management will also form part of the integrated and planned approach.

The rehabilitation and revegetation strategy has been assessed in **CHAPTER 6 – Section 6.10** and an assessment carried out of the key related environmental issues (**CHAPTER 9**):

- Materials, conservation and management
- Enhancement of environmentally sensitive areas
- Provision for post-extraction land uses
- Opportunities for regional rehabilitation planning

Whereas the extraction proposal was in sufficient detail to identify the nature of all works, the rehabilitation proposal is in the form of a strategy. It will be developed progressively with the preparation of annual rehabilitation management plans that will ultimately be able to be developed into a farm management plan to transform the site from an extractive site to an active agricultural site, albeit, with enhanced areas of native vegetation.

## ***Social & Economic Impacts***

The Minister's Directions ( **Appendix A3 of Vol. 2** ) require that Social and Economic Impacts of the Proposal be assessed. This has been done at Chapter 9 of the document. The social profile of the local North Maroota community has been developed through a process of consultation.

There are issues of community concern with the extractive industry generally within the Maroota area. Although this has been recognised and in some cases, is actively being attended to, there are unresolved concerns with many local members of the community. They feel that their ability to determine and provide input into, the development of the area, is minimal. This is an issue that can be highlighted by this document but ultimately can only be addressed by Council or the State.



The proposed works on Lots 196 and 29 are limited in their scope and limited primarily to the development of an active rehabilitation program. The economics of extractive industries determines that such rehabilitation works must be carried out in parallel with an extraction program for one to support the other. This proposal is to undertake such a parallel program.

This assessment has found that the benefits of achieving a final rehabilitation of the site far exceed any social or economic costs associated with the operations. This aspect will continue to have validity as the proposed Environmental Management Plan will ensure that the adverse community effects are not allowed to develop ( **Section 6.12 and Appendix C10** )

## ***Cumulative Impacts***

A necessary part of an Environmental Impact Assessment is to detail the potential cumulative impacts. These impacts have been considered at **CHAPTER 10** under the section headings :

- ◆ Other Extractive and Non Extractive operations
- ◆ Transport
- ◆ Community Facilities and Services
- ◆ Environmental Impacts
- ◆ Risks and Emergency Management

There are other extractive operations to the north and south of the proposed extractive operation.

This assessment indicates that, in the North Maroota area, there are no major adverse impacts in the combination of local effects.

## ***Environmental Management & Mitigation***

The mitigation measures that have been developed through the impact assessment studies have been detailed in **CHAPTER 11**.

These measures will be incorporated with the various conditions of permits, licences and approvals, (that will be obtained as part of the overall integrated development) and into an Environmental Management and Rehabilitation Plan for the operation. This plan has been prepared in draft form as detailed in **Appendix C10**. The plan will be finalised prior to extractive works commencing and be subject to annual reviews firstly by the company , then by the Council (and other Government Legislative agencies).

The final Environmental Management and Rehabilitation Plan will be a public document, made available to the Maroota community. This will allow the community to work with the Company in ensuring that the commitments made in this EIS and the requirements set down in the various statutory approvals are met. The company envisages that this approach will become an industry standard for others to aspire to.



## **Approvals Sought**

In accordance with the Legislative Requirements of Integrated Development, the approvals that will be sought, in addition to the Development Consent, are as follows:

- An Approval of Works and Licence under the Protection of the Environment Operations Act 1997. This will be sought from the Environment Protection Authority for extractive and processing operations, noise and water quality control.
- ♦ An approval from the Department of Land and Water Conservation, under the terms of the Rivers and Foreshores Improvement Act and the Water Act.
- ♦ An approval from the Roads and Traffic Authority, under the Roads Act, for the construction of an intersection between Old Northern Road and the existing Crown reserve road.

Development Approval is being sought from Baulkham Hills Shire Council for an operational period of 10 years. This will provide the necessary time for both the extractive operations and the completion of the last phases of rehabilitation.

## **Evaluation of the Proposal**

**CHAPTER 12**, the final chapter of this document, considers all of the findings to provide a justification as required under the Environmental Planning and Assessment Regulation, 1994. The justification is in the following terms:

- ♦ Biophysical issues
- ♦ Social equity
- ♦ Ecological efficiency
- ♦ Ecological Sustainability
- ♦ Consequences of not proceeding

It is the finding of this final evaluation that the proposal is justified.

The consequences of this development not proceeding are considerable, as detailed in **Section 12.6**. The area under consideration is not a greenfields development. A decision that the product is to be sourced from another, perhaps less environmentally sensitive site, has many consequences.

Prior Development Approvals have determined that extractive operations were suitable on this site. This final application for the extraction of resources on this site now consolidates previous works, particularly rehabilitation works, into the final stage of the site's development. This final stage will allow the site to be returned to its rural zoning in an orderly and environmentally sound manner.



This document provides the assessment of the proposal's environmental impacts and the mitigation measures for any adverse aspects. The assessment concludes that any adverse environmental effects that may result from the works can be overcome through the implementation of a rigorous range of safeguards and mitigation measures. These will ensure that the physical, biological and social environments surrounding the site are not adversely impacted upon by the proposal.



## CHAPTER 1 – INTRODUCTION

- 1.1 Site Location
- 1.2 Proposal Overview
- 1.3 Background to the Proposal
- 1.4 Objectives of the Proposal
- 1.5 Management of the Proposal
- 1.6 Statutory Requirements
- 1.7 Structure of the Application

This chapter provides an outline and introduction to the proposal. The aspects covered are: the site's setting, a brief history of the site's development, the objectives of and reasons for the development, the company's management for implementing the development, the planning requirements for the development application and the structure of this document. This is in accordance with the structure of Chapter 1 of Attachment 1, Development Application Guidelines, of DCP 500.



## 1.0 INTRODUCTION

### 1.1 SITE LOCATION

The proposed site comprises two land parcels:

- Lot 196 – 28.34 hectares,
  - Lot 29 – 5.7 hectares,
- within DP 752025

**Figures 1.1a and 1.1b - Locality Plan** - show the location of Maroota and its main road access system within the Sydney north west region (**Figure 1.1a**), and shows the local Maroota area west of Old Northern Road, through to the Hawkesbury River. (**Figure 1.1b**)

**Figure 1.2 - Project Site Area**, shows a more detailed plan of the site and the various landholdings, access roads, other neighbouring extractive operations and dwellings within a distance of between 1 km and 2 km from the site.

Lot 29 is a land locked block accessible from Lot 196. A Crown reserve road exists along the western boundary of all of Lot 29, between Lots 196 and 29, and between Lots 213 and 29. It is a made road, being a private internal access road, for the extractive operator, PF Formation, connecting landholdings to the north with Lot 198 to the south.

The settlement of Maroota is located about 25 km due north of Dural, on the North Western outskirts of the Sydney metropolitan area, some 50 km from the CBD. It is approximately 8 km south of the Wisemans Ferry crossing of the Hawkesbury River.

Maroota is located at the intersection of two main roads – Old Northern Road and Wisemans Ferry Road. Old Northern Road, north from Maroota, provides access to Wisemans Ferry, whilst Wisemans Ferry Road south west of Maroota, provides road access through to Windsor, some 30 km to the south west. Old Northern Road runs from Parramatta, through Dural, Glenorie, Maroota and hence, to Wiseman's Ferry.

The Maroota area falls within two Local Government areas – Hornsby and Baulkham Hills. The site is located on the Western side of Old Northern Road and within the Baulkham Hills Shire.



The landholdings and the current land uses on adjacent holdings to Lots 196 and 29 are shown at **Figure 1.2, Project Site Area**, and described in **Table 1.1**. (The area is described in this EIS as the North Maroota area).

**TABLE 1.1**  
**NORTH MAROOTA LANDHOLDINGS AND LAND USES**

Lot No.	DP	Owner	Current Land Use	Future Extraction	Possible Timing (Years)
196	752025	Manaldo Pty Ltd	Ext	Yes	0 – 5 *
29	752025	Estate of K Gouskos	Ext	Yes	0 – 5 *
117	752025	D & G Accurso	Ag	No	NR
1	595538	D & G Accurso	Ext	Yes	0 – 2 *
2	595538	A & M Salvestro	Ext	Yes	0 – 2 *
3	595538	M Trappel	NK	No	NR
1	547255	K Dixon	Ag	Yes	3 – 10
2	547255	M, M & F Taouk	Part Ag	Yes	3 – 10
213	752025	Unreserved Crown	Bushland	No	NR
198	752025	PF Formation	Ext	Yes	Consent
1	204159	Manaldo Pty Ltd	Part Ag	Yes	10+
1	590937	B Ramm	Part Ag	Yes	10+
2	590937	NK	Res	No	-
2	229941	NK	Part Ag	Yes	10+

NOTES \* Past consent has lapsed on these holdings

Ext = Extractive Industry

Ag = Agricultural

Res = Reserve

NK = Not known

NR = Not relevant

The above are the landholdings within Baulkham Hills Shire, within the North Maroota area, and within the area designated under Sydney Regional Environmental Plan (SREP) No. 9, Extractive Industries. There are other areas designated under the Regional Plan in North Maroota, within the Hornsby Shire, in that land west of Old Telegraph Road and West of Old Northern Road and North of the old Telegraph Road/Old Northern Road intersection.

To the West of Lot 196 is a large area of unreserved Crown land, which is outside of the designated area under the Regional Plan. It is part of the proposed Dryabbin Nature Reserve. It is also subject to a long standing native title claim.



## 1.2 PROPOSAL OVERVIEW

The proposal is to complete the extraction and processing of sand on Lots 196 and 29, DP 752025, North Maroota, and to undertake final rehabilitation and revegetation of the site.

Dixon Sand Pty. Ltd. propose to carry out quarrying of sand at the site in an environmentally conscious way and to process this into mortar and concrete sand. The Company will also produce small quantities of other speciality sands as required by the market.

The proposed site contains an estimated 1.7 million tonnes of in situ sand reserves.

The site has been an extraction site for almost 20 years. Access is via a Crown reserve road, between Old Northern Road and the north east corner of Lot 196. The Crown reserve easement continues along the northern boundary of Lot 196 but is not (and never will be) a "made" road over the section to the north of Lot 196.

The Maroota sand deposit contains an estimated 100 million tonnes of sand, suitable for high quality concrete sands and mortar sands. It is one of the Sydney's major regional deposits of construction sand and probably the most accessible long term source. There are also some deposits of pale firing clay, potentially suitable for brick making.

## 1.3 BACKGROUND TO THE PROPOSAL

The project site has been operated for about 20 years and was the first major extraction site in the district. To date approximately 70% of the original extractable resource on the site has been removed and processed. The proposed site contains an estimated 1.7 million tonnes of in situ sand

Site extraction has been the subject of a series of development consents since commencement of operations. These occurred at 1988, 1989, 1990 and 1993. During this period the Extractive Industry and in particular the proposed site have been the subject of changes in Legislative requirements in the form of SREPs and DCPs. This requirements have necessitated ongoing changes in the way the site has had to be operated and controlled in the past. The site has been operated by two operators, PF Formation initially, from the early 1980s through to 1992 and until recently, the proponent, Dixon Sand from 1992 to 1998. Further details are provided in **Section 3.3 - HISTORY OF SITE EXTRACTION.**

The site has a unique history in the sand extractive industry within the district due to the following:

- Continuous period of almost 20 years of extraction.
- Operated sequentially by two competitive companies.
- Over a period when environmental standards generally were evolving in society and when industry standards were being developed.

Since the mid 1980s, a comprehensive planning framework has been developed for the Maroota area by the State and Council. In 1986, SREP No. 9 (Extractive Industries) was published and under Clause 14, Portion 196 Maroota, was given specific consent requirements



*"to enable the removal of sand and clay from that land without development consent."*

This Clause contained various conditions to allow sand extraction operations to occur.

There has subsequently been a plan of management and three development control plans governing extractive industries, prepared for the Maroota area. In addition, SREP No. 9 has also been extensively revised.

A very clear planning framework is now in place in the form of the Development Control Plan No. 500, published by Baulkham Hills Shire Council in 1997.

In the period since December 1998 and the lodgement of this Development Application, the company has carried out extensive remediation and restoration work.

#### **1.4 OBJECTIVES OF THE PROPOSAL**

Dixon Sand Pty Ltd have established a reputation with their customer base for supplying a quality product and service. Their sand has a high customer acceptance with laudable quality control. This situation is proposed to be continued, upon obtaining Development Consent for the Maroota Site, within the constraints of responsible Environmental Controls.

The objectives of the proposal as defined in this EIS are as follows:

- To re-establish extractive operations on the site as soon as possible.
- To complete extraction of the remaining sand resource on the site.
- To complete the site's rehabilitation.
- To meet the standard for responsible planning and long term environmental management for the Maroota area and for this industry.
- To implement the first stage of the strategic plan of the proponent to be a major supplier for a range of sand products to the Sydney construction and building industry.

This proposal is a limited one, restricted to operations only on Lots 196 and 29, and for a defined period. It does not include any operations outside of Lots 196 and 29. Any such future operations will be subject to future development applications, as will be determined by the Company's development strategy, as it evolves.

#### **1.5 MANAGEMENT OF THE PROPOSAL**

##### **1.5.1 The Proponent Company**

The proponent is Dixon Sand (Penrith) Pty Ltd, a family owned and operated Australian Company that has been in sand quarrying since 1953. The existing management structure is proposed to continue As part of this proposal.



The Company's sand mining operations are at:

- Agnes Banks, which represented 15% of 1998 operations
- Maroota, which had 1998 sales of approximately 210,000 tonnes.

The Company commenced operations at Maroota in 1992, replacing the previous operator, PF Formation, as operator on Lot 196. It operated under an existing consent and continued operations under a consent that was issued to Manaldo Pty Ltd, the owner of Lots 196 and 29, in December 1993.

The Agnes Banks operation was commenced in 1953.

The Company employs a total of 17 persons at March 1999.

### 1.5.2 EIS Management

The EIS has been prepared under the direction of senior Dixon Sand (Penrith) Pty Ltd and Manaldo Pty Ltd personnel, by a team managed by Mr Stephen Smith Bsc. Eng., Meng. Sc., a principal of Southern Environmental Pty Ltd. Mr. Smith was backed by a large study team, as detailed in **Appendix A2**. The specialist reports of the study team are attached to this document at **Volume 2 Appendices C1 to C10**.

### 1.5.3 Quarry Management

Messrs D Dixon, D Gouskos and S Smith currently make up the EIS review committee. The committee has overseen the preparation of the EIS and will continue to meet on a regular basis to manage the consent process. A management committee will be maintained to manage the consent and it will have the responsibility for the environmental management of the operation. Mr Ken Dixon, the executive chairman of the Company, will continue to act as a consultant to the management teams.

Mr David Dixon is the designated mine manager (under the terms of the requirements of the Mines Inspection Act, 1901). A second management committee will be established to oversee the extraction operations and to make the necessary recommendations to improve the day-to-day management of operations.

The Company recognises that successful environmental management involves well organised documentation. This necessary to ensure that all aspects of operational and rehabilitation planning, environmental control, monitoring and responses to problems, are properly managed and documented.

An **Environmental Management Requirements Manual (EMRM ) – APPENDIX C10** - was prepared and put into operation in the later period of operation under the previous consent. An Environmental Management Plan (EMP) will be developed for the new consent and other approvals and licences, once issued. **Appendix B2, Draft Conditions Of Consent** will be developed into the proposed EMP.



The Company is committed to quality environmental management and documentation that will ensure the proper management of not only these proposed operations but the timely and strategic planning of future operations.

The requirements of DCP No. 500 (Extractive Industries) contains significant annual reporting requirements that will need to be planned for and scheduled from the commencement of operations. Specific details of the environmental management provisions that accompany this proposal are addressed in **CHAPTER 7- Environmental Impact and Mitigation During Extraction and Processing.**

## 1.6 STATUTORY REQUIREMENTS

The Legislative and Statutory Requirements that directly effect this proposal are:

- ◆ The Environmental Planning and Assessment Act
- ◆ The Environmental Planning and Assessment Regulation
- ◆ The Mines and Subsidence Compensation Act
- ◆ The National Parks and Wildlife Act
- ◆ The Pollution Control Act – to be replaced at July 1, 1999 by the POEO Act
- ◆ The Rivers and Foreshores Improvement Act
- ◆ The Roads Act
- ◆ The Soil Conservation Act
- ◆ The Waste Minimisation and Management Act – to be replaced at July 1, 1999 by the POEO Act
- ◆ The Water Act
- ◆ The Protection of the Environment Operations Act ( POEO ) – to come into effect at July 1, 1999

The proposed development is Designated Development as defined in Schedule 3 of the Environmental Planning and Assessment Regulation, 1994. Accordingly an EIS must accompany the Development Application and be lodged with the Consent Authority, being Baulkham Hills Shire Council.

Extractive Industries are Designated Development when they meet the following description:

- (1) that obtain extractive materials by methods including excavating, dredging, blasting, tunnelling or quarrying or that store, stockpile or process extractive materials, and
- (2) that obtain, process or store for sale or re-use, an intended quantity of more than 30,000 cubic metres per year of extractive material.

The development is also classified as Local Development and Integrated Development, under the Environmental Planning and Assessment Amendment Act, 1998. The definitions of Local and Integrated Development are as follows:

- ◆ **Local Development** is development that needs consent, and development that is not State Significant Development, as defined in Section 76A (4) of the Environmental Planning and Assessment Amendment Act 1998.
- ◆ **Integrated Development** is development (not being complying development) that, in order for it to be carried out, requires development consent and one or more of the following approvals, (as



specified under the Fisheries Management Act, the Heritage Act, the Mines and Subsidence Compensation Act, the National Parks and Wildlife Act, the Pollution Control Act, the Rivers and Foreshores Improvement Act, the Roads Act, the Soil Conservation Act, the Waste Minimisation and Management Act, and the Water Act).

It is the nature of extractive industry that the operations come under a number of statutory controls in regard to land and water management, pollution control, roads and road access, protection of the natural and cultural environment, etc. The statutory requirements of the relevant legislation are described in later sections of this EIS.

There are also a series of State policies, regional environmental plans and local environmental plans that have statutory jurisdiction over this proposal.

The full planning context, including the Development Consent process for the Environmental Impact Statement, are set out in full in **CHAPTER 3- BACKGROUND, Sections 3.4- Planning Context, and 3.5- Development Consent Process.**

Before assessing the full statutory requirements of this EIS the relevant Government agencies and organisations have been contacted and asked to state their requirements. Those requirements are attached at **VOLUME 2 Appendix A3 – Consultation.** The summary of those requirements are summarised at **CHAPTER 4 – Section 4.5 – Consultation with Government.**

## 1.7 STRUCTURE OF THE APPLICATION

This application comprises the Development Application and the Environmental Impact Statement. There are two volumes that make up the EIS:

- ◆ **VOLUME 1**, comprises EIS text, figures and plates
- ◆ **VOLUME 2**, incorporating all of the Appendices

**Figure 1.4 - EIS Structure**, describes, diagrammatically, the structure and content of the EIS.

The form and content of this EIS is in accordance with the Department of Urban Affairs and Planning's *EIS Guidelines for Extractive Industries/Quarries* and Council's *DA Guidelines*, included as Attachment 1 in *DCP 500, Extractive Industries*. To assist in Council's assessment of the application, Council's "preferred format, content and structure" for Extractive Industry Development Applications" has been closely followed.

There are twelve chapters in **VOLUME 1**, grouped as follows:

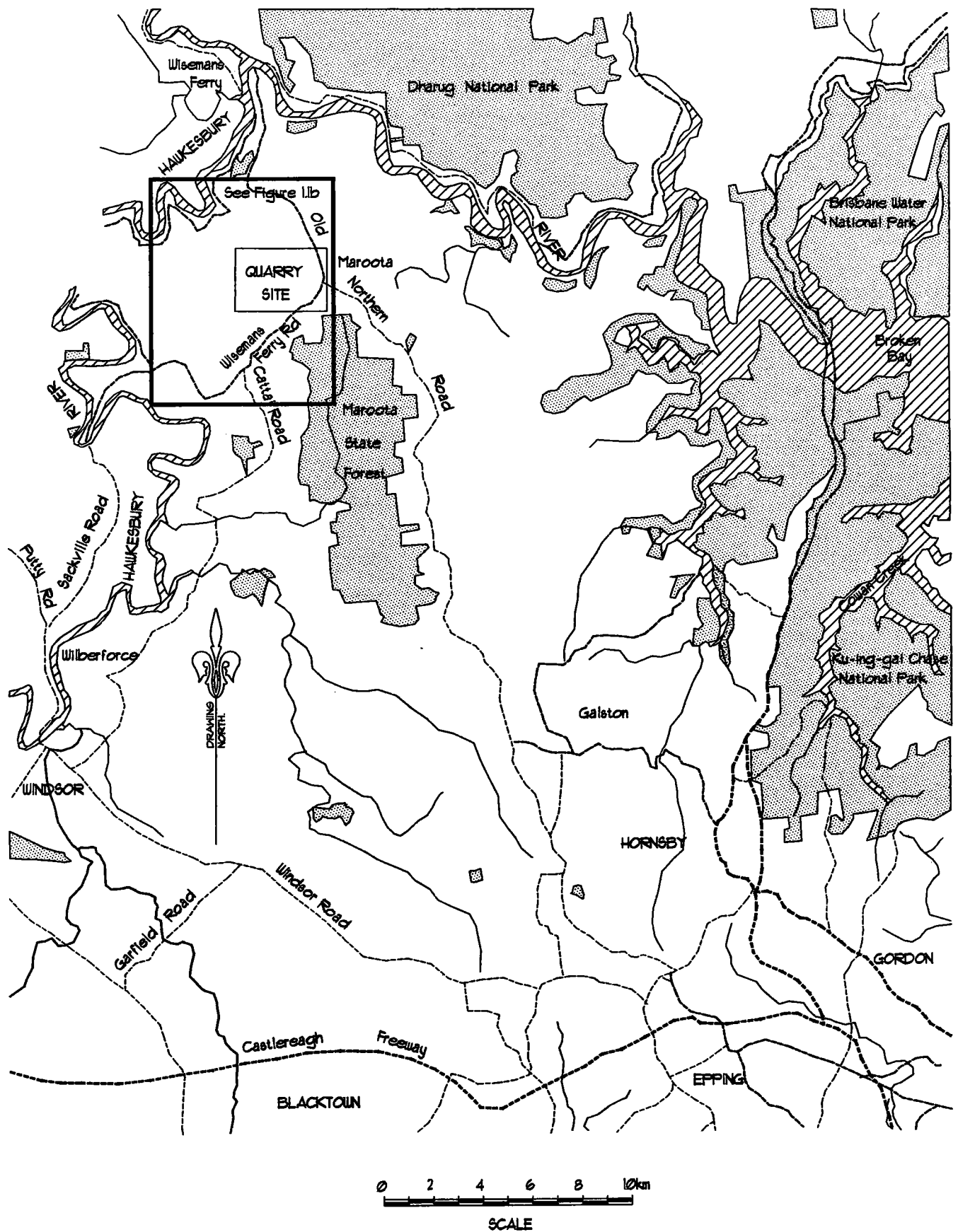
- ◆ **Chapters 1, 2, 3, 4 5 and 6** describe the setting, context, project proposal scope and future developments, under a general heading of **THE PROPOSAL.**
- ◆ **Chapters 7, 8, 9 and 10** describe the impact assessment process and the identification of mitigation measures to be employed to minimise impact, in terms of environmental, economic, social and cumulative impacts, under a general heading of **THE IMPACT ASSESSMENT.**
- ◆ **Chapters 11 and 12** provide the strategy for the ongoing environmental management of the development and the means of assessing the environmental performance of the project in the longer term, under a heading of **THE ENVIRONMENTAL PERFORMANCE EVALUATION.**



**VOLUME 2** contains fifteen separate Appendices grouped under the headings of **GENERAL, BACKGROUND and PLANNING AND ENVIRONMENTAL ASSESSMENTS**. These Appendices contain background data and specific environmental assessment studies that have been prepared as the basis for the project definition, assessment and long term planning, detailed within the text of **VOLUME 1**.



# NORTH MAROOTA OPERATION NSW

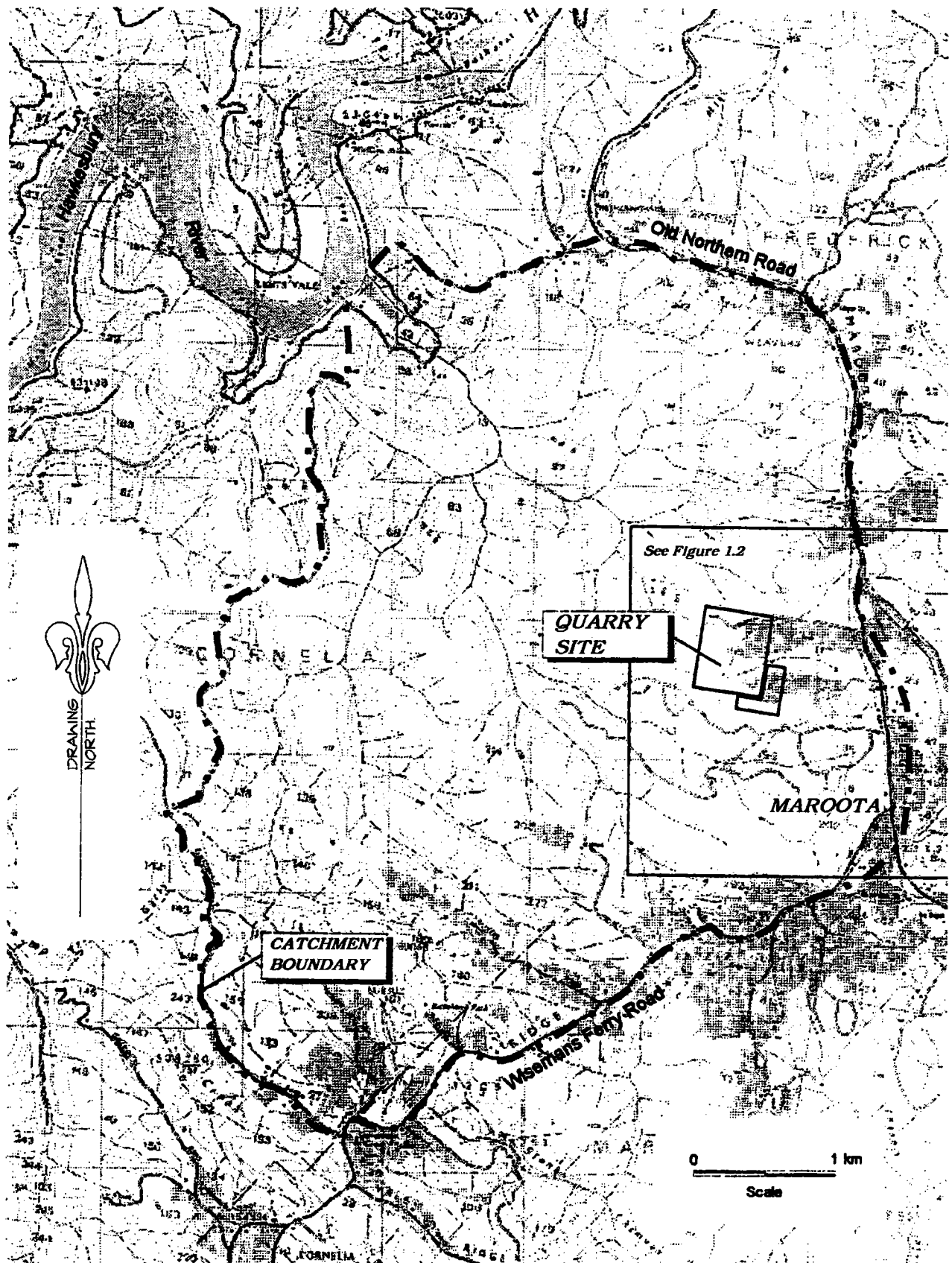


LOCALITY PLAN

FIGURE 1.1a



# NORTH MAROOTA OPERATION NSW

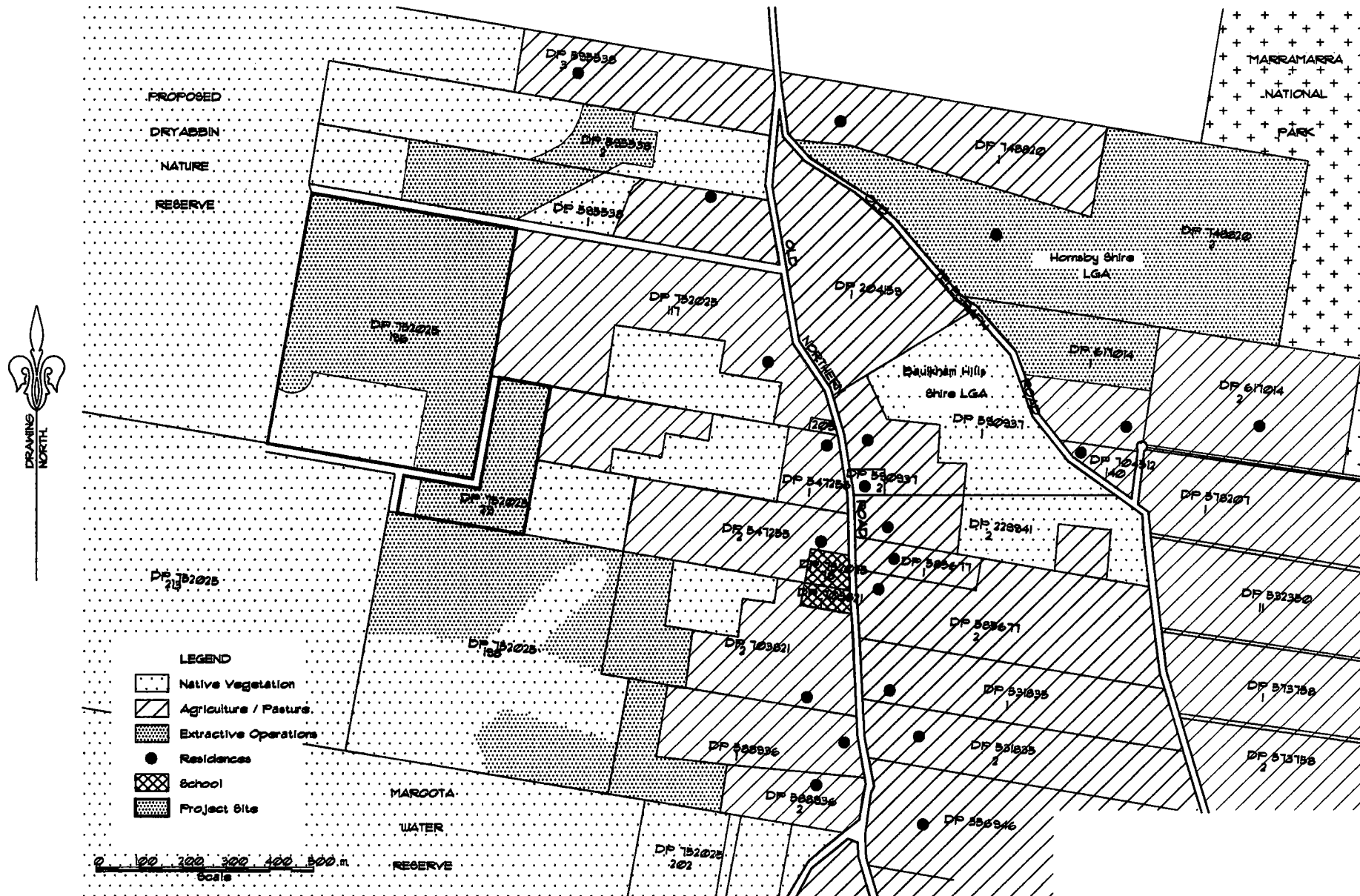


LOCALITY PLAN

FIGURE 1.1b



# NORTH MAROOTA OPERATION NSW

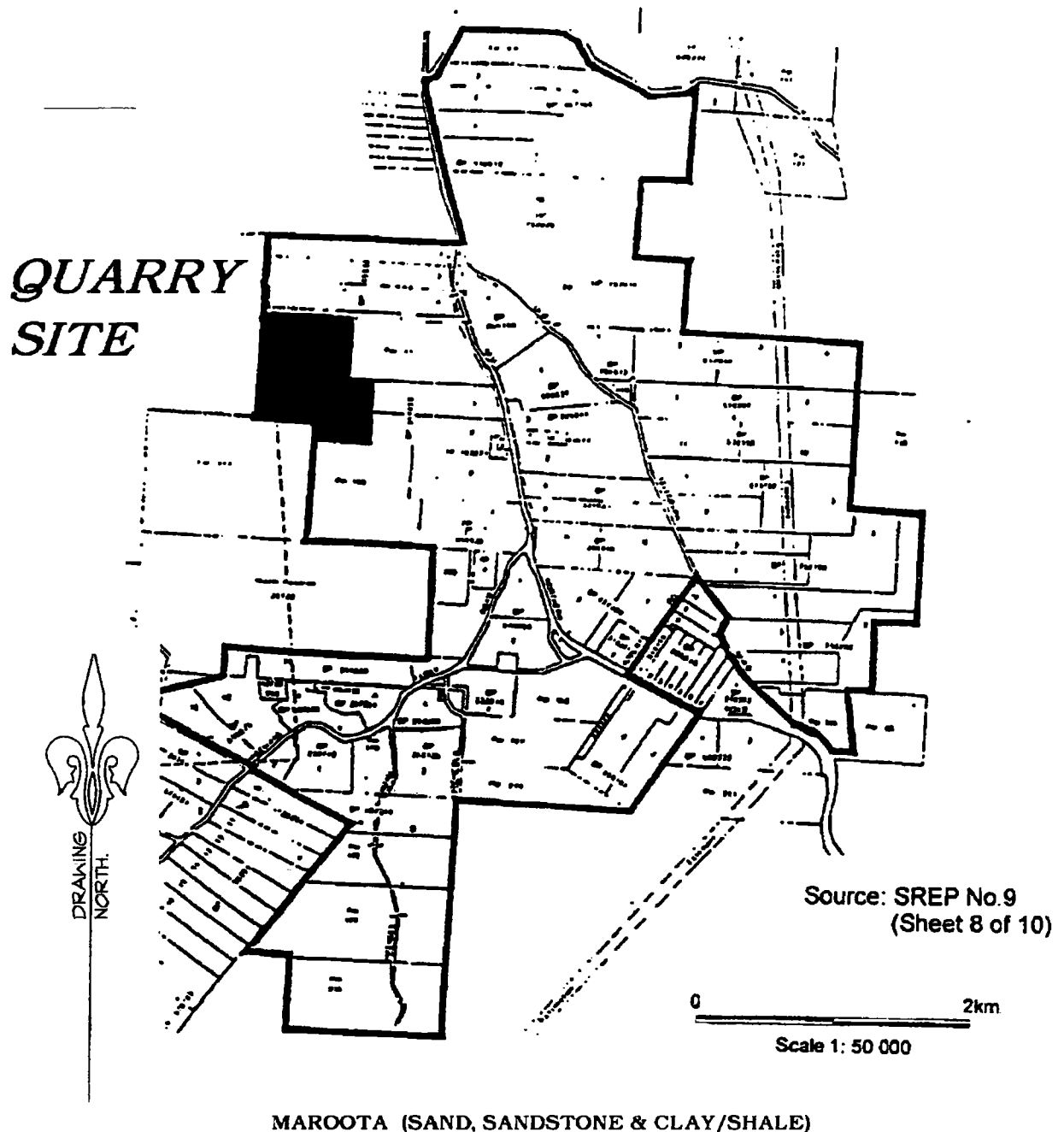


PROJECT SITE AREA

FIGURE 1.2



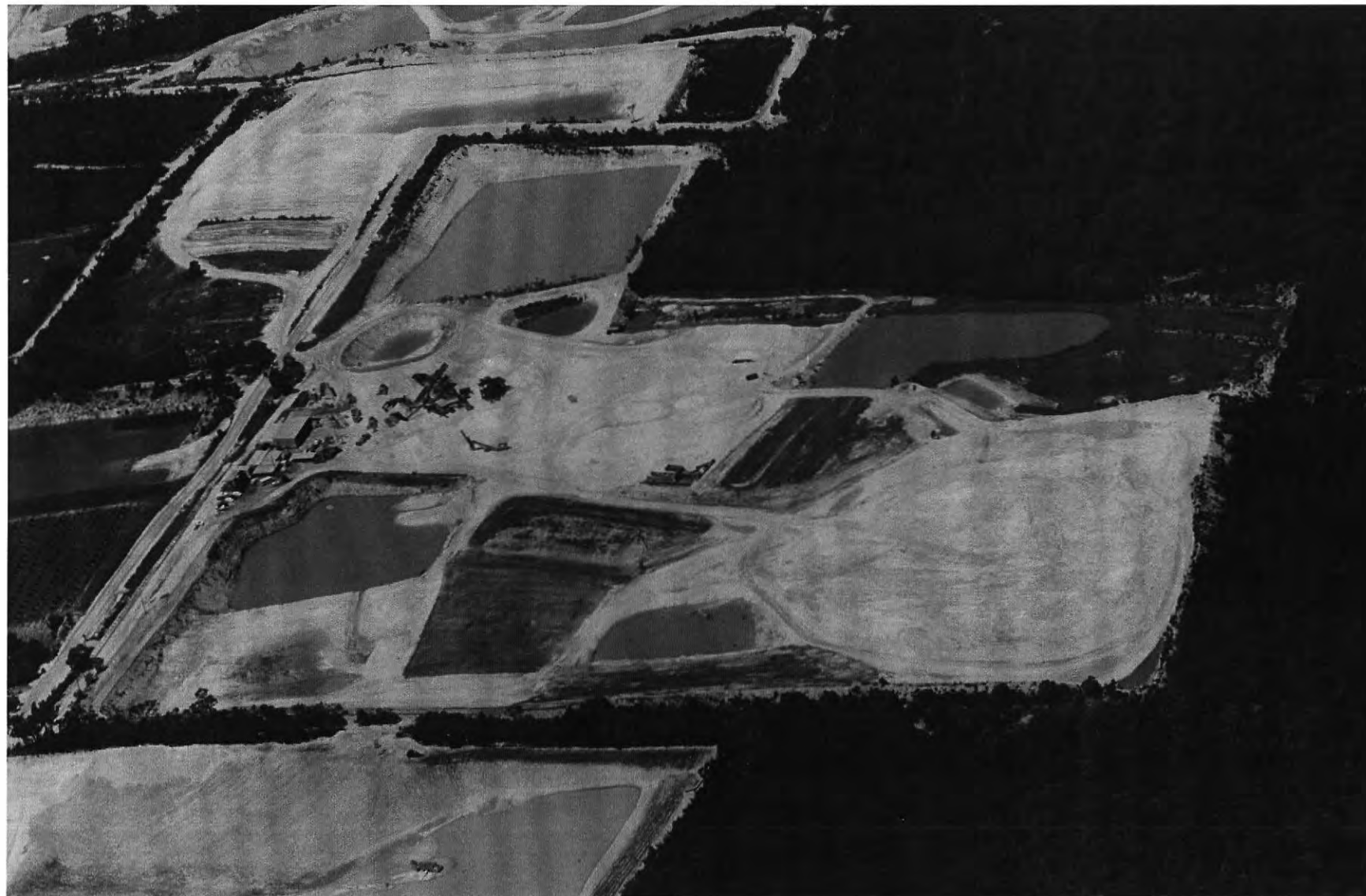
# NORTH MAROOTA OPERATION NSW



MAROOTA (SAND, SANDSTONE & CLAY/SHALE)



**NORTH MAROOTA OPERATION NSW**



**NORTH MAROOTA AREA**



## **CHAPTER 2 – JUSTIFICATION & ALTERNATIVES**

### **2.1 Justification of the Proposal**

#### **2.1.1 Introduction**

#### **2.1.2 Markets**

### **2.2 Alternative Sources of Construction Sands**

### **2.3 Development Alternatives**

### **2.4 Conclusion**



## 2.1 JUSTIFICATION OF THE PROPOSAL

### 2.1.1 Introduction

The Company had established itself as the leading supplier of mortar sand to the Sydney metropolitan area up to 1998. The interruption to quality product supply, caused by the closure of its Maroota Operation estimated to have been supplying approximately 40% of the market, has had a significant effect on the Sydney building industry. The Company has, through the provision of a quality and consistent product, supported by a high standard of service to customers, established a high degree of acceptance within the construction sands industry. The supply to the market was limited under the previous consent.

A summary of the supply and demand situation within the Sydney construction sands market is outlined at **Section 3.1, Market Sources and Demand for Construction Sands** (Further details in regard to Sydney construction sands, the resource and the market, are contained in **Appendix B1**).

Justification, under the terms of Schedule 2 of the Environmental Planning and Assessment Regulation 1994, is as follows:

- "3. An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including: (a) the consequences of not carrying out the development or activity; and (b) the reasons justifying the carrying out of the development or activity."*

In the EIS Guidelines for Extractive Industries (DUAP, 1996), the consideration of alternatives and justification for the preferred proposal, includes, in the selection of the preferred options, the requirement that they should be justified in terms of:

- (a) "Type, quality and quantities of products in relation to market demand
- (b) environmental factors including biophysical, economic and social factors; and
- (c) the principles of ecologically sustainable development".

This Chapter examines the need for the sand products proposed to be supplied from the Dixon Sand Maroota site.

The environmental factors that relate to the proposal are the core and basis of **Chapters 7, 8, 9 & 10** of this document.

**Chapter 5 – ECOLOGICALLY SUSTAINABLE DEVELOPMENT** – discusses the principles of Ecological Sustainable Development and how they apply to this proposal.

### 2.1.2 Markets

During the twelve months from December 1997 to December 1998 and until midday on December 18, Dixon Sands Pty Ltd and Manaldo Pty Ltd have supplied approximately 210,000 tonnes of sand products. The majority of that product was mortar or brickies sand. **Table 2.1 - Product Sales**, details the split of the various products for that calendar year.



**TABLE 2.1**  
**PRODUCT SALES (1998)**

Product Type	Percentage of Sales
White/yellow "brickies"	84
Washed white sand	9
Concrete sand	5
Special blend	1
Bunker sand	Less than 1
Miscellaneous	Less than 1

The above products were supplied to client base from all suburban areas within the Sydney metropolitan area. The distribution was reasonably uniform, varying from 10% for the St. George area up to 20% each for the Western Suburbs, North Shore and City area.

In the twelve months ended December 1998, Dixon Sands supplied some 67 separate customers.

Annual sales had increased significantly over the period since 1993, when the Company commenced operations at Maroota. In three months, October, November and December 1998, the Company was supplying at the rate of approximately 210,000 tonnes per year. **Table 2.2 - Sales Growth**, details the increase in production over the 6 year period. Total sales over the 5 years plus of operations was 820,000 tonnes.

**TABLE 2.2**  
**SALES GROWTH (1993-1998)**  
(tonnes)

Year	Product Sales
1993	40,000
1994	115,000
1995	160,000
1996	135,000
1997	160,000
1998	210,000

The majority of these sales were of "brickies" sand, both yellow and white, with white being in greatest demand. **Table 2.2** shows a consistent growth although fluctuations from year to year in that rate of growth is a common feature related to the variability of industry demand, based on weather and cycles in the state of the economy.

Construction and building activities are expected to maintain their current strong market conditions over the next few years and it would be expected, given the product quality and a continuing high level of market demand, that there will continue to be strong demand for the Company's products.



The other market that the Company proposes to enter, is concrete sands. Modifications to the processing plant that are proposed will allow the production of a concrete sand. The proposal is included in this Development Application for the importation of approximately 7% of the concrete sand product, from external sources, to blend with the local sand to provide the appropriate grading to meet concrete sand specifications.

The Company has demonstrated a reputation for performance, in terms of product consistency and product supplies. The strong market conditions, the favourable location of the site, and the Company's reputation will ensure a continuing demand once the Development Consent is granted.

## 2.2 ALTERNATIVE SOURCES OF CONSTRUCTION SANDS

The alternative sources of both mortar and concrete sands are described in detail in **Appendix B1**, and summarised in **Section 3.1**. It is concluded that the market demand is such for both mortar and concrete sands that supply is the limiting factor and the limits on supply are affecting price. The alternative sources that are better located in comparison to Maroota, are in their final stages of extraction.

The Maroota sand deposits are well located to supply into the Sydney market. Essentially the greater the supply capacity of the Maroota area, the greater will be this area's role in supplying the construction and building industry, at the expense of other sources more remote from the market and less reliable.

## 2.3 DEVELOPMENT ALTERNATIVES

The *Environmental Planning and Assessment Regulation*, 1994 requires that

*"Any feasible alternative to carrying out the development or activity"*

be addressed. In addition, there is a requirement to address the "no development" option, which is a requirement to consider the consequences of not carrying out any of the proposed works (as described in this impact statement).

The "no development" option is considered in **CHAPTER 12 - EVALUATION OF THE PROPOSAL**. It is however, not an option in this situation. The site has been operated for some 17 years and the issue to which all are in agreement is the issue of the need for the site's full rehabilitation. This is a key aspect of this development phase and without an approval to development application, the final rehabilitation cannot occur.

The alternatives normally considered under an "evaluation of alternatives" are:

- ◆ Alternative sources of the sand materials.
- ◆ Alternative sequencing of quarry development.
- ◆ Alternative methods of transporting the material to the product markets.
- ◆ Alternative road transport routes.
- ◆ Alternative methods for storing materials on the site.

The concept of alternatives is not really appropriate in this situation. This development is essentially a progressive transition from a disturbed site to a rehabilitated site. Maintaining a viable extractive operation in parallel is necessary to support that transition. There is a modest but definable resource



remaining and one that will support an extractive operation of approximately 10 years duration. The resource will allow the site's rehabilitation and restoration.

One option that could be considered is the form of transport from the site to the markets. Once having accessed the main road system, then the transport routes are defined. However, there has been, over the history of Maroota, a strategy to develop internal access roads that will enable the bypassing of the public road system, at least within Maroota.

This Company has consistently objected to that concept, as it provides for a system of unclassified private roads in which various safety, legal liability, tenure and management issues are so significant as to render the concept unworkable.

The DCP 500 has identified a transport access point to the main road system at the corner of the Crown reserve road and Old Northern Road. This application will utilise that designated access point.

## 2.4 CONCLUSION

It is concluded on the evidence that:

- the Company's products are premium products, well sought after by the market.
- the market is in an "under supply" situation, with demand exceeding supply from those sources that can supply quality products and are located favourably to alternative sources.

There is one other important issue. This proposal is for the completion of extraction of the remaining resource on a site for which a series of previous development applications have been granted. Justification in terms of other feasible alternatives to the carrying out of the development, in terms of the consequences of not carrying out the development, are therefore inappropriate. This development should be carried out to ensure final site rehabilitation can be completed and resource extraction is complete.



## CHAPTER 3 – BACKGROUND

- 3.1 Market Sources and Demand for Construction Sands
- 3.2 History of Extractive Industry Operations at Maroota
- 3.3 History of Site Extraction
- 3.4 Planning Context
- 3.5 Development Consent Process
- 3.6 Site Analysis of Existing Environment

This chapter outlines the history and background to the proposal, introduced in **CHAPTER 1**. Further support is provided to justify the development (in terms of market sources and demand). The previous site development and the constraints this had created on the operation, the planning and development consent process, and the environmental characteristics of the site and its setting are also detailed.



## 3.0 BACKGROUND

### 3.1 MARKET SOURCES AND DEMAND FOR CONSTRUCTION SANDS

**Appendix B1 -Sydney Construction Sands – Resource and Market** - provides an analysis of the following:

- ◆ The sources of construction sand within Sydney and the outer regions.
- ◆ The future demands for construction sands.
- ◆ Maroota's future potential as a supply source.

As an overview of the market and its demands the following points are relevant

- ◆ The total current market demand in the Sydney region is around 7 million tonnes per year.
- ◆ The annual market for concrete and mortar sands in the Sydney region is approximately 2.5 to 3 million tonnes (concrete) and 2 to 2.5 million tonnes (mortar), respectively.
- ◆ The principal uses of construction sands are ready mix concrete (40%), general construction (17%), fill sand (16%) and mortar sands (13%). An additional 14% is used for speciality purposes.
- ◆ The Maroota area currently supplies a total of around 0.5 million tonnes of predominantly fine to medium sands, principally used for mortar and concrete purposes.
- ◆ The Sydney region has been supplied principally from two major deposits of sand for the last 20 years:
  - Kurnell (fine/medium)
  - Penrith Lakes (medium/coarse)
- ◆ The current annual supplies to the Sydney region from these sources are:
  - Kurnell: 1.2 million tonnes
  - Penrith Lakes: 2.0 million tonnes
- ◆ The other principal supply sources are the areas of Londonderry, Maroota and Somesby Plateau, each currently supplying between 0.3 and 0.5 million tonnes, with most of the other supply sources generally less than 0.2 million tonnes per year.
- ◆ The future Sydney market supply situation is threatened by:
  - Phasing out of Kurnell over the next 5 years, hence the loss of 1.2 million tonnes of fine to medium sand per year.
  - Completion of extraction from Penrith Lakes in approximately 10 years time, with the loss of 2.0 million tonnes of medium to coarse sand per year.
  - No new major "committed" sources of construction sands within a reasonable proximity of the Sydney market.
  - The alternative of sourcing from marine aggregates is becoming less likely due to community objections and environmental considerations.



Maroota has been identified as major supply source. It has the following attributes:

- ◆ Scheduled under SREP No. 9 (Extractive Industries).
- ◆ A large deposit – (resource in excess of 100 million tonnes).
- ◆ Located within 50 km of the Sydney Central Business District and equally importantly located within the North- West growth sector of the Sydney metropolitan area.

Maroota's potential as a supply source has been well established. The rationale behind proceeding with the utilisation of the resource are as follows :

- ◆ Maroota is possibly the only major new source of construction sands within a reasonable proximity of the Sydney market.
- ◆ Maroota is the best located major deposit for the future, as Kurnell and Penrith Lakes come off line.
- ◆ The deposit is a relatively clean deposit in comparison with other natural friable sandstone deposits.
- ◆ Manufactured sands are unlikely to have a significant market impact within the foreseeable future.
- ◆ Transport, the most significant issue identified in the early planning stages of Maroota, is being resolved through Section 94, Contributions.
- ◆ Environmental and planning issues, considered in recent times as a likely constraint on growth, may be able to be resolved.

The key environmental issues of transport, tailings disposal, drainage and groundwater, natural ecology and land use conflicts are amenable to proper management. This document outlines these management procedures in its assessment of the Environmental Impact.

The State Government has concluded that Maroota could supply up to 2 million tonnes per year over a 50 year period. A level of 2 million tonnes per year would make Maroota equivalent to Penrith Lakes as a supply source. The problem of replacing Kurnell as a source of supply cannot be resolved by the Maroota sands in the longer term, however without the Maroota resource the problem of short supply would be exacerbated.

### **3.2 HISTORY OF EXTRACTIVE INDUSTRY OPERATIONS AT MAROOTA**

The Maroota area was originally settled through ribbon development on the flatter grades of the major ridgelines and along which the main road system (primarily Old Northern and Wisemans Ferry Roads) had been established. The original development was market gardens, of vegetables, some orchards and some grazing. Indeed, much of the land within the Maroota sand deposit area has been previously cleared and used for agricultural purposes.

There has been a history of sand extraction in the Maroota area from the early 1980s. commencing with the construction of farm dams for irrigation purposes.

The key extractive industry planning and resource assessment studies that have been carried out since the early 1980s are:



- ◆ Geological Investigation and Resource Assessment of the Maroota Tertiary Alluvial Deposit, by L T Etheridge - 1980
- ◆ Sydney's Extractive Industry and Regional Environmental Study, Department of Planning - 1984
- ◆ Sydney Regional Environmental Plan No. 9 – Extractive Industry, Department of Planning - 1986
- ◆ Draft Plan of Management, Extractive Industries, Baulkham Hills Shire Council - 1987
- ◆ Plan of Management, Extraction Industries, Baulkham Hills Shire Council - 1989
- ◆ Joint Plan of Management for Extractive Resources at Maroota, Baulkham Hills Shire Council/Hornsby Shire Council/Department of Planning - 1991
- ◆ Development Control Plan No. 108 (Extractive Industries), Baulkham Hills Shire Council - 1992
- ◆ Development Control Plan No. 14 (Extractive Industries), Baulkham Hills Shire Council - 1994
- ◆ Sydney Regional Environmental Plan, No. 9 Extractive Industry (No. 2) - 1995
- ◆ Development Control Plan No. 500 (Extractive Industries), Baulkham Hills Shire Council - 1997

The Maroota sand deposit was identified as a significant regional resource, under SREP No. 9, Extractive Industry, in 1986. In the revision of the plan (DUAP, 1995), it was identified that one of the major issues that had emerged was *"concern about the control and management of extraction at Maroota"*.

SREP No. 9 (2) required, under Clause 11, a new DCP to be prepared for extraction at Maroota before further approvals could be granted. The plan clearly identified that the primary objective was to

*"facilitate the development of extractive resources close to Sydney's metropolitan area by identifying land that contains extractive material of regional significance"*

and that an equally important objective was to:

*"ensure that extractive industries are carried out in an environmentally acceptable manner"*.

Objective 3, the *"environmentally acceptable manner"* requirement, goes on to identify that notwithstanding the inclusion of an extractive industry resource site within the plan, :

*"an application for extractive industry may still be refused if the Council considers environmental impacts are unacceptable"*.

The need for a co-ordinated approach to be taken to extraction in Maroota was reinforced by the plan's requirements for the preparation of a new DCP, before further approvals could be granted. DCP No. 500 was subsequently prepared by and adopted by Baulkham Hills Shire Council at December 2, 1997. By this act Council has established the basis for further growth in extractive developments within the Maroota area.

The Maroota sand resource is an extensive one and is considered to be in excess of 100 million tonnes. Extraction to-date, over the last 15 years, has been relatively minor in terms of the total size of the resource. However, the extent to which management of the environment will restrict the potential extractive industry in Maroota is still being determined.

Within SREP No. 9(2), Clause 11, Special requirements for Extractive Industry at Maroota, listed the matters that were required to be addressed under the DCP, namely:



- (b) set out for a staged extraction program .....
- (c) determine the potential impact of the staged extraction program on the groundwater and soils, and set extraction depths and contours, so that the potential impacts will be minimised.
- (d) locate an internal road network and external road access and address the road traffic considerations and limitations which the road system will place on extraction.
- (e) set out a post-extraction land use plan which will specify the proposed land use after extraction and the intended final landform and method of rehabilitation.
- (f) contain provisions aimed at ensuring that landowners wishing to remain in agricultural production are not adversely affected by extractive operations, especially in relation to groundwater. (The plan must provide for extraction to be limited in depth so that the water table is not affected to such an extent as to disadvantage neighbouring land that is not to be used for extraction).

Further consideration of these strategic matters is contained in **CHAPTER 4 - STRATEGIC CONSIDERATIONS.**

Since 1996, Council has prepared bi-annual assessments on the status of Extractive Industry in the Shire. These reports provide a record of recent extraction history.

The reports are presented with the following structure:

- ◆ Executive Summary
- ◆ Overview Extractive Industries Within the Shire
- ◆ Transport and Access Arrangements
- ◆ Tailings System
- ◆ Section 94 Contributions
- ◆ Extraction and Rehabilitation
- ◆ Community Views
- ◆ Overall Performance
- ◆ Legal Matters
- ◆ Maroota Groundwater Study
- ◆ Future Directions – Maroota
- ◆ Financial Impact
- ◆ Recommendations

At the time of preparing this EIS Council were engaged in reviewing and checking the Section 94 Contributions of the Extraction Companies within the Maroota area. Dixon Sand have their records available for this review and are confident that their contributions are correct and up-to-date.

There is still concern within Baulkham Hills Council and the State Government over extractive industry operations, their management and assessment within the Shire. Such concerns led, at the October 1998 27, 1998 Council meeting, to a Mayoral Minute which stated:



*"A report be submitted to Council's next ordinary meeting outlining the feasibility of engaging external qualified technical expertise to independently assess and report to Council on all aspects of extractive industry activities. This report will also outline the options available for engaging the relevant expertise from the EPA, Department of Land and Water Conservation or external expert consultants and include options for funding this work."*

Subsequent to the adoption of this minute, a meeting was held with the Minister for the Environment, the Hon. Pam Allen, with a view to obtaining the Minister's support to assist Council. In Council's Business Paper for the November 11, 1998 meeting, it was reported that:

*"Options to be discussed include:*

- The legislative change to make the extractive industry more accountable and contribute towards independent auditing.*
- Financial assistance to enable Local Government to commission independent auditing.*
- Making available environmental auditing resources."*

It is understood the State Government, through the Department of Urban Affairs and Planning, is currently considering a response to Council. The Executive Director of the Department of Urban Affairs and Planning (see **Appendix A3 - Consultation**) has advised that:

*"The Department is examining in the wider context, issues concerning extractive industries in the Maroota area, in consultation with Baulkham Hills Council. This includes consideration of appropriate future controls, taking into account past environmental performance and the level of compliance with conditions of consent. The matters raised in your letter will be further considered in the course of this examination."*

### 3.3 HISTORY OF SITE EXTRACTION

Extraction of sand on Lot 196 reportedly commenced in the early 1980s and has continued through to December 1998.

Details of the nature of the early consents are not available. However, it is understood that early extraction for a dam was commenced around 1981/82 and without development consent. A 1984 plan shows the extent of the site at that time (see **Figure 3.2 – Site Layout (1984 Proposal)**).

SREP No. 9, gazetted in 1986, legitimised the extraction on Lot 196, permitting extraction to continue until October 1987 (Clause 14). The plan also imposed various conditions on the operation.

A 1987 Development Application was lodged for the extension of the existing pit to the north and west. At that time, the extent of site disturbance was modest and the extension was modest. Most of the site was vegetated with two defined drainage channels existing across the site (again see **Figure 3.2**).

A 1989 proposal contained in an EIS dated May 1989, proposed a significant expansion of extraction to effectively encompass all of the Lot 196 site that is now disturbed. Described as an interim application, pending the resolution of, *"obstacles to the preparation of a long term plan of management for PF Formation's areas of interest"*, the 1989 DA proposed no increase on the approved 50 loads per day but effectively established the site as it is now developed. The scope of the application was not clear, with the only details of the extraction plan being:



- ◆ A maximum 15 m depth
- ◆ The extractable resource of the order of 0.5 million cubic metres
- ◆ A development program of some 2.5 years at a production rate of up to 250,000 tonnes per year

At the time there was no extraction plan provided, no rehabilitation schedule and no basis for the calculation of the reserves.

A summary of consents, over the last ten years, has been:

- February 16, 1988 – Development consent to PF Formation, to extract sand on Lots 117 (to the east) and 196 (1987 Proposal).
- August 15, 1989 – Development Consent No. 89/359 to PF Formation, to extend the existing extractive industry on Lot 196 (1989 Proposal).
- August 7, 1990 – Development Consent No. 89/879 to PF Formation, to provide alternative truck access to Lots 196, 198, 29 and Crown land.
- November 3, 1993 – Development Consent No. 92/591 to Manaldo Pty Ltd, to extract sand from Lots 196 and 29.

There have been three applications by Dixon Sand to modify consent conditions for operation on Lots 196 and 29. One was approved and two refused by Council.

- April 1994 – Section 102 (now Section 96) application to amend Conditions 1 and 2 of Consent No. 92/591.
- September 1998 – Section 96 application to amend Condition 5 of Consent No. 92/591, and so extend the life of the consent from 5 years to 6 years.

Land and Environment Court appeals against Council's refusal of both applications were made.

At recent meetings with Council's officers the issue of the internal access road and access for PF Formations across the Dixon Sand site between Lots 196 and 29 has been flagged as a major issue by Council. Dixon Sand wish to achieve a uniform rehabilitated site, necessitating the temporary relocation of the existing internal access road (including the Crown Road ) – see– **Plate 3.2 - Existing Private Internal access road, Figure 6.6 Final Site Rehabilitation and Figure 6.7 - Preferred Site Final Landform.**

Lot 196 has seen sand extraction for the last 17 years and Lot 29 for the last 5 years. Two operators have extracted that sand, being PF Formation from the early 1980s to 1992 and Dixon Sand from 1992 to 1998. Dixon Sand has extracted some 0.8 million tonnes since 1992 and it is estimated PF Formation extracted over 2 million tonnes in the ten year period they occupied the site. In total, at least 2.8 million tonnes has been extracted (some 66% of the total extractable resource). There is approximately 1.65 million tonnes remaining on the site, which is able to be extracted (see **Section 6.2**).



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### 3.4 PLANNING CONTEXT

#### 3.4.1 Local Environmental Plan

The Baulkham Hills Local Environmental Plan 1991, details the zoning for the proposed site as Rural 1(b).

The objectives of the zoning are as follows:

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

The proposed extractive development that is described in this document is permissible with Development Consent.

Under Part 3 – Special Provisions of the LEP, Clause 34 addressed extractive industries. The Clause requirements are as follows:

- "(1) In respect of extractive industry development the Council must aim*
  - (a) to ensure that extractive industries are not carried out in areas of particular environmental sensitivities; and*
  - (b) to ensure that extractive industries are undertaken in accordance with management and planning provisions as contained in any Plan of Management adopted by the Council; and*
  - (c) to permit extractive industry development which is of regional significance without burdening the Council with costs for the provision of services and roads.*
- (2) Before granting consent to an application to carry out extractive industry development, the Council must take into consideration whether the development is in accordance with:*
  - (a) The provisions of any management plan adopted by the Council; and*
  - (b) Any staging in rehabilitation of plan and rehabilitation plan adopted by the Council."*

Development Control Plan No. 500, 1997 (Extractive Industries) is the plan prepared under the LEP as a consequence of the Sydney Regional Environmental Plan No. 9, Extractive Industries.



**3.4.2 Regional Environmental Plans**

There are two Regional Plans that are relevant to the site:

- ◆ **Sydney Regional Environmental Plan No. 9 – Extractive Industry (No. 2)**
- ◆ **Sydney Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No. 2 – 1997)**

In respect to **SREP No. 9**, sub-Clause (2) states that:

*"A person may, with the consent of Council, carry out development for the purpose of an extractive industry on land to which this Clause applies."*

Sub-Clause 4 (1) states that:

*"This plan prevails to the extent of any inconsistency between it and another environmental planning instrument, except a State Environmental Planning Policy."*

In respect to **SREP No. 20**, the site is located within the Catchment of the Hawkesbury River.

Clause 4 of **SREP No. 20** states, inter alia:

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

The "General planning considerations" detailed in Clause 5, which are applicable to the subject development application are:

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

Of the "Specific planning policies and recommended strategies" listed in Clause 6, the following are considered applicable to the subject development applications:

- "(1) Total catchment management*
- (2) Environmentally sensitive areas*
- (3) Water quality*
- (4) Water quantity*
- (6) Flora and fauna"*

The aim of the plan is:



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

### 3.4.3 State Environmental Planning Policies

In addition to those planning instruments identified at **Section 3.4.2**, number of State Environmental Planning Policies (SEPPs) have been identified which could be seen to apply to this proposal, namely:

- **SEPP No. 11 – Traffic Generating Developments**
- **SEPP No. 33 – Hazardous and Offensive Development**
- **SEPP No. 44 – Koala Habitat Protection**

In regard to **SEPP No. 11**, the proposal involves an extractive industry that falls within Schedule 1 of the Policy. The Policy requires the Road and Traffic Authority of NSW to be made aware of the proposed development and be given an opportunity to make representations about the proposed development.

In respect to **SEPP No. 33**, it is stated in the aims of that Policy, that inter alia:

- "(d) to ensure that in determining whether a development is a hazardous or offensive industry, any measures proposed to be employed to reduce the impact of the development are taken into account; and*
- (e) to ensure that in considering any application to carry out potentially hazardous or offensive development, the consent authority has sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact."*

The proposed development is not a "Hazardous Industry", "Potentially Hazardous Industry" or "Hazardous Storage Establishment" as defined in SEPP No. 33, as it will not pose a significant risk in relation to the locality to human health, life or property, or to the biophysical environment.

The proposed development is, however, "Potentially Offensive Industry" and as such, SEPP No. 33 does apply.

When determining an application for Potentially Offensive Industry, Council must, pursuant to Clause 13 of SEPP No. 33, consider:

- "(a) current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development;*  
*and*
- (b) whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply;*  
*and*
- (c) any feasible alternatives to the carrying out of the development, and the reasons for choosing the development( the subject of the application) - including any feasible alternatives for the location of the development and the reasons for choosing the location (of the subject application);*  
*and*
- (e) any likely future use of the land surrounding the development."*



In relation to the current circulars and guidelines, the then Department of Planning has prepared Circular B27 and the publication "Applying SEPP 33, Hazardous and Offensive Development Application Guidelines". It is the information contained within these Guidelines which has been used to determine that the subject development is not "Hazardous Industry", "Potentially Hazardous Industry" or a "Hazardous Storage Establishment", but is "Potentially Offensive Industry".

In assessing whether the proposal is a "Potentially Offensive Industry", the Guidelines, on pages 13 and 14, give guidance to Council, with regard to the information which should be provided with a development application. This EIS provides sufficient detail in this regard.

As outlined in the guidelines, if a licence is required by the EPA, then it is safe to assume that the proposed development is "Potentially Offensive Industry". The EPA has indicated that Pollution Control Approval is required to operate the proposed extractive industry, and as such, it is concluded that the proposed development is "Potentially Offensive Industry". The Protection of the Environment Operations Act similarly requires the Approval of the EPA by defining the proposed extraction as activity requiring approval and licensing.

With regard to assessing a "Potentially Offensive Industry", the guidelines state that:

*"The key consideration in the assessment of a potentially offensive industry is that the consent authority is satisfied there are adequate safeguards to ensure emissions from a facility can be controlled to a level at which they are not significant. An important factor in making this judgement is the view of the EPA (for those proposals requiring a pollution control licence under EPA legislation). If the EPA considers that its licence requirements can be met, then the proposal is not likely to be "offensive industry"."*

The technical studies which were undertaken as part of the EIS process, and concerned with noise, air quality, flora and fauna, archaeology, groundwater, hydrology, and surface water management, demonstrate that the impact of the proposed development will not be significant.

The EIS demonstrates that the consent authority can be satisfied in that:

*"... there are adequate safeguards to ensure emissions from a facility can be controlled to a level at which they are not significant."*

The implementation of the safeguards and controls outlined in this EIS will change the nature of the proposal such that it can be regarded as a "Potentially Offensive Industry", and not an "Offensive Industry".

In regard to **SEPP No. 44**, Baulkham Hills Shire is identified within Scheduled 1 of the Policy as a Local Government area in which the Policy applies and for which an investigation is required to determine the presence of core Koala Habitat.

The operating site has been cleared by past operations and accordingly, could not be considered as habitat. Accordingly, no investigation has been carried out. The 6.1 ha pristine area of Lot 196, which will be left as dedicated native bush-land, has the potential to support Koala Habitat.



### 3.5 DEVELOPMENT CONSENT PROCESS

**Section 1.6- Statutory Requirements** has provided the background to the development and its status under the *Environmental Planning and Assessment Act* as Local and Integrated Development, requiring the lodgement of a Development Application for Designated Development.

**Figure 3.4- Development Consent Process**, is extracted from the Department of Urban Affairs and Planning's *EIS Guidelines for Extractive Industries – Quarries*, and clearly defines the process for approvals required under Part 4 (development approval is required). The preparation of the EIS, the exhibition of the EIS and the receipt of submissions from government authorities and the public are all steps in the process for which Council have a responsibility for completing, once the development application and EIS is submitted.

### 3.6 SITE ANALYSIS OF EXISTING ENVIRONMENT

#### 3.6.1 Introduction

This section provides an overview of the existing environment of the site, and where appropriate, the local area.

The site has been extensively worked and site operations have been continuous for approximately 17 years. Most of the site's environment has been heavily modified, as has the environment of some of the neighbouring lands. There are however, extensive natural vegetation areas adjacent to the site, to the West and South-West of the site. There is also a significant part of Lot 196, which has not been disturbed. This area of 6.1 ha has been preserved and protected in its original pristine state. It occupies almost 25% of the area of Lot 196. There is also a smaller area at the western extremity of Lot 29 which has been retained in its natural state, as a protective measure for the *Kunzea rupestris*, located both to the East and West of the Crown road reserve.

The site's environmental characteristics have been grouped and reviewed in this document as follows:

#### ♦ Biophysical environment

- flora and fauna
- topography
- surface soils
- land capability
- meteorology
- drainage
- water resources
- ambient noise
- air quality
- bush fire hazard



**♦ Social environment**

- o land use and settlement
- o visual access
- o transport system
- o heritage

The descriptions provided here are only an overview. Where it is necessary to provide greater detail, this is contained in the impact assessment chapters from **CHAPTER 7** onwards.

**Plate 1.1- North Maroota Area**, shows all of the site and the surrounding landholdings.

The site's Eastern boundary is located approximately 600 metres West of Old Northern Road.

**Figure 1.1- Locality Plans**, and **Figure 1.2- Project Site Area**, are used as reference drawings for this section. **Figure 3.5- Existing Environment Data**, is the principal figure used to describe the existing environment. It shows all of Lots 196 and 29, and Lots 1 and 2 to the east (where there are a number of monitoring sites).

**3.6.2 Biophysical Environment****Flora and Fauna**

Field surveys carried out for this EIS, reported at **Appendices C7** and **C8**, are of the following areas:

- i) along the western boundary of Lots 196 and 29
- ii) downstream of the site along the creek line, in the south west corner of Lot 196
- iii) of most of the area of Lots 1 and 2, to the east of Lot 29
- iv) of the Crown road reserve north of Lot 196

Three previous Environmental Impact Statements, in relation to the proposed site, provided background data that is useful, these documents are:

- ♦ The 1989 EIS (PF Formation, 1989). This document provided no survey report on the pre-existing vegetation or any survey of faunal habitats.
- ♦ The 1992 EIS (Dixon Sand, 1992). This document contained a flora survey, by a Dr. T M Straede; it covered part of the site which contained natural vegetation at the time, namely Lot 29 and the area in the south west corner of Lot 196. The dominant floral associations were described and importantly, the presence of *Kunzea rupestris* on the western part of Lot 29 and adjacent areas, was documented.
- ♦ A faunal survey was also carried out for the 1992 EIS by Mount King Ecological Surveys. This survey covered :
  - o the south west part of Lot 196 (creek line)
  - o the open timbered area to the south of the above area
  - o the open heath land in the south west corner of Lot 29



The survey recorded a wide range of species, particularly avifauna, in the area of the creek line and in the open timbered area to the south of the water course. Other species of note included the Yellow-bellied Glider and the Long nosed Bandicoot.

To the west of Lot 196 and indeed to the west of all of the Maroota "settlement area" and marking the boundary of the SREP No. 9, Extractive Industries area, is a large area of unalienated Crown land extending from Maroota through to the Hawkesbury River, some 3 km to the west and north west. In DCP 500 (1997), this bushland area is identified as the Dryabbin Nature Reserve. It is however, a proposed nature reserve, as acknowledged by both Council and the National Parks and Wildlife Service. (Nature reserves are established under the National Parks and Wildlife Act, and are defined as areas of special scientific interest containing wildlife or natural environments or natural phenomena).

No details of any actual proposal to dedicate the area as a Nature Reserve have been able to be identified. To date no survey work, to the knowledge of the writers or Dixon Sand, has been carried out in preparation for such dedication. However, the area is down slope of the site area and is continuous with the area of undisturbed vegetation in the South- West corner of Lot 196.

### **Topography**

The site has a Westerly aspect, varying in level from 188 m AHD in the North-Eastern corner of Lot 196 and 187 m AHD on the Eastern boundary of Lot 29 to approximately 160 m AHD on the western boundary of the site adjacent to the undisturbed gully area. The levels in the gully on Lot 196 would be below 150 m AHD.

The site is relatively gently sloping (with the exception of the gully area) although the original slopes and landforms have been somewhat modified by extractive operations. The existing slopes are generally in the range of 3% to 5%.

Regionally, the landform rises gradually to the East, to levels in excess of 220 m AHD along Old Northern Road and fall to the west, in rather steeper terrain, through to the Hawkesbury River. Old Northern Road forms the catchment divide, (with the areas east of Old Northern Road draining east – see **Figure 1.1b**).

The topography of the site is relevant in terms of drainage direction and velocities. Topography of the area is also be relevant in terms of the level of visual access of the site.

### **Surface Soils**

There is minimal record of the site's original soil type and profile. The 1992 EIS contains no soil information. The 1989 EIS identifies the site as within a land unit characterised by "*yellow duplex soils occurring on the thinly laminated shale and sandstones of the Mittagong formation*".

All the original topsoil has been stripped from Lot 196. The northern part of Lot 29 still has the original soil and grass cover although most of the previous arboreal vegetation has been removed many years ago, for agricultural purposes.

Soils have been stripped and stockpiled, with stockpiles located as shown on **Figure 3.5- Existing Environment Data**.



**Appendix C2- Rehabilitation and Re-vegetation Strategy**, provides a series of analyses undertaken of the soil stockpiles in the northern and central part of Lot 196.

The soil landscape of the Maroota area is described in *Soil Landscapes of St. Albans 1:100,000 Sheet (DLWC, 1997)* in which the typical soils of the area are classified under the soil landscape known as Sydney Town (st). The particular soil landscape is located on a Hawkesbury Sandstone geology and which is characterised by a range of dominant soil materials of sandy loam, sandy clay loam, pedal clay, etc.

The characteristics of the soils have been classified as follows:

- ◆ Very low fertility
- ◆ Strongly acidic with low water holding capacities and low to very low nutrient status and cation exchange capacities
- ◆ All soil materials are sodic and have a high potential aluminium toxicity
- ◆ Soil depth varies considerably and occasional rock outcrops limit root penetration
- ◆ Erosion hazard is high to very high

#### **Land Capability**

Land capability is defined (*NSW Soil Conservation Service, 1986*) as:

*"The ability of land to accept a type and intensity of use permanently or for a specified period under specific management, without permanent damage".*

It is an expression of the effect of biophysical land resources, including climate, on the ability of land to sustain use without damage under various uses.

An American system of land capability classifications, has been modified by the Soil Conservation Service of NSW, to suite local conditions. The system is based on an assessment of the biophysical characteristics of the land, the extent to which these would limit a particular type of land use and the current technology that is available for the management of that land. (The classification system is described in *Rural Land Capability*, (Emery, undated).

Under the classification system, all of the site would be classified as Class M land – (areas disturbed by past or current extraction and sand processing activities). Only the heavily timbered gully in the South- West corner of Lot 196 would have a classification of Class VII, (land best protected by green timber).

There is a similar classification system used by NSW Agriculture for the assessment of land suitability for agriculture (Woodward, 1988).

The area of land in the northern part of Lot 29 would be classified as Class IV, because of the low soil productivity and soil fertility.



**Meteorology**

The meteorological parameters of the Maroota area have been extensively documented in all of the proceeding EISs and in other studies, including the Maroota Stage 1 Groundwater Study (DLWC, 1997).

**Appendix C3- Integrated Surface Water Management Strategy** provides details of the rainfall and evaporation data for the area.

The nearest Bureau of Meteorology station is at Glenorie and it is from here that wind data has been obtained. In the 1992 EIS (Dixon Sand, 1992), the wind rose data is provided. The predominant wind is from the East, at 3 pm during Spring, Autumn and Summer. This is an important feature in the assessment of dust dispersion.

**Drainage**

**Appendix C4-Integrated Surface Water Management Strategy**, described in Section 2.2, the site's drainage system. The site, with an area of some 34 ha, is located at the confluence of two small upstream catchments, of a total area of some 49 ha. The main upstream catchment is predominantly farmland and has an area of some 33 ha.

Upstream run-off, including that sourced from the internal access road utilized by PF Formation, is diverted along the eastern boundary of Lot 196 and then flows through the site via a series of water quality control ponds, to the main storage pond located at the downstream boundary of the site's operational area. Most run-off from the site itself flows to the main storage pond by gravity. Run-off from part of Lot 29 is not free draining and has to be pumped to the main storage pond.

Sediment control ponds and dams prevent sediment release from the site.

**Water Resources**

The water resources of the site occur within both surface run-off and within the groundwater systems. The surface water system is described above.

The groundwater system comprises a shallow aquifer at a depth generally of between 15 m and 20 m, although along the western boundary of the site, that depth reduces and groundwater outcrops along the creek line gully, downstream of the site in the south west corner of Lot 196.

There is understood to be a deep groundwater system within the Maroota area but that has not been investigated.

There is no groundwater use on the site. Surface water is used for sand processing but is recycled and re-used through the tailings system. There is minimal net use of any water. It is proposed to utilize three production bores to top up supply during dry periods, these bores are License Numbers:

- ◆ 10BL 159035
- ◆ 10BL 159036
- ◆ 10BL 159037

These bores are yet to be advertised and fully approved by The Dept. of Land and Water Conservation. The estimated production capability of each bore is 20ML/yr.



**Ambient Noise**

The existing acoustic environment was measured using an Environmental Noise Logger, type EL-215 (see **Appendix C4-Noise Impact Assessment**).

The sites for background noise level monitoring were:

- **Location A:** Residence at 169 Old Northern Road, Maroota (550 m from the Eastern site boundary).
- **Location B:** Residence at 167 Old Northern Road, Maroota (700 m from the Eastern site boundary).
- **Location C:** Maroota North Public School, west of the closest classroom to the boundary (650 m from the Eastern site boundary).

The above sites are in proximity to the quarry site. They are shown on **Figure 3.5- Existing Environmental Data**. They are also to be found at **Figure 1 of Appendix C4**.

For the assessment of traffic noise, the following sites were assessed for background levels:

- **Location D:** Residence at 165A Old Northern Road, Maroota, 10 m from the road.
- **Location E:** Residence at Lot 1 Old Northern Road, Maroota, 20 m from the closest road.
- **Location F:** Residence at Maroota Motors Pty Ltd, Maroota, 20 m from the closest road.
- **Location G:** Residence at corner of Wisemans Ferry Road and Hearses Road, Maroota.

For traffic noise, the existing median noise levels are well below the current and proposed objectives for arterial roads. However, the noise level regularly exceeds the NSW EPA *Draft Environmental Criteria for Road Traffic Noise* for local roads, which means there is potential for annoyance at residences along these roads.

**Table 3.1-Ambient Noise Levels (Site Area)** sets out the ambient levels for locations A, B and C, and **Table 3.2-Ambient Noise Levels (Road Noise)** sets out the Levels for Sites D, E, F and G. The Dixon Sand plant was not operating at the time of the Site Noise measurement.

**TABLE 3.1**  
**AMBIENT NOISE LEVELS – (SITE NOISE - LA90)**

Period	Location		
	A	B	C
6 am to 7 am	39.1	37.5	
7 am to 6 pm	39.2	39.2	36.7



**TABLE 3.2**  
**AMBIENT NOISE LEVELS – ROAD NOISE (LAeq)**

Descriptor	Location			
	D	E	F	G
18 hour	57.4	62.7	55.3	55.1

For the school (Location C), the background level is representative of school hours, being 8 am to 4 pm.

The background noise levels resulted from:

- ◆ At locations A and B, the primary noise sources were road traffic noise, agricultural noise and noise from dogs barking. Noise from the adjacent quarries was inaudible.
- ◆ Levels at the school (Location C) were primarily influenced by noise from the students and road traffic noise. The quarries in the area surrounding the school were inaudible during observations. The school Principal confirmed that noise from the operations of the quarries was rarely audible. However, noise levels from trucks travelling along Old Northern Road was a cause for concern.
- ◆ Noise levels at locations D, E, F and G were primarily influenced by road traffic noise. The median noise levels were well below the current and proposed objectives for arterial roads. Whilst neither Old Northern Road or Wisemans Ferry Road could be considered local roads, measured noise levels exceeding 55 dBA for extended periods of time could have the potential for annoyance.

### **Air Quality**

Air quality in the vicinity of the site is determined by a range of quarry and non quarry related activities. The non quarry related activities are primarily agricultural activities, such as ploughing, vehicle movements, smoke from farm activities, etc. Exhaust fumes from vehicles travelling along Old Northern Road are another non quarry contributor. The quarry related activities, which will influence air quality, will be from activities on the subject site as well as from quarry operations to the north and the south of the Dixon quarry. Quarrying activities that can generate dust emissions include:

- Topsoil and overburden removal and scraper and dozer operations in the extraction process.
- Movement of vehicles on unsealed roads, including the site's internal access roads and the adjacent internal access/Crown road (for the PF Formation operation).
- Wind erosion from overburden, raw materials and finished products stockpiles and from surfaces awaiting rehabilitation.
- Exhaust emissions from mobile and fixed plant and equipment, and from product and employee vehicles.



Dust depositional rates have been monitored on the site for a period of two months. **Table 3.3- Average Monthly Dust Deposition Level** (October/November & November/December 1998) provides the monthly mean deposition levels from some of the seven gauges, located as follows:

- ◆ Gauges D1, D2, D3 and D7 are located around the boundary of Lot 196, principally along the Eastern boundary (although D4 is located on the Western boundary and D7 on the Southern boundary).
- ◆ Gauges D5 and D6 are located to the East of the quarry site, between the site and Old Northern Road.

**TABLE 3.3**  
**AVERAGE MONTHLY DUST DEPOSITION LEVEL – QUARRY SITE**  
(gm/m<sup>2</sup>/mth)

Gauge No.	Location	Oct/Nov 98		Nov/Dec 98	
		Total Solids		Insol. Solids	
D1	Front gate	NI	NI	IR	IR
D2	Nr car park	6.8	5.9	IR	IR
D3	Nr weighbridge	33.4	31.7	IR	IR
D4	W bdg Lot 196	3.2	2.5	0.8	0.5
D5	N bdg Lot 1	2.5	1.2	IR	IR
D6	School	NI	NI	NI	NI
D7	Nr Kunzea	NI	NI	NI	NI

There has been some difficulties in establishing the monitoring network. Not all of the gauges were installed correctly (NI = not installed), which meant that only four gauges were able to produce results that were useful in the first period of monitoring for the Oct/Nov period of 1998. Unfortunately, for the Nov/Dec period four of the five samples were corrupted and gave results that were totally incorrect. (IR = Incorrect result). Quarrying activities ceased in December 1998 and hence the usefulness of further monitoring also ceased.

All that can be assessed from the results to-date is that the general background for the area away from quarrying activities is likely to be in the range of 1 gm to 2 gm/m<sup>2</sup>/month, typical of reasonably well vegetated rural areas.

Within the extractive areas (see gauge D2), levels of around 6 gm/m<sup>2</sup>/month would not be unusual. At the boundaries of extractive operations (gauge D4), levels of between 2 gm and 3 gm/m<sup>2</sup>/month are again typical of levels that would be expected.

(The only unacceptable result is from gauge D3, located adjacent to the internal access road of the other operator, along the western boundary of Lot 117. This level, in excess of 30 gm/m<sup>2</sup>/month, is grossly excessive. However, it is only one result and further monitoring will be necessary before this matter can be properly assessed). The generation of dust in this area is outside the control of the proponent.



The EPA requires that the assessment of the impact of activities, which may adversely affect air quality, be undertaken. In the case of dust, the Authority makes a distinction between dust particles that are sufficiently small and remain air borne (with the potential to be inhaled), and dust particles that are sufficiently large to readily fall out of the atmosphere (be deposited on surfaces and so in effect, impact on amenity).

Deposited dust will not effect public health but can, if present in sufficient levels, reduce the amenity for people living within the area. The principal effect is the presence of visible dust, either in the air or on surfaces and soiling of surfaces and materials.

**Table 3.4- EPA Guidelines for Dust Fallout**, set out the criteria adopted by the Authority. This criteria is based around a maximum level of dust deposition of 4 gm/m<sup>2</sup>/month in suburban residential areas and 5 gm/m<sup>2</sup>/month in rural, semi rural commercial and industrial areas.

**TABLE 3.4**  
**EPA GUIDELINES FOR DUST FALLOUT**

Existing Deposited Dust Level (gm/m <sup>2</sup> /month)	Maximum Acceptable Increase over Existing Deposited Dust Level (gm/m <sup>2</sup> /month)	
	Residential/Suburban	Rural, Semi-Rural, Urban, Commercial and Industrial
2	2	2
3	1	2
4	0	1

**Note:** If the existing deposited dust level is greater than 4 gm/m<sup>2</sup>/month in a residential/suburban area or is greater than 5 gm/m<sup>2</sup>/month in a rural or semi-rural area, then no increase in dust fallout is acceptable as a result of any proposed dust emitting works.

In summary, the monitoring data assembled to-date, indicates that at points external to the site the EPA criteria will be met in terms of dust produced by the proposal. This may not be the case as other external sources may have the individual capability to adversely effect air quality beyond EPA criteria. Only on-going monitoring collated with wind direction will pinpoint these external sources and their individual affect.

### 3.6.3 EROSION AND SEDIMENTATION CONTROL

In relation to erosion and sedimentation control, the findings of various surveys appropriate to this EIS are contained in the report in **Appendices C2, C3 and C5**. They are summarised as follows:

- ◆ There was some discharge of sediments from the North-West boundary of the site prior to Dixon Sand commencing operations on the site. There is no current evidence of sediment discharge from the subject site and none as a result of recent heavy rainfall ( March/April 1999).
- ◆ The existing operations at Maroota involve an extensive array of water management and sediment control measures, which essentially confine sediment and other contaminants to the existing disturbed portion of the subject site. As proven after recent ongoing site inspections following heavy rainfall.



- ◆ The creek line in the South- Western corner of Lot 196 displayed no evidence of sediment discharge and deposition following long periods of rainfall in March/April 1999. It is not likely that significant adverse impacts have been or will be imposed upon the natural environment as a result of sediment discharge from the site. The current restoration works are effectively restraining erosion.
- ◆ The sand extraction operations being conducted by Dixon Sand at Maroota do not appear to be adversely affecting the threatened plant species *Kunzea rupestris*, which is located on Lot 29 and adjacent lands. There is no evidence to indicate any decrease in vigour of plant specimens in the vicinity of the extraction operations, arising from the extraction activities themselves.
- ◆ Upgrading of the environmental management measures along the periphery of the sand extraction operation has been undertaken since December 1998. This was done to reduce any potential for sediment discharge from external bund walls and embankments. A Draft Environmental Management Plan has been prepared to document the location and extent of the earthworks, the species and mix of native vegetation to be used in regeneration activities, and the use of native seed and propagation measures to provide plants for re-planting programs and the rehabilitation process.

#### 3.6.4 Social Environment

##### Land Use and Settlement

The Maroota North area is sparsely settled with residences generally located along and adjacent to Old Northern Road (and Old Telegraph Road further to the East).

**Figure 1.2- Project Site Area**, shows the location of all residences within the North Maroota area and the various land use types. Land use is still predominantly agricultural although the balance is changing with increasing areas of extractive operations, particularly to the West of Old Northern Road. Generally, extractive operations in the North Maroota area are confined to the area West of Old Northern Road. A recent development application to Hornsby Council is the first extractive operation proposed within this North Maroota area. It is however noted that there are other operations North of Maroota, to the East of Old Northern Road.

##### Visual Access

**Appendix C9- Visual Amenity Assessment**, provides an analysis of both the local and regional views of the site. The local views can be classified as limited to 2 km. The only visual access location within the local view category is from Old Northern Road, along the section of road east of Lot 117. To the north of the Crown road reserve, topography and vegetation (along the road corridor) restricts any further visual access.

Regional views, although possibly less significant, are available to the north of the site, again from Old Northern Road and from areas along the Hawkesbury River corridor, approximately 3 km to 4 km to the north west of the site.



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**Transport System**

Old Northern Road is located approximately 600 m to the east of the eastern boundaries of the site. It is the only Northern road corridor from Maroota through to the Hawkesbury River at Wisemans Ferry (connecting them with the Mangrove Mountain, Somersby and Central Coast areas).

The road is a two lane rural road, classified as a main road by the RTA.

Access to the site is from Old Northern Road via a Crown road reserve, through to the North- Eastern corner of Lot 196. This intersection is identified under DCP 500 as a "Transport Access Point".

**Appendix C6- Traffic and Transportation Assessment**, provides further details of traffic levels, pavement standards, etc. for the road system.

**Heritage**

There are no known items of European heritage within the North Maroota area and none on the quarry site or areas immediately adjacent to the site.

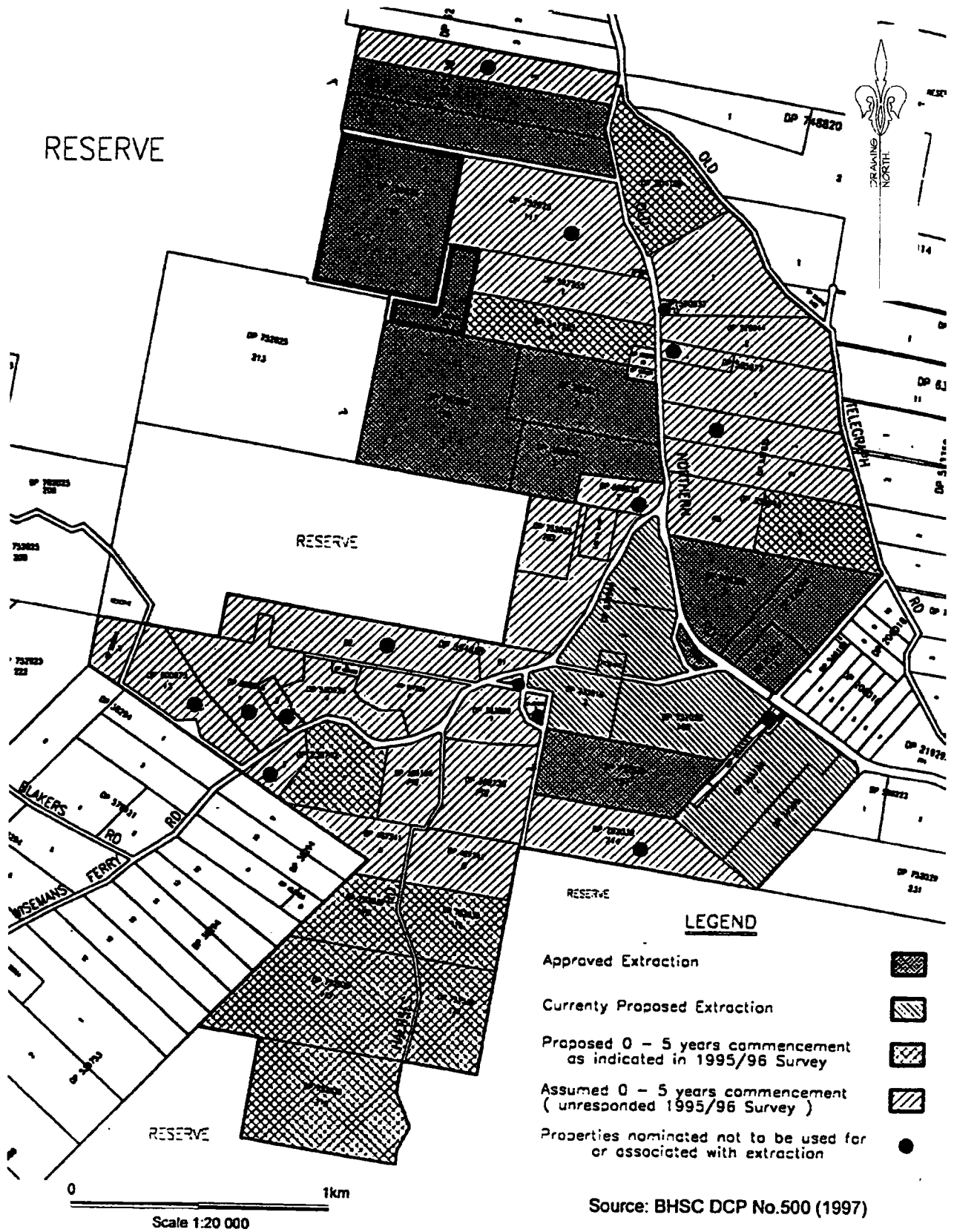
In regard to pre-European heritage, a survey has been carried out, of lands to the east of the quarry lands. There were no findings of any Aboriginal sites or relics although there was reported to be a site located within the vicinity of Lot 2 DP 547255.

An archaeological assessment of Lot 196 was conducted in January 1984 and was reported in the 1989 EIS (PF Formation, 1989). No evidence of items of archaeological significance was found and it was reported that there were no recorded sites of significance on the surrounding lands. It was also stated that because of the long history of agricultural activity on Lot 196 that would have disturbed the topsoil to a considerable depth and because the extraction operation had already stripped and removed a large quantity of surface material, that there was no original surface left to inspect. At that time, the only relatively undisturbed part of the proposed extractive operations was the area in the North-West corner of the site. It was reported in the later EIS that no items of significance had been previously recorded on the site in the surrounding area.

No heritage surveys have been carried out on Lots 29 or 196 since that time. Disturbance of these lands in the last 17 years would now prevent identification of any such sites, should they have originally existed.



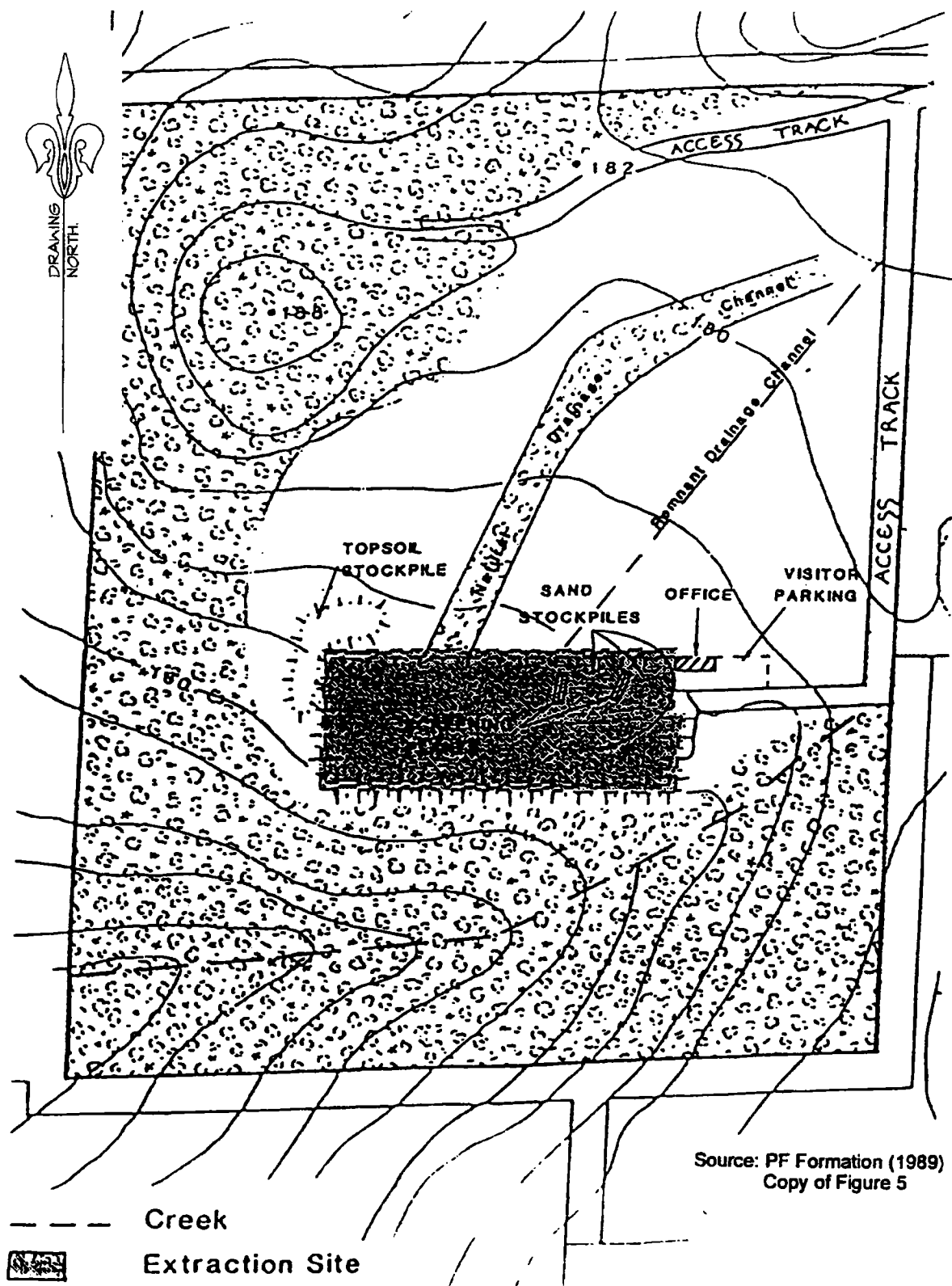
# NORTH MAROOTA OPERATION NSW



MAROOTA EXTRACTION OPERATIONS FIGURE 3.1



# NORTH MAROOTA OPERATION NSW

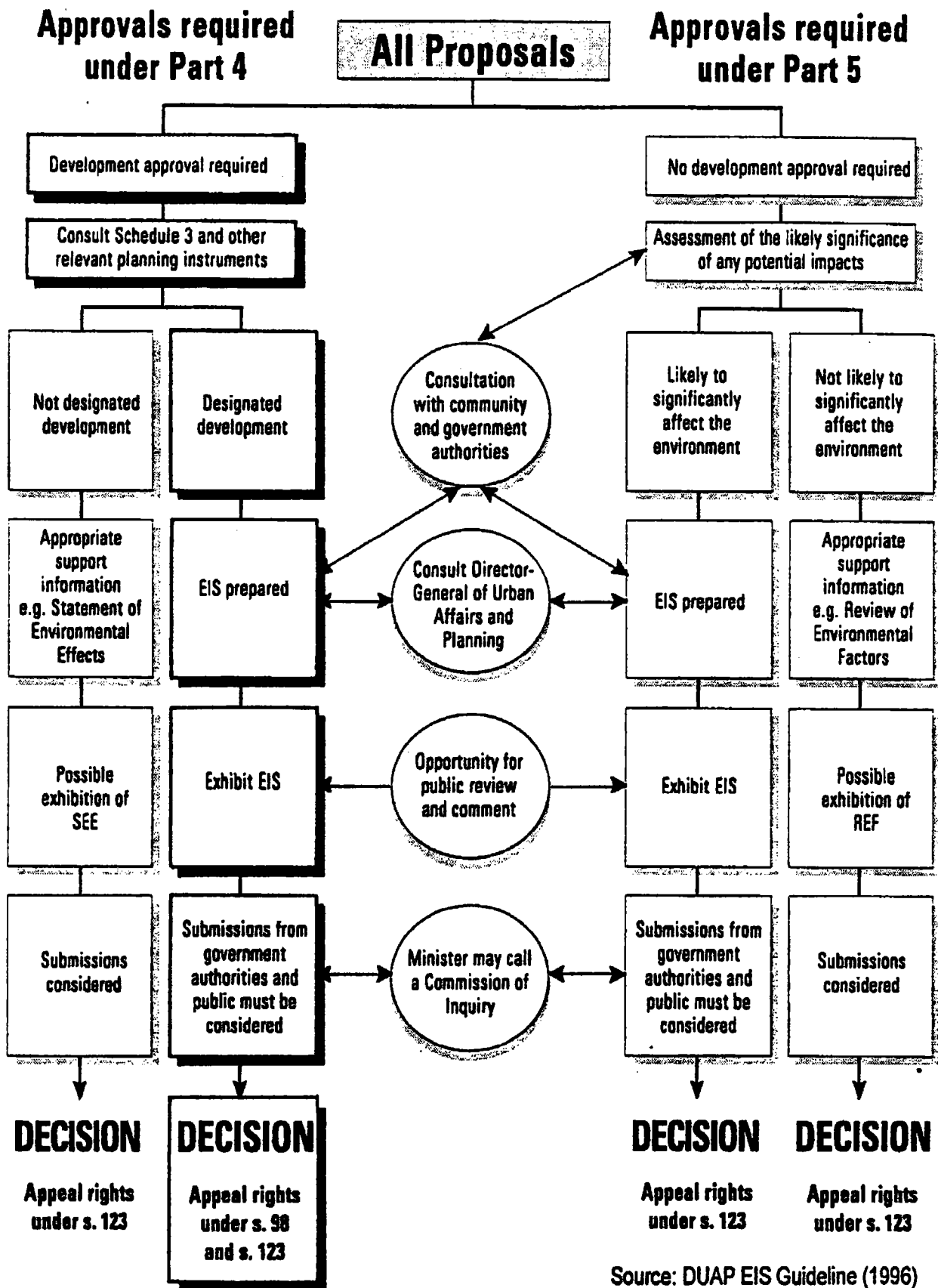


SITE LAYOUT (1984 Proposal)

FIGURE 3.2



# NORTH MAROOTA OPERATION NSW



Source: DUAP EIS Guideline (1996)

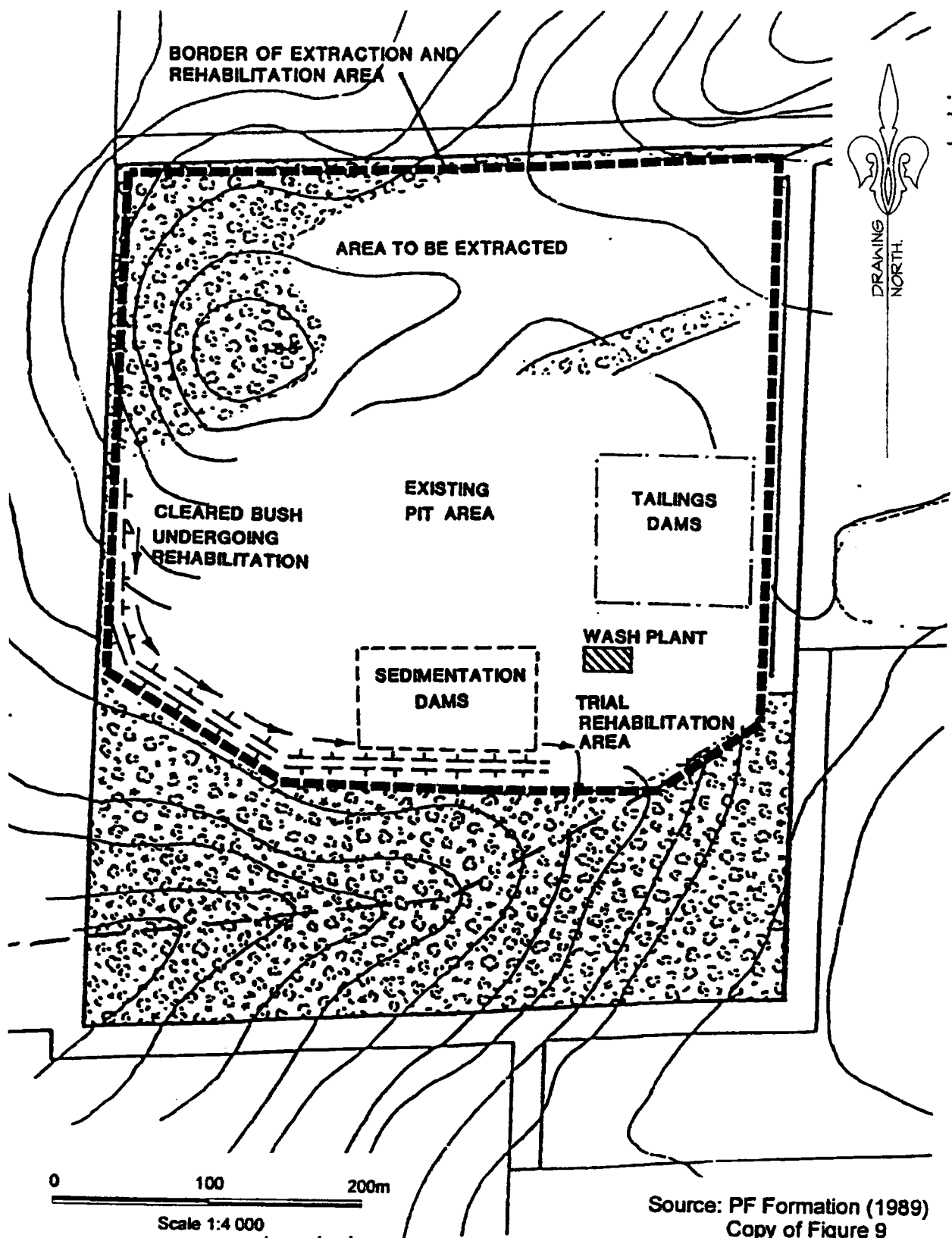


- Crown access road





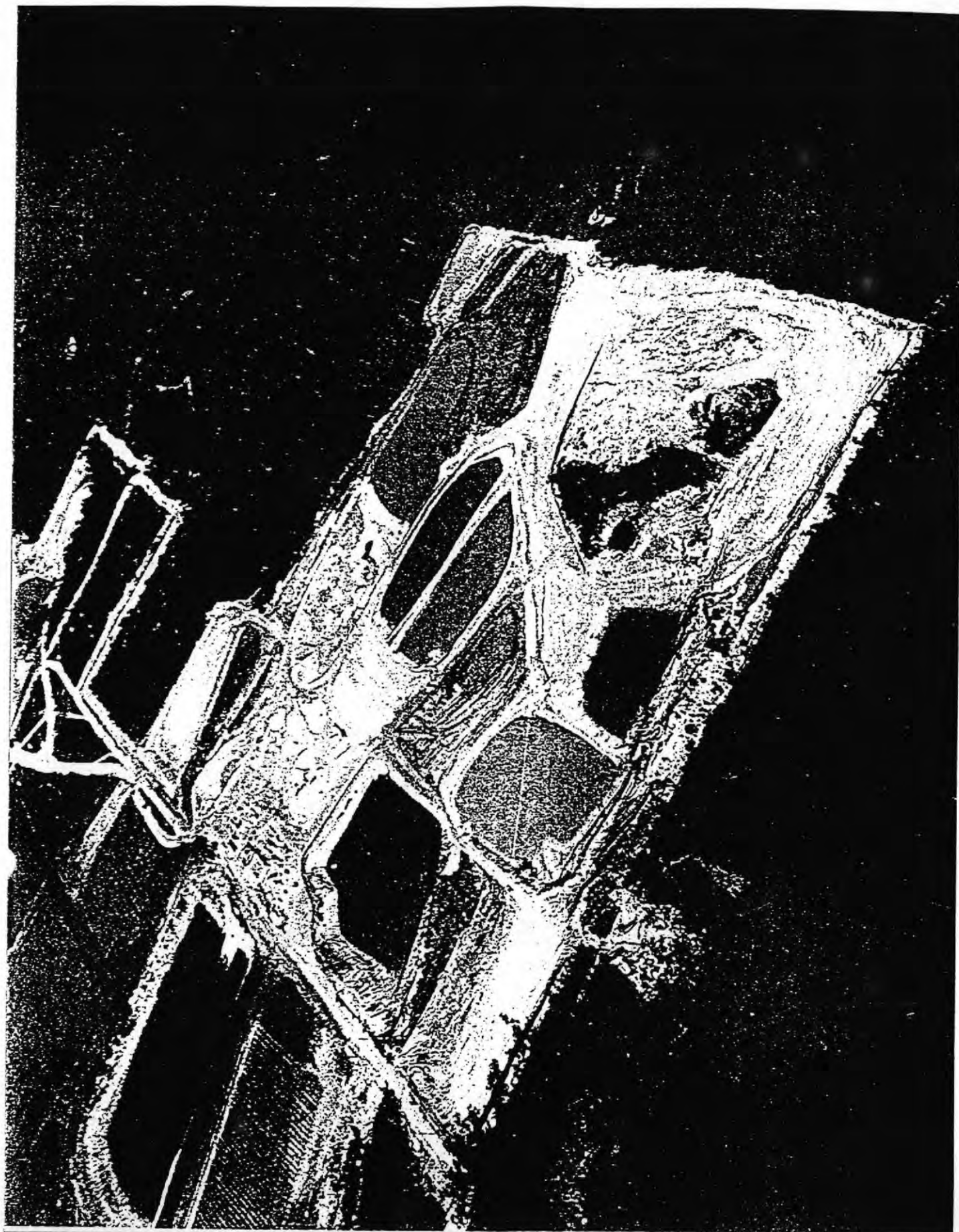
# NORTH MARROTA OPERATION NSW



SITE LAYOUT (1989 Proposal)

FIGURE 3.3





Source: SKYCAM AUSTRALIA Photo 6566, 2 July 1992

NORTH MAROOTA OPERATION, NSW

Plate 3.1

100196 IN 1992





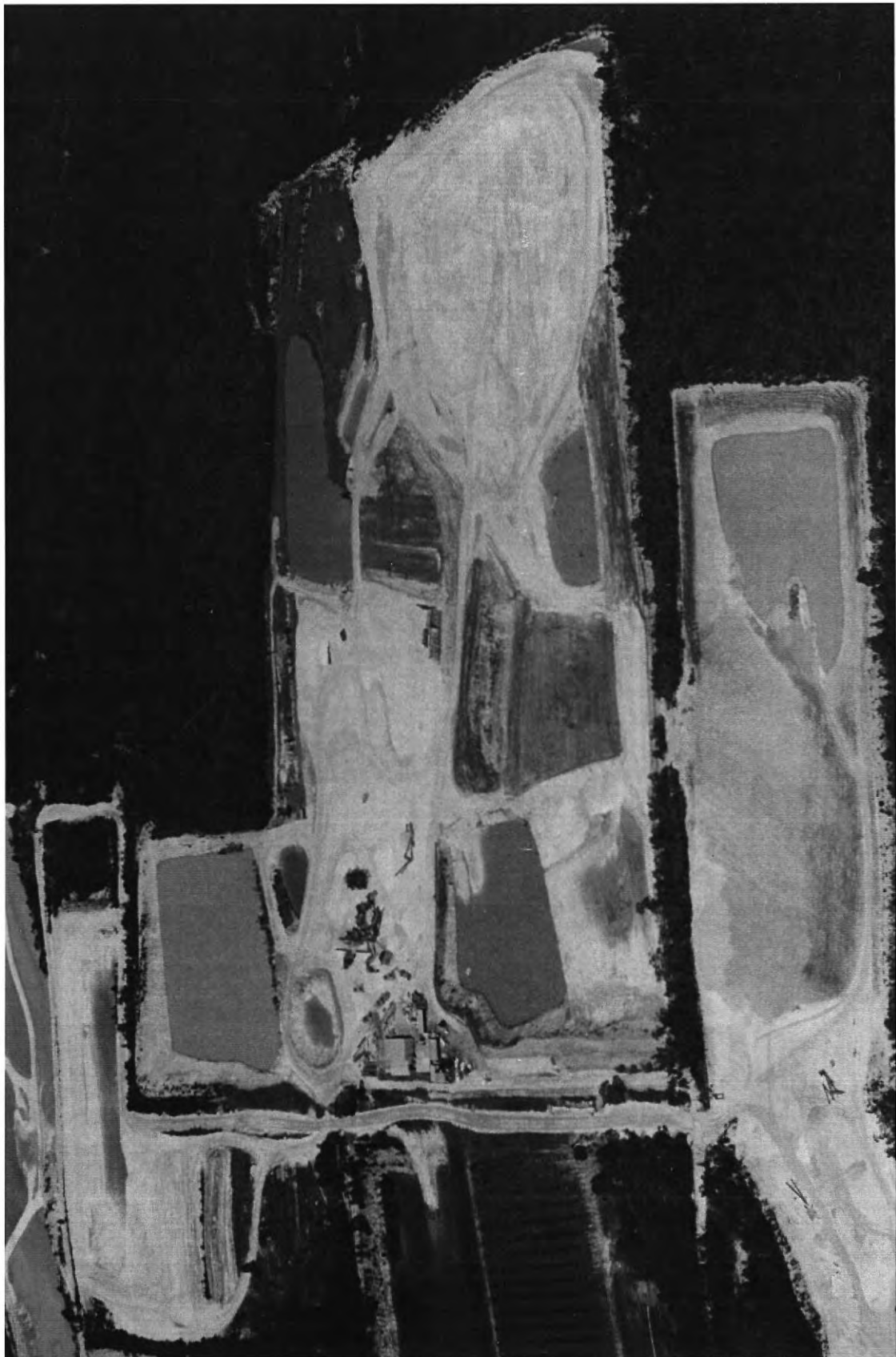
Source: SKYCAM AUSTRALIA Photo 4439, 7 May 1998

NORTH MAROOTA OPERATION, NSW

3.1  
Plate 2.2

EXISTING PRIVATE HAUL ROAD  
LOT 1 TO LOT 198





**EXISTING PRIVATE INTERNAL ROAD**

**Plate 3.2**



## CHAPTER 4 – STRATEGIC CONSIDERATIONS

- 4.1 Introduction
- 4.2 Strategic Planning Context
- 4.3 Company's Development Strategy
- 4.4 Internal access road across Lot 29
- 4.5 Consultation with Government
- 4.6 Community Consultation Program
- 4.7 Key Environmental and Planning Issues

This chapter considers a number of strategic matters that are important in the framing of the proposal. The consultation program in particular, has been an important and strategic part of the environmental assessment.



## 4.0 STRATEGIC CONSIDERATIONS

### 4.1 Introduction

**CHAPTERS 1 and 3** have presented the "context or background" to the Development Application – including:

- ◆ the process of Development Application and approval in NSW,
- ◆ the history of extraction at the site,
- ◆ the estimate of the quantity of remaining resource,
- ◆ the significance of the Maroota deposit to the construction sand industry within the Sydney region,
- ◆ the planning framework for extractive industry within NSW and specifically in the Baulkham Hills Shire,
- ◆ an analysis of the site's existing environment.

The background chapters provides an introduction to this assessment of the strategic framework for the proposal. This framework is important, as it provides the basis for formulating the specifics of the proposal and will provide the basis for the justification of the proposal.

The strategic considerations covered in this chapter are:

- ◆ The strategic "planning and environmental" context for extractive industry development within the Baulkham Hills Shire and specifically at Maroota (**Section 4.2**).
- ◆ The Company's development strategy for this application and possible future applications to extend their operations in the Maroota area (**Section 4.3**).
- ◆ The outcome of the consultation process with the various stakeholders – community and government (**Sections 4.4 and 4.5**).
- ◆ The key environmental and planning issues to be addressed in the EIS, both in framing the proposal and in addressing environmental concerns (**Section 4.6**).
- ◆ The ecological sustainability considerations for the development (**Section 4.7**).

### 4.2 Strategic Planning Context

The EIS Guidelines for Extractive Industries/Quarries (DUAP, 1996) require an early consideration of the "strategic context". Section 2.1 requires the following:

*"The proposal's relationship to broader strategic plans and goals should be clearly identified ..... Strategic mechanisms such as policies and plans which illustrate how the proposal has been developed should be discussed in the EIS so that information is available and relevant ..... Any existing relevant, cumulative or strategic environmental studies should be considered when formulating and justifying and undertaking the proposal."*



In this regard the strategic plans and goals are detailed by both Council and the State Government, and are considered to be:

- ◆ The specific planning for extractive industry in the Sydney region, as contained in SREP No. 9(2), Extractive Industry and DCP 500 (which was created as a condition of the revision to SREP No. 9(2)).
- ◆ The goal of both the State Government and the Council of achieving a sustainable extractive industry at Maroota.
- ◆ The agreement with PF Formation to straighten their internal access road, as indicated by Council's officers.

There is strong evidence that there has been difficulties in developing both an appropriate planning regime and in achieving a level of environmental performance within the Maroota area that meets the standard required.

This is evident over the 1990s, in the development of a planning framework that clearly sets out the environmental and planning context for development to occur successfully at Maroota. The series of planning documents, commencing with the Plan of Management in 1989 and the series of three DCPs in 1992, 1994 and 1997, attest to this process.

The recent revision of SREP No. 9(2) incorporated a clause, Clause 11, Special Requirements for Extractive Industry at Maroota, which required the Council to develop a new development control plan before the granting of any further development for the purposes of extractive industry at Maroota.

The clause required the preparation of more than a standard DCP that outlined a "strategic planning" document, that would identify:

*"the areas to be developed and not developed, the form of a staged extraction program, limitations on extraction, in terms of depth, effects on groundwater, etc. so that impacts would be minimised, and a resolution of transport arrangements, including resolving the concept of an internal access road"*

Unfortunately the concept of an internal access road, that had been originally formulated in the first Plan of Management in the 1980s, has over the course of time shown to not work. In addition its necessity after 2002, when the PF Formation Consent over their Northern Extraction Sites lapses is negated. Finally, there was a recognition that the issue of rehabilitation planning and post-extraction land use needed to be identified. Importantly, a recognition was required that the agricultural production of the Maroota area and particularly, its use of groundwater, had to be protected.

DCP 500 now exists. It has been a significant step forward from earlier development control plans and now provides the basis for long term planning. It does not resolve all of the issues but hopefully, will allow further extractive industry development to occur in Maroota, provided it can meet the standards set by the plan. Clearly, those proposals that cannot meet the standards should not be permitted and this will control the rate at which development occurs within the area. The issue of existing extraction activities that may not meet the requirements of DCP 500 is outside the scope of this document and a matter for Council.

DCP 500 requires some of the most detailed planning and environmental assessment documentation ever required in this industry. It is noted that this is the first EIS produced under DCP 500.



Clause 11 of SREP No. 9(2) identified four issues that have been addressed in this document as follows:

1. The **groundwater issue** is being resolved but will not be fully resolved until the Groundwater Plan of Management has been completed. That is unlikely in the next few years, until a long period of monitoring has been completed.
2. The **transport issue** is being resolved, through the use of Section 94 contributions permitting the upgrading of the main transport corridors.
3. The DCP was also required:

*"to address road traffic considerations and limitations which the road system will place on extraction".*

This has not been done. The use of an internal "road network" or internal access (haul) road still exists but not in the form of a common user facility. The necessity for this road will be nullified when the PF Formation Consent on the properties immediately to the North of the Dixon Sand proposal lapses in 2002.

This planning issue of access between an operational quarry area and a centralised processing plant has been one that has caused particular angst for Dixon Sand. The resolution of access across Lot 29, to accommodate the other operator and yet not adversely impact or prejudice extraction operations on the site, is an issue that could not be resolved under the previous consent. This matter is still under negotiation and is yet to be resolved. As a result of this difficulty this proposal contains two options for the final landform, one assumes agreement with PF Formation over temporarily relocating the internal access (haul) road and the other does not. In the event that agreement cannot be reached Dixon Sand intend to press Council for Consent for the option that assumes that the road is temporarily relocated ( see **Figure 6.7- Preferred Final Landform**) when the Consent on the land to the North of their site lapses in 2002.

The resolution of this access would allow the closure of the Crown reserve, the relocating of trucks away from the rare plant (*Kunzea rupestris*) and the quarrying of the road. This would also allow consolidation of Lots 196 and 29, in terms of both their extractive operations and their final drainage/rehabilitation, an outcome that would appear positive to all parties. This issue is addressed in **Section 4.4 - Internal Access Road Across Lot 29**.

4. The post-extraction land use plan for the area has also not been developed under DCP 500. It is understood that the Department of Mineral Resources has written to Council, seeking to resolve this matter but to-date there has been little progress.

In summary, DCP 500 is both a significant improvement over its predecessors and goes some way to resolving the issues. However, there are still a number of key issues that are outstanding and until they are resolved through some form of "regional strategy plan", there will continue to be problems for proponents and community concerns.



This issue of a broader examination of the strategic components of development planning is a matter that should involve the whole of Government, both Local and State, in much the same way that the Penrith Lakes issue was resolved in the 1980s.

In this respect, as part of the consultation with Government, a proposal was put to the Department of Urban Affairs and Planning that this development be classified as State significant development, under Section 88 of the *Environmental Planning and Assessment Act*. In the response, in May 1998, the Department was not prepared to make a recommendation at that time.

The Department did however advise that it was examining the wider context issues concerning extractive industries in the Maroota area in consultation with Council. The Department has undertaken that the consideration of appropriate future controls will be addressed.

#### 4.3 Company's Development Strategy

The objective in preparing this EIS (for what is a relatively small scale development) is to set a standard and commit to compliance, in both planning and operation terms, with DCP 500.

The prime focus of this Development Application is the consolidation of the site environmentally, and also the development of a realistic and practical final rehabilitation strategy. Unfortunately at the time of preparation of the EIS two final landform options have to be presented. The preferred option is detailed at **Figure 6.7- Preferred Final Land Form**.

Baulkham Hills Shire Council's officers have requested that the total Development strategy for the company's future be revealed in the EIS. In answer to this request the Company's longer term development strategy for further developments within the Maroota area is shown in **Figure 4.1- Future Development Strategy**. The figure is an extract from DCP 500 and shows those land holdings approved for extraction, those for which extraction was proposed (in 1996), those land holdings which were expected to be developed in the short term and those land holdings which would not be used or associated with extraction.

Identified in a heavy outline on **Figure 4.1**, are the properties that will be considered for development, by this Company in the future. They include:

- Lots 1 and 2, DP 547255 to the east of Lot 29.
- Lot 1, DP 204159 and Lot 1, DP 590937 to the east of Old Northern Road, bounded by Old Northern Road and Old Telegraph Road.
- All that land to the south of Wisemans Ferry Road, along Hearses Road, in the southern area of Maroota.

This land holding is owned by the Company or owned by interests involved with the Company, totals some 25% of the likely extractible area within the SREP No. 9(2) area of Maroota.

The sequence of future development applications for extraction on these lands has not been finally determined. However, given a satisfactory resolution of some of the outstanding issues and provided market conditions stay favourable in the future, it would be expected that development approval for operations in these areas would be sought within the next 10 years.



#### 4.4 Internal Road Access Across Lot 29

**Plate 3.2- Existing Private Internal Road** – Lots 1 and 2 to Lot 198, shows the existing internal access road that is used to transfer sand from Lots 1 and 2 (currently mined by P F Formation and due to cease when the Consent runs out in 2002), to the north of Lot 196, to P F Formation's processing plant on Lot 198 to the south. This road was not used by Dixon Sand in the past and is not proposed to be utilized for transport purposes by the company.

The material access road is located partly in a Crown reserve which commences at the northern boundary of Lot 29 and parallels Lot 29 along its western boundaries through to its end at the boundary of Lot 198. From there, the road continues within Lot 198, located along the northern boundary of Lot 198.

The issues associated with the road in its current location are as follows:

- ◆ Impacts from dust generation and possibly from surface water runoff on the *Kunzea rupestris*, located in what is known as the 'dog leg', at the western end of this road. It can be seen on **Plate 3.2 - Existing Private Internal Road** and is identified by the 50 m setback provided to extractive operations at the western end of Lot 29.
- ◆ The safety of the road in the section within Lot 198, between that Company's tailings ponds on the southern side of the road and the excavation in Lot 29 on the northern side of the road. That section of road can be seen in the central part of **Plate 3.2**. There were no setbacks provided for this road, either from the boundary of Lot 198, from the boundary of Lot 29 or to the edge of the excavation, for the area containing Lot 198 tailings ponds.
- ◆ The situation created by having the existing road left to bisect the Company's operations in Lots 29 and 196 will result in a number of walled off areas and some "land bridges".

Council officers have insisted that Dixon Sands negotiate with PF Formation in order to achieve an agreement with respect to this road. This agreement is to allow mining of the road such that a uniform final land form can be achieved between Lots 196 and 29. This will involve Dixon Sand providing a temporary road whilst the existing road is mined and levelled to the final RL. At this point the road will be restored to its original position to continue to allow PF Formation access between Lots 1 and 198. This negotiation was taking place at the time of writing this document.

An earlier proposal to relocate the road to along the Northern and Eastern boundaries of Lot 29 was not possible because of difficulties in agreeing on the form of the various agreements.

This Company actively sought such an agreement. This is demonstrated by:

- ◆ The provision of a corridor for such a road was left along the eastern boundary of Lot 29 (see **Figure 6.1-Existing Site Layout**).
- ◆ An application being lodged to the Department of Land and Water Conservation for the closure of the Crown road, to allow for its future extraction once the relocation had been effected.



In the event that the internal access road cannot be relocated and mined by agreement with P F Formation the problems associated with the existing route will have to be resolved. The strategy is as follows:

- ◆ Provide appropriate setbacks to the Crown reserve in accordance with the 10 m setback requirements of the DCP 500. This will provide sufficient opportunities for an improvement by the other operator of the road's drainage provisions within those setbacks.
- ◆ An agreement being achieved between operators for the reduction in level of the "land bridge between Lots 29 and 196".
- ◆ The management of the area of *Kunzea rupestris*.
- ◆ The proponent's preferred final land form is to smoothly contour the whole extracted area including Lot 198 ( adjoining operations ) to enable all "land bridges" and raised road sections to be at the same level as the fully extracted surfaces (see **Figure 6.7- Preferred Final Land Form**).

Negotiations are concurrent with those detailed above for the reduction and height of the land bridge, by some 15 m, transitioning over the 100 m length. This will reduce the height of the batter on the southern side to approximately 10 m and on the northern side to approximately 15 m. Importantly, it will provide setbacks on both sides of the road, thereby improving the geotechnical stability of the "land bridge". To the date of lodgement of this EIS these negotiations have not proved successful.

The impact of continued use of the internal access road on the population of *Kunzea rupestris*, along the "dog leg" has been discussed with the National Parks and Wildlife Service. A draft management plan has been prepared for Council. The flora survey for this EIS ( **Appendices C7 AND C8** ) has also established that there are no adverse effects being caused to the species as a result of the current operations by Dixon Sands.

It is stressed that this proposal is not one preferred by the Company. It produces difficulties in the rehabilitation program set out in this EIS and has certain drainage problems associated with it. Ultimately, it is hoped that the matter can be resolved, the road closed, the Crown reserve excavated and the two Lots consolidated, in terms of their final topography( see **Figure 6.7** and compare to **Figure 6.6- Final Site Rehabilitation - Containing land bridges**).

It is noted that the consents for Lots 1 and 2, the operating quarry area associated with this internal access road, are limited in duration and the remaining resource is limited. It is believed the approval for Lot 1 has already lapsed. It is therefore argued that the life of the internal access road is limited.

Notwithstanding however, it is always open to the other operator in future development applications for further extractive operations within Lots 1 and 2, to apply for access to Old Northern Road via the designated transport access point at the junction of the Crown reserve road and Old Northern Road.



#### 4.5 Consultation with Government

**Section 3 of Appendix A3- Consultation** summarises the issues raised in submissions from the various Government agencies and describes the planning process that was followed.

Set out below is a summary of all of the issues raised by the various agencies at both the planning focus meetings and in their written submissions:

##### Planning and Project Definition

- ◆ An assessment of the requirements of the various State Environmental Planning Policies (Nos. 11 and 33), the Sydney Regional Environmental Plans (Nos. 9 and 20) and the Baulkham Hills Local Environmental Plan, 1991 and DCP 500.
- ◆ Definition of the amount, characteristics and quality of the material, its anticipated annual production and the life of operation.
- ◆ An assessment of the alternative sources of sand, providing a justification for the proposal.
- ◆ Proposed means of access to the site, the routes to be followed by vehicles transporting the product to the market and the impact of truck traffic.

##### Environmental Issues

- ◆ Groundwater management and other water quality impacts.
- ◆ Assessment of the effects on species listed under the *Threatened Species Conservation Act*.
- ◆ Crown land issues, including setbacks, permissible extraction depths, etc.
- ◆ Soil and erosion control issues.
- ◆ Final landform and geomorphical stability.
- ◆ Air quality effects.
- ◆ Preparation of an Environmental Management and Rehabilitation Plan.
- ◆ Effects on Aboriginal heritage.
- ◆ Alienation of agricultural land, potential conflict with agricultural activities, etc.
- ◆ Proposed methods of rehabilitation, final land use of the site, etc.
- ◆ Water management, including surface water management plan and development of a closed system.
- ◆ Noise impact assessment.

#### 4.6 COMMUNITY CONSULTATION PROGRAM

**Section 4 of Appendix A3**, provides an outline of the community consultation program. The program involved an initial attitudinal and briefing survey in which residents living within approximately 1 km of the site were contacted and interviewed on a face-to-face basis. This was undertaken in April 1999.

Residents groups, including the Local Aboriginal Land Council, the Maroota Public School Parents and Citizens Association, the Maroota and District Residents Association, the East Bend Community Research Team, and the Maroota Planning Group were all contacted with briefing details. Also,



throughout the preparation of the EIS, they were provided, on a regular basis, with a series of Briefing Papers as to the progress of the EIS preparation.

The issues of concern to local residents are summarised below:

- ♦ **Truck traffic** - speed of the trucks and associated noise.
- ♦ **Visual amenity** – did not rank highly in discussions although one resident did note that 5 years ago there were no views of extractive operations anywhere along Old Northern Road.
- ♦ **Dust generation** – again, not a problem of significance to local residents. Any problem was related to dust generation from trucks on Old Northern Road. There were also possible health effects related to dust raised by the Maroota Public School Headmaster.
- ♦ **Operational noise** – the majority of residents could identify a low hum from extractive operations, although again, the issue was noise from truck traffic.
- ♦ **Rehabilitation** – one criticism was received on the overall lack of rehabilitation generally, within the Maroota area.
- ♦ **Effect on land values** – residents were concerned as to the effects on land values as a result of expanding sand mining operations.
- ♦ **Groundwater** – concern was expressed (and has been expressed previously in relation to the Maroota Groundwater Study) of the impact of sand mining on levels of groundwater with shallow aquifer.

In general, there was a feeling, especially from the relatively high proportion of retirees within the Maroota area, that the peaceful district that used to exist, has, with the advent of sand mining, become increasingly "industrialised". There is clearly an opinion within a percentage of the local community that extractive industry operations should cease at Maroota.

#### 4.7 KEY ENVIRONMENTAL AND PLANNING ISSUES

**Section 3.6-Site Analyses of Existing Environment** provides an assessment of the various characteristics of the biophysical and social environments. This section provides a summary of those findings as a precursor to the later assessment of potential environmental impacts. The environmental characteristics of the site are summarised as follows:

- ♦ **Flora and fauna** – Large areas of undisturbed natural vegetation exist downstream of the site, with there being documented evidence of a number of species of special conservation status within these areas. Surveys have shown that there have been minimal effects on the adjacent flora outside of the site. The species of prime concern in the area, being *Kunzea rupestris*, has been downgraded from an endangered species as it has now established itself over a wide area locally.
- ♦ **Topography** – The site's topography does not present any factor that may constrain further development of the site.
- ♦ **Surface soils** – Generally, the site soils have now largely been removed (and have been stockpiled for further use). The soils are poor in nutrient status, have a low pH, and a generally elevated level of aluminium.



- ◆ **Land classifications** – Soil conservation and agricultural capability and suitability classification systems have been used to rank the site. (It is noted that 90% of the site has already been disturbed). 25% of Lot 196 will be left in its natural state- bushland.
- ◆ **Meteorology** – Extensive data systems are available for all meteorological characteristics, with the possible exception of local wind data.
- ◆ **Drainage and water resources** – The site is located across a natural drainage system, however, only a small part of that drainage system is affected within the site itself. The drainage system has however, been modified upstream. There was no use of groundwater on this site and limited use of surface water up to December 18, 1998. This proposal includes limited use of groundwater, as to be approved by DLWC, from three site bores.
- ◆ **Noise** – Existing operations (from the monitoring work) are not audible from any of the closest residence to the quarry site. At each of the locations monitored, road traffic noise was the dominant noise source.
- ◆ **Air quality** – Air quality monitoring for depositional dust has been carried out for only two months. Levels to-date are generally within the levels set as appropriate by the Environment Protection Authority. It is noted that only limited results are available and the monitoring period has been a period of above average rainfall.
- ◆ **Land use and settlement** – The Maroota North area is relatively sparsely settled with residents generally located along or adjacent to Old Northern Road. There are two residences within 800 m of the site boundary.
- ◆ **Visual access** – There is one local area, including one local residence and two regional locations where visual access of parts of the site are possible.
- ◆ **Transport system** – Site access is from Old Northern Road, a two-lane road classified as a main road under the State road system. Access to the site is via the Crown road reserve from Old Northern Road. A new intersection is proposed for the junction of this Crown road and Old Northern Road; this is to be to RTA specification.
- ◆ **Heritage** – There are no known items of either European or pre-European heritage on the site.

The above issues are addressed in **CHAPTERS 6, 7, 8 and 9** of the EIS.



## CHAPTER 5 – ECOLOGICALLY SUSTAINABLE DEVELOPMENT

### 5.0 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The concept of “sustainable development” has emerged over the past two decades to describe a new framework for development aimed at achieving economic and social development whilst maintaining the long term integrity of ecological systems.

The principles of sustainable development have been firmly entrenched in Government policy and much legislation in Australia and internationally, as well as in environmental policies of private organisations.



## RESERVE



## FIGURE 4.1



## 5.0 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

According to the National Strategy for Ecologically Sustainable Development (1992), the broadest meaning of Ecologically Sustainable Development (ESD) is:

*"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased".*

Apart from being another term for environmental protection, it suggests how far protection needs to extend. It does this by measuring how a development influences the natural environment's ability to maintain itself. The main thrust behind ESD is that current and future generations should have a natural environment that functions as well as or better than one inherited.

Under the *Environmental Planning and Assessment Regulation*, it is necessary to justify the proposal, having regard to

*"The biophysical, economic and social considerations and the principles of ecologically sustainable development."*

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

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

- *when developing the objectives for the project*
- *during project formulation, planning and design*
- *when considering project options and alternatives*
- *during construction*
- *for the operational life of the proposal*
- *afterwards during decommissioning site rehabilitation and re-use*

The recent *Local Government Amendment (Ecologically Sustainable Development) Act, 1997* which was gazetted in January 1998, requires of Councils, inter alia, the following:

- ♦ to consider the principles of ESD when they exercise their approval powers
- ♦ to prepare annual management plans to manage the environment consistent with the ESD principles

Schedule 2 of the NSW Environmental Planning and Assessment Regulation 1994, lists four principles of ecologically sustainable development to be considered in assessing a project. These are:

1. *The precautionary principle*
2. *Social equity, including inter-generational equity*
3. *Conservation of biological diversity and ecological integrity*



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**4. Improved valuation and pricing of environmental resources**

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Defining ecologically sustainable development for extractive industries development has been attempted in previous EISs. The following may help to define what is required to assess ESD in this context:

- ◆ There is no question that quarry products contribute substantially to the material well-being of all Australians and underpin the physical fabric of our society by providing the basic material for housing, roads, bridges, construction materials etc.
- ◆ In the context of ESD, the issue of whether environmental impacts are irreversible or affect long term ecological sustainability is important.
- ◆ The extraction involves the removal of non renewable resources, and accordingly, the focus must be on achieving efficient use of the identified resources and achieving maximum resource utilisation.
- ◆ Ecological sustainability very much involves taking a long term and precautionary view of the various aspects of the proposal and their impacts, rather than a short term project life view. The precautionary principle would dictate that risk and uncertainty are carefully evaluated and any potential for irreversible effects be recognised. A risk adverse approach should be taken and issues of longer term groundwater effects and final land use planning are important for both the sustainability of the agricultural sector and the ecological values of the Maroota area.
- ◆ Intra and intergenerational equity is to ensure that no part of the community would be unacceptably disadvantaged. This applies to both the current residents and those future generations that will occupy the Maroota area. The employment opportunities for present generations provides social equity. Future generations will benefit as the site will ultimately be returned to grazing land, which may be used for a variety of agricultural purposes.
- ◆ The conservation of biological diversity and ecological integrity is self explanatory. Off-site direct and indirect effects on ecosystems of both flora and fauna must be controlled. In addition, progressive rehabilitation and enrichment planning programs, using locally occurring species, should link with existing ecosystems and promote the re-establishment of the previous habitat and flora and fauna that existed on the site before extractive operations were commenced.
- ◆ Approved valuation and pricing of environmental resources – this principle involves consideration of the materials proposed to be extracted and the surrounding environmental resources of air, water, land, biology, etc. which may be affected. Whilst it is difficult to assign dollar values to environmental resources, the management of these resources needs to be demonstrated by a commitment to research, planning and design of environmental safeguards and measures to prevent unacceptable adverse impacts on those resources.

Ecological sustainability requires in-depth consultation with both the community and the regulatory agencies, to ensure both the values systems of the community are understood and the environmental control requirements of Government are met.



## CHAPTER 6 – PROPOSAL FOR COMPLETION OF EXTRACTION, REHABILITATION AND PROCESSING

- 6.1 Introduction and Background
- 6.2 Sand Resource on Lots 196 and 29
- 6.3 Sales & Production Rates
- 6.4 Quarry Operational Details
- 6.5 Materials Processing and Stockpiling
- 6.6 Wastes Management
- 6.7 Infrastructure & Services
- 6.8 Off-Site Transportation
- 6.9 Surface Water Management &  
Erosion/Sediment Control
- 6.10 Rehabilitation Planning- two options
- 6.11 Site Operations, Safety and  
Security Management
- 6.12 Environmental Management Controls



## 6.0 PROPOSAL FOR COMPLETION OF EXTRACTION, REHABILITATION AND PROCESSING

### 6.1 INTRODUCTION AND BACKGROUND

#### 6.1.1 Objectives

The Company's principal objectives in submitting this proposal are for the completion of quarrying operations at the North Maroota sand quarry and the rehabilitation of the site to a uniform land form. The re-establishment of the Company's operations at Maroota will continue the supply of high quality construction sands to the Sydney market. Achieving this objective will secure the continued employment of the Company's direct and indirect workforce. The principal objectives can be achieved, provided the following two objectives are also achieved:

1. Providing a product range of high quality products for the community's use in the building and construction industries and become a supplier of first preference for both concrete sands and mortar sands.
2. Operating the quarry in a manner that not only is consistent with the Company's environmental policy but also meets all relevant statutory requirements and does not adversely impact on surrounding land owners or land uses in the short and long terms.

#### 6.1.2 Extent of Existing Site Development

The history of past operations was outlined in **CHAPTER 3- BACKGROUND** of Volume 1 of this EIS. Dixon Sand operated the site from 1992 to 1998 and since extraction on the site commenced in the early 1980s, the site has seen continuous operations for some 17 years. Over that time, some 2.5 to 2.8 million tonnes of resource (as sales) has been extracted. There is estimated to be a residual resource on the site of some 1.65 million tonnes. (The residual sand resource of the site is described further in **Section 6.2-Sand Resource on Lots 196 and 29**).

**Figure 6.1- Existing Site Layout** and **Plate 6.1- Existing Site Layout**, show the layout of the site as it currently exists. The total site comprises 34 ha, of which some 27 ha has been disturbed or delineated as the extractive area. The areas not to be extracted are the large area in the South- West corner of Lot 196, the small area at the Western extremity of Lot 29, and the various boundary setbacks. There are of course, those areas where extraction has been completed.

The extractive area has been divided into some 11 operating Precincts. These Precincts are shown on **Figure 6.2-Extraction Precincts**. Within each Precinct, the state of extraction or the current state of rehabilitation, is uniform. Each Precinct is essentially an extractive area or cell.



The current state of development of the site is described below:

- ◆ There are four Precincts where the extraction operations are complete and the land has been formed to final rehabilitation levels (Precincts 1, 2, 6 and 7).
- ◆ There are four Precincts where extraction has been completed but rehabilitation has not commenced because these areas are still in some form of active use for other non extractive purposes (Precincts 3, 4, 8 and 10).
- ◆ There are three Precincts where there remains significant sand reserves remaining to be extracted (Precincts 5, 9 and 11).

The current operating Precincts are 10 (close to full extraction), Precinct 9 (the Precinct with the largest remaining resource) and Precinct 5 (not operated in the last 5 years). All the other Precincts can generally be said to have been rehabilitated or currently have some "post extractive" use, either for tailings storage, water storage, processing plant, etc. Hence, the three operating Precincts are effectively the only unrehabilitated parts of the site and in total, they occupy an area of 8.75 ha (32%) of the total extractive site area of some 27 ha.

DCP 500, in **Section 2.11**, Extraction Program, requires that

*"proponents should ensure that each completed extraction area commences rehabilitation works prior to proceeding onto the next extraction area".*

This requirement has been substantially complied with. However, the site is effectively not one quarry but two contained within one area and in the first ten years of operation, the site was randomly developed with many areas being opened up. This situation has been rectified by the proponent and all areas which have been fully extracted are either fully rehabilitated (ie. Grassed and sown to pasture ready for agricultural uses) or have been partially rehabilitated (ie. Filled, stabilised and capped). These latter areas are proposed to be utilized for site operations such as processing plant and site buildings.

Fundamental to an understanding of the site is the fact that the site contains two very different sand types, each with totally different characteristics and market uses or demands. These sand types are:

- 1 Yellow sands across most of Lot 196
2. White sands in Lot 29 and Precinct 4 (in Lot 196) – south east corner of the site

The site has been operated as two distinct quarries within one area since the late 1980s. **Plate 3.1-Lot 196 (1992)**, shows the site as it existed in 1992, prior to the Company commencing operations. At that time, the development approval only covered Lot 196 and did not include Lot 29. As it can be seen, the only additional Precincts that have been developed since 1992 are an expansion of Precinct 4 and Precincts 10 and 11, in Lot 29 (approved in 1993). The large Precinct 9, in 1992, had only just commenced being extracted.

Hence, the only expansion of the disturbed area by this Company has been in the South -Western corner of the site and primarily involving extraction in Lot 29 to access those areas of the site which are the source of the white sand.



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**6.1.3 Development Scope**

The proposed development will involve extraction, processing and rehabilitation to complete the extraction of the remaining resource on the site, process it into different product types, at a rate depending on market requirements and demands, and to complete the rehabilitation that has started, for all of the site. The processing plant will remain on the site in its current location for 35 years and be utilized to process sand from other operations in the area as they are approved.

There will be improvements to drainage, erosion controls, workshop and processing plant, the site access road and other works. This will be aimed at improving the functioning of the site, its environmental performance and finally, to restore the majority of the site to a productive end land use, following the completion of what will be about 25 years of extractive operations. A portion of Lot 196, labelled as Existing Works Site Precinct 1 at **Figure 6.1-Existing Site Layout**, will remain as indicated after the completion of the extraction and rehabilitation of Lots 196 and 29.

The extraction, processing and rehabilitation works include:

- ◆ Completion of extraction of the residual resource on the site, of both Lots 196 and 29 (contained primarily within Precincts 5, 9 and 11).
- ◆ Completion of rehabilitation in those areas where rehabilitation has commenced under the previous consent (Precincts 5 and 7).
- ◆ Continuation of operations within those Precincts that are currently operating for tailings storage, water storage or for works and sand processing operations (Precincts 8, 4, 1 and 10).
- ◆ Progressive rehabilitation of Precincts 3, 6, 5, 4, 10, 11, 9, 8 and 1 (generally in that order).
- ◆ Processing of sand at the upgraded processing plant, including the production of quantities of concrete sand to Australian standard specifications (Precinct 1).

The non extractive, non rehabilitation, site environmental works will include:

- ◆ Enlarging the workshop area, including upgraded drainage provisions.
- ◆ Upgrade the waste oil and diesel containment as well as security measures.
- ◆ Install a company identification sign at the junction of the private access road and Old Northern Road.
- ◆ Construction of overburden/topsoil bunds for visual and noise control.
- ◆ Plantings of setback and bunded areas along the external site boundaries.
- ◆ Ongoing modifications of the site's erosion and sedimentation control structures as the site is developed.
- ◆ Establishment of native species propagation facilities on the site, including rehabilitation trials, in order to provide the tube stock necessary for the extensive site rehabilitation program proposed.
- ◆ Re-establishment of the original creek line that originally traversed the site along the Northern boundary of Precinct 4, and provide for direct discharge to the downstream creek.

Extraction will be undertaken in accordance with the plan contained in **Appendix C1-Extraction Plan** and rehabilitation in accordance with the strategy contained in **Appendix C2-Rehabilitation and Re-vegetation Strategy**.



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Dixon Sand also recognises that there will be continued refinements to quarry operations to respond to market needs. Also to specifically respond to the needs of Environmental Management, which has a history of Legislative change and amendment; this will evolve over the remaining life of the quarry. It will be the responsibility of the Company to advise Council in an annual submission of an updated annual Environmental Management Plan (EMP), as to the ongoing development of the strategies, outlined in this EIS. The Environmental Management provisions of this application are described in **CHAPTER 11-ENVIRONMENTAL MANAGEMENT MITIGATION MEASURES.**

**6.1.4 Approvals Required**

Schedule 2 (7) of the *Environmental Planning and Assessment Regulation*, 1994, requires the EIS to list the approvals required for the development.

The following approvals will be required:

- ◆ Development consent from Baulkham Hills Shire Council for:
  - A period of 10 years to enable extraction and rehabilitation activities to be completed
  - A period of 35 years to enable processing of extracted material from the Maroota area.
- ◆ Approvals from the Department of Land and Water Conservation, under the terms of:
  - *Rivers and Foreshores Improvement Act*, in terms of the past disturbance of land within 40 m of a creek line
  - Approvals and licences as required under the *Water Act* for three production bores.
- ◆ Approval and licence modifications from the Environment Protection Authority under *The Protection of the Environment Operations Act 1997* for extractive and processing operations, and water discharges from the site.
- ◆ An approval from the Roads and Traffic Authority, under the *Roads Act*, for the construction of an intersection between Old Northern Road and the Crown reserve road.

**6.2 SAND RESOURCE ON LOTS 196 AND 29****6.2.1 Resource Assessment**

The "Extraction Plan" is detailed at **Appendix C1**, which provides the following information:

- ◆ Definition of the material variability of the deposit, specifically the location of the different sand types, yellow and white.
- ◆ Estimated tonnages within each Precinct (or extractive unit or cell) within the site.
- ◆ Expected duration of extraction within each Precinct.

The basis of the resource estimates are also provided in terms of:

- Average extraction depths remaining.
- Allowances for waste material (overburden, interburden and from sand processing (tailings)).



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The estimated reserves were calculated by surveyors Keown & Drummond Pty Ltd by the modelling of volume differences between the existing surface levels and the final excavated level (as determined by the various depth constraints on extraction).

The estimated reserves are set out in **Table 6.1**.

**TABLE 6.1**  
**ESTIMATES OF REMAINING RESERVES**  
**LOTS 196 AND 29**

Precinct No.	Average Depth of Extraction (m)	Remaining Reserves (tonnes)	Cumulative Total (tonnes)
<b>Yellow sand</b>			
5	8	180,000	
9	10	700,000	
8	Minor	80,000	
			960,000
<b>White sand</b>			
4	Minor	50,000	
10	Minor	80,000	
11	13	550,000	
			680,000

The total remaining reserve is some 1.65 million tonnes, which is estimated to yield approximately 1.4 million tonnes of product sales. As shown in **Table 6.1**, the bulk of the remaining reserve of sand is in Precincts 9 and 11.

### 6.2.2 Sand Wastes

There are various losses in the extraction process which must be taken into account when assessing finished product quantities.

The non sand constituents or wastes are as follows:

- ◆ Topsoil and overburden material associated with the weathered horizons of the sandstone deposit.
- ◆ Lenses and layers within the sandstone deposit of clay and silt materials.
- ◆ Various clays and silts incorporated within the natural sandstone deposit.

Extractive operations require the stripping and stockpiling of topsoil and overburden material. The removal of interburden material, when and as encountered in the extractive process is also required.

Tailings are created when the sand is processed by washing, to meet final product specifications, as in the case of the production of concrete sands.

The following allowances have been made in the resource assessment when calculating the losses from the various "waste" materials:



- ◆ Tailings loss – 15% of total resource
- ◆ Overburden and interburden – 5% of total resource
- ◆ Topsoil – 0% of total resource. With the single exception of Precinct 11, all of the topsoil has been stripped from the site)

There have been various assumptions made of the future market for washed and unwashed sands. On this basis, tailings production from the washing process to produce concrete sands is estimated to generate some 50,000 tonnes of tailings (measured as dry weight), which, assuming a final moisture content of 50%, is equivalent to a volume of 40,000 m<sup>3</sup>.

Actual tailings production could vary significantly from this figure, depending on the volume of concrete sands produced (ie quality required). This is totally dependent on how the market demand develops when operations commence. The processing facilities and facility capacity will flexible. If product demand is significantly different to that predicted then the volume of tailings will alter accordingly.

The volumes of overburden and interburden have been calculated and are provided within the Extraction Plan contained in **Appendix C1**.

**Section 6.6- Wastes Management**, provides details of the handling and management of both sand wastes and other non sand wastes produced as part of the operation.

### 6.3 SALES AND PRODUCTION RATES

**Section 6.2- Sand Resource on Lots 196 and 29**, has provided the assessment of the extractable reserve and the potential sales quantities (after processing). **Section 3.1-Market Sources and Demand for Construction Sands** has provided an assessment of the market and future demand for both mortar and concrete sands (see **Appendix B1, Sydney Construction Sands – Resource and Market Availability and Market Demand**) and is the basis for this assessment of future sales. This section examines the likely market demand for the various products as the basis for then determining the development period that will be sought for this application.

There are a number of ways of defining sales (or production):

- ◆ **Average daily** – Daily quantities averaged over a full year. Variations occur day-to-day, week-to-week as a result of market demands, the weather, production problems, etc. Can be expressed as an annual figure or as an equivalent daily or weekly figure.
- ◆ **Peak daily** – The peak rate on any single day that is possible from the operation, considering available plant and equipment production capacities, workforce, etc.

#### Sales Projections

Over the period from 1993 to 1998, annual sales grew over 500%, or at an average annual rate of just under 50%. (see **Table 6.2- Past Annual Sales**). Although the growth was not linear, with variations in production from year to year, the significant overall increase in sales figures is a testament to a high level of market demand and the good market relationships, built on service and product quality.



**TABLE 6.2**  
**NORTH MAROOTA – PAST ANNUAL SALES**  
**(tonnes)**

Year	Sales
1993	40,000
1994	116,000
1995	160,000
1996	135,000
1997	160,000
1998	210,000

Dixon Sand's position in the market has been established. It is recognised that the same build-up in production that has occurred over the last 5 years, until December 1998, will not necessarily occur in the future.

The 1993 development consent provided a maximum limit on sales equivalent to 40 loaded trucks per day. (It is noted that this was not reached until the 1997/98 years).

**This application proposes a limit to product sales of 60 loaded trucks per day, or 120 vehicle movements, over an operating day of 12 hours, from 6 am to 6 pm, 6 days per week, Monday to Saturday, and 52 weeks per year ( but excluding Sundays and public holidays).**

**No truck will be permitted to leave the site before 6 am or after 6 pm, and no truck will be permitted to access the site before 5:30 am. Site operations will not commence until 6 am, with the only exception being the operation of a front end loader for the loading of trucks prior to 6 am. The weighbridge supervisor will be the regulator of truck dispatch, this person will not be permitted to endorse weighbridge dockets until 6 am.**

The previous consent limit of 40 loads per day, based on an average truck load that varied between 11 and 34 tonnes (and an average of 24 tonnes in 1998), was equivalent to an annual rate of 250,000 tonnes per year. (Over the period of October, November and December 1998, the total production for those three months was approximately 60,000 tonnes, equivalent to the annual production rate of approximately 250,000 tonnes).

In projecting future sales figures, it is necessary, based on experience, to make provisions for not only public holidays but also wet days when sales (and production) will not be possible. The following items are relevant to the assessment of production capability:

- ◆ In the Sydney area, rainfall occurs over some 115 of the 365 days per year (LMCE, 1998). However, many rainfall days are relatively trivial. Rainfall that occurs at the rate of over 10 mm per day, occurs on some 26 days, at the rate 25 mm per day on 10 days, and at the rate of over 50 mm per day on only 3 days on average per year.



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- ◆ The probability assessment of rainfall is based on records at Prospect Dam. It is noted that Maroota rainfall compares favourably with Prospect's rainfall, with an average long term annual rainfall of 869 mm and over the last 20 years, of 962 mm.
- ◆ It has been assessed, based on experience, that rainfall greater than 10 mm per day will cause sales to be lost for a quarter of those days, that is, 6 days. In addition, for those days when rainfall is greater than 25 mm per day, it has been assumed that sales will be lost for an additional day, that is, an addition 10 days a year, and for a rainfall over 50 mm in any one day, sales will be lost for 2 additional days, or 3 in total. In total, this amounts to some 19 days on average per year, that sales would not be possible because the site was to wait for trucks to be loaded.
- ◆ When 10 public holidays per year are allowed for, total production days per year becomes 283.
- ◆ On the basis of a limit of 60 loads per day and an average truck tonnage of 24 tonnes, this is equivalent to 375,000 tonnes per year. For an average truck tonnage of 29 tonnes, this is equivalent to an annual production of 490,000 tonnes per year. (The unit capacity of trucks is increasing. It is considered that over the next 5 to 10 years, it will increase to an average of 29 tonnes).

**Figure 6.3- Annual Production (Sales)**, shows the historical figures up to the end of 1998 and the forecast production figures for the year 2000 and onwards. The upper and lower bound lines, for the future, are based on a start to production, equivalent to 40 loads per day and a start to production of 60 loads per day, based on the average truck tonnage of 24 tonnes. The growth in the upper bound line simply represents the increase expected in average truck tonnages. It is based on an increase in average truck tonnages from 24 to 33 tonnes.

**Production Forecast**

Based on a range of forecast sales rates, and based on the reserve estimates contained in **Section 6.2**, the following cumulative quarry stripping requirements and production life for the site can be estimated as set out in **Table 6.3**.



**TABLE 6.3**  
**CUMULATIVE STRIPPING REQUIREMENTS**  
**(Tonnes)**

Year	Total Yearly Stripping	Concrete Sand		Mortar Sand	
		Annual	Cumulative	Annual	Cumulative
1	157,500	70,000	70,000	70,000	70,000
2	234,000	90,000	160,000	120,000	190,000
3	270,000	120,000	280,000	130,000	320,000
4	328,500	160,000	440,000	140,000	460,000
5	328,500	160,000	600,000	140,000	600,000
6	300,000	180,000	780,000	80,000	680,000
7	216,000	180,000	960,000 (resource limit of 960,000 tonnes)		680,000 (resource limit of 680,000 tonnes)

The above table is based on the following:

- ◆ Total remaining resource (in situ) of concrete sand is 960,000 tonnes and of mortar sand is 680,000 tonnes.
- ◆ A loss of 15% in the washing process for concrete sands.
- ◆ An interburden/overburden loss of 5% for both concrete and mortar sands.
- ◆ A 0% topsoil allowance, given that most of the site has already been stripped and topsoil stockpiled.

The production (in terms of stripping requirements) shown in **Table 6.3** assumes up to 40 loads per day, growing up to 60 per day by year 4. The total resource of some 1.65 million tonnes (960,000 plus 680,000 tonnes) will produce total sales of the order of 1.4 million tonnes.

It can be seen from **Table 6.3**, that based on the assumed production levels of 40 loads per day in year 1 rising to 60 loads per day in year 4, that the remaining resource of white sand will provide almost 5 years of operations and of concrete sands, over 10 years. It is also evident from the table that the maximum number of truck movements cannot be maintained every production day; the figures of 40 and 60 trucks per day are maximum days. If the alternative scenario of a continuous production of 60 loads per day were to be achieved, equivalent to an annual stripping rate of some 450,000 tonnes per year, then the mortar or white sand would last approximately 2 years and the concrete or yellow sands, less than 4 years.

Peak daily production on the quarry site will exceed the average daily sales figures because of the need to ensure adequate stockpiling of raw sand, product sand and to allow for maintenance of both mobile and fixed plant.



In summary, the development proposal will see the finalisation of resource extraction on Lots 196 and 29 within 10 years and will involve the extraction of some 1.65million tonnes, producing some 1.4 million tonnes of sales.

In practice, the life of the operation will depend predominantly on the level of market demand (with the assumption that the operation can maintain stripping, processing and sales rates, which are able to meet these market demands). With the most optimistic scenario of 60 loads per day from day 1, the operation will be completed in less than 4 years and with a more gradual build-up, the total resource will be extracted in under 5 years.

If an average of only 20 or 30 loads per day is possible because of a decline generally within the construction industry, slow penetration back into market, etc. then the resource will not be fully depleted for the predicted 10 years. It is proposed therefore, that a consent be sought for 10 years, so as to ensure there is sufficient time, not only to complete the extraction and market the resource, but also to complete the site's final rehabilitation. This rehabilitation, although carried out progressively over the life of extractive operations, will nevertheless extend beyond the completion of extraction operations. The plant is proposed to be operational for 35 years to process material from the surrounding Maroota area and this Application is for this period for Precinct 1, to allow final rehabilitation of this area.

## 6.4 QUARRY OPERATIONAL DETAILS

### 6.4.1 Introduction

The quarry development, in operational terms, is described in this section. The progressive development, over the life of the operation, is described in terms of activities in:

- Initial years (generally years 1 and 2)
- Final years (generally years 6 and 7)

(It is noted that the same approach is taken in describing the associated activities of Surface Water Management (see **Section 6.9**) and rehabilitation (see **Section 6.10-Rehabilitation Planning**)).

Quarrying is carried out by activities within the defined Precinct areas. The activities at any time, in the Precincts, being one of the following:

- Activity 1: Processing, workshop and activities (Precinct 1 only)
- Activity 2: Extractive activities
- Activity 3: Tailings and water storages
- Activity 4: Rehabilitation activities



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Only the location and operation of the activity number 1 never changes (within Precinct 1). All other Precincts generally progress from Activity 2 to Activity 3 and then to Activity 4, or from Activity 2 directly to Activity 4.



### **Quarrying Activities**

The quarrying activities, in terms of preparation for and carrying out of the extractive operations, will be exactly the same as those practised over the last 5 years. The various steps are:

- ◆ Stripping of topsoil, involving scrapers and dozers (only required for Precinct 11).
- ◆ Stripping of overburden, involving scrapers and dozers (generally only required for Precinct 11 and part of Precinct 8).
- ◆ Ripping, loading and transporting excavated material, primarily by scrapers assisted by dozers, to the processing plant.
- ◆ Processing and load-out from stockpiles, utilising front end loaders.

Maintenance and support mobile plant includes the grader for road maintenance, an excavator for construction of site works, and a water cart for dust control. This control is achieved by the watering of access and internal access roads.

The full site plant list is set out below:

- ◆ 2 Caterpillar 637D scrapers (40 tonnes),
- ◆ 1 Komatsu 470 front end loader
- ◆ 1 Komatsu 500 front end loader
- ◆ 2 Komatsu 375 bulldozers.
- ◆ 1 case 580C front end loader
- ◆ 1 Komatsu 300 front end loader
- ◆ 1 water cart (10,000 L)
- ◆ 1 grader (Cat 12)
- ◆ 1 Komatsu PC 400 excavator
- ◆ 4 x mobile water pumping stations

This equipment list may alter due to resource extraction availability. There will also be additional machinery which may be required on a short term basis to assist with rehabilitation and associated earthworks.

There are two additional quarry "land uses", one passive, one active, namely:

- ◆ Setbacks
- ◆ Quarry roads

**Setbacks** are specified in DCP 500 as follows:

- ◆ Objectives – Setbacks are:
  - To provide an effective buffer to protect the high landscape quality of the Shire.
  - To protect the habitat of species, population and ecological communities.
  - To maintain and enhance the rural residential streetscape of the Shire.
  - To maintain and enhance the character and amenity of existing rural residential activities.



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- ◆ Requirements – There are certain requirements for specific setbacks for extractive operations that are specified in Section 2.2, Setbacks and in Section 2.16, Maroota, of the DCP:
  - 0 m from adjoining property boundaries involved in extractive operations.
  - 10 m from adjoining property boundaries for those properties identifying as being excluded from extraction.
  - 40 m from the Dryabbin Nature Reserve or other unalienated Crown land.
  - 50 m from known critical or potential habitat of threatened species (including *Kunzea rupestris*).
  - 40 m from the top bank of the watercourse (or as specified by DLWC).
  - 100 m from any residence not associated with extraction.

The specific setbacks that will be provided as part of the development of the site are shown in **Figure 6.6-Final Site Rehabilitation** or **Figure 6.7- Preferred Final Land Form** and are as follows:

- ◆ To the northern boundary of Lot 196 and Lot 29 – 10 m setback from adjoining property boundaries.
- ◆ To the western boundary of Lot 196 – 10 m as was specified in DCP No. 14 (Extractive Industries).
- ◆ To the Crown road reserve between Lots 196 and 29 – 10 m setback on both sides, with existing 10 m setback to Lot 196 already provided and 10 m setback to future operations in Lot 29 to be provided.
- ◆ To the southern boundary of Lot 29 – no setback has been provided here, as this boundary is a boundary with an adjacent extractive industry operator.
- ◆ To the eastern boundary of Lot 29 – no setback to be provided here, as adjacent properties have been identified as future extractive industry operations.
- ◆ To the eastern boundary of Lot 196 adjacent to Lot 117 – site access road has been located along this boundary since operations were first commenced on the site back in the early 1980s. The private internal access road for PF Formation is also located adjacent to this boundary on Lot 117 and also has no setback.

There are two locations where the setbacks depart from the requirements of DCP 500:

- ◆ DCP 500 departs from the previous DCPs in requiring a 40 m setback from any boundary to any National Park or State forest or Nature Reserve or other unalienated Crown land. This requirement did not exist previously and accordingly, setback provisions along the western boundary of Lot 196 were provided at 10 m, a requirement at the time extractive operations commenced in 1991/92. It is proposed that this setback be maintained. It would be difficult if not impossible, to provide retrospective changes to setback distances once operations have commenced. It is also noted that the land to the west of Lot 196 has not been gazetted as a nature reserve but is merely proposed to be one in the future, should such proposal be adopted by the National Parks and Wildlife Service.



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- ◆ Internal access carriageways on any site should be setback no less than 10 m from adjoining property boundaries. The access road to the site office areas is not set back 10 m from an adjoining property boundary. (It is also noted that the internal access road for PF Formation is equally not set back 10 m from the boundary between Lot 198 and 29). Both these roads were constructed some time ago, were approved to be constructed in those locations by Council under a consent at the time, and again, because such works were put in place prior to the current DCP, it is reasonable to argue that they should be retained.

**Quarry roads** are specified in *Section 2.3, Transport, of the DCP 500* and are as follows:

- ◆ Should not be less than 20 m wide.
- ◆ Should be in accordance with established and recognised road construction standards.

Internal access roads are shown on **Figure 6.1- Existing Site Layout**. These roads provide access to the following:

- ◆ all Precincts,
- ◆ through and around the process plant area,
- ◆ from the Processing Plant area across the Crown reserve road
- ◆ Lot 29,
- ◆ the main storage pond and pumping facilities
- ◆ from the entrance gate to the site office area.

Road design standards and widths proposed in DCP 500 are considered to be excessive, when considering internal quarry roads. Such design is appropriate for an off-site access road between extractive operations such as is currently operating between Lot 1 to the north and Lot 198 to the south, for the operator PF Formation. However, within the confines of an operating quarry, it is excessive.

The only road associated with this proposal that is appropriate to have such a design standard, is the Crown access road from Lot 196 to Old Northern Road. Details are provided in **Section 6.8-Off Site Transportation**.

#### 6.4.2 Preparatory Works

There are certain works that would be undertaken immediately after Consent is granted, some because of requirements for building approvals for structures and for pollution control approvals for various works. In addition, there are works for environmental control and works that have been committed to within this EIS, to correct existing problems.

Those works necessary to be carried out prior to quarry works commencing would be identified. Other works would be carried out in the early stages of quarrying activities, so as to ensure such works can be complete within the specified period that will be required under the consent, to demonstrate compliance.

The list of the preparatory works are as follows:

- ◆ Building and pollution control applications and approvals.



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- ◆ Early completion of reinforcement plantings of boundary setbacks and existing bund walls.
- ◆ Stripping of Lot 29 and construction of bund wall along eastern boundary.
- ◆ Completion of the construction of all works required under the water management and erosion and sediment control system.
- ◆ Completion of Stages 2 and 3 of the rehabilitation of Precincts 2 and 7( almost complete at the time of preparation of this EIS ).

It would be anticipated that these works can all be completed within the first 6 months following the granting of consent.

#### 6.4.3 Quarry Development (Initial Years)

A parallel operation will be developed in both white and yellow sand reserve areas. Based on the scenario developed, stripping requirements for mortar or white sands will be greater than for concrete sands. Accordingly, activities in the white sand area in Precinct 10 and predominantly, Precinct 11, will advance faster than operations within Precinct 5, the initial Precinct to be operated for extraction of yellow sands.

The developmental activities in years 1 and 2 will be as follows and are shown on **Figure 6.4- Quarry Development Initial Years**:

- ◆ Early stripping of Precinct 11 but on a progressive basis, so as not to strip areas until they are required for excavation.
- ◆ The construction of bunds along both the northern boundary of Lot 29 (Precinct 11) and as necessary, along the eastern boundary.
- ◆ As necessary, the stockpiling of topsoil and overburden in the setback to the Crown reserve road, along western boundary of Precinct 11.
- ◆ Earthworks for enlarging the extent of the Processing Area, involving the filling of Catch Pond 1, on the southern boundary of the Processing Area.
- ◆ Construction of new catch ponds immediately south of the processing area, along the northern boundary of Precinct 4.
- ◆ Completion of the final stages of rehabilitation in Precincts 7 and 2.
- ◆ Further plantings along the boundary setback with the proposed Dryabbin Nature Reserve.
- ◆ Extraction from Precinct 5 to supply concrete sands over years 1 and 2.
- ◆ The extraction of the private internal access road and crown road between Lots 1 and 198 would proceed as adjacent areas (Precincts 3,4,10 and 11) are developed and then rehabilitated.

#### 6.4.4 Quarry Development (Latter Years)

The final stages of the development will see operations to produce concrete sands (yellow sands only), with the mortar or white sands extraction having been completed by the end of approximately year 6 or earlier. This will mean that in the latter years, site activities will involve the completion of rehabilitation of white sands areas and the latter stages of extraction of yellow sands.

The activities described below generally cover years 6 and 7. The exact timing of course, must remain flexible.



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- ◆ Final stages of rehabilitation of Precincts 10 and 11.
- ◆ Capping and revegetation of Precinct 3.
- ◆ Continuing operation of Precinct 5, as the tailings pond.
- ◆ Extraction being well advanced in Precinct 9.
- ◆ Restoration of the Crown Road Reserve and private internal access road between lots 1 and 198 to its original alignment.

These works are shown in **Figure 6.5- Quarry Development -Final Years**. By the latter years all or most of Precincts 2, 3, 6, 7, 10 and 11 will be rehabilitated and revegetated. The only active areas of the site will be:

- ◆ Processing plant area, Precinct 1
- ◆ Overflow catch pond, Precinct 4
- ◆ Active extraction area, Precinct 9
- ◆ Tailings pond, Precinct 2

Only the western end of Precinct 8 will be awaiting extraction, to be carried out at the completion of extraction in Precinct 9

At this stage, some 50% of the site will be revegetated while most of Precinct 4 and 8 will be active water storages.

## 6.5 MATERIALS PROCESSING AND STOCKPILING

### 6.5.1 Overview

Sand will be processed on site using the existing crushing, screening and wet scrubbing plant that has operated under the previous consent, over the duration of that consent, but upgraded to include additional items of plant (for which building certificates/building applications have been lodged with Council, but need approval). The completed infrastructure plant will be a multimillion dollar effort and be the most modern available, meeting the most stringent Standards (Including Australian Standards). Most of the additional plant is on site but not operational. The entire processing plant is described in this EIS so that approval can be obtained for the total plant.

The completed plant will be the most modern sand processing plant in the Sydney basin. It will be constructed to the most stringent standards for safety and materials handling.

Scrapers will feed the plant by dumping friable sandstone into one of 3 dump hoppers. Sandstone will be sized using a series of screens and crushers and then if required, the sized product will be washed of a part of its clay fraction and stockpiled.

The general arrangement of the processing plant is shown on **Figure 6.8- Works and Processing Area-General Arrangement**. **Figure 6.9- Processing Plant Flow Sheet**, details the flow of material through the different processing streams. **Plate 6.2, Office and Processing Plant Area**, shows an oblique aerial view of the existing plant.



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The core equipment of the plant has been in use on the site for many years and the method of processing will not change for the use proposed over the coming years. The only significant addition is the modification of the cyclones to allow for the production of new products.

The processing plant area will be significantly upgraded. Additional areas are being provided for both raw and finished product stockpiles, the road access system is being restructured and new drainage systems installed.

### **6.5.2 Proposed Processing Plant**

Details of the proposed processing plant are as follows:

◆ **Dump Hoppers DH-01 to DH-03 (Figure 6.8).**

Dump hopper DH-01 has been in existence on the site for many years and dump hoppers DH-02 and DH-03 have been installed on the plant but have not been used. All three dump hoppers are steel framed, in-ground bins approximately 4 metres square at the top, 6 metres deep with drive over grizzly bars.

The dump hopper inlets are located on the same bench level as the office and machinery sheds.

◆ **Belt Feeders BF-01 to BF-03**

Belt Feeder BF-01 has been used on the site for the past 5 years and is a 1.2 m wide conveyor, powered by a hydraulic drive and gearbox. The new belt feeders have been assembled on the site but have not been used. They are powered by an electric motor and shaft mounted gearbox. The drive of BF-01 will be changed to an electric motor as part of the upgrading of the plant.

The three belt feeders are used in the same manner. They remove the extracted material from the bottom of each dump hopper by shearing through the bed of material at a slow rate and feeding the material onto the following conveyor belts.

The installed power of the drives is 4 kW.

◆ **Belt Conveyors BC-01 to BC-11**

These belt conveyors are used to convey the material from the transfer points at the ends of the belt feeders to the various screens, crushers and scrubbers.

All of the conveyors are open gantry type standard conveyors, that is, their structure comprises two beams on which the conveyor idlers are supported. None of the conveyors are enclosed. The conveyors range in width up to 600 mm and are all electrically driven drives, with a maximum drive size of 11 kW.

The design capacity of all of the conveyors has not been based upon the material flow through the processing plant but rather upon the maintenance criteria that minimal maintenance work will be required on the conveyors during the life of the plant. Conveyors BC-01 to BC-11 have been constructed to meet the requirements of AS1755 "Conveyors-Design, construction, installation, and operation-Safety requirements".

The maximum design capacity of BC-01 to BC-11 is 300 tonnes per hour.



♦ **Vibrating Screens VS-01 to VS-04**

The vibrating screens are used to size the extracted or crushed material into the required particle sizes. Screens are used early in each of the processing streams, to remove the fines from the extracted material so that the crushers that follow in the process are not inefficient, by trying to crush material that is already sized correctly.

The maximum screen size on the plant is 10' x 5' and they range in "decks" from single to triple. The different decks are used to size the material to the required specification, the coarser material will be separated at the top deck and each deck thereafter, will separate finer product with fines produced after the bottom deck. Hence, a 3-deck screen will produce four different sizes of material.

The screens are supported by four springs from steel beams, the screen is vibrated by an out of balance electric motor, which causes the material to be shaken through the holes in the screen decks. All of the screens are run dry, except VS-04. Screen sizes range from 10' x 5' triple and double deck to 16' x 6' triple deck screens. The screens are installed below ground level to provide additional noise mitigation.

♦ **Crushers CR-01 to CR-03**

Crusher CR-01 has been in operation on the plant for many years. It is a 36" x 24" single toggle jaw crusher, with a 110 kW electric drive. This crusher is presently powered by a diesel engine but this will be converted to an electric motor as part of this consent. Crusher CR-02 is an existing TSAB 623 horizontal shaft impact crusher. This crusher is powered by an air-cooled diesel engine with a rated capacity of 175 kW. It is currently proposed to change this motor to electric in the near future. The crusher has a maximum capacity of 120 tonnes per hour. Crusher CR-03 is a new vertical shaft rotary crusher, powered by a 275 kW electric drive.

♦ **Radial Stacker RS-01**

Radial stacker RS-01 is used to convey the finished washed sand product from the paddle wheel scrubber SC-01, to the washed product stockpile. If desired by the operators, this stacker will be able to rotate to discharge into the transfer chute TC-02, that allows this product to be scrubbed and washed again in the wash plant.

This stacker conveyor is approximately 27 metres long, and will have an elevation of approximately 16°. The conveyor will operate at a maximum rate of 200 tonnes per hour and is constructed from an open welded truss gantry. The conveyor drive is an electric driven, shaft mounted gearbox.

♦ **Scrubbers SC-01 and SC-02**

The scrubbers are used to remove fines or clay material from the product. Scrubber SC-01 has been in operation on the plant for many years and is a paddle wheel type scrubber and dewaterer. Scrubber SC-02 is new and is a propriety piece of equipment, purchased from Warman International.



♦ **Wash Plant**

The new wash plant was fabricated on the site during 1998 but has not been commissioned. The purpose of this plant is to wash any clay materials from the sand, to allow for concrete grade sand to be produced.

The plant comprises a steel structure some 12 m x 7 m in plan and 13 m in maximum height. Incorporated into this structure is the three wash tanks, BN-01, 02 and 03, pumps, screen VS-04, cyclones CY-01, CY-02 and the rotary scrubber SC-02.

♦ **Cyclones CY-03 and CY-04**

Cyclones CY-03 and CY-04 are new 27" linatex cyclones with a design capacity of over 150 tonnes per hour each. The cyclones are used to separate the finished washed product from the slurry created from the wash plant. The cyclones are fed by pumps, from the new wash plant. The slurry will be pumped via rubber pipes to the cyclones.

The cyclones will be supported on towers, triangular in plan shape and each tower some 22 metres high. The towers will be supported from footings. On each cyclone, a launder will be used to chute the product from the cyclones into a kidney shaped stockpile.

• **Powerscreen Process Line**

The Powerscreen processing line has been used on the plant for over 5 years. It is a mobile plant that will be used to process fill sand, yellow "brickies" sand and other specialist products.

The process line comprises the Powerscreen feeder, VS-05, belt conveyor BC-12, a double deck vibrating screen and a radial stacker conveyor ST-02. As part of this consent, it is proposed to delete this process line and to install a new stacker conveyor to allow easier removal of waste from this line.

Whilst this plant is mobile, it will generally be located in the position shown on **Figure 6.8**.

### **6.5.3 Stockpiling**

Stockpiles will be established in the processing area in the locations shown on **Figure 6.8**. Stockpiles are essential for the efficient operation of the processing area, as they will provide a buffer in the event of inclement weather that will allow the processing plant to continue to operate and they provide a reserve of product that can be sold. It is planned to maintain the stockpile volumes at approximately 4 weeks of production.

The raw (unprocessed) material stockpile area is located in close proximity to the dump hoppers, to allow for easy feed of the plant. The stockpile will be built by scrapers dumping their 40 tonne loads on the top of the stockpile and a front end loader will then be used to shape the stockpile. The extracted material is to be separated into the six different types of raw material and six individual stockpiles will be maintained. The total volume of raw material to be stockpiled will be approximately 40,000 tonnes.

A smaller raw material stockpile area will be established close to the "powerscreen" processing line. This area will contain stockpiles of feed for yellow brickies sand and of material that is considered as



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waste. The size of this stockpile area will vary, dependent upon the amount of waste material, however, it is anticipated that the total volume of the stockpile will not exceed 20,000 tonnes.

Five stockpile areas will be established, as shown on **Figure 6.8**, for the storage of finished product. Each stockpile will contain approximately 4 weeks production. Approximate finished stockpile capacities are as follows:

- |  |                    |
|--|--------------------|
| ◆ Washed product from existing wash plant            | 7,500 tonnes       |
| ◆ Brickies product from radial stacker RS-01         | 30,000 tonnes      |
| ◆ Yellow brickies sand from powerscreen              | 10,000 tonnes      |
| ◆ Concrete grade sands from cyclones CY-03 and CY-04 | 15,000 tonnes each |

#### **6.5.4 Processing Plant Capacity**

The processing plant described above has a throughput which is limited by the capacity of the crushers CR-01 to CR-03 plus the capacity of the wash plant, which is attached to dump hopper DH-03.

The capacity of the crushing and screening lines is limited by the crusher capacity, that is, an absolute maximum of 120 tonnes per hour. Allowing that 50% of the material will be screened from the crushers, this portion of the plant has a capacity of approximately 240 tonnes per hour. The wash plant will have a maximum theoretical capacity of 300 tonnes per hour. The Powerscreen process line has a maximum throughput of 70 tonnes per hour. If the entire plant were being operated through the separate process streams all at the same time, the theoretical throughput of the plant would be in the order of 610 tonnes per hour.

For this to occur, the crushing plant, following dump hoppers DH-01 and DH-02, would need to operate at maximum capacity and pre-processed coarse graded sand would need to be dumped into dump hopper DH-03 at the same time. This will never occur, due to the grading of the washed product produced at Maroota. For the production of concrete grade sands, Dixon Sand will process the friable sandstone from Maroota, using the crushing plant, following dump hoppers DH-01 and DH-02 and will add up to 7% pre-processed coarse graded sand imported from another quarry.

The processing plant capacity should therefore be based upon the operating capacity of the crushing plant and screening plant, with the additional 4 to 7% of imported coarse graded sand plus the "Powerscreen" process line. This will define the plant as having a maximum theoretical capacity of 320 tonnes per hour.

#### **6.5.5 Construction of Plant**

As discussed above, the majority of the fixed processing plant has been fabricated on site. Some of it has been installed but not yet commissioned. The remainder of the plant will be installed and commissioned once development and building approvals are obtained.

The plant that is still to be installed includes dump hopper DH-03, conveyors BC-10 and BC-11, cyclone towers supporting CY-03 and CY-04, radial stacker RS-01 and minor transfer conveyors. The installation and commissioning of the remainder of the plant will take approximately 4 weeks and will involve the on-site work of approximately 6 fitters and boilermakers and a mobile crane.



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The "Atco" huts in the area adjacent to the existing weighbridge office will accommodate the workers during the construction.

**6.5.6 Load-Out Arrangement**

Customer's trucks will enter the site adjacent to the office area. An employee of Dixon's will direct them to the product stockpile and they will travel via the internal access roads shown on **Figure 6.8**. The trucks will be loaded by a front end loader. Once loaded, they then proceed to the weighbridge. Once the correct weight is established, they then travel to the "tarping" area to cover loads and to brush away spillage prior to leaving the site.

**6.5.7 Plant Operating Hours**

It is proposed to operate the plant within the existing operating hours of 6 am to 6 pm Monday to Friday but extend operations to 6 am to 6 pm on Saturdays. Operations are not proposed on Sundays or public holidays. In exceptional circumstances, such as major breakdowns for safety, it may be necessary to repair the plant on Sundays or public holidays.

It is proposed that loading of trucks only can occur prior to 6 am, but no truck will be allowed to exit the site before 6 am, or enter the site before 5:30 am. Similarly no truck will be permitted to enter or leave the site after 6 pm.

**6.5.8 Staffing**

It is anticipated that the following staff will be employed at the Maroota Dixon Sand operation:

- ◆ 1 x Mine Manager
- ◆ 1 x Clerk
- ◆ 1 x Supervisor
- ◆ 1 x Weighbridge attendant/record keeper
- ◆ 1 x Processing plant operator
- ◆ 10x Scraper and front end loader operators

Additional casual and contracting staff may also be employed for tasks such as nursery work, rehabilitation, planting, environmental monitoring and in caring for the 15 acres of bushland remaining at the South-Western corner of Lot 196.

**6.5.9 Processing Plant – Future Modifications**

Sand processing plants by their nature require constant modifications to the processing methodology to ensure that the plant operates at its maximum capacity. These modifications or process improvements are necessary to cater for differences in the quarried raw material. Without such process improvements, the plant would operate inefficiently.

The process improvements envisaged in the future could involve the addition of new vibrating screens, redirection of conveyors or the addition of new conveyors. The improvements would all be installed in accordance with relevant Australian Standards and would not increase the overall capacity of the processing plant above the approved level.



## 6.6 WASTES MANAGEMENT

### 6.6.1 Generated Waste Types

The wastes generated by the proposed extraction operations will be as follows:

- ◆ Overburden from new extraction Precinct areas.
- ◆ Interburden from all extraction excavations.
- ◆ Processing plant tailings (a slurry of fine clays and silt extracted from the sand during the processing operations).

There will also be minor quantities of oversized material scalped from the raw feed prior to processing.

The non production wastes will include:

- ◆ General domestic solid wastes from the office, amenity and workshop areas.
- ◆ Waste oils and grease from vehicle and plant servicing and maintenance .
- ◆ Domestic strength sewage.

### 6.6.2 Production Wastes

Overburden waste will only be generated from those extractive areas where extractive operations have yet to commence. As discussed previously, this includes Precincts 11 and parts of Precinct 4 and Precinct 8.

An allowance of 15% (overburden and interburden) waste has been made for the concrete grade sands and 5% for the higher grade white sands. In total, this amounts to approximately 184,500 m<sup>3</sup> tonnes of material.

Overburden material will be used to cap tailings storages prior to topsoil placement and revegetation, for permanent bunds, and for other general filling purposes (Catch Pond 1).

Overburden stockpiles will be placed along the northern and eastern boundaries of Precinct 11 and utilised for filling works associated with the expansion of the processing area by the infilling of Catch Pond 1.

Scalpings and interburden are expected to be produced only in small quantities and will be disposed either directly to rehabilitation areas or stored with overburden stockpiles.

### 6.6.3 Processing Plant Tailings

Approximately 15% of the raw feed processed in the plant constitutes fine clays and silts, referred to as fines, which are removed as a tailings stream in the wet processing operation. Under the existing operating scenario, fines are pumped in the form of a slurry to the current tailings storage located within Precinct 3.



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**Section 7 of Appendix C1- Extraction Plan**, provides the details of tailings production, handling, dewatering and rehabilitation.

It is proposed that once the existing tailings storage has reached rehabilitation levels (within approximately 2 to 3 years of operation), a new tailings storage will be created in Precinct 5, following the excavation to final levels of that Precinct.

There is a volume of 120,000 m<sup>3</sup> that will be available in Precinct 5 for future tailings storage. This will be more than sufficient for the tailings likely to be generated after the initial years. It is however noted, that the calculation of tailings volumes is a function of the likely quantities of concrete sands to be produced.

#### 6.6.4 Management of Non Production Waste

All general solid waste from the site, separated wherever possible for external recycling, will be disposed of by a licensed disposal contractor on an 'as needs' basis. Separate paper, aluminium cans, plastic and putrescible food type waste receptacles will be provided on site to allow this off-site recycling. Only contractors who can access the recycling of the above will be permitted to remove this waste.

All routine servicing of mobile quarry equipment will be carried out at the site workshop. All used oil and grease will be collected and stored in a bunded storage tank to await collection by a licensed waste recycling contractor.

Domestic sewerage waste is handled and processed as described in **Section 6.7.3** below.

### 6.7 INFRASTRUCTURE & SERVICES

#### 6.7.1 Workshop and Machinery/Maintenance Shed

It is proposed to extend the existing machinery shed and to improve the maintenance facilities in the works area, which will allow for the undercover storage and maintenance of all front end loaders and scrapers. The proposed extensions are shown on **Figure 6.10- Workshop Area**.

The proposal involves the construction of a steel framed colourbond building machinery shed, with plan dimensions of 28 m x 31 m to the southern end of the existing machinery shed. The building will be approximately 6.5 m high at the eaves on the low side. The roof will pitch at 5° from the low side. The new machinery shed will be used for the storage and maintenance of front end loaders and scrapers. At night and during times of maintenance, the equipment will be locked in the shed. It is also proposed to make the western bay of the machinery shed a washing bay. In this bay, the machinery would be washed with a high pressure hose to remove any sediment.

All of the workshop area will be constructed with a concrete bunded floor, to contain any oil or fuel spills. The floor will be graded to a grated drain at the perimeter of the building, which will then fall to a collection pit for the collection of sediment. A precast oil separator will then be provided after the collection pit for the collection of any oil. The system will then drain by an underground pipe to the secondary catch pond. It is proposed that the pit be constructed as a shallow wedge type pit, with an overflow weir. This will allow the pit to be cleaned as required, using a bobcat. The sediment would be returned to the process. The precast oil separator would be a proprietary item similar to the "CI&D" products with a corrugated plate solids and oil separator.



A 45,000 litre diesel storage tank will also be installed as part of the extension to the machinery shed. The steel tank will be approximately 3 m in diameter and 6.5 m long and will be constructed in a bunded area containing a live volume of at least 120% of 45,000 litres. The entire bunded area will have a steel framed roof over it, to prevent rain entering the bund.

The bunded area will be provided with a collection sump and manually operated control valve at one end, which will drain to the collection pit upstream of the oily water interceptor. The control valve will be normally closed to prevent a fuel leak and will only be opened to release any clean water contained in the bunded area.

#### **6.7.2 Office and Amenity Facilities**

The existing office and amenities facilities are sufficient for the proposed workforce, hence no major changes are planned for this area. Facilities provided include 4 toilets, 3 male and 1 female, and 3 showers. Amenities provided for the workers include a lunchroom and a change room as well as small area for under cover parking.

#### **6.7.3 Sewage Treatment and Disposal**

All sewage from the amenities area is piped to an "enviro-cycle" type treatment plant. This type of package treatment is an activated sludge aerated fixed film continuous system. The effluent quality is better than the 20:30 standard. The treated water from the plant is trickle irrigated to water grass adjacent to the amenities area. This plant has an approved capacity of 10 full time residents or a hydraulic equivalent of 20 operational staff and an organic equivalent of 28 operational staff.

#### **6.7.4 Communications**

The existing phone lines are proposed to be up-graded with an additional dedicated Fax line to be installed. It is not anticipated that these will be further upgraded. Two-way radios are provided to all of the workers, to allow for ease of communications between the office and the quarry area and for the safety of the workers. In addition, senior staff will have two mobile phones at the site each day.

### **6.8 OFF-SITE TRANSPORTATION**

#### **6.8.1 Scope of Transportation Assessment**

In relation to Transport of sand, both raw and processed, DCP 500 sets out the following planning objectives:

- ◆ *"To maintain and upgrade the safety and efficiency of the existing external road network.*
- ◆ *To provide safe, co-ordinated and controlled transport links for extractive industries.*
- ◆ *To protect and maintain the safety and amenity of existing rural and residential activities."*

Under the Maroota section of the plan, one of the six objectives is:

*"To maintain and upgrade the safety and efficiency of the existing external road network".*



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Under each of these sections of the plan, there are various Performance Criteria and Prescriptive Measures identified in relation to transport. Specific details are as follows:

- ◆ "Extraction operations should use controlled and limited access points to main roads.
- ◆ Proponents should provide and maintain controlled and limited access points to Old Northern Road and Wisemans Ferry Road.
- ◆ When planning and designing projects at Maroota, proponents should reference Figure 12, Schematic Extraction and Transport Plan, in the DCP.
- ◆ In preparing extractive industry proposals, reference should be made for the provisions of the Roads Act and SEPP No. 11 – Traffic Generating Developments."

The Traffic and Transportation Assessment is contained in **Appendix C6-Traffic and Transportation Assessment**. It outlines the following:

- ◆ existing traffic volumes on the proposed truck traffic routes.
- ◆ estimated hourly and daily truck movements generated by the proposed operations.
- ◆ distribution of trucks on the State arterial road system.
- ◆ proposed access to and from the site.
- ◆ access to Old Northern Road and need for improvements.
- ◆ standard of site access road.
- ◆ impacts of increased truck movements.
- ◆ safety issues and measures to improve safety.

### 6.8.2 Traffic Routes

The Company owns no trucks for the delivery of its products. All sales are from the site, effectively from the weighbridge. Once loaded, the trucks leave the site via the site access road, the Crown reserve road, and turn right onto Old Northern Road. The intersection with Old Northern Road is proposed to be upgraded in line with the RTA and Australian Standards. There are effectively no customers located North of the site and hence, no deliveries in that direction.

Old Northern Road, at the intersection with the quarry access road, is main road MR 181. Traffic from the quarry will proceed South along Old Northern Road then, to either continue travelling down Old Northern Road towards Glenorie and Dural, or turn right into Wisemans Ferry Road (MR 181) which connects through to Windsor, Richmond and Penrith. Old Northern Road, south of Maroota, is Main Road 160. The split between traffic on the two routes south from Maroota has been based on an analysis of sales within 1998. It is shown that approximately 50% of the sales proceed down Old Northern Road and the other 50% proceed down Wisemans Ferry Road, towards Windsor. A traffic count, in April 1999 by Southern Environmental, of sand trucks using the intersection of Old Northern Road and Wisemans Ferry Road indicated that this split has skewed to 65% and 35% respectively. There was an additional vehicle load travelling North of the intersection to and from the PF Formation facilities North of the Dixon site, equivalent to the entire truck numbers travelling South of the intersection.

This traffic split has been adopted for this assessment, as the vehicle movements through the intersection are expected to return to the pre December 1998 levels after Consent is granted.



Traffic generated by employee vehicles is minor. Most employees live in the Maroota area..

### 6.8.3 Traffic Generation

A maximum of 60 loads or 120 truck movements per day is proposed. On the basis of the route split, this will mean that up to 30 trucks per day access the site and Old Northern Road (North) from Wisemans Ferry Road and 30 trucks access from the Old Northern Road (south). 60 will depart the site via Maroota via Old Northern Road (north). The average truck movements (nominally 40) will be less than the numbers currently generated by PF Formation between their two operations that require connection along Old Northern Road. This is expected to significantly reduce once Dixon Sand achieve their Consent and re-establish a customer base.

The generation of traffic on a daily basis is set out in **Table 6.5- Predicted Maximum Hourly Truck Movement Generation**.

**TABLE 6.4**  
**PREDICTED MAXIMUM HOURLY TRUCK MOVEMENT GENERATION**

Time Period	Maximum No. of Movements
6 am to 7 am	30
7 am to 8 am	10
8 am to 6 pm	80
	(average 8/hr)
Total daily	120

### 6.8.4 Environmental Management Issues

To ensure that all Statutory Regulations are complied with, signs have been erected on the site to remind all drivers that it is a breach of the Company's consent should loads not be covered prior to leaving the site. Practices have been implemented, under the previous Environmental Management Requirements Manual, that required the weighbridge operator to report all trucks who refused to cover their loads. A transport policy was issued to all companies, stating that if there were repeated incidence of loads not being covered, the company involved could be refused service the next time it sought product from the quarry. This policy will be strictly adhered to.

The problem of truck arrivals has been an issue that has been reported to the Company although evidence as to specific details has not been available.

It is a proposal of this application that trucks be permitted to access the site after 5.30 am but not permitted to leave the site until 6 am. The relative remoteness of the Maroota area, from the Sydney metropolitan area, has meant that truck drivers attempting to access the site early, so as to be able to



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complete deliveries during the day, seek to get early loading from the quarry. It is considered that the ability to load between 5.30 am and 6 am, only from stockpiles will ensure that truck drivers are able to leave the site at such a time that will enable them to complete the deliveries that they desire, before there is traffic build up on the arterial road system. The vehicle movements before 6.30 am will ensure that the greatest density of truck movements does not coincide with Sydney's peak road congestion time. This will also apply to the Maroota area, specifically in relation to the North Maroota School, to avoid the school opening period – 8 am to 9 am.

The Environmental Management Plan will issue further policy directives to customers that will stipulate times of arrival, standards required when accessing the site, covering of loads requirements and an incentive scheme which will encourage and reward those drivers that consistently meet all requirements in the policy.

### 6.8.5 Road Improvements and Upgrades

#### Crown Road/Old Northern Road Intersection

**Figure 6.13 - Old Northern Road (and Crown Reserve) Intersection Detail**, sets out the design detail of the intersection upgrading at this junction.

**Appendix C6-Traffic and Transportation Assessment**, has recommended that the intersection be upgraded to facilitate turning movements of articulated vehicles entering the site. A 100 m deceleration lane will be provided.

#### Crown Reserve Road Improvements

Upgrading of the Crown reserve road pavement and signage will be carried out, along with the intersection improvements described above.

The works recommended for the road upgrading are set out in **Appendix C6** and include:

- ◆ The road be sealed with a hot flush bitumen seal following reforming, to construct a 7 m wide pavement, with appropriate shoulders, based on Austroads Table 4.1, Traffic Lane Widths for Undivided Sealed Roads. (It is noted that this is a departure from Figure 4, Typical Cross Section of Internal access roads, DCP 500, where a 9 m lane width is recommended). However, this road is for vehicles accessing the Dixon Sand site only.
- ◆ The road be sign posted for a 60 km/hr road speed for both safety and environmental reasons.
- ◆ "Give Way" and "Stop" signs be installed approaching the intersection of the Crown reserve road, with the private internal access road of the other operator. In addition, advance warning signs of "Intersection" and "Heavy Machinery Crossing" signs should also be installed approaching this intersection from both directions.

### 6.8.6 Recent truck Movements on Old Northern Road

Vehicle counts on Old Northern Road, during April 1999, indicate that there are between 109 and 156 sand trucks travelling in each direction per day (past the intersection with Wisemans Ferry Road 145 movements per day average). These trucks are generated by the North Maroota area. During the hour 6 am to 7 am up to 16 trucks were counted travelling in both directions (32 movements).



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These counts were taken at a location South of the Intersection in question. North of the intersection a further 16 movements were recorded as a maximum. **Table 6.5 – Recent Sand Truck Counts** details the movements North and South of the intersection.

**TABLE 6.5**  
**Recent Sand Truck Counts (April 1999)- Maximum**

Time Period	Number South	Number North
6 am to 7 am	32	16
7 am to 8 am	20	10
8 am to 9 am	17	8
10 am to 11 am	12	5
11 am to 6 pm	22	16
Total Daily	103	55

**Note :** rigid body trucks, semi – trailers and trucks with dog trailers were counted as one truck.

## 6.9 SURFACE WATER MANAGEMENT & EROSION/SEDIMENT CONTROL

### 6.9.1 Scope and Content

The surface water management strategy and sediment and erosion control plan is contained in **Appendix C3-Integrated Surface Water Management Strategy**. The report provides both a water management strategy for operations over the development life of the project and a detailed sediment and erosion plan for initial operations.

The report is structured to cover the following areas:

1. A review of the requirements for the water management strategy, as set down by Statutory Authorities.
2. The characteristics of the site and environs, in terms of flow and water quality.
3. The existing water management system on the site, with details of sediment control structures and water storages as well as an assessment of site water usage and discharge.
4. The proposed progressive development of the site, including specific proposals to manage stormwater run-off.

The report only addresses surface water management, with groundwater management being addressed separately at **Appendix C5- Groundwater Impact Assessment**.

The Statutory Authorities' requirements, referred to in item 1 above in relation to water management, are addressed and responded to in **Appendix-C5**. These Authorities are:



- ◆ Environment Protection Authority
- ◆ Department of Urban Affairs and Planning
- ◆ Department of Land and Water Conservation
- ◆ Hawkesbury-Nepean Catchment Management Trust
- ◆ Baulkham Hills Shire Council

Specifically, the requirements of DCP 500, contained in Section 2.4, Water Resources, and Section 2.8, Soil Conservation, have been addressed.

### 6.9.2 Site Drainage System

**Section 3.6- Site Analysis of Existing Environment**, provides a brief overview of the site's drainage system. Occupying a total area of approximately 34 ha, the site is located at the confluence of two drainage systems. The upstream drainage catchment is approximately 49 ha. The site is located near the headwaters of the drainage system, which ultimately discharges into the Hawkesbury River, passing through a major wetland (listed as Wetland No. 88). Total catchment of the wetland is some 2,300 ha.

There are no flow records from the site or from any adjacent catchments. However, there are details of the sandstone characteristics of the site and also detailed local records of rainfall.

The hydrology of the site and its upstream catchments has been assessed in **Appendix C3** for:

- ◆ Estimation of peak flow rates through the site, as a result of individual storms, using a run-off routing model.
- ◆ Assessment of long term site water balance, by means of a water balance model.

Water quality has also been extensively sampled on the site although the period of analysis is relatively small. The extensive number of sampling sites has also been necessary because of contaminated run-off received from upstream lands, as a result of agricultural activities. The receipt of this run-off has meant certain changes have been necessary in the management of water on the site, to protect discharge of nutrient rich run-off to the natural creeks system (and ultimately the wetland) downstream.

Other characteristics of water quality in run-off from the site is the low pH levels, the relatively low tepidity, except during first flush run-off events, and the low salinity or electrical conductivity.

### 6.9.3 Existing Water Management and Erosion Control System

The existing stormwater management and sediment control facilities are as follows:

- ◆ Primary catch pond to receive run-off from the upstream catchment.
- ◆ Secondary catch pond providing a series of control run-off, again from upstream and as well, receiving run-off from the wet production area of the processing plant.



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- ◆ Sedimentation Basins 1, 2 and 3, located in the central part of the site, providing first flush sedimentation control from the active areas of the site on Lot 196.
- ◆ Tailings pond to receive reject fines material from the processing plant (and local run-off from the site access road).

Sedimentation basins have recently been constructed and comply with the Department of Housing, Managing Urban Stormwater Manual (Department of Housing, 1998) for type C soils.

The major water storages on the site are as follows:

- ◆ The main storage pond with an approximate storage volume of 32 ML.
- ◆ The overflow catch pond, with a maximum capacity of 58 ML, at a top operating level of 168 m AHD. This pond is used to store excess run-off from upstream catchments, in the event that the water quality is below discharge standards.

Site water usage has been analysed and the details are as follows:

- ◆ Water is re-circulated from the main storage pond to the processing plant at a rate of approximately 0.7 ML per day. Discharge from the processing plant in the form of tailings, is discharged to the tailings pond from where decant water is drawn off and recycled back to the main storage pond.

In total, water use on the site has been estimated to be:

- ◆ Approximately 5 ML per year, where water is lost in the washing process.
- ◆ Water use for dust suppression is a maximum of 0.06 ML per day, on dry days. Total water use for dust suppression is estimated to be approximately 5 to 10 ML per year. Dust suppression will be installed along the road from the front gate to the weighbridge and for 100 m beyond. Additionally sprinklers will be installed on the stockpiles and conveyors.
- ◆ Domestic water use is negligible.

The site water balance is estimated as the average annual discharge from the site of both site run-off and run-off from upstream. It has been estimated that because of the changed nature of the run-off from the site, that discharge to the downstream creek system is similar to that which would have occurred under pre-quarry conditions.

A summary of the assessment of the performance of the existing water management system is as follows:

- ◆ The site water management system meets EPA and Council requirements for being self contained and for maximising the re-use of water captured on-site.
- ◆ The site is self sufficient for water and a low flow outlet from the main storage pond provides a base flow to the downstream creek.
- ◆ The volume of flow entering the downstream creek is similar to that which occurred under pre-quarry conditions.
- ◆ The system does not make provision for contaminated runoff from upstream areas through the site.



#### 6.9.4 Proposed Water Management and Erosion Control System

The objectives in developing the future site water management and sediment control system has been as follows:

- ◆ Ensure the site is self sufficient in water supply for operating purposes and recycle water to the greatest extent possible.
- ◆ Seek to mimic the pre-existing flow regime downstream of the site. The performance objective is that the downstream flow should reflect flow rates and hydrographic shapes experienced under natural conditions.
- ◆ Protect downstream eco systems and meet ANZECC criteria for protection of eco systems.
- ◆ Allow flow from upstream catchments to pass through the site.
- ◆ Minimise the disturbed area of the site but only clearing areas immediately prior to sand mining and progressively rehabilitate areas where operations have been completed. Proposed changes will address this.

The proposed water management system for the operation is shown in **Figure 6.11-Water Management Plan System**. The works proposed to be carried out are as follows:

- ◆ Reconfigure the outlet arrangements for the overflow catch pond.
- ◆ Relocate the primary catch pond to South of its existing position.
- ◆ Relocate the low flow pipe draining the wet production area.
- ◆ Relocate Sedimentation Basin No. 1.
- ◆ Construct Sedimentation Basin No. 4 in the North- West corner of Lot 29.

The development of the water management and sediment and erosion control system will be progressive over the life of the operation. Details are provided in **Appendix C3**. There are various sediment and erosion control facilities to be constructed to manage local run-off in the latter stages of the site's development. In the annual water management plans, specific details will be provided to Council that will provide the engineering details and furtherance of the strategy as outlined in **Appendix C3**. The water management strategy report provides an indicative site water balance for the latter years of quarrying operations. It shows that under all climatic conditions, there is only a marginal reduction between inflows and outflows from the site because of the considerable buffer provided by the storage ponds and the recycling of flows that are returned to the processing plant for sand washing purposes.

#### 6.9.5 Licensing and Monitoring

The Annual Water Management plan to be incorporated in the site's Environmental Management and Rehabilitation Plan will provide for:

- ◆ Application for a Protection of the Environment Operations Act discharge water licence and the associated monitoring requirements for such discharges.



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- ◆ Periodic site inspections involving field monitoring, to establish particularly, the water quality in terms of pH conductivity and tepidity of any actual or potential site discharges.
- ◆ Reporting of any abnormal water quality results to the quarry manager, who will be required under the EM&RP, to immediately respond in terms of the requirements of the plan.

The existing site is the subject of an existing Approval of Works under the Pollution Control Act. This Approval will automatically transfer to the PEO Act at July 1, 1999. However a new Application for Additional works will be required.

**6.10 REHABILITATION PLANNING**

**Appendix C2-Rehabilitation and Re-vegetation Strategy**, contained in this EIS, outlines the rehabilitation strategy, environmental impacts and mitigation measures associated with rehabilitation. This is addressed in **CHAPTER 8-Environmental Impact and Mitigation During Rehabilitation**, in accordance with the structure required under DCP 500.

**6.11 SITE OPERATIONS, SAFETY AND SECURITY MANAGEMENT****6.11.1 Quarry Operations and Management**

**Section 1.5.3-Quarry Management**, outlines the following:

- ◆ The management committee established for the purposes of the EIS production,
- ◆ The future quarry management committee to oversee extractive operations
- ◆ A management committee that will be established specifically to manage the consent and the environmental responsibilities. These responsibilities will be defined under the consent, other approvals and licences.

Mr David Dixon has been designated as mine manager, under the terms of the Mines Inspection Act, 1901.

In addition, both a safety officer and an environmental officer would be appointed as soon as a Development Consent is issued.

The responsibilities of all of the site's management team would be designated under the Environmental Management Plan which will be prepared within 6 months of a consent being issued by Council.

**6.11.2 Safety and Security Management**

The need to protect the safety of the public, its employees and the visitors to the quarry is recognised by the proponent. There will be a proactive approach towards employee and public safety adopted as well as complying with the legislative requirements of the WorkCover Authority and the Mines Inspection Act, 1901. This document, together with the Company's written safety policy, identify the requirements for the occupational safety of employees and the general safety of working conditions around the extractive areas and the processing plant.



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A Safety Plan has been prepared in final draft. Discussions have been held with the Mines Inspectorate of the Department. Inspections of all mobile and fixed plant will be carried out before operations commence, to ensure that all safety equipment is fitted correctly. Just prior to December 1998 the fixed plant and equipment received a major electrical upgrade to ensure compliance with all safety requirements.

The general safety and security measures on the site will include:

- ◆ Ensure entrance gate is kept locked at all times outside of working hours.
- ◆ The continuous occupation of the site by a site security officer.
- ◆ Security signs positioned around the site, notifying "danger quarry – no entry".
- ◆ Perimeter agricultural type fencing around all of the site.
- ◆ Security fencing around the workshop and mobile plant parking area, with lockable access gates.
- ◆ Employee education and safe working practices, including employee induction on appointment and re-training sessions at specified intervals.
- ◆ Signs to direct all visitors to the office to not permit unauthorised access past the office area.

The site's Safety Plan will be integrated with the Environmental Management Plan for the site.

## 6.12 ENVIRONMENTAL MANAGEMENT CONTROL

Environmental management and the system that achieves it is the key to successful compliance and the achievement of environmental standards. Accordingly, DCP 500 (Section 218) and the DUAP Extractive Industry and Quarry EIS guidelines are specific as to the requirement for an environmental management system.

**CHAPTER 11-ENVIRONMENTAL MANAGEMENT MITIGATION MEASURES** set out the specific details of the environmental management systems that will be implemented, following the receipt of Development Consent and the other Statutory approvals.

**Section 1.6.3, Quarry Management** quotes the Proponents attitude:

*"The Company recognises that successful environmental management involves well organised documentation to ensure all aspects of operational and rehabilitation planning, environmental control, monitoring and responses to problems are not only properly managed but properly documented".*

An Environmental Management and Rehabilitation Plan (EM&RP) will be prepared. The EM&RP structure was developed specifically for quarries and mining operations by the Department of Mineral Resources in the late 1980s (DMR, undated).

An environmental management manual was produced for the final period of the operation under the 1993 consent. Set out below is the content of that document, which was entitled *Manual of Site Environmental Management Requirements*:

- ◆ Contents of Environmental Requirements Manual
- ◆ Use and restrictions on use of Environmental Requirements Manual



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- ◆ Environmental policy
- ◆ Standing site instructions
- ◆ Responsibilities of employees and contractors to protect the environment
- ◆ Routine inspection requirements
- ◆ Annual environment compliance audit
- ◆ Complaints register
- ◆ Issue of Environmental Requirements Manual
- ◆ Amendments to Environmental Requirements Manual

DCP 500 sets requirements for various management plans. DCP 500 also requires an annual update of each management plan to be submitted to Council, including the overall performance of the past year as well as presenting the revised strategy for the coming year. It is in effect, a further development of the EIS proposal in the form of a management plan.

The EM&RP will be prepared to meet both Council and DUAP guidelines. It will be prepared after receipt of Development Consent and other Statutory approvals. The document will include a strategy for short term environmental management as well as any comments on long term environmental management issues.




This EM&RP will be developed around the proposals outlined in this EIS, but with modifications to reflect the Conditions Consent and other approvals. It would be consistent with similar documents developed for the mining and quarrying industry elsewhere in NSW. The proposed structure of the EM&RP will be as follows:

- ◆ Preamble – including background information, approvals, reporting procedures, etc.
- ◆ Site development phase
- ◆ Extraction planning
- ◆ Water management plan
- ◆ Rehabilitation management plan
- ◆ Acoustic management plan
- ◆ Social impact management plan
- ◆ Waste management plan
- ◆ Environmental management plan
- ◆ Environmental monitoring program and results
- ◆ Training programs
- ◆ Inspection and audit schedule

The plan will be reviewed every year, based on changes in planning and the experience gained over the previous year of operations. It would be modelled around the structure set out in the ISO 14001, Environmental management systems – Specification with guidance for use. In particular, there would be a focus on the level of potential risks, a review against the Company's environmental policy and an assessment as to the extent to which environmental performance has been achieved in comparison to the previous year.



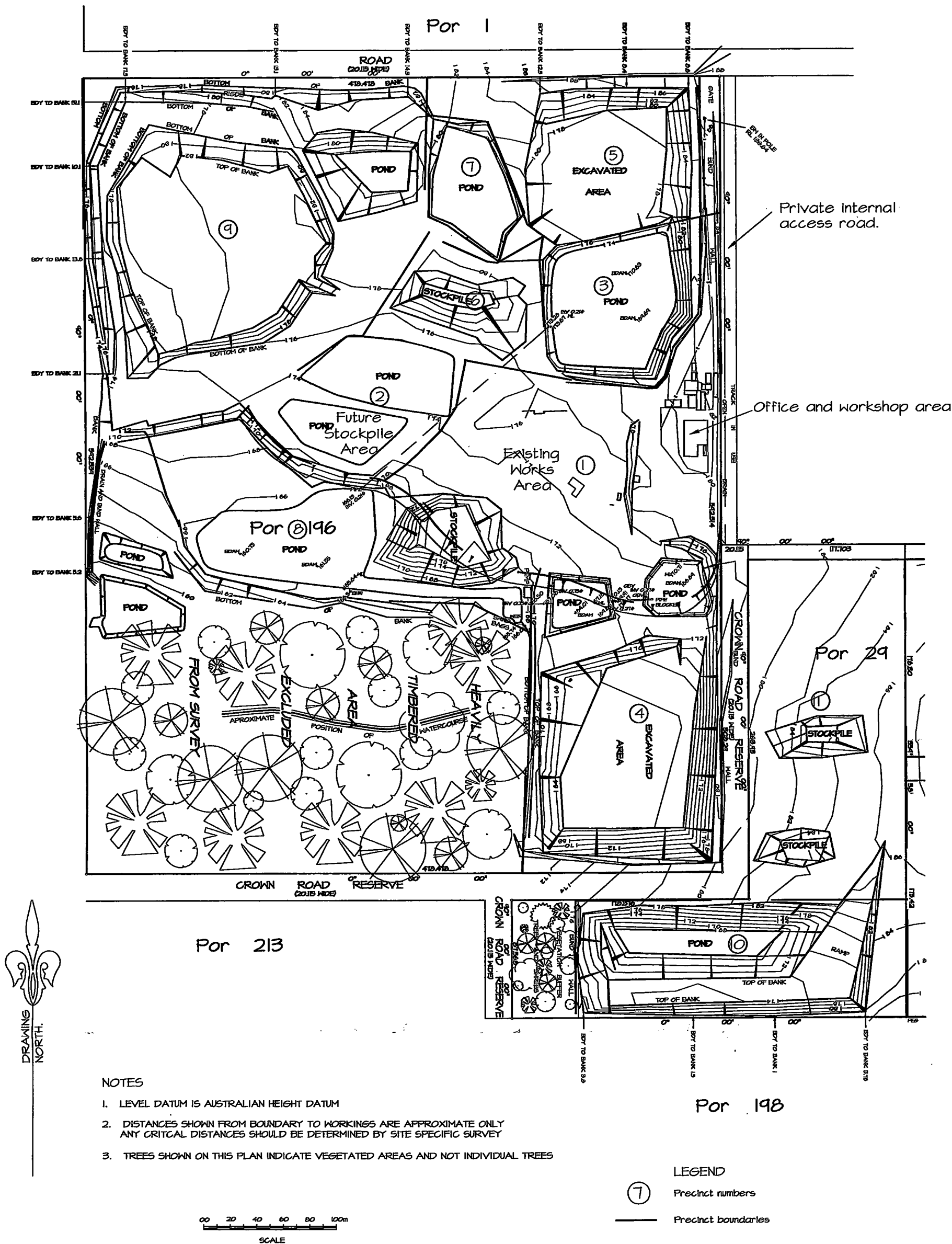
[illegible]

 Temporary water storage  
 Water storage  
 Rehabilitation

### FIGURE 6.1



# NORTH MAROOTA OPERATION NSW

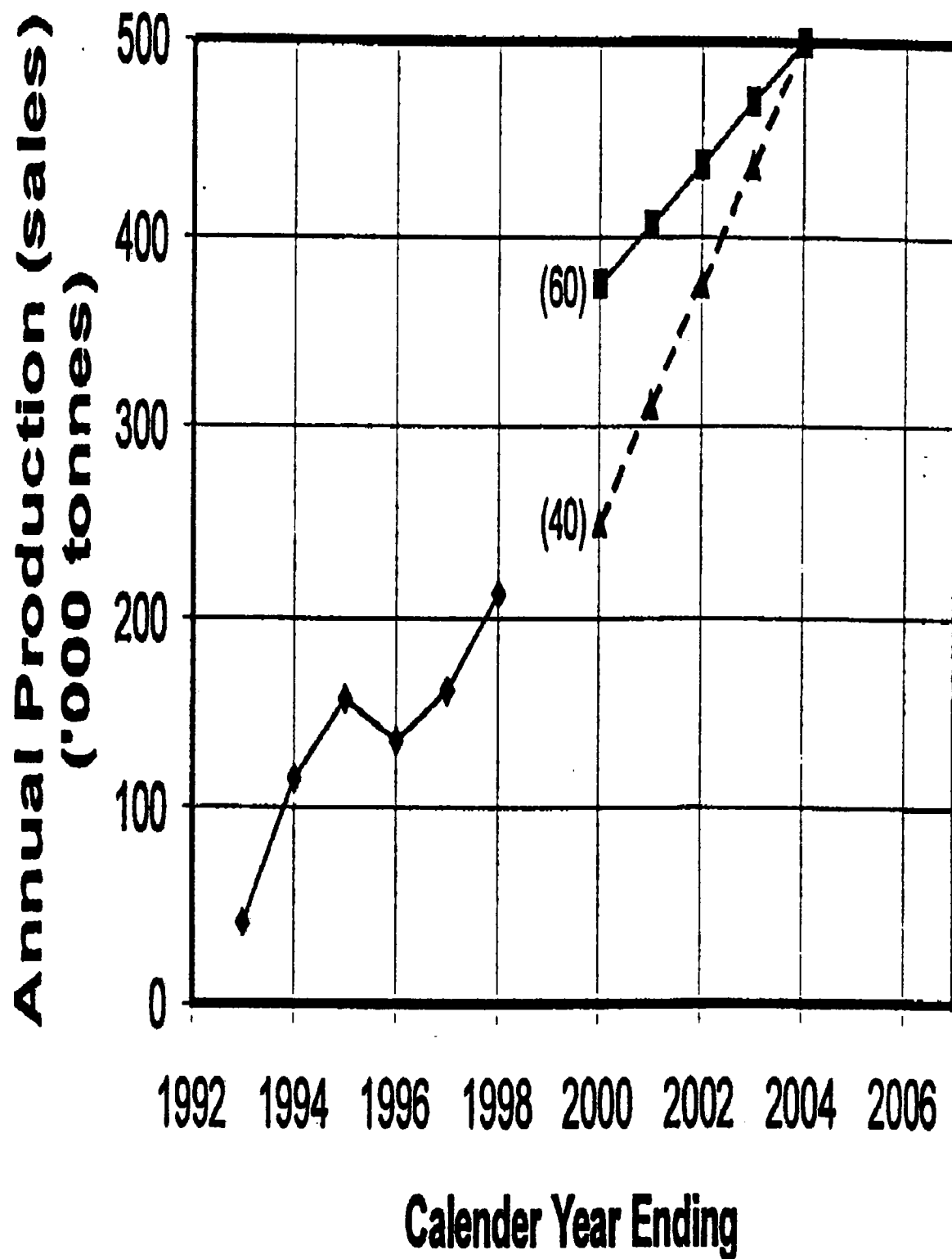


EXTRACTION PRECINCTS

FIGURE 6.2

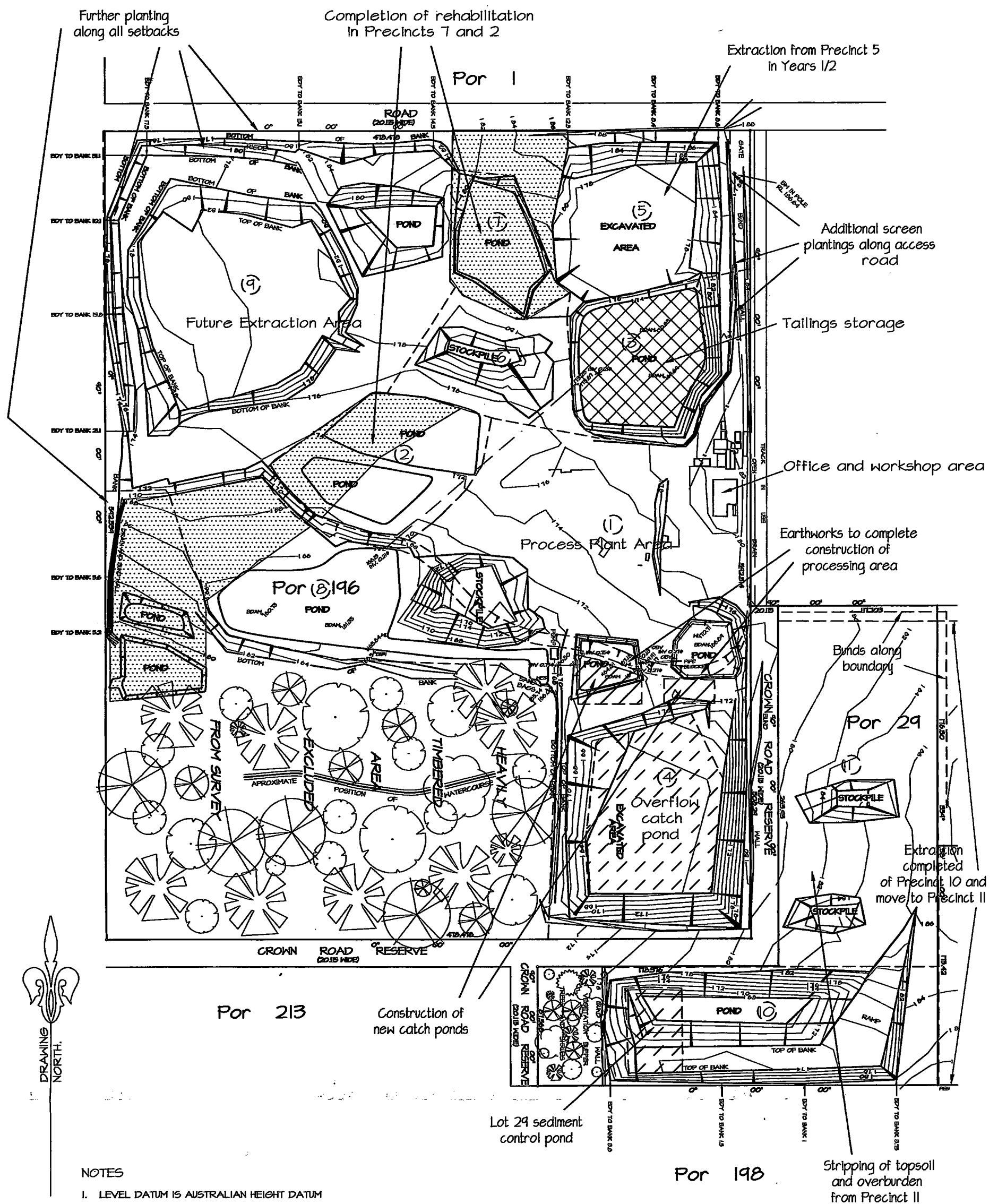


# NORTH MAROOTA OPERATION NSW





# NORTH MAROOTA OPERATION NSW



## NOTES

1. LEVEL DATUM IS AUSTRALIAN HEIGHT DATUM
2. DISTANCES SHOWN FROM BOUNDARY TO WORKINGS ARE APPROXIMATE ONLY  
ANY CRITICAL DISTANCES SHOULD BE DETERMINED BY SITE SPECIFIC SURVEY
3. TREES SHOWN ON THIS PLAN INDICATE VEGETATED AREAS AND NOT INDIVIDUAL TREES

A graphical scale bar labeled "SCALE" with markings at 00, 20, 40, 60, 80, and 100m.

### LEGEND

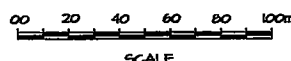
- ⑦ Precinct numbers
- Precinct boundaries
- Drainage diversion
- Temporary water storage
- Water storage
- Rehabilitation

## QUARRY DEVELOPMENT (initial years)

### FIGURE 6.4

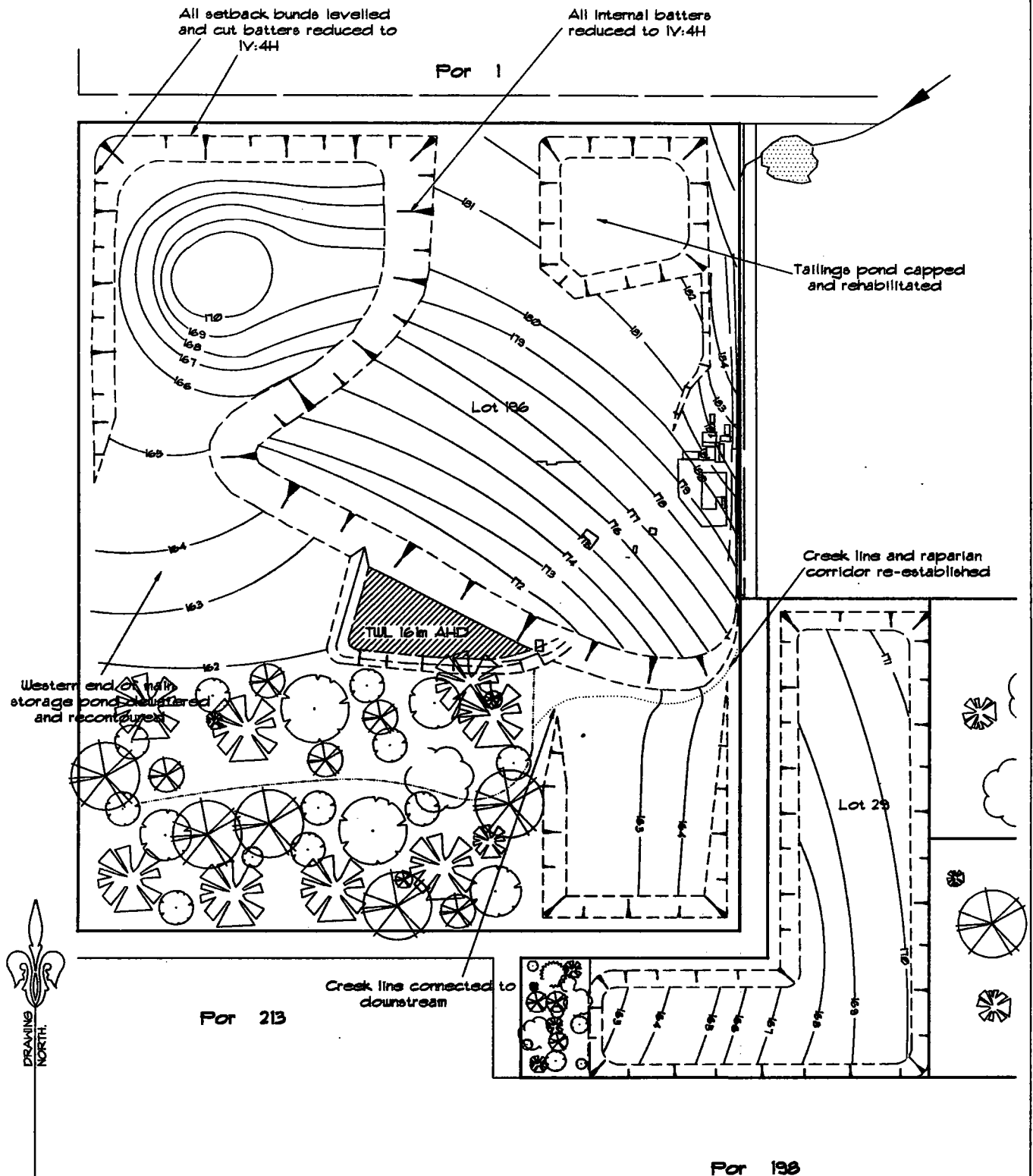


## REHABILITATION COMPLETED FOR PRECINCTS 2, 6, 7



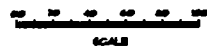


# NORTH MAROOTA OPERATION NSW



## NOTES

1. LEVEL DATUM IS AUSTRALIAN HEIGHT DATUM
2. DISTANCES SHOWN FROM BOUNDARY TO WORKINGS ARE APPROXIMATE ONLY. ANY CRITICAL DISTANCES SHOULD BE DETERMINED BY SITE SPECIFIC SURVEY
3. TREES SHOWN ON THIS PLAN INDICATE VEGETATED AREAS AND NOT INDIVIDUAL TREES
4. FUTURE BATTERS ARE NORMAL 1:1 SLOPES



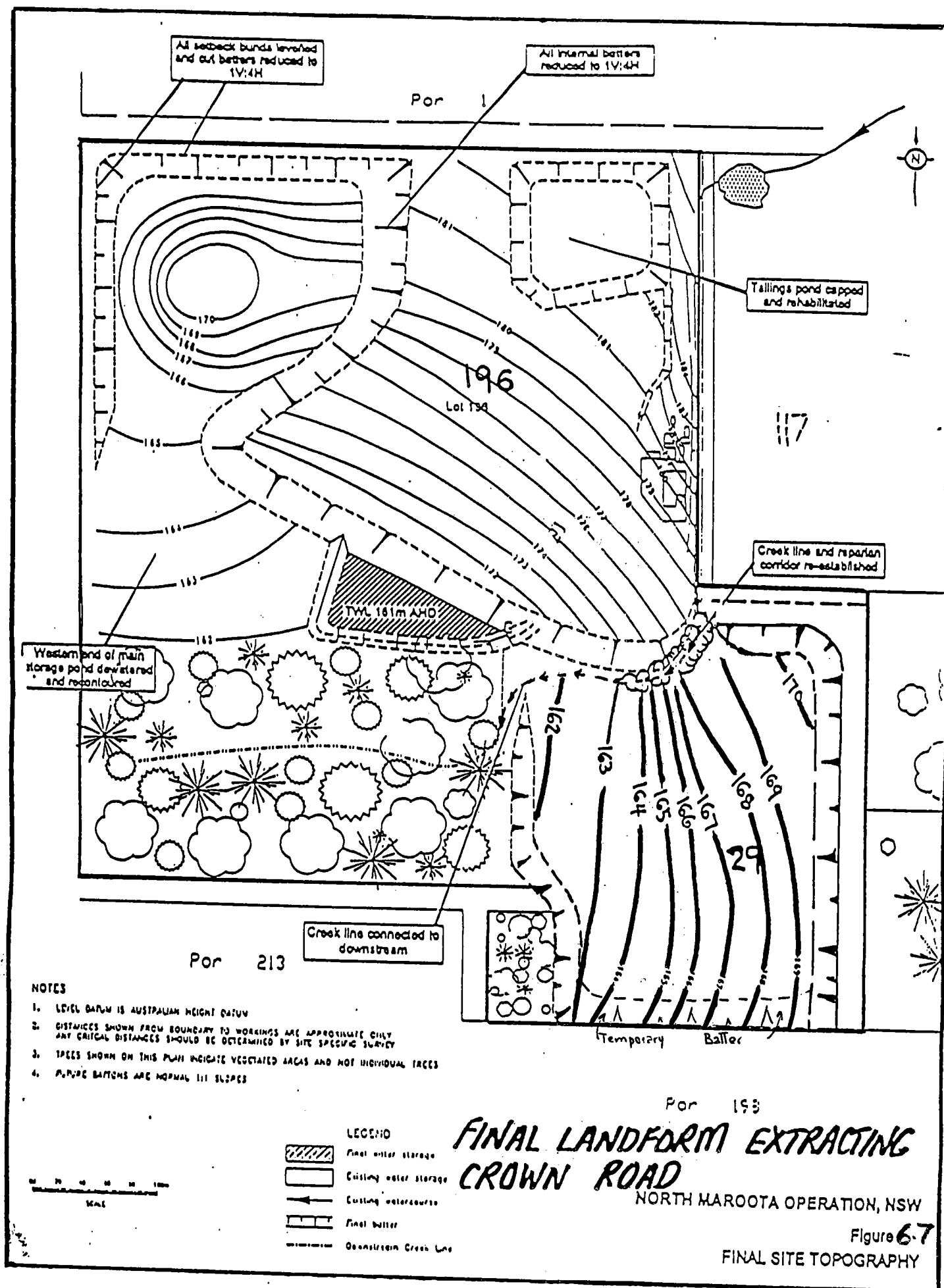
## LEGEND

- Final water storage
- Existing water storage
- Existing watercourse
- Final batter
- Downstream Creek Line

FINAL SITE REHABILITATION

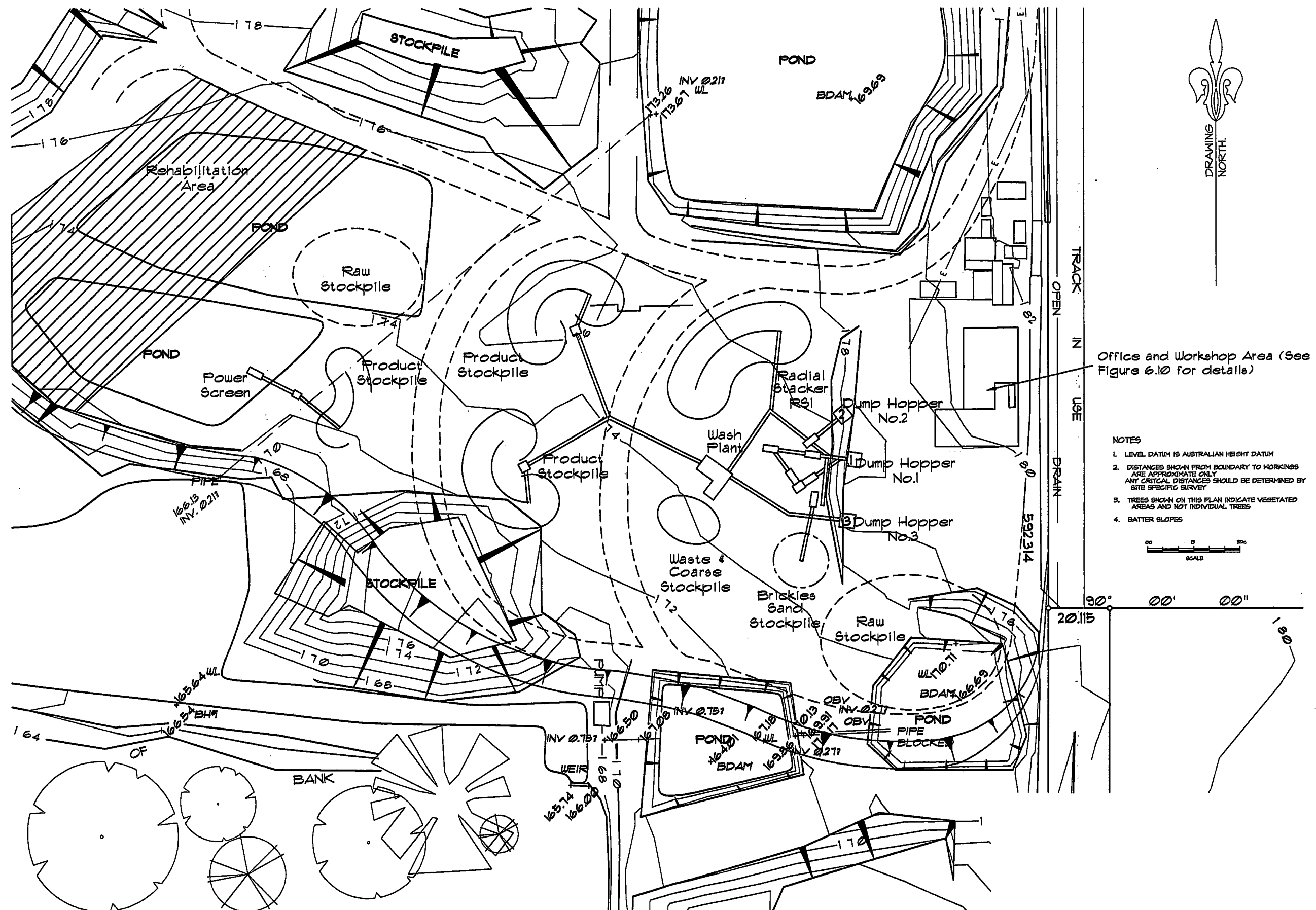
FIGURE 6.6







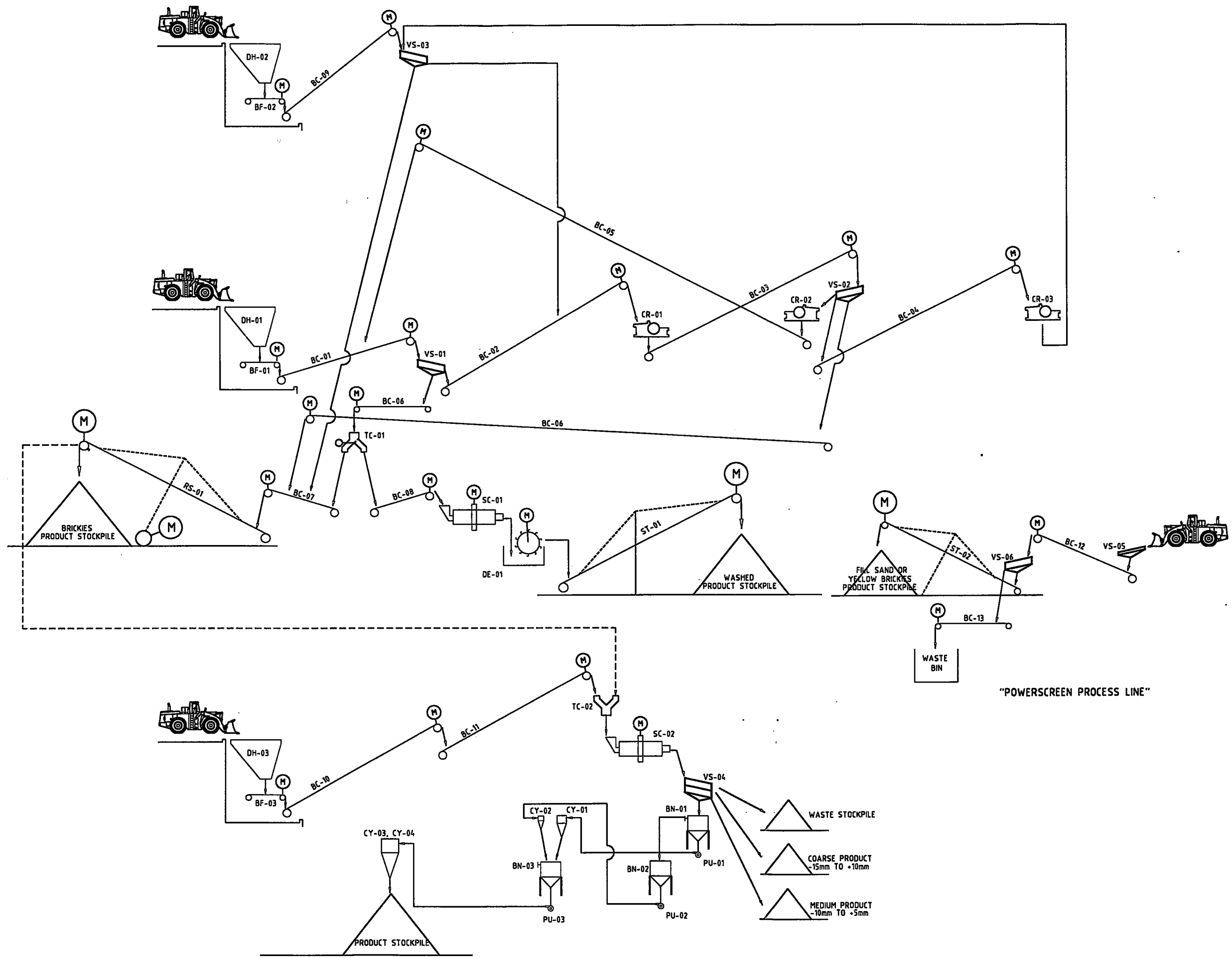
# NORTH MAROOTA OPERATION NSW



WORKS AND PROCESSING AREA - GENERAL ARRANGEMENT

FIGURE 6.8





- DH-02 DUMP HOPPER No 2
- BF-02 BELT FEEDER No 2
- BC-09 BELT CONVEYOR No 9
- VS-03 VIBRATING SCREEN No 3
- DH-01 DUMP HOPPER No 1
- BF-01 BELT FEEDER No 1
- BC-01 BELT CONVEYOR No 1
- VS-01 VIBRATING SCREEN No 1
- BC-02 BELT CONVEYOR No 2
- CR-01 JAW CRUSHER No 1
- BC-03 BELT CONVEYOR No 3
- VS-02 VIBRATING SCREEN No 2
- CR-02 TSAB CRUSHER No 2
- CR-03 ROTARY CONE CRUSHER No 3
- BC-04 BELT CONVEYOR No 4
- BC-05 BELT CONVEYOR No 5
- BC-06 BELT CONVEYOR No 6
- TC-01 TRANSFER CHUTE No 1
- BC-07 BELT CONVEYOR No 7
- RS-01 RADIAL STACKER No 1
- BC-08 BELT CONVEYOR No 8
- SC-01 SCRUBBER No 1
- DE-01 PADDLEWHEEL DEWATERER No 1
- ST-01 STACKER No 1
- DH-03 DUMP HOPPER No 3
- BF-03 BELT FEEDER No 3
- BC-09 BELT CONVEYOR No 9
- BC-10 BELT CONVEYOR No 10
- BC-11 BELT CONVEYOR BC-11
- TC-02 TRANSFER CHUTE No 2
- SC-02 WARMAN ROTARY SCRUBBER No 2
- VS-04 VIBRATING SCREEN No 4
- BN-01 WASHED PRODUCT BIN 01
- PU-01 CYCLONE FEED PUMP No 1
- BN-02 WASHED PRODUCT BIN No 2
- PU-02 CYCLONE FEED PUMP No 2
- CY-01 24" LINATEX CYCLONE No 1
- CY-02 9" LINATEX CYCLONE No 2
- BN-03 WASHED PRODUCT BIN No 3
- PU-03 CYCLONE TOWER FEED PUMP No 3
- CY-03 27" LINATEX CYCLONE No 3
- CY-04 27" LINATEX CYCLONE No 4
- VS-05 "POWERSCREEN" VIBRATING FEEDER
- BC-12 BELT CONVEYOR No 12
- VS-06 VIBRATING SCREEN No 6
- ST-02 STACKER No 2
- BC-13 BELT CONVEYOR No 13

"POWERSCREEN PROCESS LINE"

REV	DESCRIPTION	DATE	CHECKED	REFERENCE DRAWINGS	DESCRIPTION
				DWG No.	

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EMAIL eiszele@loam.com.au

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DESIGNED	-	-
APPROVED	-	-
JOB No.	98002	

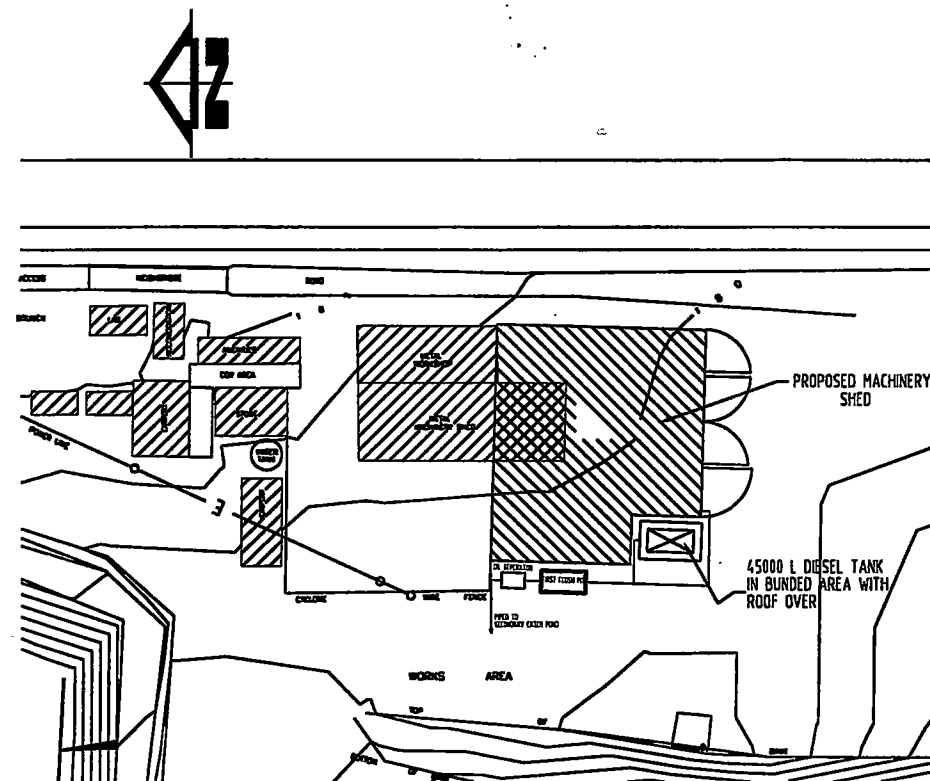
**DIXON SANDS (PENRITH) PTY LTD**

**MAROOTA - SAND PROCESSING PLANT**

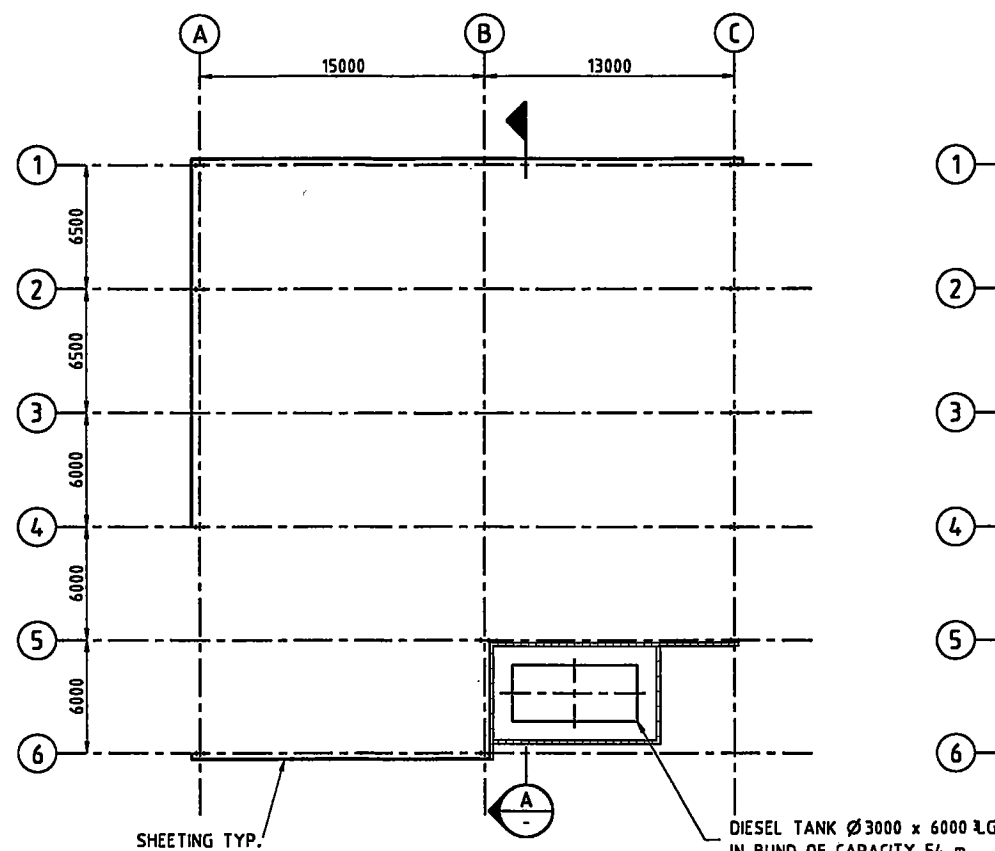
**PROCESS FLOW DIAGRAM**

SCALE NIL
SHEET B1
FIGURE 6.9
NOTE A

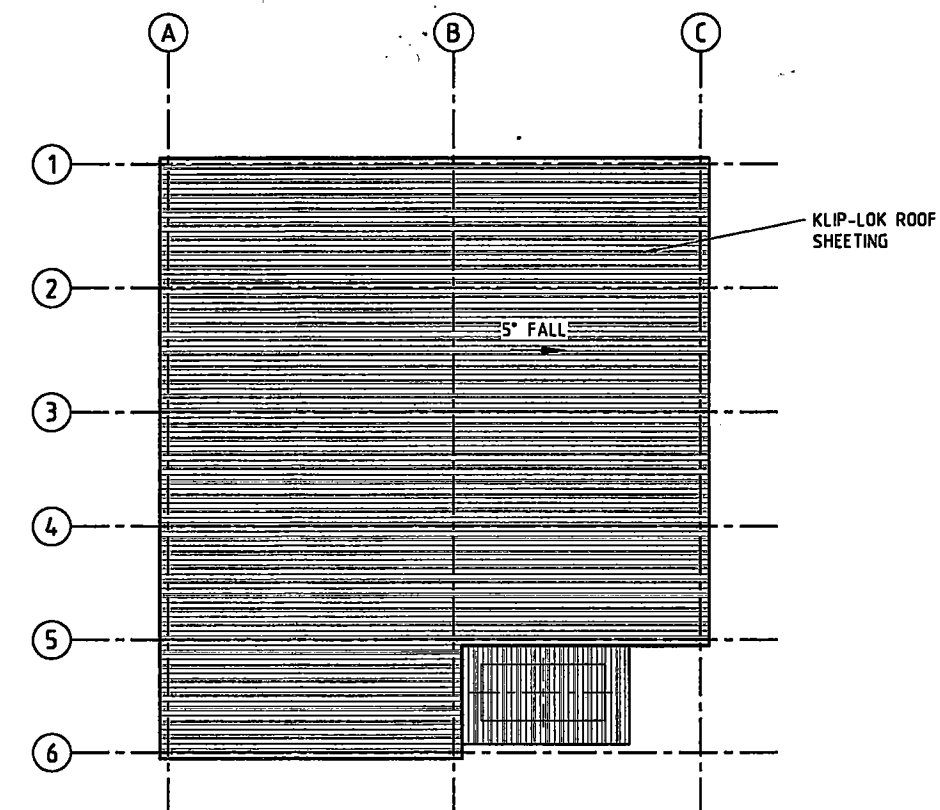




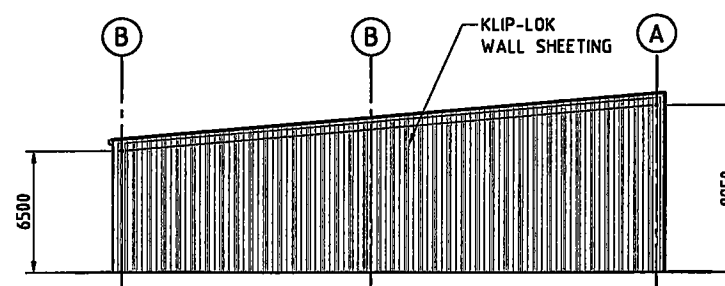
SITE PLAN



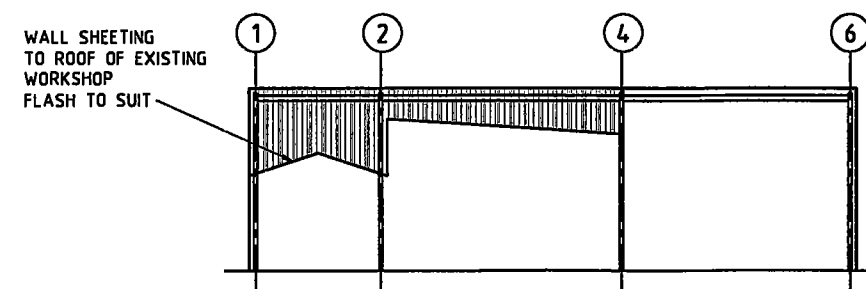
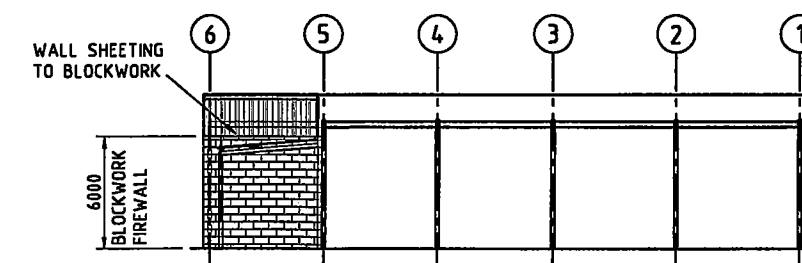
PLAN VIEW ON FLOOR LEVEL



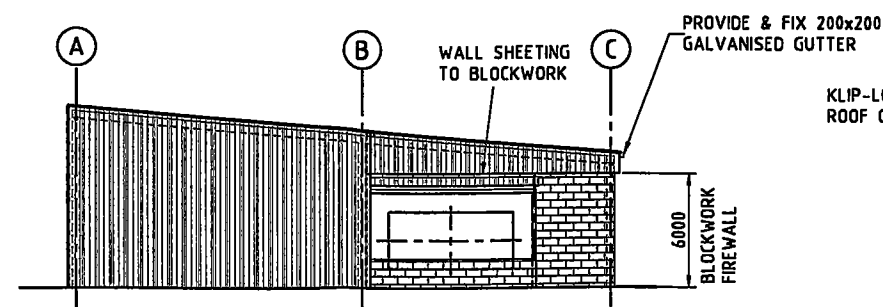
PLAN VIEW ON ROOF



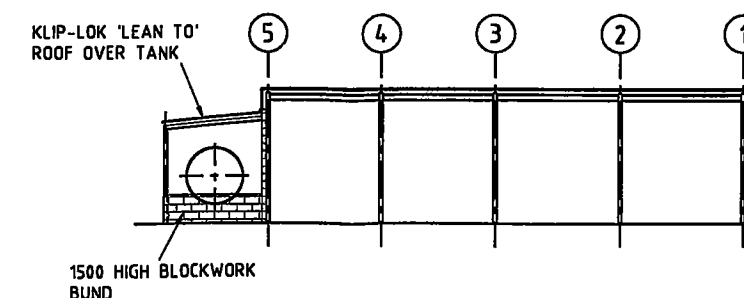
EAST ELEVATION



NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION

REV	DESCRIPTION	DATE	CHECKED	REFERENCE DRAWINGS
				DWG No. DESCRIPTION

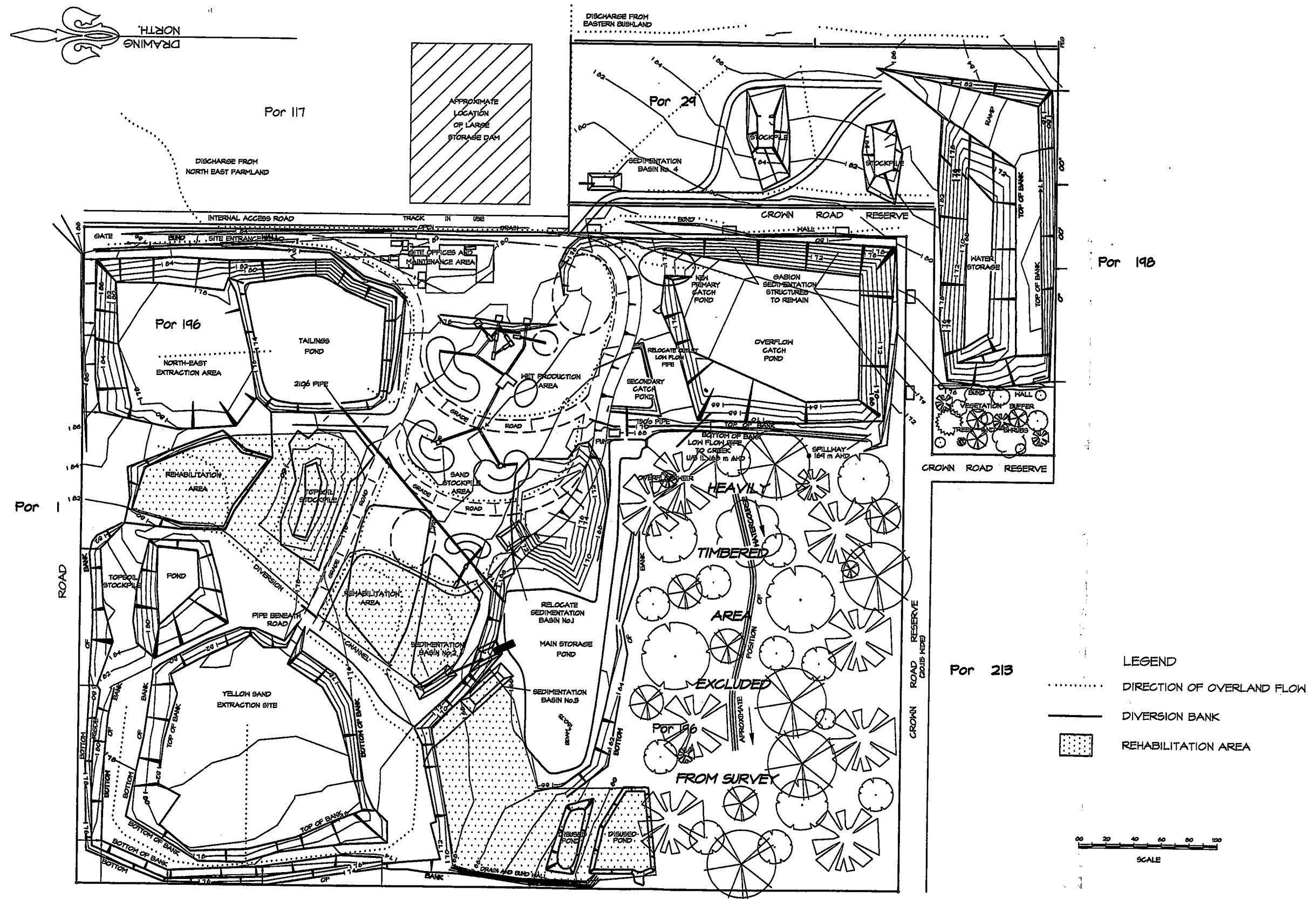
PRIORITY PROJECT MANAGEMENT PTY LTD  
 73 ELTHAM STREET  
 GLADESVILLE NSW 2111  
 TELEPHONE (02) 9817 0395  
 FAX (02) 9817 0174  
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DESIGNED	P.EISZELE	APRIL 99
APPROVED	-	-
JOB No.		

DIXON SAND (PENRITH) PTY LTD NEW MACHINERY SHED ARCHITECTURAL G.A PLAN & ELEVATIONS		
SCALE 1:200	SHEET B1	FIGURE 6.10
		REV# A



# NORTH MAROOTA OPERATION NSW

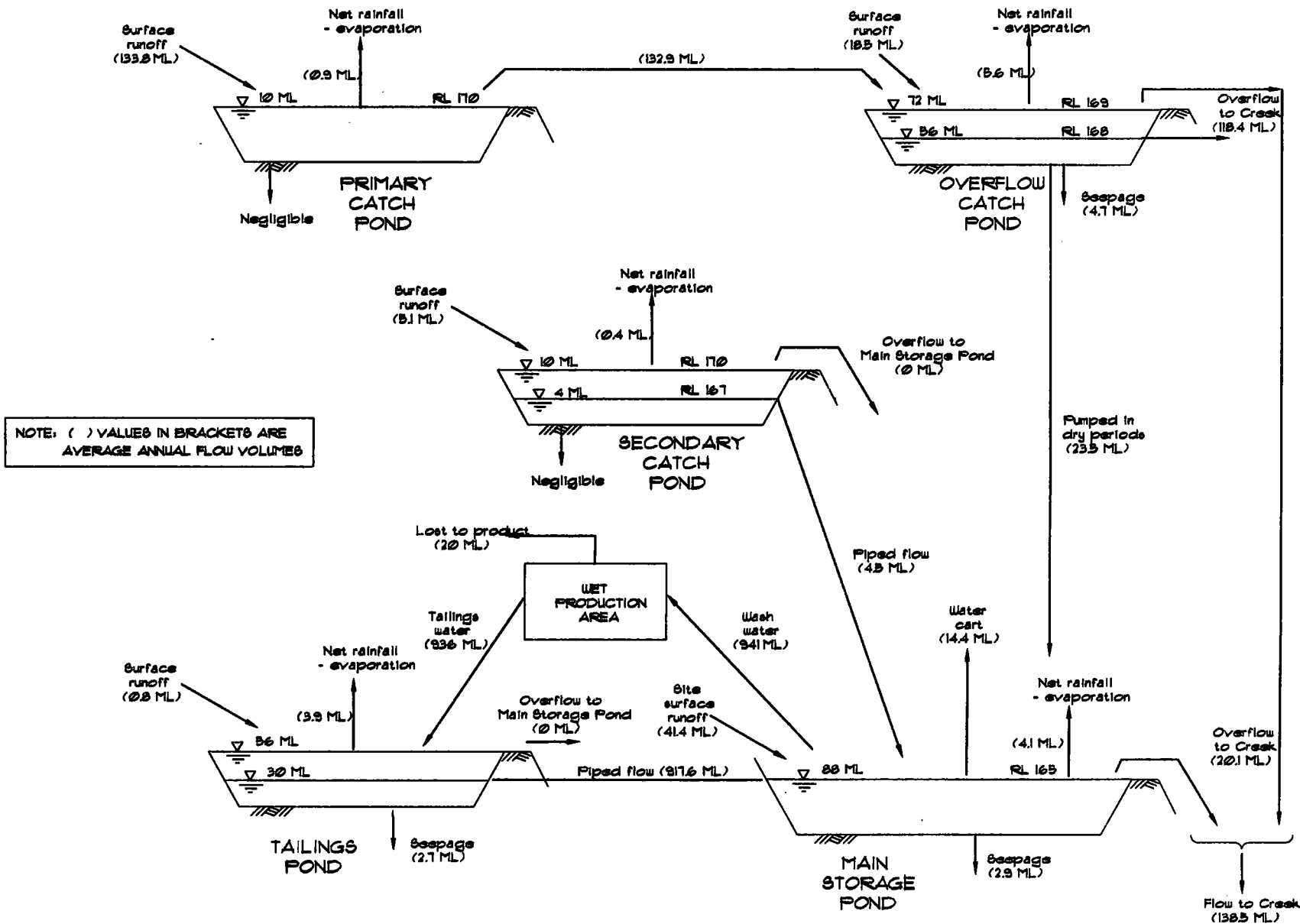


WATER MANAGEMENT PLAN SYSTEM

FIGURE 6.11



# NORTH MAROOTA OPERATION NSW

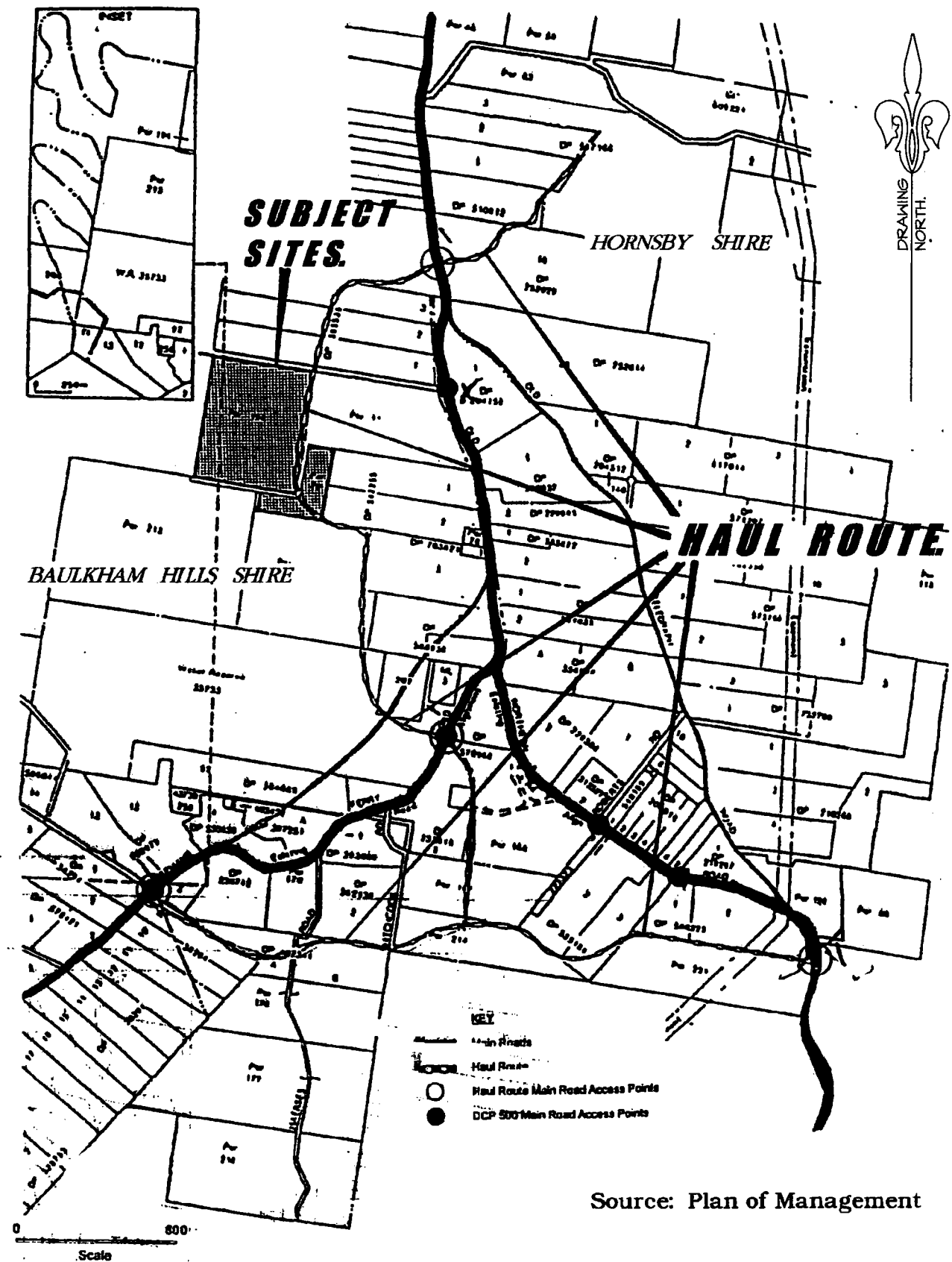


**SITE WATER BALANCE**

**FIGURE 6.12**



# NORTH MAROOTA OPERATION NSW



OLD NORTHERN ROAD INTERSECTION FIGURE 6.13

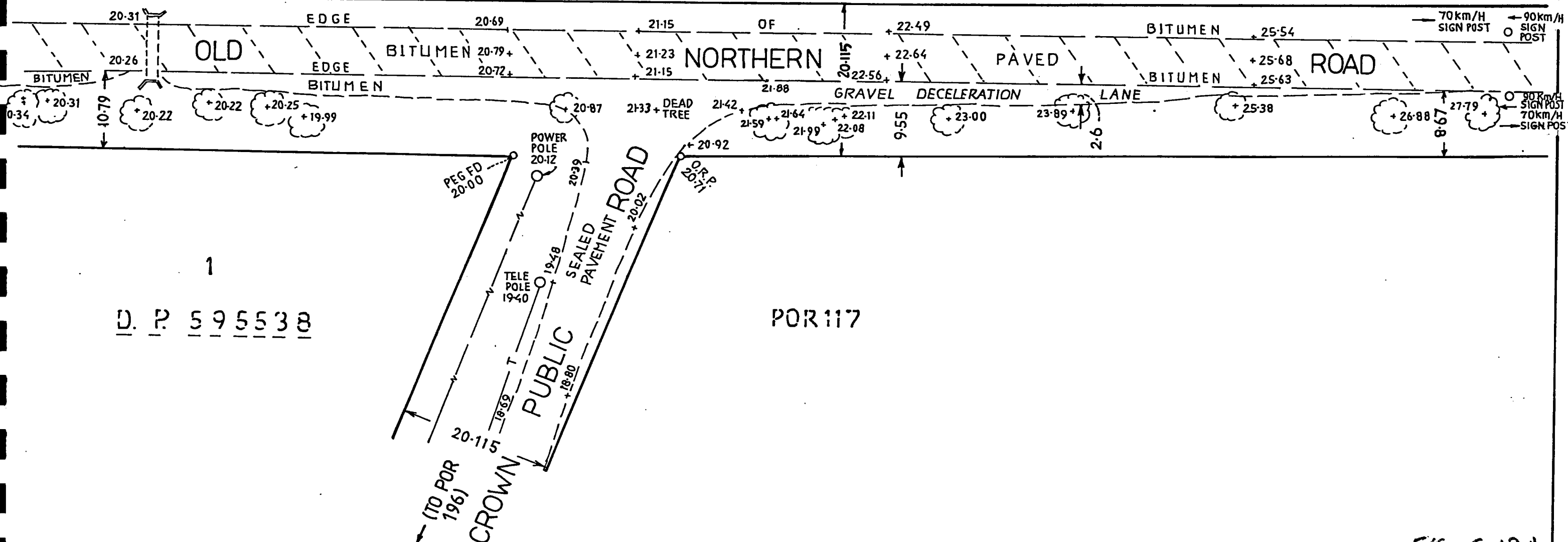


D. P. 204159

1

from WISEMANS FERRY

to DURAL



D. P. 595538

POR 117

CLIENT: MANALDO - DIXON SANDS

PLAN SHOWING EXISTING LEVELS & FEATURES AT THE INTERSECTION OF OLD NORTHERN RD & CROWN PUBLIC ROAD MAROOTA N.S.W.

**KEOWN & DRUMMOND PTY. LTD.**

CONSULTING SURVEYORS & TOWN PLANNERS

371A PITT STREET, SYDNEY  
AUSTRALIA 2000  
TELEPHONE: (02) 267 8255  
FAX: (02) 267 1087



FIG. 6.13A

REDUCTION RATIO:  
1:500

REF. NO.  
6441

DATE:  
APRIL 1995



**NORTH MAROOTA OPERATION NSW**



**EXISTING SITE**

**PLATE 6.1**



**NORTH MAROOTA OPERATION NSW**



**OFFICE & PROCESSING PLANT AREA**

**PLATE 6.2**



## CHAPTER 7 – ENVIRONMENTAL IMPACT AND MITIGATION DURING EXTRACTION AND PROCESSING

- 7.1 Introduction
- 7.2 Extraction Program Details
- 7.3 Water Management
- 7.4 Noise Management
- 7.5 Traffic Management
- 7.6 Air Quality Management
- 7.7 Waste Management
- 7.8 Protection of Environmentally  
Sensitive Areas
- 7.9 Risk Management Guidelines for  
Assessment of Impact
- 7.10 Other Issues



## 7.0 ENVIRONMENTAL IMPACT AND MITIGATION DURING EXTRACTION AND PROCESSING

### 7.1 INTRODUCTION

The format, content and structure of this chapter (and indeed all the following Impact Assessment Chapters) are modelled on the "*preferred form, content and structure*" outlined in DCP 500.

Separate "*works*" chapters are required under the preferred format in the DCP for clearing, extraction and rehabilitation. In this EIS, only chapters on extraction and rehabilitation are provided, as clearing is not relevant to this Application for Consent.

The Chapter dealing with "*extraction*" in DCP 500 lists the following as a checklist:

- ◆ *extraction program plans (extent and depth)*
- ◆ *extraction materials and equipment*
- ◆ *soil conservation and management procedures*
- ◆ *hydrology, including drainage works, groundwater protection and management strategies*
- ◆ *sediment and erosion control plan, including tailings dam designs*
- ◆ *temporary structures and works*
- ◆ *location and containment of major work areas*
- ◆ *hours of operation*
- ◆ *noise generation during works*
- ◆ *transport arrangements*
- ◆ *air quality management, including dust suppression*
- ◆ *waste minimisation measures*
- ◆ *protection measures for environmentally sensitive areas, including flora, fauna and heritage*
- ◆ *number of employees*
- ◆ *expected timeframe for each extraction phase/stage*
- ◆ *site management issues*
- ◆ *risks, safeguards and contingency arrangements*

There are seventeen items listed above. Some are related to the definition of the extractive operations but most cover the environmental assessment of extractive operations. For better and more full presentation, the following structure has been adopted:

- ◆ Matters related to the extraction program, materials, hours of operation, waste minimisation, employees, timeframes and site management are addressed in **Section 7.2 - Extraction Program Details**.
- ◆ The environmental assessment issues are addressed in the following sections:



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- o **Section 7.3** addresses water management, soil and erosion control, tailings dam designs, temporary works and structures ;
- o **Section 7.4** addresses noise management;
- o **Section 7.5** addresses transport management;
- o **Section 7.6** addresses air quality;
- o **Section 7.7** addresses waste management;
- o **Section 7.8** addresses flora, fauna and heritage; and
- o **Section 7.9** addresses risks, safeguards and contingency arrangements.
- o **Section 7.10** addresses other issues that are not included in the DCP structure, but are considered relevant issues to be address in this EIS.

## 7.2 EXTRACTION PROGRAM DETAILS

This chapter provides an environmental impact assessment under each of the issue headings as well as a listing of the mitigation measures that will be incorporated in the proposal. These mitigation measures are to be implemented where necessary to improve, amend or remeliorate a potential environmental problem. A later chapter, **CHAPTER 11 - ENVIRONMENTAL MITIGATION MEASURES**, provides a separate scheduling of those mitigation measures as required under the *Environmental Planning and Assessment Regulation, 1994*.

### 7.2.1 Guidelines for Assessing Extraction Program

Section 2.11, *Extraction Program of DCP 500*, sets the objectives that an extraction program has to meet, these being:

- ◆ *To facilitate and ensure extraction occurs in an orderly sequence and in a controlled manner.*
- ◆ *To ensure extraction is undertaken in an environmentally acceptable manner.*
- ◆ *To protect land holdings not currently being extracted and to facilitate future extraction.*

The DCP requires the preparation of an extraction program plan and an extractive philosophy that would require each completed extraction area to have commenced rehabilitation works prior to proceeding onto the next extraction area.

It is also required that the extraction program should consider reducing the depth and area of extraction in locations likely to have an impact on groundwater, flora, fauna, etc.

Extractive operations should also have the following four goals:

1. *maximise the quality and volume of material.*
2. *minimise the generation of adverse impacts.*
3. *minimise the volume of waste.*
4. *limit the potential impact upon sensitive site features and areas.*



### 7.2.2 Response to Requirements

Extraction has been planned by dividing the Lots 196 and 29 into eleven Precincts *see Figure 6.2 - Extraction Precincts*. This will ensure that all remaining reserves of sand are quantified and scheduled (to achieve sequencing of extraction to meet market requirements). This allows an environmental assessment to be carried out, utilising the details provided by the extraction plan.

The requirements to commence rehabilitation prior to proceeding with the next extraction phase is to be followed, except in situations where the completed extraction area is required for some other form of post-extraction land use, such as tailings disposal, water storage, etc.

It is also noted that the extent of development in each of the Precincts (of which only one has not been commenced) limits the potential for controlling the extent of site disturbance. Future extraction will however be carried out in an orderly sequence.

An outline of the various extraction program details have been presented in **CHAPTER 6**, namely:

- ◆ Extraction Program Plan – see **Section 6.4** and **Appendix C-Extraction plan**.
- ◆ Extraction materials and equipment – see **Sections 6.4 and 6.5**.
- ◆ Location and containment of major work areas – see **Section 6.4** for Precinct layout.
- ◆ Hours of operation – see **Sections 6.3 and 6.5**.
- ◆ Number of employees – see **Section 6.5**.
- ◆ Expected timeframe for each extraction phase – see **Section 6.4**.

In regard to the expected timeframe, quarry development has been scheduled into "initial years" (years 1 and 2 approximately) and "later years" (years 6 and 7). In an operation expected to last 10 years, the level of detail is considered appropriate.

## 7.3 WATER MANAGEMENT

### 7.3.1 Guidelines for Assessing Water Management Issues

DCP 500 addresses water management, sediment and erosion control and associated structures and works, in the following three sections:

1. *Section 2.4, Water Resources*
2. *Section 2.8, Soil Conservation*
3. *Section 2.16, Maroota*

In addition, there are the various responses from the consultation programs addressed in **CHAPTER 4 - Strategic Considerations**.

The objectives in relation to water quality issues are:

- ◆ *To conserve the integrity and quality of the groundwater resources in the Shire.*
- ◆ *To protect groundwater dependent and riparian ecosystems and natural habitats.*



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- ◆ To conserve and effectively manage the sustainability of water supplies and resources of the Shire.
- ◆ To protect downstream drainage patterns including location, quantity and quality of waters.
- ◆ To protect groundwater dependent ecosystems and natural habitats.
- ◆ To minimise (wind), water and soil erosion of disturbed and rehabilitated areas.
- ◆ To implement and maintain effective sediment and erosion control measures for the protection of downstream properties and areas of environmental sensitivity.

The specific requirements that are necessary to meet these objectives are:

- ◆ Maintain and monitor drainage outlet points at downstream boundaries.
- ◆ Preparation of a water management strategy and groundwater impact assessment report.
- ◆ Extraction should not occur within 2 m of the high groundwater level.
- ◆ Proponents should ensure that drainage control measures are provided for upstream catchments, so that run-off may bypass the extraction site. Proponents should ensure long term stability of natural channels downstream of the site by maintaining pre-existing rates, volumes and qualities of channel flow. A sediment and erosion control plan is required with each application.
- ◆ Proponents should ensure that drainage control measures, sediment control dams and tailings ponds are designed to the hydrological, hydraulic and geotechnical requirements specified in Section 2.8 of DCP 500.

### 7.3.2 Water Management System Design

**Section 6.9.3 - Existing Water Management and Erosion Control System**, and **Section 6.9.4, - Proposed Water Management and Erosion Control System**, set out the details of the existing system and those changes that have been proposed to that system in order to meet the requirements of DCP 500 (and others). The objectives that have been set for the water management and erosion control system are:

- ◆ Ensure the site is as self sufficient as possible in regard to water supply for operating purposes and recycle on-site water to the greatest extent possible.
- ◆ Seek to mimic the pre-existing flow regime downstream of the site.
- ◆ Protect downstream ecosystems.
- ◆ Allow flow from upstream catchments to pass through the site uncontaminated.
- ◆ Minimise the disturbed area of the site by limiting future clearing and progressively rehabilitating areas when operations are completed.

### 7.3.3 Impact Assessment and Mitigation Measures

The site has been developed over some 17 years by two operators and development practices in the past, although they may have complied with requirements at the time, may not meet current day standards.

There are a number of issues identified that need to be resolved in respect to water management. The following summarises both the positive features and the problems with the existing water management and erosion control system:



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- ◆ The erosion and sediment control system protects downstream water quality in the main drainage path downstream except under conditions of excessive rainfall and except in circumstances when high nutrient run-off enters the site. (This is a result solely of unacceptable land farming practices on the upstream property. The matter has been the subject of a report to Council, with copies to DLWC and EPA).
- ◆ Drainage from the site is not now permitted to occur from multiple locations around the site boundaries. Extensive remedial work has recently been undertaken in the stabilisation of some of the batter faces to prevent erosion and subsequent siltation. The downstream natural channel and the ecology of the downstream creek line (and ultimately the downstream wetland) are protected by the fact that the volume of flow passing downstream of the site is approximately the same as that which occurred under pre-quarry conditions.
- ◆ There are no provisions in place that allow run-off from upstream catchments to bypass the extraction site. Run-off from upstream is passed through two catch dams. High nutrient run-off from agricultural activities and occasionally high pH off the private road between Lots 1 and 198 are diverted and stored in the Overflow Catch Pond. Accordingly, upstream flow does not pass directly downstream. This is not necessarily a negative aspect as it provides retention and dilution for those upstream sourced pollutants that enter the site.
- ◆ Local drainage control measures and sediment control dams/sedimentation ponds are located and designed to control local run-off from various parts of the site and to retain the first flush run-off from those areas of the site that are determined to be active and disturbed, (or potentially could contribute sediment).
- ◆ Tailings pond design is not in accordance with the standard approach set out in DCP 500 (see Figure 6 of the DCP). The alternative method of storing tailings in extractive pits is preferred. Accordingly, any concern over the stability and operation of conventional tailings dam systems does not apply, especially in relation to the stability of such dam walls if they were to be utilized.

The main mitigation measures for surface water management that will be introduced over the life of the operation, include:

- ◆ Initial application for a discharge water licence from the EPA under the POE Act, with the associated requirements for monitoring for downstream discharges.
- ◆ Initial application for various licences and permits as required under the *Water Act* and *Rivers and Foreshores Improvement Act*, including an application for three production bores for use in extreme circumstances.
- ◆ Continuous water quality monitoring and inspection requirements will be specified in protocols under the Environmental Management and Rehabilitation Plan, from the outset.
- ◆ Following the completion of quarrying, as part of the final site rehabilitation, it is proposed to re-establish the original creek and riparian corridor in order to pass upstream flows directly through the site and directly into the downstream water course. This should not be constructed until the issue of the management of upstream water quality is resolved.
- ◆ Following the completion of quarrying and as part of the final site rehabilitation, certain changes to the main storage dam in its western part, by dewatering this area and re-establishing near to original contour profiles in this South-Western corner of Lot 196. Such a change would be in accordance with the limitations under the recently released farms dam policy of the Department of Land and Water Conservation and in keeping with the scale of water use required in the future on the site. Another dam linked to the permanent site dam will be constructed in the North-East



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corner of Lot 196. This dam could either be an in-ground dam or an above ground storage tank. It would provide irrigation waters to future agricultural type operations that will be developed in that part of the site.

Reference should also be made to **CHAPTER 11- ENVIRONMENTAL MITIGATION MEASURES**, for a complete list of the measures discussed.

### 7.3.4 Groundwater Impacts and Mitigation Measures

**Appendix C 5 - Groundwater Impact Assessment**, provides an analysis of the available monitoring data within the North Maroota area that can provide an indication of the potentiometric surface for the shallow aquifer.

Stage 2 of the Maroota Groundwater Study has enabled a collection and collation of existing groundwater information. This study has been extremely useful in compiling the groundwater impact assessment report for these proposed operations.

This report has been provided to the Groundwater Section of the Department of Land and Water Conservation, who have advised on licensing requirements for both surface and groundwater systems. It has been accepted by the Department, that the site operations have not to-date intercepted any groundwater systems and hence, do not require a licence.

The Groundwater Report at **Appendix C** has found that there is no evidence on either Lot 196 or 29 of any prior or current excavation having intersected the shallow aquifer. Although monitoring data is only recent, there is nevertheless a prima facie support for this conclusion. However, it will be important to monitor all excavations in the future, particularly those deep excavations which will have the greatest potential for approaching the seasonally highest level of the shallow groundwater table.

The Department of Land and Water Conservation have set a minimum of a 2 m separation. By examination of the final site topography (see **Figure 6.5- Quarry Development- Final Years and Figure 1 of the Groundwater Impact Assessment Report**), it can be seen that the main extraction areas in this development have the following difference in level between the final excavation depth and the extracted groundwater level:

- ◆ Precinct 9, will have excavation depths between 165 m AHD and 170 m AHD, with groundwater table levels between approximately 158 m AHD and 164 m AHD providing separation distances of approximately 6 m.
- ◆ Precinct 5, will have an excavation depth of 172 m AHD, with a groundwater level of approximately 170 m AHD.
- ◆ Precinct 11, will have final excavation levels of 168 m AHD to 171 m AHD, with groundwater levels between 163 m AHD and 169 m AHD, providing separation distances of between 2 m and 5 m.

The annual water management plan will report on the aquifer monitoring data and on any indications that extraction may be approaching the groundwater table level.

To the extent possible from the monitoring carried out to-date, the groundwater impact assessment report has:



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- ◆ identified and classified the aquifer system.
- ◆ identified groundwater dependent land uses and environments.
- ◆ assessed that the groundwater is not vulnerable to extractive operations.
- ◆ has adopted the freeboard levels suggested by the Department.
- ◆ will continue to monitor groundwater and surface water qualities, to identify any effects from seepage from tailings dams, and to monitor groundwater flow and quality.

Finally, for the purposes of defining Integrated Development requirements, included in the attachments to **Appendix A3 - Consultation**, is the correspondence from the Department of Land and Water Conservation This correspondence identifies the requirements for permits, approvals and licences under the *Water and Rivers and Foreshore Improvements Acts*.

The Mitigation measures for the protection of the groundwater will be (as an integral part of this proposal) as detailed below:

- ◆ The ongoing monitoring of water quality from the springs that outcrop in the downstream natural gully area to assess any effects on water quality within the groundwater system as a result of seepage from tailings storages.
- ◆ Obtain frequent inspections of the site from the hydrogeologists of the Department of Land and Water Conservation to confirm appropriate precautionary measures to protect groundwater system.
- ◆ Annual water management plan to record and report on aquifer monitoring data and any indications that extraction may be approaching the groundwater table level.

## 7.4 NOISE MANAGEMENT

### 7.4.1 Guidelines for Assessing Noise Impacts

DCP 500 sets out the acoustic management objectives in Section 2.9 of that document:

- ◆ *To maintain the acoustic quality of the Shire.*
- ◆ *To protect and maintain the acoustic environment of residents, the public, community facilities and other receivers in the Shire.*
- ◆ *To limit the potential offensiveness of noise from specific sources.*

The specific requirements in the DCP are summarised below:

- ◆ Acoustic buffers need to be provided to protect residents and public places not associated with the operations.
- ◆ Noise assessment and controls will have to achieve the minimum acoustic criteria and standards set down by the EPA.
- ◆ Proponents will have to seek to have innovative extraction techniques which facilitate low noise emissions.
- ◆ An acoustic impact assessment report is required, and background noise measurements will need to include the most sensitive points nearest to the development site.



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- ◆ Extractive activities should not occur within 100 m of a residence not associated with the activities.
- ◆ Proponents are encouraged to facilitate acoustic shielding by implementing the extraction cell technique.
- ◆ Proponents should ensure that road traffic noise is minimised, to reduced potential impacts on the acoustic environment of residents and community facilities within the locality. In this regard, proponents will need to indicate the special transport needs of the activity which are most likely to generate noise outside normal operating hours.
- ◆ Proponents should ensure the hours of operation of extraction and transportation of materials are kept between 7 am and 6 pm, Monday to Friday inclusive and 7 am to 4 pm, Saturday. Variations to these hours may be justified having regard to the nature and location of a particular project.

#### 7.4.2 Impact Assessment and Mitigation Measures

##### Operational Site Noise

Noise level modelling for the proposed operation had been undertaken, using the Environmental Noise Model, Version 3.06 (see **Appendix C4-Noise Impact Assessment**) by Dick Benbow & ASSOCIATES Pty Limited. This model is recommended by the NSW EPA for noise modelling. The meteorological conditions under which the modelling has been undertaken provide for neutral to slightly adverse conditions. Three operational scenarios were simulated in the model:

- ◆ Scenario 1 represents normal extraction operations from Lot 196 and processing operations.
- ◆ Scenario 2 represents normal extraction operations from Lot 29 and processing operations.
- ◆ Scenario 3 presents worst case of peak operations, including extraction from Lot 29, processing operations and auxiliary plant operations.

It should be noted that although parallel operations will be occurring in both white and yellow sand areas, at any day only one area will be operated.

The noise sources and the locations of the sources of each scenario are presented in the report **Appendix C4**. All mobile equipment noise sources were modelled at the original or existing surface level. In other words, no allowances for extraction working faces have been made. Model results are shown in **Table 7.1** below, predicting noise levels from site operations in terms of the dBA scale.



**TABLE 7.1**  
**PREDICTED NOISE LEVELS FROM SITE OPERATIONS**  
**(WITH EARTH BERMS IN PLACE) dB(A)**

Scenario Design objective	Location A 44.0	Location B 44.0	Location C 43.0
1A	34.0	37.0	31.9
1B	39.2	41.8	40.7
2A	36.3	37.9	33.0
2B	40.8	43.3	41.5
3A	38.1	40.8	33.5
3B	41.9	45.5	41.4

In the above scenarios, the 'A' scenario represents no wind and the 'B' scenario represents a wind towards the east at 2 m per second.

It is noted that the design objectives are based on the EPA published criteria and the background monitoring undertaken at each of the assessed locations. The results in **Table 7.1** are also achieved only after berms have been constructed at various locations around the site. These berms are to be located at the following sites:

- ◆ Along the full Eastern boundary of Lot 29 – 3 m high.
- ◆ Along the Northern boundary of Lot 29, with Lot 117 – 2.5 m high.
- ◆ Existing and recently reformed berms along the western side of the site entrance road, adjacent to Precincts 5 and 3, and a second berm along the full length of the eastern boundary of Lot 196, adjacent to Lot 117 from the site entrance gate through to the start of Lot 29.

A set of berms along the entrance road are partly existing berms that were constructed some time ago and have recently been reformed and revegetated as part of the rehabilitation program. They vary in height generally, between 0.8 m to 1.5 m. The surveyed crest of each has been input into the noise model, to achieve the results presented in **Table 7.1**.

**Table 7.1** demonstrates that following the construction of the berms, noise emissions would generally comply with the noise design objectives for daytime operations.

The only site for which there is an exceedance of the design objective is Location B for scenario 3. This is not considered significant as this scenario is for worst case operating conditions. The modelling is based on maximum noise sources from all equipment operating simultaneously. Actual noise levels at the residence can be expected to be less than the predicted values presented in the table and hence be below the Design Objective.

It is also noted that the predicted noise levels comply with the Noise Design Objectives for the period from 6 am to 7 am for all scenarios, except scenarios 2B and 3B. The Noise Design Objective for the this period is 43 dBA for Location B. During adverse wind conditions, the Objective may be exceeded



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by 1.5 dBA. However, the potential for adverse wind conditions in conjunction with all equipment operating simultaneously, occurring in this period is minimal. The exceedance is therefore unlikely to cause any annoyance.

Noise contour plots have been generated for each of the scenarios with the earth berms in place. Those contour plots are overlayed upon the actual ground conditions to demonstrate the effect of the noise controls. The contour plots are contained in **Appendix C4**. The predicted noise levels exceed the design objectives in the following circumstances:

**Road Traffic Noise**

Proposed operations will generate a maximum of 60 truck loads per day. This equates to 120 truck movements per day. The assessment is based on 15 truck loads during the 6 am to 7 am period (30 movements), 5 truck loads during the 7 am to 8 am period (10 movements) and the remaining movements, (80 movements) spread over the remaining 10 hour period, in an even distribution. The traffic noise assessment has been based on a 50% directional split at the junction of Old Northern Road and Wisemans Ferry Road. These truck movements are similar to those noted in April 1999 along Old Northern Road derived from other neighbouring operations. The exception is that currently 65% of movements are direct South.

Four locations have been assessed for road traffic noise:

- ◆ **Location D** is the residence at 165A Old Northern Road, which is located on the Eastern side of Old Northern Road and set back 50 m from the road.
- ◆ **Location E** is the residence at Lot 1, Old Northern Road, Maroota, which is located close to the intersection of Old Northern Road and Wisemans Ferry Road. The residence is set back approximately 55 m from both roads and the logger was positioned approximately 20 m from Old Northern Road and 50 m from Wisemans Ferry Road.
- ◆ **Location F** is the residence at Maroota Motors, at the corner of Old Northern Road and Roberts Road, Maroota. The logger was located adjacent to the residence 20 m from Old Northern Road.
- ◆ **Location G** is the residence at the corner of Wisemans Ferry Road and Hearses Road, Maroota. The residence is set back approximately 25 m from the road.

Tables 5.7 to 5.10 inclusive, in **Appendix C4**, provide the modelled hourly noise levels in  $L_{Aeq}$  at the four locations for both existing traffic levels and future traffic levels.

The criteria used to assess impact is a limit on the hourly increase to no more than 2 dBA. Whilst it could be argued that this objective is overly stringent, it will ensure that the potential for adverse impact to residents is minimised.

The results show that the increase in hourly noise levels is well below 2 dBA for the locations South of the intersection of Old Northern Road and Wisemans Ferry Road (Locations F and G).

The residences between the intersection and the site access road are exposed to all of the 120 anticipated truck movements per day. However, the hourly increase in noise levels remain below 2 dBA for all periods, except the 6 am to 7 am period, where the objective it exceeded. These predictions were based upon the premise that there would be no or minimal truck movements between the site and the intersection of Old Northern Road and Wisemans Ferry Road before Dixon Sand commenced operation. This is not the case as there were 82 and 96 sand truck movements



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recorded on two separate days in April 1999 along this stretch of road. These numbers are not dissimilar to or less than those predicted on average, for the Dixon proposal. As these movements represent, to a large extent, the business lost buy Dixon Sand to a competitor, it is reasonable that when Dixon Sand receive their Consent to operate that the truck movements will remain nominally consistent with the existing numbers. In April a survey of the residents in the area around the proposal and along old Northern Road up to the intersection with Wisemans Ferry Road was undertaken. This survey clearly indicated that of the twenty-four residents surveyed seventeen were not affected by truck noise, three reported a slight effect but felt that it was not a problem, two reported a problem and two had no opinion.

The noise assessment report argues that whilst theoretical increase in predicted traffic noise levels exceed planning objectives in this period, the potential for additional noise impact is minimal and the reduced truck movements during school hours will improve the safety for the community at Maroota. This has been an issue raised by the Maroota Public School Headmaster.

It is proposed that a noise compliance study will be undertaken as part of the ongoing environmental management of the site. The compliance study will accurately determine the impact of truck movements on existing noise levels. Any possible restrictions on truck movements from those proposed should be reserved until the full compliance study is assessed.

A specialist assessment has been made of the traffic noise impacts at the Maroota Public School. Although Location D provides noise levels at a position approximately 10 m from the roadway, the nearest classroom to Old Northern Road is approximately 35 m from the road.

The objective for residential traffic noise assessment will be satisfied at the classrooms. That is, the increase in hourly equivalent traffic noise levels will be less than 2 dBA. However, the traffic noise objective for existing classrooms, as outlined in the NSW EPA Draft Environmental Criteria for Road Traffic Noise, is an internal objective of 45 dBA. An acceptable method of achieving this objective is limiting the external traffic noise level to 55 dBA.

Based on the anticipated truck movements outlined in the report, the maximum hourly noise level will be 53.6 dBA. It can therefore be seen that the increased truck movements will comply with all criteria relating to existing classrooms.

The mitigation measures are summarised below:

- ◆ New berms along the eastern and northern boundaries of Lot 29.
- ◆ An extraction process, which maximises the use of the working face for shielding.
- ◆ A restriction on the use of auxiliary mobile equipment before 7 am.
- ◆ Driver education to encourage truck drivers to respect sensitive areas of the community, For example, when passing the public school and particularly near residences in the hours between 6 am and 7 am.
- ◆ Environmental training programs for site staff, to make them aware of the importance of certain activities in regard to noise control.
- ◆ A compliance survey within 6 months of operations commencing.



## 7.5 TRAFFIC MANAGEMENT

### 7.5.1 Guidelines for Assessment of Transportation Effects

**Section 6.8 - Off-Site Transportation**, of **CHAPTER 6 - PROPOSAL FOR COMPLETION OF EXTRACTION, REHABILITATION AND PROCESSING**, sets out in **Section 6.8. 1- The Scope of the Transportation Assessment**.

### 7.5.2 Assessment of Impact and Associated Mitigation Measures

The transportation assessment has found that the road system is adequate for the proposed traffic increases, assuming in fact that there will be an increase. However, a number of recommendations have been made in regard to both upgrading the access road, its safety provisions, etc. They have been adopted in this EIS and are as follows:

- ◆ The Crown road/Old Northern Road intersection be upgraded by the provision of deceleration lanes, etc.
- ◆ The Crown reserve road be re-made and sealed with a hot flush bitumen seal, to construct a 7 m wide pavement with appropriate shoulders. Sealing should be continuous from Old Northern Road to the site entrance gates.
- ◆ Give Way or Stop signs with other advance warning signs be installed on the Crown reserve road approaching and at the intersection with the private internal access road.

Other recommendations including a need for maintenance work to be carried out to Old Northern Road within the vicinity of the intersection, given the rather narrow width of the sealed pavements. This is a matter to be addressed by Council and the RTA.

In addition, the EM&RP will include provisions for ensuring the timely arrival and departure of trucks, in accordance with the transportation protocol outlined in **Section 6.8**. There will also be provisions in the protocol for the covering of loads for trucks prior to them being permitted to leave the site.

## 7.6 AIR QUALITY MANAGEMENT

### 7.6.1 Guidelines for Assessing Impacts on Air Quality

The objectives for the management of air quality are set out in **Section 2.10, Air Quality Management, of DCP 500** and are as follows:

- ◆ To maintain the good air quality of the Shire.
- ◆ To protect the health and amenity of Shire residents, visitors and industry employees.

The particular requirements in the DCP are summarised below:

- ◆ Proponents should identify and assess all potential sources of air pollution by preparing an Air Quality Assessment Report.
- ◆ Proponents should ensure that dust suppression equipment is fitted to all processing equipment.



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- ◆ Proponents should employ wind activated water sprinkler systems, to ensure extraction sites minimise dust generation.
- ◆ Proponents should ensure that stockpiles are effectively stabilised, to prevent dust nuisance.
- ◆ Proponents should provide details of effective measures that will be implemented to suppress dust from the various potential site sources.
- ◆ Proponents should ensure that, prior to leaving extraction sites, all laden trucks have their pay loads fully covered.
- ◆ Proponents should ensure that access roads are sealed to the entrance of extraction sites and the unsealed portions of any roads are watered on a regular basis.

**7.6.2 Air Quality Assessment Report (AQAR)**

The AQAR is set out in this section. It is in accordance with the requirements stipulated in DCP 500.

**Meteorological Conditions**

The meteorological conditions for the site and locality in general, have been described elsewhere in the EIS in the various supporting studies. The important characteristic of wind directions was provided in **Section 3.6 - Site Analysis of Existing Environment**, which referred to the wind rose data that was included in the Company's previous EIS (Dixon Sand, 1992/1993). It was noted that the predominant wind direction at 3 pm during the spring, autumn and summer seasons is an Easterly wind, that is, blowing from the East towards the West.

**Number of Emission Sources**

In the same section as referenced above, under the sub-heading of Air Quality, the various quarrying activities that can generate dust emissions were listed. From experience, with operations over the last 6 years and from the limited results from the dust deposition monitoring to-date, the primary source of dust is traffic on unsealed roads.

**Figure 1.2 - Project Site Area**, shows the location of residences and land uses within the immediate vicinity of the site. In terms of dust distribution, it would be expected that any off-site dust deposition would be unlikely to be recorded outside a radius of approximately 500 m. There are no residences located within that distance but there are agricultural producing areas, including orchards where there could be a possible concern over dust on fruit. During the April 1999 survey of the local residents (24 in number) five reported current dust problems associated with an adjoining operation to an affected or greatly affected level and one reported a slight effect. No comments or complaints were noted about the Dixon operation in the past or from the current closed site.

**Propensity for On-Site Material to Generate Dust**

From the sandstone materials analysis that has been carried out (see **Appendix C1**), the percentage of clays and fine silts within the Maroota deposits is, by Maroota standards, low and by general standards, extremely low. Accordingly, the propensity for dust emissions is low. In comparison, excessive dust levels monitored from the private internal access road, located adjacent to the site, is as a result of high fines contained within the deposits on Lots 1 and 2 (to the north). These had been spilt on that road. This effect, which also had a pronounced impact on turbidity levels in run-off from the road, was demonstrated in the report submitted to Council, entitled, *Report on Management of*



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*Discharges of Polluted Surface Run-off from Upstream Catchments: Analysis of Problem and Recommended Solution, September 1998.* The operation of Lots 1 and 2 to the North of the proposed site are not in the control of the proponent.

**Gaseous Emissions from Mobile Plant**

The relatively small number of mobile items of plant and equipment utilised on the site means that overall vehicle emissions are relatively low. The criteria adopted by the EPA is the same for cars and trucks on public roads, that is, exhaust gases should not be visible for more than 10 seconds continuously.

**Maximum Acceptable Increase for Dust Deposition over Existing Levels**

In the section on the site's existing environment (see **Section 3.6 - Site Analysis of the Existing Environment**), it was identified that the EPA criteria for dust deposition is based around a maximum level of dust deposition of 5 gm/m<sup>2</sup>/month in rural, semi-rural, commercial and industrial areas. From the monitoring to-date, background levels at the site boundary would appear to be in the order of 2 to 3 gm/m<sup>2</sup>/month. Accordingly, an increase at the boundary of up to 2 gm/m<sup>2</sup>/month would be permitted under the EPA criteria. It is stressed however, that further background monitoring will be necessary before dust levels can be confidently assessed. (It is also noted that this cannot occur until operations are commenced). Away from the site, in areas more remote from extractive operations, dust lands in the Maroota area would seem to be in the range of 1 to 2 gm/m<sup>2</sup>/month.

In documentation provided by PF Formation to Council at the time of the assessment of their Trig Hill application, dust monitoring results adjacent to the Maroota Public School were provided. It is noted that one of the seven gauges recently installed by the Company is located immediately west of the school boundary and immediately north of the other company's gauge, on what is called Site 1.

In the period between July 1995 and July 1996, the other gauge adjacent to the school site recorded deposition levels of insoluble solids at levels of between 1.1 and 4.1 gm/m<sup>2</sup>/month, with an average of approximately 2 gm/m<sup>2</sup>/month. (It is noted that a figure in May 1996 of 4.1 was the only recorded one in excess of 3 gm/m<sup>2</sup>/month).

**Expected Average Dust Concentration and Deposition Levels**

The proposed operation is a continuation of activities that have been carried out over the last 6 years. All except one Precinct area has previously been worked and it is therefore expected that dust emission levels from Lots 196 and 29 operations will be similar to those that might have occurred in the past.

**Compliance with EPA Goals**

From the limited monitoring to-date and other monitoring results (see information from the other gauge located adjacent to Maroota Public School) there would seem to be prima facie evidence that past levels of dust emissions from the site are in keeping with average levels expected at the boundary of, and remote from, an extractive sand operation.



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**Recommendations for Dust Control Measures**

In conclusion, dust dispersion is not an issue that requires further control measures to ensure that the level of emissions are reduced. The community survey of residents within the North Maroota area also showed that dust from extractive operations was not a prime issue of concern to local residents in relation to the Dixon proposal. There was some concern expressed about other operations in the area.

There are two factors working to maintain a low level of dust generation:

- ◆ The contained water within the deposit generally provides a product with a moisture content of between 5% and 10%, in situ. That moisture content, under dry climatic conditions, will reduce, however the nature of at least some of the processing (sand washing), generally ensures that the working areas of the site, with the exception of internal access roads, do not produce fugitive dust emissions.
- ◆ The other factor is the predominantly East to West wind direction that exists for most of the year in the afternoon period when dust emission would be expected to be the greatest. Accordingly, it is the expectation that dust levels will conform to EPA criteria and will not provide any basis for community concern from an amenity viewpoint.

No new mitigation measures are necessary in addition to the sprinkler system proposed on stockpiles, conveyors and the access road. The only other additional measures will be the monthly monitoring of dust deposition levels at the network of seven gauges located on and around the site and the sealing of the site access road. The annual environmental management plan will report on depositional levels monitored over the year and as necessary, it will be required under the EM&RP that additional protocols be introduced to respond to local problems of excess dust generation, if they occur.

**7.7 WASTES MANAGEMENT****7.7.1 Guidelines for Assessment of Environmental Effects**

Section 2.11, *Extraction Program Planning of DCP 500*, requires that extractive operations employ an efficient and environmentally sensitive extractive operation, which inter alia "minimises the volume of waste".

In addition, under the EM&RP, an annual waste management plan will be required to be submitted, to demonstrate the:

- ◆ *Type, composition and quantity of material proposed to be re-used, recycled and removed.*
- ◆ *Source and quantity of material imported.*
- ◆ *Destination of all material removed from the site.*

Attachment 4 of DCP 500 provides a suggested form and structure for the plan. It is a pro forma waste management plan which has the following introduction:

*"To facilitate waste management and reduction, Council requires on-site sorting and storage of waste products, topsoil and overburden, pending re-use or collection."*



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The pro forma is broken up into the following:

- Section 1:      *Demolition and Clearing Stage*  
Section 2:      *Extraction Stage*  
Section 3:      *Ongoing Management*

The waste referred to varies from topsoil and overburden, being part of the extractive operation, to green waste (clearing), bricks and concrete (structure demolition), and food waste and sludge (amenities).

### **7.7.2 Guidelines for Assessment of Impact and Appropriate Mitigation Measures**

Management of wastes, other than tailings, are not addressed here. The reason is:

- ◆ Amenity wastes are minor and are currently recycled on to landscaping after secondary treatment and disinfection, in line with standard Council and State Government requirements.
- ◆ There will not be any demolition wastes until the latter period of the consent.
- ◆ Interburden wastes, for which a net allowance of 5% of extraction quantities has been provided, have been addressed as part of the extractive operation.
- ◆ In general, overburden of topsoil will be used for earth berms/bunds in the initial stages. Once extraction operations adjacent to such berms are at depth, they will be utilised for rehabilitation purposes for filling, capping, etc.

The management of tailings is a key issue within any of the Maroota sands operations. It is recognised as such within DCP 500 by an extensive section under 2.8, *Soil Conservation*.

The Company's method of tailings disposal is to use the tailings for the filling of extracted Precincts and thereby create at least part of the site at levels that approximate pre-extraction surface levels. As will be discussed in **CHAPTER 8 - ENVIRONMENTAL IMPACT AND MITIGATION DURING REHABILITATION**, the North- West part of Lot 196 will be effectively reformed close to pre-existing levels, notwithstanding extraction over most of that area to a depth of the order of 15 m. This has been possible by maintaining discreet insitu material between extraction Precincts, thereby providing containment of tailings storage and ensuring geotechnical problems associated with the more traditional tailings dam techniques are not encountered.

Such an approach however, may lead to slower dewatering times, given the lower permeability of insitu material in comparison with constructed embankments or filtered walls.

In the management of tailings deposition and the dewatering process, various practices have been followed at the site and are proposed to be continued. These include:

- ◆ Ensuring continuous decant while the tailings pond is operational.
- ◆ Ensuring surface water does not pond on the surface of completed tailings deposition areas.
- ◆ The provision of slit trenches in the walls of completed tailings ponds to act as vertical filters to assist dewatering.



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The Australian Centre for Mine Site Environmental Research (ACMER), based at Griffith University in Queensland, has commenced a specific study into the problem of tailings at sand mining operations. Stage 1 is programmed to commence shortly with the provision of field data to assess the scale of problems and to develop the agenda for latter stages.

The Company will be participating in this study.

Mitigation measures proposed for waste management are as follows:

- ◆ Complying with Council policies for waste minimisation and site separation.
- ◆ Recycle, wherever possible, wastes that are generated on the site.
- ◆ Managing tailings in accordance with the best available technology and working with the mining industry to research opportunities for applying mining technology to extractive industries.

## **7.8 PROTECTION OF ENVIRONMENTALLY SENSITIVE AREAS**

### **7.8.1 Guidelines for Assessing Environmental Effects**

Section 2.6, *Flora and Fauna of DCP 500*, sets the objectives for the protection of ecological values and ecologically sensitive areas:

- ◆ *To preserve the significant native flora and fauna communities of the Shire.*
- ◆ *To conserve the biodiversity of the Shire, including habitat of threatened flora and fauna.*
- ◆ *To protect the environment of threatened species, populations or ecological communities.*

The site is effectively fully cleared and in most areas, extraction operations have already commenced. Hence the assessment of flora and fauna is related to those areas bordering the site. This particularly applies to the West and South-West, for the site's effect on these adjacent and downstream areas. **Appendix C7, Flora and Fauna Assessment**, provides on the basis of survey work, an assessment of the impacts of the existing activities on:

- ◆ the downstream creek line,
- ◆ all areas of native vegetation bordering the site boundary
- ◆ on the area of *Kunzea rupestris*, in the South- West corner of Lot 29.

The flora and fauna assessment has firstly determined that no species impact statement is required. It has however, identified certain environmental management measures which are recommended and are listed below.

The heritage and archaeological resources component of DCP 500 also identifies these objectives, in *Section 2. 7- Heritage and Archaeological Resources*, where they are:

- ◆ *To clearly identify and protect specific sites or relics of heritage importance.*
- ◆ *To identify specific Aboriginal sites or relics of archaeological and Aboriginal importance.*
- ◆ *To preserve and protect the diverse Aboriginal and colonial heritage of the Shire.*
- ◆ *To identify, conserve and protect areas of outstanding geological features.*



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Section 2.7 identifies the requirement for an archaeological study and the provision of buffers to any area of heritage significance, either European or pre-European.

**7.8.2 Assessment of Impact and Associated Mitigation Measures****Heritage**

There are no items of heritage significance on the site. There have been surveys as part of planning work for a future development in Lots 1 and 2. The survey of these sites was carried out by a qualified archaeologist. It has been reasonably concluded that there are no items of significance requiring protection.

**Flora and Fauna**

In respect to flora and fauna, the assessment report has concluded:

- ◆ There are only limited adverse impacts arising from sediment discharge associated with the existing sand extraction activities. In general, stormwater management of the site is appropriate and successful. There is no evidence of adverse impacts upon the stand of *Kunzea rupestris*, located on Lot 29, or to the west of the Crown reserve.
- ◆ The downstream creek line appears in good condition, with only extremely limited evidence of sediment discharge and no indication of adverse impacts upon native vegetation.
- ◆ External embankments and bund walls display only limited past erosion and sediment deposition into adjoining vegetation that is generally limited to a distance of less than 2 m. This 2m is within the buffer zones to the property boundaries. The buffer zones range from 10m to 30m on all boundaries.

The mitigation measures that will be adopted include:

- ◆ Upgrading of the sediment discharge channels and erosion control measures at the North-West extremity of Lot 196.
- ◆ The addition of topsoil in areas to embankments, which are at their completed levels, and additional plantings of native endemic vegetation. In this regard, a combination of natural regeneration, transplanting of individuals and the use of commercially available native seed would be appropriate.
- ◆ The collection of seed from adjacent vegetation for propagation and subsequent re-planting on the embankments and for rehabilitation generally.
- ◆ Some limited regrading of areas of steep embankment.
- ◆ Consideration of the necessity for a reduction of the height of some bund walls and embankments to limit the potential for sediment discharge.

The report has recommended that such management requirements be incorporated in the EM&RP, with the assistance of a local nursery and plant ecologist for the revegetation and rehabilitation process. This will be adopted.



## 7.9 RISK MANAGEMENT

### 7.9.1 Guidelines for Assessment of Impact

DCP 500 does not specifically identify a requirement for an assessment of risks. However, in the "preferred format, content and structure for an EIS", one of the issues under Environmental Impact and Mitigation During Extraction, is "risks, safeguards and contingency arrangements".

The EIS Guidelines (DUAP, 1996), under Section 10, Hazards Issues, identifies the following potential hazards:

- ◆ Accidental release of toxic substances, explosions or fires.
- ◆ Natural events, including bushfire, landslip, flooding or subsidence.

(For quarries using explosives a preliminary hazard analysis is required. Additionally for quarries located in flood prone areas a list of hazard issues is identified. For quarries located in areas of other natural risks, including high bushfire risk, a range of issues are again provided for the assessment).

For this assessment, the following risks have been identified:

- ◆ Risks to the environment and workforce associated with the storage of fuels and other dangerous goods.
- ◆ Risks to the environment, if the assessment or management of operations is not in accordance with this assessment.
- ◆ Occupational health and safety risks to employees, as a result of the operation of plant and equipment, both fixed and mobile.
- ◆ Risks to the public who may enter the site, either legally or illegally (trespass).

### 7.9.2 Risk Management Assessment

The risk management of the various categories of risk, outlined at **Section 7.9.1 -Risk Management Approach** will be as follows:

- ◆ **Fuels and dangerous goods management** – the site will contain a 45,000 L, above ground diesel storage tank, to be installed in a bunded area adjacent to the proposed extension to the machinery shed. Fuelling will take place in a designated area adjacent to the diesel storage, with any spills contained within the bunded area. The fuels area will be classified as a dangerous goods store. The requirements of the *Draft Dangerous Goods (General) Regulation, 1999*, under the *Dangerous Goods Act, 1975* will be followed, including licensing and the need for periodic inspections by the WorkCover Authority.
- ◆ **Occupational health and safety** is an issue of paramount importance to any mine or extractive site. Under the Mines Inspection Act, the responsibility for the management of occupational health and safety rests with the Mine Manager, along with the requirement for the preparation of a Safety Plan. A draft Safety Plan has been prepared and following the issue of Development Consent, representatives of the Mines Inspectorate will be invited to the site to review the plan and the procedures that are being implemented for the management of health and safety.



It is proposed that fencing will be installed around the site to assist in providing protection for the local community. Warning signs will be placed on that fencing, and on the approach road to the site, warning of the dangers of entering the quarry and the requirement for official visitors to report to the office. It will be prohibited to enter any other part of the site except within the company of a site officer.

Prior to any operations commencing, the safety plan and all occupational health and safety procedures will be in place. In addition, a designated safety officer will be appointed to ensure training and procedures are maintained throughout the operational phase.

- ◆ **General risks to the environment** – as part of the development of the Environmental Management and Rehabilitation Plan, a risk assessment will be carried out to identify those aspects of the operation that need a contingency plan to be prepared. Examples may include a breach of a dam or other incident, with potentially major consequences.

In conclusion, it is considered as a result of the operating experience gained on the site and the wide experience of the Company management personnel, that risks can be managed successfully and that adverse environmental incidents can be prevented.

## **7.10 OTHER ISSUES**

### **7.10.1 Visual Amenity and Scenic Quality**

**Appendix C9 - Visual Amenity Assessment**, has provided an assessment of the requirements for and impacts on both local and regional visual amenity, with local as being determined for distances under 2 km. Regional being defined as distances over 2 km from the boundaries of the proposed site.

The objectives and requirements of both SREP No. 9 and DCP 500 are set out in **Appendix C9**. The issue of prime concern is the limited visual access that nevertheless can be obtained locally from the section of Old Northern Road, South of the Crown reserve road intersection and from the house located on Lot 1, immediately to the north of this intersection.

Both locations have good visual access to the site and it has been recommended that further reinforcement plantings occur along the bund wall paralleling the site access road adjacent to Precincts 3 and 5 as well as consideration being given to raising the height of the bund wall.

### **7.10.2 Bush Fire Management**

Bush fire management is an issue that is not required to be assessed under DCP 500 and has not been required by any Statutory Authority in the consultation process.. Nevertheless, the Company is conscious of the need to ensure adequate bushfire controls are maintained, to ensure the safety of its own operation and that site activities do not increase the potential for fires on or surrounding the site.

The principal concern would be for fires to emanate from the site to the surrounding bush. Accordingly, the EM&RP will specify a range of precautions to prevent the initiation of a fire. It will identify contact details with the local bushfire brigade and will adhere to all other guidelines relating to fire fighting equipment and the requirements of the WorkCover Authority.



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**Chapter 7. Environmental Impact and Mitigation**

**During Extraction and Processing**

*North Maroota Operation, NSW*

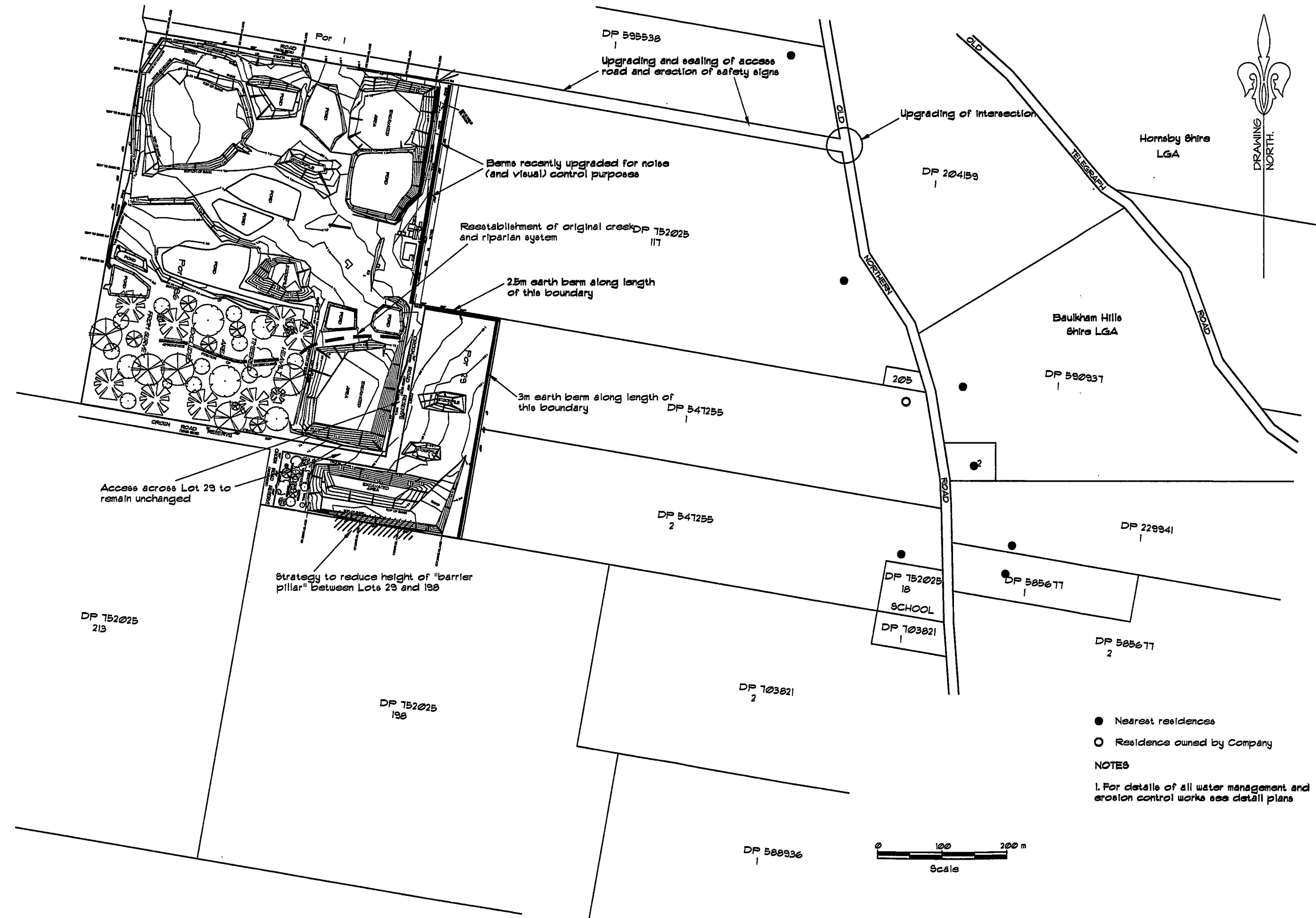
The Occupational Health and Safety Act would be strictly adhered to.

The response mechanisms to any incidence of fire will be in place and the steps to be taken detailed in a Fire Protocol Response Document.. No work would be carried out adjacent to native vegetation during periods of high fire risk.

It is assessed that the potential for bush fire risk is small.

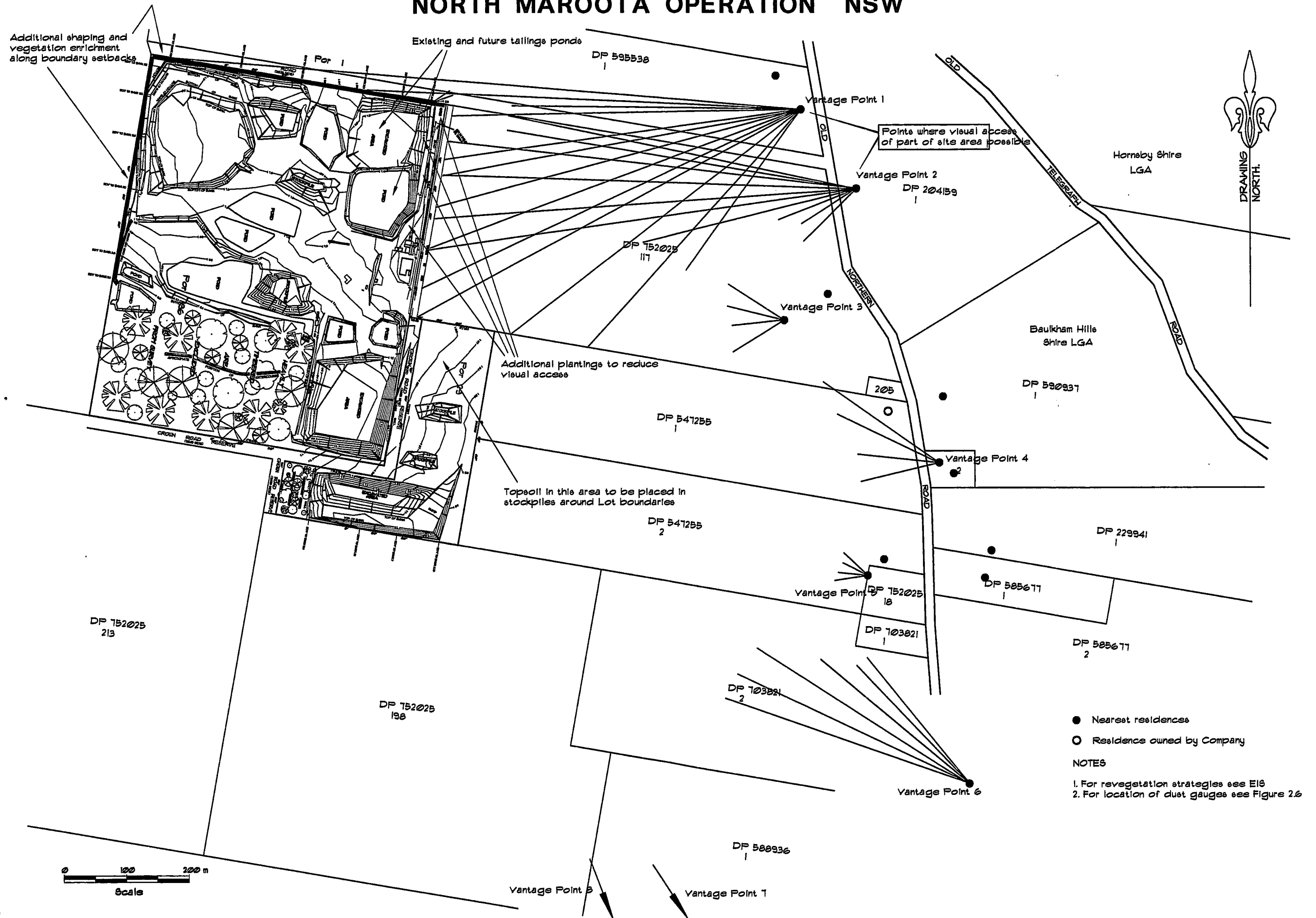


# NORTH MARROTA OPERATION NSW





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## CHAPTER 8 – ENVIRONMENTAL IMPACT AND MITIGATION DURING REHABILITATION

- 8.1 Introduction
- 8.2 Rehabilitation Strategy
- 8.3 Materials Conservation and Management
- 8.4 Enhancement of Environmentally Sensitive Areas
- 8.5 Post-Extraction Land Uses
- 8.6 Regional Rehabilitation Planning



## 8.0 ENVIRONMENTAL IMPACT AND MITIGATION DURING REHABILITATION

### 8.1 Introduction

This chapter is the second of the two major impact assessment chapters for biophysical effects. **CHAPTER 7 - ENVIRONMENTAL IMPACT AND MITIGATION DURING EXTRACTION AND PROCESSING**, considered those impacts related to the extraction operations.

The structure of this chapter has been presented as follows:

- ◆ An outline of the strategy developed in **Appendix C2-Rehabilitation and Revegetation Strategy** is at **Section 8.2** of this document.
- ◆ Preferred rehabilitation strategy detailed at **Section 8.3**
- ◆ Materials Conservation and Management (**Section 8.4**), addressing the handling of topsoil and overburden/interburden waste materials.
- ◆ Enhancement of Environmentally Sensitive Areas (**Section 8.5**), which assesses the key aspects of the re-vegetation strategy and the linking of the proposed re-vegetation areas with the existing vegetation around the perimeter of the site (some areas of which have been classified as Areas of Environmental Sensitivity under DCP 500).
- ◆ Post-Extraction Land Uses (**Section 8.6**)
- ◆ Regional Rehabilitation Planning (**Section 8.7**)

The rehabilitation strategies in **Sections 8.2 and 8.3** provide an overview of the post-extraction land uses and the details of the final landform, including water management issues associated with long term management of the site. There are two strategy options as the negotiations with PF Formations have not yet resolved the issue of excavating the private access road between lots 1 and 198. This access road should be temporarily relocated to allow excavation of the road and attached Crown road. The net result would be the regularization of the final landform. This preferred landform is detailed at **Figure 6.7 - Preferred Site Rehabilitation**.

DCP 500, in **Section 2.12, Rehabilitation**, sets out the objectives for rehabilitation:

- ◆ To ensure extraction sites are fully rehabilitated in an orderly, progressive and controlled manner.
- ◆ To maintain and enhance the scenic, heritage and environmental quality of the Shire.
- ◆ To conserve and protect the environment of threatened species.
- ◆ To facilitate and ensure a final landform capable of supporting sustainable agricultural production or other post-extraction land use compatible with the rural/residential character of the region.

The strategies that are to be implemented in order achieve the above objectives are:

- ◆ Extraction areas will be progressively rehabilitated to integrate in shape, form, contour, colour, land use, drainage characteristics, landscape quality and diversity of the surrounding terrain.



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- ◆ Due regard will be given to the ecology within the site together with the requirements for plant growth and appropriate mechanisms for plant reproduction.
- ◆ Stockpiles of topsoil and overburden will be appropriately formed.
- ◆ Each Precinct will be progressively rehabilitated so that vegetative covers are established.
- ◆ Rehabilitation will incorporate, where appropriate, endemic native plants, grass covers and native tree species.
- ◆ Topsoil and overburden will be used as bund walls during extraction and will be properly stabilised.
- ◆ The collection, processing and storage of native seed will be done by qualified personnel.
- ◆ The composition of seed mixes, application rates, etc. used in the rehabilitation program will meet the requirements of the Department of Land and Water Conservation and the Environment Protection Authority.
- ◆ Weed infestation will be controlled in accordance with the *Noxious Weeds Act*.
- ◆ Nutrient cycles will be re-established in rehabilitated areas.
- ◆ Rehabilitated areas will be appropriately maintained, to ensure the success of revegetation programs.
- ◆ A rehabilitation strategy is required to be submitted with all Consent Applications. An annual rehabilitation management plan, as part of the Environmental Management and Rehabilitation Plan, will be submitted to demonstrate the effective implementation of that strategy.

The EIS Guidelines for Extractive Industries (DUAP, 1996) in *Section 7* of **CHAPTER 6**, sets out a series of requirements to be addressed in an EIS. The particular issues not directly covered in DCP 500 are as follows:

- ◆ If a recreation lake is proposed, consider the appropriateness of the grading of the slopes, potential groundwater impacts, etc.
- ◆ If agricultural purposes are proposed, consider the agronomic suitability of the proposed sub-surface/topsoil profile and drainage patterns.
- ◆ The general suitability of the soil material for rehabilitation purposes.
- ◆ The monitoring and maintenance program.

**Appendix C2 - Rehabilitation and Re-vegetation Strategy** outlines the strategy for rehabilitation. Details are summarised in **Section 8.2**.

## 8.2 Rehabilitation Strategy

The objectives of the rehabilitation strategy, detailed at **Appendix C2**, is to achieve the following:

- ◆ Be able to be implemented in a progressive manner in line with the continued extraction process.
- ◆ Enhance the scenic and environmental qualities of the site.
- ◆ Provide opportunities for increased habitat for local flora and fauna species.
- ◆ To utilise the site in various forms of active environmental pursuits in the post-extractive stage.
- ◆ Be consistent with the various other planning strategies contained in the EIS.



- ◆ Prior to the commencement of rehabilitation, surface material sampling will be necessary (and possibly of sub-strata material) and the material analysed for a range of parameters to determine surface soil behaviour, nutrients status, etc.
- ◆ The preliminary testing of topsoil and capping material will identify deficiencies or limitations relating to soil chemistry and soil fertility. The limitations of the soil materials need to be addressed through the addition of fertilisers and soil conditioners to possibly adjust either pH or soil structure. (Interpretation of the soils analysis will be carried out by qualified soil scientists and laboratory).
- ◆ A sacrificial cover crop will be planted initially to improve the structure of the topsoil. This cover crop (which has been sown on the two Precincts rehabilitated to-date) will supply a valuable source of organic matter in the form of standing mulch, which can be slashed and incorporated into the soil prior to secondary application of seed or the planting of tube stock. It has been recommended that to ensure there is no transport off-site of cover crop seeds, that cover crops be selected which will not become invasive, that is, have a low fecundity (production of viable seed head). The report provides a list of species suitable as cover crops. Cover crops would also be used to stabilise stockpile and other work sites on a temporary basis (if needed).
- ◆ Final vegetation species selection, seeding and planting will then follow. This will be based on native seed collection and plant propagation proposed to be carried out on the site. Some quantities of local provenance seed has already been sourced and collected from the site. (The collection of seed and other plant material will be carried out by experienced and competent personnel). Chapter 4 of the report provides a discussion of the progressive rehabilitation strategy. Details of the staged rehabilitation is provided in **Figure 8.3 – Preferred Contour and Vegetation Plans**. Again, the text in Chapter 4 relates more to rehabilitation and classes than it does to the sequence of rehabilitation of those classes.
- ◆ **Section 4.1 of Appendix C2**, describes the capping and rehabilitation work carried out for Precincts 2 and 7 over recent months. The progression of the rehabilitation for those Precincts is now up to Step 3, identified as approximately 6 weeks following the completion of Phase 2. Phase 2 or Step 2, was the planting of a millet crop and allowing that crop to mature.

### Special Rehabilitation Aspects

**Figures 6.6 and 6.7 Final and Preferred Site Rehabilitation** have been used as the base for the various **Figures 8.1 to 8.4**. In addition to the rehabilitation process for each of the various Precincts and areas of the site, there are two specific rehabilitation aspects related to the site's long term drainage provisions.

In accordance with the NSW Farms Dams Policy, the capacity of on-site storages is limited to a maximum of 7 ML. Accordingly, the main storage dam, which will be enlarged during the life of the site development will, in the final stages of the rehabilitation program, be reduced in area to the storages shown on **Figure 6.6** and **Figures 8.1 to 6.4**.

In addition, the upstream drainage lines to the undisturbed drainage line downstream of the active quarry area will be re-established. **Section 4.8 of Appendix C2** addresses the restoration of the creek line.

The detail of the stream restoration works will be developed at the completion of extractive operations. At this time it will be possible for most of the sedimentation dams and other water storages on the site



The rehabilitation and revegetation strategy has adopted the following approach:

- ◆ Classify the site into various rehabilitation classes based on the sub-strata and the depth of growing material.
- ◆ By working with the flora and fauna consultant and the local native plant ecologist, develop a structured re-vegetation methodology for the re-vegetation on an area by area basis, in accordance with the anticipated limitations of soil and sub-strata characteristics. (This has been based on comprehensive soil test results of available and stockpiled overburden and topsoil material).
- ◆ Develop a staged rehabilitation and re-vegetation program based on the initial use of cover crops as standing mulches, followed by the progressive plantings and seeding of native vegetation, linked to the rehabilitation classes and the nature of vegetation adjacent to the rehabilitation areas on adjacent natural bushland.
- ◆ Identify ongoing monitoring and reporting requirements to manage the progressive development of rehabilitation and revegetation.

The rehabilitation program is proposed to run in parallel with the extraction program (identified in **CHAPTER 6** of the EIS). In the case of both the extraction plan and the rehabilitation plan, a degree of flexibility is necessary to take account of market variances and demand for the products produced from the site.

The rehabilitation strategy has been developed working in close consultation with the flora and fauna consultant, the water management consultant, the local plant ecologist and the proponent.

The requirements of the DCP 500 has been consulted in detail (see content of rehabilitation strategy) in developing the rehabilitation strategy. The requirements of the Department of Land and Water Conservation and the NSW Agriculture have equally been incorporated into this strategy.

### Rehabilitation Classes

The site has been divided into three areas for the purposes of rehabilitation - Classes 1, 2 and 3. These classes describe areas of the site where different strategies will be adopted in line with the final surface soils, the sub-strata, and the resultant re-vegetation strategy to be adopted. The classes will also reflect the post-extractive land uses likely in each of the areas of the site. *Figure 8.1- Precinct Plan and Rehabilitation Classes*, shows the layout of those classes.

### Re-vegetation Methodology

The revegetation strategy for the various areas of the site will depend on the soil and underlying strata conditions and the desired final land use of each area. **Figures 8.2 - Final Contours and Vegetation Plans** and **8.3 - Preferred Contours and Vegetation plan**, show the development of the re-vegetation strategy for the site in terms of the non-preferred and preferred landform.

The report at **Appendix C2** recommends a series of procedures that should be followed as part of the development of the re-vegetation methodology:



to be rehabilitated. Also at this time, the creek line will be reconstructed with bed structures and bank works to mimic the natural morphology of the creek line that existed prior to the site's development as an extractive operation. Appropriate native plant material will be sourced from areas downstream to re-establish riparian vegetation. Detailed engineering plans will be developed and submitted to the DLW and Council prior to these works being carried out.

### 8.3 MATERIALS CONSERVATION AND MANAGEMENT

The extent of remaining available topsoil material and stockpiles of overburden and interburden material will limit, to an extent, the rehabilitation works that will be carried out. The requirements for the capping of tailings ponds and for topsoils for rehabilitation of most site Precincts of the site will be somewhat constrained by the availability of suitable materials and the inability to import such materials to the site.

There is limited opportunity for developing further stores of such materials. The limited amount of remaining topsoil and the future interburden material that will be encountered in the excavation of the remaining resource, will nevertheless be carefully managed. This will be undertaken to both conserve all available quantities and to manage particularly the topsoil material to preserve the viability of the soil and the seed source.

The material in question will be stored in bunds limited in height to no more than 3 m and will generally be placed to form various berms required for noise control around the boundaries of Lot 29. It is noted that these berms are not required on a long term basis but simply to limit the extent of noise propagation from extractive activities within Lot 29. Once operations have been developed and extraction is at depth, such berms can be removed and utilised in the rehabilitation of other areas.

### 8.4 ENHANCEMENT OF ENVIRONMENTALLY SENSITIVE AREAS

*Figure 8.2, Final Contours and Vegetation Plans*, shows three vegetation types, namely:

- ◆ Native heath grasses and small shrubs.
- ◆ Mallee type vegetation of mid storey and lower.
- ◆ Full floristics, including over storey species.

The objectives in locating the various types of vegetation associations for the site's re-vegetation has been to link the site with adjacent vegetation types and thereby remove the defined boundaries that have developed as a result of extractive operations being defined by the property boundaries.

Specific aspects of this re-vegetation are:

- ◆ Full floristics in the North-West corner and Western boundaries to link with vegetation that has been preserved through all of the site's quarrying operations in the South -West corner of Lot 196. Vegetation will be continuous along the Western boundary and will continue through the area that previously formed the South- Western embankment of the main storage dam.
- ◆ A corridor of the mallee type mid storey vegetation to provide fauna access across the central part of Lot 196, from North to South.



- ◆ A full floristic association, in the south east corner of Lot 196, to link with the vegetation in the western part of Lot 2. (From surveys carried out to-date, but not reported in this EIS, it is known that this area contains species, associations, etc. listed under the *Threatened Species Conservation Act*).
- ◆ Limited development of endemic vegetation along the eastern half of Lot 196 and in the areas either side of the Crown road reserve, between the south eastern part of Lot 196 and Lot 29. It will be these areas that will be developed in the future, in terms of active post-extraction land use. Further details are provided in **Section 8.5 - Post-Extraction Land Uses**.

## 8.5 POST-EXTRACTION LAND USES

The rehabilitation as outlined in this chapter is a time dependent strategy. This strategy can only be developed as experience is gained and reported in annual rehabilitation management plans. This will occur over the life of the extraction and rehabilitation program.

In the latter stages of the site's rehabilitation, a farm management plan would be developed to identify the details of soil, water, productivity and farm management generally, once a better understanding of the site's potential is gauged from the early stages of rehabilitation.

Currently, the post-extraction land uses proposed by the land-owner are a combination of various intensive agricultural activities, including hydroponics, vermiculture and other activities. This will be carried out in production sheds. The vermiculture in particular, could assist in the improvement of both soil structure and productivity over time, if some of the products of that operation are returned to the site.

Such activities will be the subject of future development applications towards the end of the life of the activities proposed under this Development Application. At that time the extent of the water requirements for, and the various environmental management issues of, these operations will be developed.

There would also be an intent to develop orchard areas, provided horticultural and soil science advice can support such a venture. This land use option will not be an initial activity but will be considered later in the site's post-extractive operations.

## 8.6 Regional Land Use Planning

**Figures 6.6 - Final Site Rehabilitation** and **6.7 - Preferred Final Landform**, show the morphology, drainage and general topography of the site at the completion of extractive operations and land forming rehabilitation works. Features highlighted are:

- ◆ The preferred final landform pre-supposes that an agreement with PF Formation can be reached over the temporary relocation of their access road between Lots 1 and 198. This preferred regulation of the site's final contours is backed by Council's officers. If no agreement can be reached the preferred landform may still be able to be implemented when the PF Formation Consent for Lot 1 lapses in 2002. The achievement of an early agreement is Dixon Sand's preferred alternative.



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- ◆ The batters forming the boundary between the upper or North-Eastern area of the site and the lower parts of the site would be reconstructed to a slope of approximately one vertical to four horizontal, to provide a more sustainable landform for the final rehabilitation works.
- ◆ The reduction in area of the main storage dam to form a future farm dam.
- ◆ The ability to provide continuous re-vegetation along the Western boundary of the site. This will link with the area of environmental sensitivity land to the North of the site and the area of environmental sensitivity in the gully in the South-West corner of the site (see Figure 12, DCP 500, Schematic Extraction and Transport Plan).

The short term objective is for negotiations with PF Formation to be successful and result in the closure of the access road. This will allow the excavation of the road to allow a continuous rehabilitation grade from the South-East corner Lot 196 through to Lot 29 and ultimately through to Lot 198 to the South. The longer term objective, if negotiations prove unsuccessful, will be to achieve a Consent as part of this Application to excavate this road when the PF Formation Consent lapses. The Department of Land and Water Conservation have indicated in their correspondence that they also support a successful negotiation between the two companies (see **APPENDIX A3**).

The strategy put forward for the future provision of access across Lot 29 – (the “land bridge”) provides for an extension of the internal access road by lowering it to both enhance the geotechnical stability of the road as well as to provide the basis for the future rehabilitation of this site. This will conform with adjacent extractive sites and is a serious attempt to solve the various problems associated with this access road, as well as start the process of co-operation that will be needed to develop appropriate local area rehabilitated landforms.

It is the Company's committed intention to develop a combined final rehabilitation strategy to link all extracted areas, including Lot 196 with Lot 1 to the North and link Lot 29 with 198 in the South. As shown in **Figure 1.2 - Project Site Area**, there are adjacent extractive site operations to the North of Lot 196 covering the same approximate area of the North-Eastern corner of Lot 196. The compatibility of final topography through this area and the re-vegetation of the areas to the West has significant merit in the long term and sustainable management of this part of the North Maroota area.

**Figure 6.7 - Preferred Site Rehabilitation** details the appropriate layout discussed above.

The rehabilitation strategy would allow for a final landform across all existing operations ( PF Formation and Dixon Sands). This would produce a continuous landform with no land bridges and keep trucks away from the Kunzea areas.



[illegible]

FIGURE 8.1



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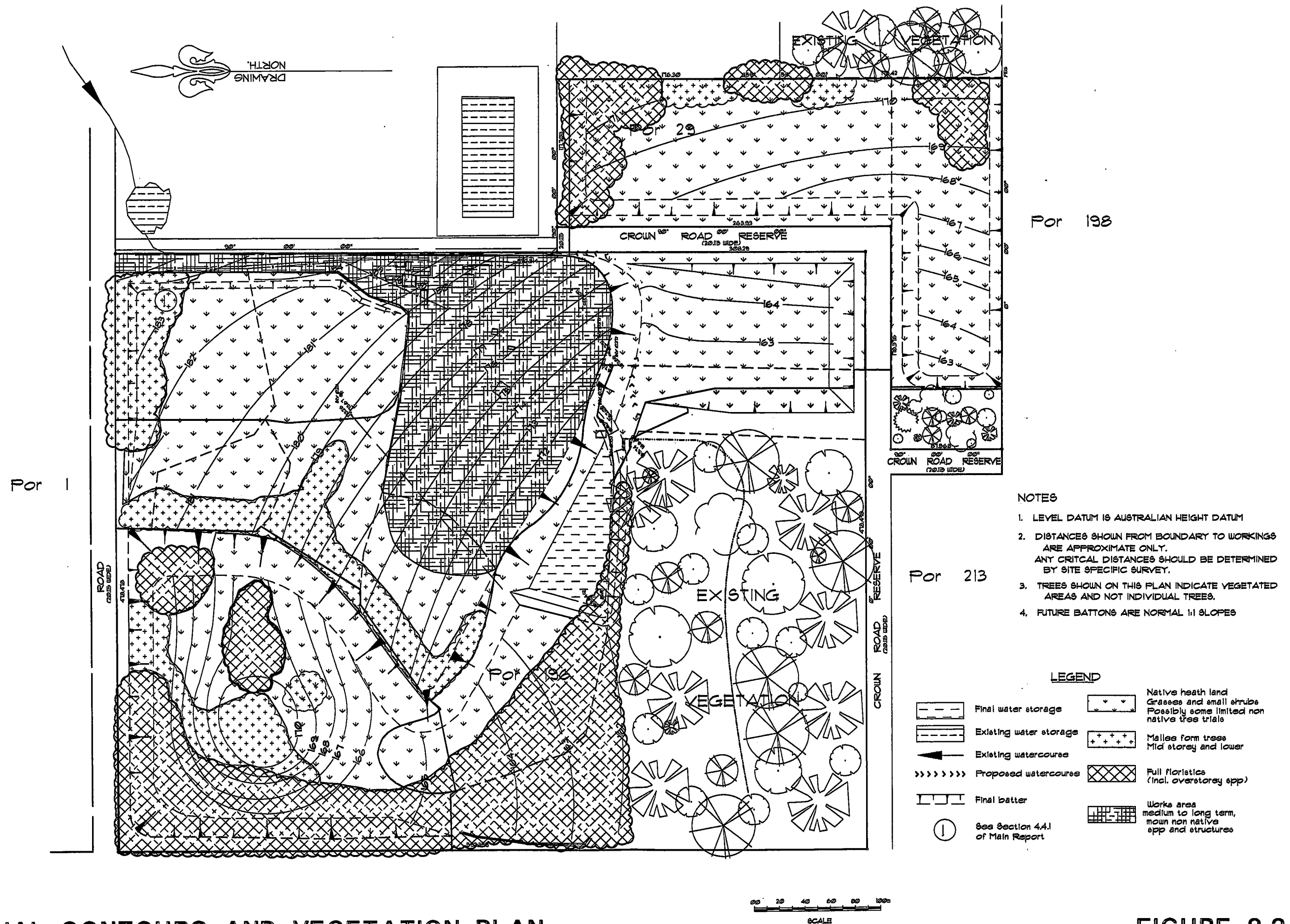
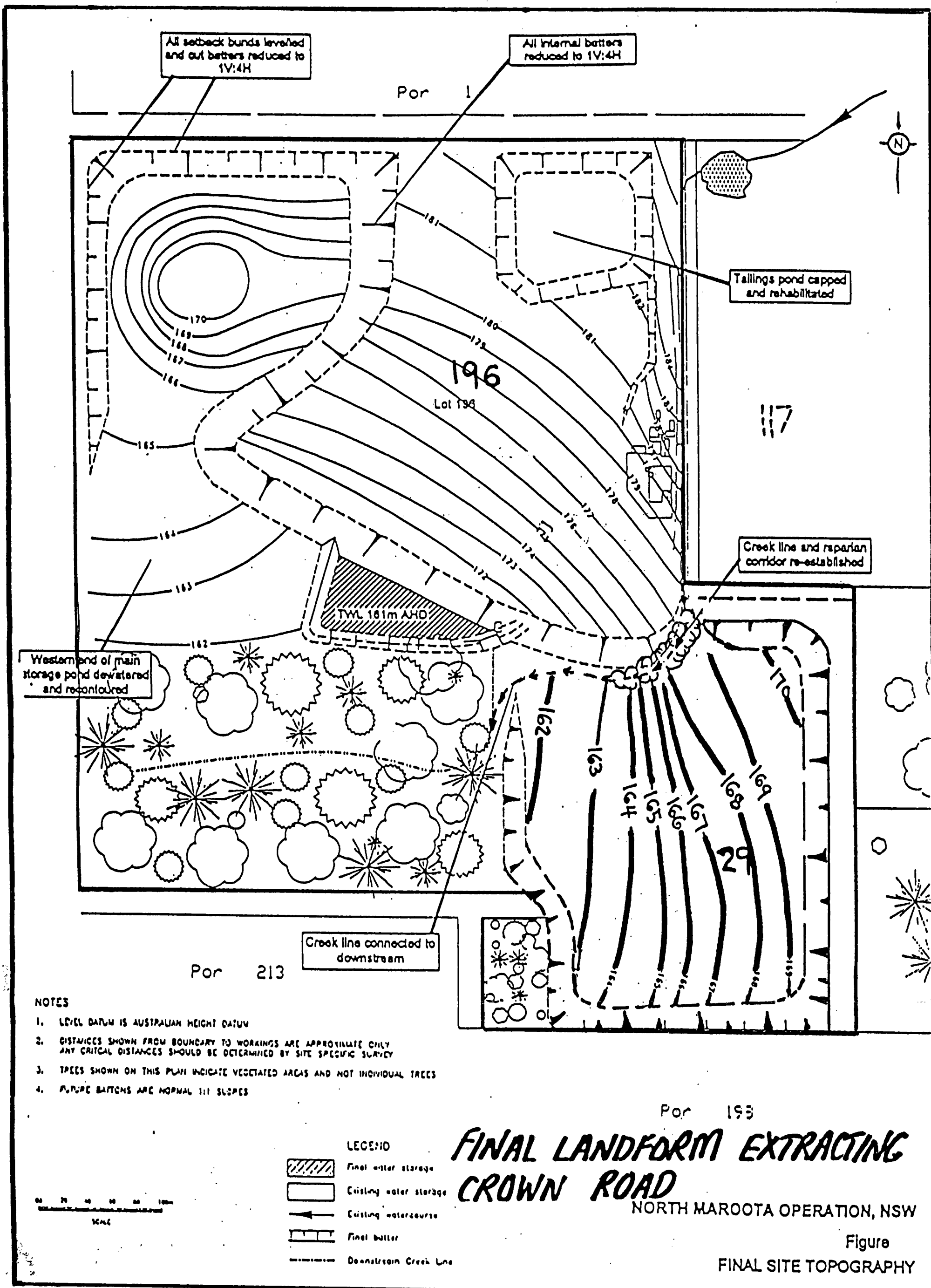


FIGURE 8.2



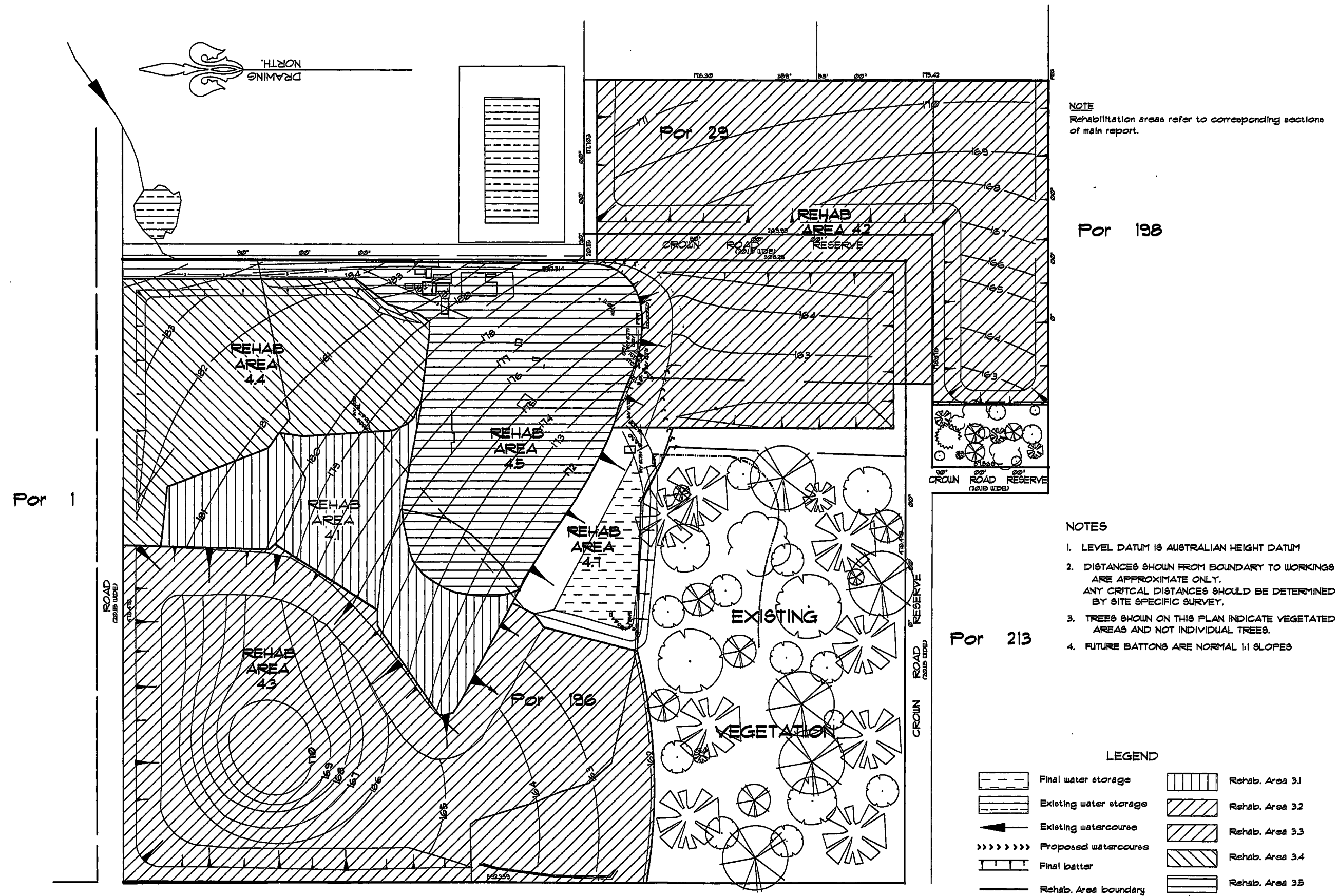


PREFERRED CONTOURS

FIGURE 8.3



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STAGED REHABILITATION PLAN

FIGURE 8.4



## CHAPTER 9 – SOCIAL AND ECONOMIC IMPACT ASSESSMENT

- 9.1 Objectives and Scope
- 9.2 Social Impact Assessment
- 9.3 Economic Appraisal



## 9.0 SOCIAL AND ECONOMIC IMPACT ASSESSMENT

### 9.1 OBJECTIVES AND SCOPE

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

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

The specific issues to be addressed include the social impact assessment and an economic appraisal report. The detail required is as follows:

- ◆ Proponents should identify, mitigate and manage/monitor social impacts resulting from extractive industries and prepare a **social impact assessment** (and a social impact management plan under the EM&RP). The social impact assessment should provide a social profile of the local community. It should identify the range of likely environmental impacts on that community and the range of community values, including recreational, cultural, social and community, security and employment. The environmental impacts should consider the impacts on property values, land use aspirations and community health generally.
- ◆ An **economic appraisal report** should be prepared, which in essence, should seek to quantify all project costs and benefits in some form of economic assessment, to be able to justify the project by comparison with other alternatives, including the 'do nothing' option.

The DUAP's EIS Guidelines (1996), at Section 11, lists a series of issues that should be considered for any Extractive Industry which is located close to residential communities.

The issues include changes to employment patterns, changes to amenity, and impacts on the health of the community (from the effects of air quality, noise, vibration and safety on roads).

The same Guidelines at Section 12, *Economic Issues*, has the followings list of suggested content matter:

- ◆ Costs and benefits to the community.
- ◆ Any proposal for a performance bond.
- ◆ Any flow on costs from the need to upgrade infrastructure.
- ◆ Any additional employment.
- ◆ Potential impact on property values.

This project is a minor one. It involves the extraction, processing and sale of approximately 1.65 million tonnes of sand over a nominated 10 year period, with an additional 28 years for processing on a limited site area ( 35 years from Consent ). The proposal does not involve any expansion of the extraction area or the extraction from any area that has not previously been approved for extraction. In the case of the private access and crown roads they have already been disturbed. The changes in site infrastructure and site practices are also minor. The major changes are in the approach to environmental protection and management.



The EIS is predominantly about the closing stages of a site that has operated for 17 years. It is about the rehabilitation of the site. Importantly, it is also about setting a standard for environmental impact assessment for Extractive Industries in the Maroota area, in keeping with the Company's long term strategy.

Economic and social assessments should be in keeping with the scale of the proposal. The DCP 500 requirements for an economic appraisal report is directed at major new "greenfields" development. The details required of the social impact assessment are also more appropriate for a new development in a new social climate in which local residents have not before been confronted with an extractive resource development.

The "do nothing option" is not an environmentally acceptable option. If the site were to be left in its current state it could be argued that some environmental impacts would be reduced, however other more significant issues would be left (ie. Regularization of the final landform). It should be remembered that this development has been continuous for some 17 years. This final stage is essentially about the inclusion of additional environmental protection and mitigation measures that have not always been part of previous operations, or in some cases, required under previous consents for the site.

The question that should be asked is :

Will the economic or social profile of Maroota, the Shire and indeed the Sydney region be better off with an unrehabilitated site, no continuity of employment and no opportunity for the Company to demonstrate how it will manage future development within this area?

The scope of both assessments has therefore been significantly modified from those requirements set down in the DCP and the DUAP Guidelines.

DCP 500 has addressed many of the planning and biophysical environmental issues. However, this specifying of requirements for social and economic assessments does little in resolving some of the key issues, particularly sand areas. There is a very real argument that a Maroota Strategic Impact Assessment study should be carried out by Council, the Department of Urban Affairs and Planning or the Department of Mineral Resources (or a combination of all three), to provide the framework for individual proponents to be able to assess their proposals. The study would provide some valuable direction in deciding future expansion of the industry within the Maroota area. It would also define the ground rules for that expansion. In much the same way as the Maroota Groundwater Study, there is a need for a regional study by Government.

## 9.2 SOCIAL IMPACT ASSESSMENT

A preliminary social profile of the local Maroota (North Maroota) community is set out below:

- ◆ A high percentage of retirees.
- ◆ A relatively constant population level.
- ◆ Employment predominantly in the farming and extractive industries. Employment percentages not known.
- ◆ Employment in Agricultural pursuits are in predominantly family business. This leads to a close knit community.
- ◆ Changing land use characteristics as some agricultural areas are given over to extractive operations, some are not being worked (possibly pending future extraction) and others are being



developed for more intensive and specialised agricultural activities (including wholesale plant nurseries, hydroponics, etc).

- ◆ A community "disenchantment" generally, as to the inequity between local impacts on the community, as a result of extractive operations, and the benefits to the wider community from the "export" of sand from the Maroota area.
- ◆ Some community concerns in relation to truck traffic, truck traffic noise, effects on property values, lack of rehabilitation progress, effects on water supplies and the overall effect on the character and local amenity of Maroota generally.

In response to both these concerns and the issues listed to be addressed in the various guidelines (particularly DCP 500), the following provides a response on behalf of this proposal:

- ◆ **The facilitation and encouragement of community participation** – this has been attempted although a close working relationship with the local community has not been achieved to-date. Representatives of the community have been on site for an inspection and a community open day is planned for a weekend 21 days after the commencement of exhibition of this EIS. The company regularly outline local sand mining issues in the Local Community Newspaper. An April 1999 survey of the residents within 1.5 km of this proposal indicated that 83% of these residents are not effected by truck noise or will not be affected by quarry noise from the Dixon proposal. However 25% were affected by dust from an adjoining quarry, this appeared to be the major area of concern.
- ◆ **Promotion of employment associated with the extractive industry** – again this is limited although most of the employees currently on the site are local Maroota people and a botanist has recently been engaged to manage the collection of seeds and propagation works for the forthcoming rehabilitation works. Upon Consent being granted an additional four employees will be hired. The current Nine will continue to be employed if Consent is granted.
- ◆ **Impacts from changes in employment patterns** – this is not a simple question. There are land use changes as a result of properties being given over to sand extraction and other properties that were originally viable agricultural properties, waiting future extraction. It is likely sand mining will increase employment opportunities and raise wage levels. The employment increase proposed for this development is four full time staff in addition to the current staff numbers (11). The question of long- term changes to employment patterns is more a matter to be addressed in a regional social impact assessment.
- ◆ **Health of the community from effects on air quality, noise, road safety, etc.** – this is a major question which has been addressed in the specifics of each impact type in this EIS but is not addressed in this EIS in terms of an overall health impact assessment. (See *National Framework for Environmental and Health Impact Assessment*, National Health and Medical Research Council, 1994). The recent surveys of the residents (1998 and 1999) indicated that these areas were of concern, but not directly attributable to the Dixon operation
- ◆ **Impact on recreation areas, usage, quality and access** – The walking access to natural bush land to the West of the site will be kept available.
- ◆ **Impact on cultural and heritage significance** – there are no known items of cultural or heritage significance on the site.
- ◆ **Impact on social and community services** – this is not relevant to this assessment.
- ◆ **Security and human and civil rights** – The security and safety of a site is an important issue and this is being addressed by the provision of fencing, warning signs, and a permanent site caretaker.



- ◆ **Impact on agricultural viability** – again this is an issue more for a regional assessment. It is at least 17 years ago since any of the subject lots were viable agricultural producing areas.
- ◆ **Land use aspirations and property values** – a number of local property owners have aspirations to have sand extracted from their properties. *Figure 11 of the DCP, Expected Extraction Program*, identifies those properties where extraction is likely in the future. As regards property values, the following is an excerpt from a supplementary document supporting a previous EIS prepared by PF Formation (1994):

*"We do not believe that this development will impact on residential housing prices as the development is in the middle of the Maroota area incorporated in the Sydney Regional Environmental Plan No. 9, Extractive Industry. This area has been in the REP area for at least 10 years it has been included to protect the existing and potential extractive resources of regional significance. Clearly whether this development proceeds or not, house values reflect that it is a sand mining area. For larger areas able to be sand mined, the approval of this development will only add value for prospective sand miners. If this approval is declined it will significantly negatively impact property values because they already incorporate a value for future sand extraction rights."*

- ◆ **Social impacts resulting from changes in the amenity of the area** – again an issue more properly addressed in a regional social impact assessment although it is noted that the scope of the development in this instance, will improve the amenity of the local area.

In conclusion, it is considered that the proposed development will not adversely effect any of the social attributes required to be assessed under DCP 500. In terms of facilitating and encouraging community participation an invitation has been issued to the East Bend Community Research Team, as being the most viable local community group, for a public meeting to discuss this proposal at any time to their convenience. The community have been surveyed three times in the past year.

### 9.3 Economic Appraisal

An economic appraisal report is not appropriate in the circumstances of this development, for the following reasons:

- ◆ There is a small additional employment proposed.
- ◆ The project relates to the completion of extractive operations and the site's rehabilitation.
- ◆ The "do nothing" option is not viable. The "Do nothing" option would mean that the site would be left to be rehabilitated by the use of the rehabilitation bond previously lodged with Council. This is not a viable proposition as:
  - it would be irresponsible for the Company to not meet its obligations for rehabilitation.
  - it is not in accord with the Company's development strategy.
  - The land owners wish to see the site ultimately rehabilitated.

It is again stressed that the bulk of the proposal is a very modest one for a short period and does not involve any "Greenfield" developments.



## Environmental Impact Statement

## Chapter 9 Social and Economic Impact Assessment

North Maroota Operation, NSW

In an economic appraisal prepared in support of the recently approved Trig Hill development (PR Formation, 1994), the following points were made:

- ♦ *there will be a significant shortfall in supplies of construction sands to the Sydney market.*
- ♦ *the Maroota district supplies approximately 700,000 tonnes per annum to the Sydney market (and not 500,000 tonnes per annum as was identified by the Department.*
- ♦ *the development would generate at least \$400 million (1996) of economic activity in terms of production and delivery costs, to get the resource to the Sydney market.*
- ♦ *the development would generate in excess of \$1 million per year for employees, land owners and residents of the Maroota area, equating to an average of \$5,000 per person per year, for the 49 years to each member of the Maroota community of approximately 200 persons.*

The assessment did not provide an assessment of the total impact of the project in terms of community costs and benefits.

In conclusion, the Company will encourage and promote employment of local persons within their operations. Wherever possible, all resources will be used for not only extractive employment but for environmental purposes. The need for a regional economic development report for the extractive industry in Maroota is encouraged.



## **CHAPTER 10 – CUMULATIVE IMPACT**

### **10.1 Introduction**

### **10.2 Other Extractive and Non Extractive Operations**

### **10.3 Transport Effects**

### **10.4 Community Facilities and Services**

### **10.5 Environmental Impacts**

### **10.6 Risks and Emergency Management**



## 10. CUMULATIVE IMPACT

### 10.1 INTRODUCTION

DUAP, in their EIS Guidelines for Extractive Industries/Quarries (DUAP, 1996) under Specific Requirements for an EIS, lists in the section on cumulative issues:

*"Cumulative impacts may result from a number of activities with similar impacts interacting with the environment in the region. They may also be caused by the synergistic and antagonistic effects of different individual impacts. They may be due to the temporal or spatial characteristics of the activities and impacts."*

The Guideline goes on to recommend that an extractive industry proposal should:

- ◆ Identify other extractive industries in the area.
- ◆ Identify the extent to which the surrounding environment is already stressed by existing development.
- ◆ Consider any likely long - term and short term cumulative impacts (considering air quality, noise, traffic disturbance, visual impacts, surface water and groundwater issues, public health, heritage items, vegetation and fauna habitat).
- ◆ Consider the receiving environment's ability to achieve and maintain environmental objectives.

DCP 500 does not specifically identify a requirement for a cumulative impact assessment but does list, in their *"preferred format content and structure for an EIS"*, a cumulative impact chapter with the issues to be considered, being:

- ◆ *the extraction activities within the locality.*
- ◆ *social impacts and mitigating measures/management.*
- ◆ *environmental impacts including groundwater, flora, fauna, noise and air quality.*
- ◆ *transport routes including road damage and access arrangements.*
- ◆ *community facilities and services.*
- ◆ *hazard analysis.*
- ◆ *relationship with other non extraction land uses.*

This chapter has been structured so as to consider the following:

- ◆ Other local extractive and non extractive operations (**Section 10.2**)
- ◆ Transport effects (**Section 10.3**)
- ◆ Impact on community facilities and services (**Section 10.4**)
- ◆ Environmental impacts (**Section 10.5**)
- ◆ Risk and emergency management (**Section 10.6**)

In terms of most of the physical and social effects, consideration of the extent of possible cumulative impact has been limited to the area of North Maroota, shown in **Figure 1.2 - Project Site Area**.



## 10.2 OTHER EXTRACTIVE AND NON EXTRACTIVE OPERATIONS

The various extractive and non extractive land uses within the North Maroota area are shown on **Figure 1.2 - Project Site Area**. Within this area, west of Old Northern Road, the land uses are approximately evenly divided between the two principal uses of agriculture and sand mining. In some cases, agricultural areas are not being actively managed, presumably, in anticipation of future extraction. There are some notable exceptions, including intensive agricultural development (hydroponics, etc).

Adjacent extractive operations are active to the North and to the South of the site, being Lots 1, 2 and 198 operated by PF Formation. These operations are connected by the internal access road located between Lots 196 and 29. The future duration of adjacent extractive operations is not known. It is understood that the operations to the North of the site will continue, in part, until the year 2002, due to the expiration of the Development Consent for that site.

**Figure 1.2** also shows the location of local residences that could be impacted, in a cumulative sense, from the various extractive operations.

## 10.3 TRANSPORT EFFECTS

**APPENDIX C6 - The Traffic and Transportation Assessment** has been based on traffic count information from both Old Northern Road and Wisemans Ferry Road, reinforced by an updated count in April 1999. Hence, the proposed traffic to be generated by this application has been assessed alongside the existing traffic and takes account of the cumulative effects of traffic generation. (It is noted that the "Trig Hill" development of PF Formation will not create any additional traffic. The application by a Mr Vella in Hornsby Shire, is unlikely to gain an approval in the short term).

The traffic assessment has determined that the road capacity is more than adequate for both the existing and future traffic (allowing for this development), although it has identified that road pavement widths do not meet road classification standards. It should be noted that the recent (April 1999) traffic count of PF Formation truck movements North of the intersection of Old Northern Road and Wisemans Ferry Road will be approximately equal to the projected Dixon Sand sourced movements. This will occur as these PF Formation sourced trucks represent the customer base formally held by Dixon Sand.

The report in **Appendix C6** notes the safety improvements that have been made at the school for bus pick up and set down. It has also been noted that no road improvements at the school are recommended as a result of the increased traffic proposed by this development. It can be concluded therefore, that the cumulative effects in relation to transport do not either exceed the capacity of the road system or create unacceptable impacts in terms of reduced safety, increased noise, etc. However, further reference should be made to **Appendix C6**. A recent (April 1999) traffic survey carried out by Southern Environmental ( see **Table 6.5**) in fact found that the total truck movements will not significantly increase as PF Formations have increased their truck movements to presumably service former Dixon Sand's client base. This assumption is reinforced by enquiries to that client base.

## 10.4 Community Facilities and Services

New development often places extra strains on Government facilities, in terms of those community facilities and services related to health, education, housing, etc. The Dixon proposal already exists and requires no further community facilities or services.



There is a small employment increase as a result of this application. There can therefore be little, if any, additional cumulative effects associated with community facilities and services.

### 10.5 Environmental Impacts

Various guidelines reference potential environmental effects related to air quality, noise, surface water, groundwater and the natural environment.

It is noted that the criteria established by the regulatory authorities, such as the EPA, for the assessment of impacts on aspects of noise, air quality and water quality, do take into consideration both incremental and cumulative effects.

The assessment of cumulative and incremental impacts have incorporated those limitations provided by the Statutory Authorities that have a legislative interest in the proposal.

It is concluded that cumulative impacts on the environment generally, from this and adjacent operations, are not such as to be unable to accommodate this development because of any limit to the environment or environments that are already stressed. It is felt that this proposal has less impact on the environment than adjacent similar operations.

The cumulative impact issue will become more significant as the level of production from the Maroota area increases (should this occur). It is recommended the Government consider, in terms of future regional planning, a cumulative impact assessment be prepared along the lines of the assessment recently carried out by the Department of Urban Affairs and Planning for the Upper Hunter area. (It is however, considered that the level of potential cumulative impact from extractive operations in the Maroota area is not the equivalent or as pressing as the level of cumulative impact from mining operations in the Upper Hunter).

### 10.6 Risks and Emergency Management

The objective of this section is to assess whether the potential risk from natural events or operational activities is likely to, in a cumulative sense, be more significant than might be created by operations on this site alone.

One potential issue could be the risk of a traffic accident from the increasing percentage of truck traffic along Old Northern Road and Wisemans Ferry Road. As the total number of trucks will in fact not increase significantly when the proposal is given Development Consent (see **Section 10.3-Transport Effects**) this aspect will not have a significant cumulative effect.

The potential for bushfire creation has been assessed previously (see **CHAPTER 7 Section 7.10.2**). Cumulative risk of bushfires being initiated from the Maroota sand operations and affecting the community within the Maroota area is not considered at this stage of Maroota's development to be a significant one. This is due to the large buffer zones to that bush which could be at risk.



## CHAPTER 11 – ENVIRONMENTAL MITIGATION MEASURES

- 11.1 Objectives
- 11.2 Compilation of Mitigation Measures
- 11.3 Water Flow and Quality Management
- 11.4 Noise Management
- 11.5 Transport Management
- 11.6 Air Quality Management
- 11.7 Wastes Management
- 11.8 Protection of the Natural Environment
- 11.9 Social Issues

*This chapter details the way in which all facets of the proposed operation will employ and maintain good environmental management practices to mitigate against any potential adverse impacts*



## 11.0 ENVIRONMENTAL MITIGATION MEASURES

### 11.1 OBJECTIVES

Section 2.18 of DCP 500 - Environmental Management Systems outlines the objectives, these being:

- ◆ To ensure Extractive Industries consistently perform to good environmental management practices.
- ◆ To ensure the ecological sustainability of Extractive Industry sites.
- ◆ To implement internationally and nationally recognised environmental management systems.
- ◆ To ensure all the objectives of DCP 500 are achieved.

The DCP requires proponents to detail the way in which all facets of their operation employ and maintain good environmental management practices. Proponents are required to submit annual management plans.

The EIS Guidelines (DUAP, 1996) set out a requirement for an Environmental Management and Rehabilitation Plan (EM&RP). This plan is defined as :

*"designed to ensure that commitments in the EIS, subsequent assessment reports and approval or licence conditions are fully implemented"*

The Guidelines also make the following points:

- ◆ The EM&RP should take into consideration any existing Plan of Management for the whole of the extractive industry resource (effectively this is DCP 500).
- ◆ With major or controversial projects, it may be appropriate to establish a community committee and to exhibit an annual environmental management report, outlining the environmental performance of the proposal. Council have encouraged the proponent to do this.
- ◆ The proposal should also make provisions for auditing the effectiveness of the proposed environmental protection measures and procedures.
- ◆ The proposal should outline the monitoring program, with a feedback loop to the management program.

This chapter of the EIS outlines the mitigation measures (to be incorporated in the EM&RP) that have been identified in the environmental assessments contained in this EIS. Section 6.12 has provided the likely contents of the full EM&RP. The mitigation measures are those commitments identified by and made in this EIS. The EM&RP will also incorporate all consent, permit and licence conditions, once these have been issued.



## 11.2 COMPILATION OF MITIGATION MEASURES

In the development of this proposal and the environmental assessment, various mitigation strategies have been developed. These will ensure that the operation proposed will meet environmental standards and compliance requirements.

Specific mitigation measures that have been identified to-date are set out below under the following headings:

- ◆ Water Flow and Quality Management,
- ◆ Noise Management,
- ◆ Transport Management,
- ◆ Air Quality Management,
- ◆ Protection of the Natural Environment,
- ◆ Waste Management, Social Issues,

The mitigation measures are summarised in this chapter. The specifics of each measure is provided within relevant sections of the EIS. The form of each mitigation measure will be developed in the EM&RP.

### 11.3. WATER FLOW AND QUALITY MANAGEMENT

The mitigation measures are as follows:

- ◆ Apply for discharge licence, under the Protection of the Environment Operations Act 1997 (via the EPA), to control the quality of off-site flows.
- ◆ Construct water retention basins and holding ponds to EPA standards.
- ◆ Ensure compliance with the *Water Act* and *Rivers and Foreshores Improvement Act*.
- ◆ Re-establish pre-existing creek line and associated riparian vegetation, to provide "flow through" discharge of upstream run-off.
- ◆ Maintain close to pre-existing flow regime downstream of the site.
- ◆ Develop protocols for periodic site inspections and water quality monitoring parameters and frequency.
- ◆ Meet criteria for protection of aquatic ecosystems for all discharges downstream.
- ◆ Comply with the DLWC Farms Dam Policy, in terms of water capture and uses for post-extraction purposes.
- ◆ Continue monitoring of shallow aquifer system in bore holes DS 1, 2 and 3.
- ◆ Update on an annual basis, proposed maximum extraction depths, based on groundwater monitoring for all future extractive operations.
- ◆ Continue to monitor natural spring discharges downstream of the site, to assess any change in groundwater quality as a result of site operations
- ◆ Continue to monitor upstream water quality as it enters the site and provide site storage if it exceeds the water quality discharge standard.
- ◆ Actively seek assistance from Council and the EPA to resolve upstream water quality problems.



## 11.4 NOISE MANAGEMENT

**Appendix C4 - Noise Impact Assessment** outlines the mitigation and management measures as does **Section 5.4- Noise Management**. These are as follows:

- ◆ Earth berms or bunds to be constructed at locations and heights as set out below:
  - A 3 m earth bund along the eastern boundary of Lot 29
  - A 2.5 m earth berm along the northern boundary of Lot 29
- ◆ Extraction from the various Precincts to be orientated such that the working face provides shielding for residences and the school to the East of the site.
- ◆ The use of the grader and water cart not to be permitted before 7 am.
- ◆ Truck drivers entering and leaving the site to be encouraged to consider noise effects on the community, wherever possible. Particular attention will be given to limiting exhaust braking while travelling past the Maroota Public School between 8 am and 4 pm. Limit their exhaust braking in areas during the period from 6 am to 7 am.
- ◆ Best management practice to be encouraged through the Environmental Management and Rehabilitation Plan and to include training of staff. All employees to be made aware of the problems associated with noise.
- ◆ Future plant to be selected after considering their noise emission profiles and their likely impact on the overall noise climate.
- ◆ A noise compliance study be conducted within 6 months of operations. The noise management plan for the site would be updated to include any recommendations arising from that compliance study.

## 11.5 TRANSPORT MANAGEMENT

**Section 5.5 -Traffic Management** sets out the impact assessment of the proposed 60 (maximum) loads per day on the road system through Maroota. In addition, the report provided various recommendations for the provision of a new intersection, the sealing of the access road and various warning and safety signs. It outlines a need for some of the Section 94 contributions to Council to go towards the upgrading of the pavement width along Old Northern Road.

To summarise, mitigation measures are:

- ◆ Upgrading of site road, intersection and signage.
- ◆ Specification on various protocols under the EM&RP for the arrival and departure of trucks, the covering of pay loads, etc.
- ◆ A schedule of maximum allowable truck departures, particularly in the early operating periods of the day (that is, 6 am to 8 am).



## 11.6 AIR QUALITY MANAGEMENT

The quarrying operation that took place at the proposed site until December 1998 had air quality management practices in place. The air quality monitoring and the recent community consultation indicates that these were sufficient. However these will continue to need to be strictly practised. No new mitigation measures are therefore considered necessary or will be proposed. Continuation of those practices followed under the previous Consent will however be part of the management system embodied in the EM&RP. These provisions include:

- ◆ The ongoing management of the seven gauge dust deposition network across the site, and in the areas adjacent to the site.
- ◆ Maintaining the philosophy of no visible dust on the site, from either natural wind lift-off or from traffic operations on unsealed site roads, and the use of the water tanker, as necessary, to meet this objective.
- ◆ The sealing of the site access road to the gate of the site.
- ◆ The sprinkler system along the access road and on the stockpiles.

To ensure there is compliance with the standards of air quality control, annual monitoring results will be provided to Council as part of the annual environmental management report.

## 11.7 WASTES MANAGEMENT

The mitigation measures, in terms of the management of the various wastes, both extractive and non extractive will be as follows:

- ◆ Comply with Council's and the NSW Government's policies for waste minimisation and source separation.
- ◆ Recycle, wherever possible, building wastes that are generated on the site.
- ◆ Manage tailings in accordance with best available technology and work with the mining industry to research opportunities for applying mining technologies to extractive industries.

## 11.8 PROTECTION OF THE NATURAL ENVIRONMENT

Mitigation measures proposed in **Section 7.8 - Protection of Environmentally Sensitive Areas**, have been identified by the specialist survey carried out and reported on in **Appendices C7 and C8** as follows:

- ◆ Low flow pipe to ensure downstream constant flow of water.
- ◆ Upgrading of the sediment discharge channels and erosion control measures at the North-West extremity of Lot 196, some of which has already been done since December 1998 as part of the stabilisation allowed by the Land and Environment Court.
- ◆ The addition of topsoil to some areas of embankments and the provision of additional plantings of native endemic vegetation, again some of this has been substantially completed.
- ◆ The collection of seed from adjacent vegetation for propagation and subsequent replanting on embankments and for rehabilitation generally- mostly completed.
- ◆ Some limited regrading of areas of steep embankments- mostly completed.
- ◆ Consideration of the necessity for reduction of the height of some bund walls.



- ◆ The development of nursery propagation facilities on the site and the early revegetation of completed extractive areas.
- ◆ The provision of a range of vegetation types across the site, to provide a reinforcement of adjacent native vegetation outside of the site.
- ◆ Monitoring of the success of the revegetation program by the provision of annual rehabilitation management plans.
- ◆ Continued monitoring of site run-off during both wet weather and dry weather, to detect any possible long term effects of leachates from tailings deposits.
- ◆ Complying with the requirements, where appropriate, of the *Kunzea rupestris* management plan developed for Council. This will be done, although this species has recently been downgraded.

## 11.9 SOCIAL ISSUES

**CHAPTER 9 - SOCIAL AND ECONOMIC IMPACT ASSESSMENT** provides, in **Section 9.2 - Social Impact Assessment**, a compilation of findings of other studies. It also provides details of the first (1998) community consultation program and attitude survey, as well as reference to the second survey in April 1999.

In addition, it is proposed that a meeting with the local East Bend Community Research Team will be undertaken during the public exhibition of this EIS.

The mitigation measures that are proposed as part of this assessment are set out below:

- ◆ Noise controls – see **Section 11.1**
- ◆ Transport management – see **Section 11.5**
- ◆ Air quality management – see **Section 11.6**
- ◆ A public meeting be held, at a time to be agreed, and covered by the East Bend Community Research Team.
- ◆ The appointment of a site environmental officer to be available to act on any community concerns, during operations.
- ◆ An annual "open day" in which members of the community will be invited to the site and have the opportunity of inspecting the site.
- ◆ The availability of the EM&RP each year, for community perusal.



## CHAPTER 12 – EVALUATION OF THE PROPOSAL

12.1 Principles and Objectives

12.2 Biophysical Issues

12.3 Social Equity

12.4 Ecological Efficiency

12.5 Ecological Sustainability

12.6 Consequences of Not  
Proceeding

12.7 Conclusion



## 12.0 EVALUATION OF THE PROPOSAL

### 12.1 PRINCIPLES AND OBJECTIVES

The *Environmental Planning and Assessment Regulation, 1994*, in Schedule 2 requires the environmental impact statement to justify the proposed works (at the Dixon Sand North Maroota quarry) as follows:

*"Having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development."*

This final chapter of the statement addresses each one of these considerations in turn, drawing principally on the assessment of impacts as set out in **CHAPTERS 7,8,9 and 10** of this document.

This final chapter provides:

- ◆ Justification in terms of biophysical considerations (**Section 12.2**)
- ◆ Justification in terms of social equity (**Section 12.3**)
- ◆ Justification in terms of economic efficiency (**Section 12.4**)
- ◆ Justification in terms of ecological sustainability considerations (**Section 12.5**)
- ◆ An assessment in the consequences of the development not proceeding (**Section 12.6**)
- ◆ Concluding remarks (**Section 12.7**)

### 12.2 BIOPHYSICAL ISSUES

The proposal to be undertaken at the Dixon Sand North Maroota quarry has been planned and designed in such a way that it will be possible to extract, process and supply to the market, the remaining sand resource on the site without adversely affecting Maroota, particular the North Maroota arear. Although certain physical changes will occur on the site as a result of the works, those works will in general be beneficial in transforming the site from an active site to a fully rehabilitated and partly active sand processing and agricultural site. Finally the site will become fully agricultural. It has been found that all works can be carried out within specified statutory criteria and can meet reasonable community expectations.

The assessed physical impacts on the local environment from this development and the justification of resultant impacts are set out as follows:

- ◆ The proposal will result in the final and complete rehabilitation of an area of some 26 ha and the development of a final landform suitable for post-extractive uses, especially if the preferred land form is achieved.
- ◆ A range of soil erosion and sediment controls and water management facilities will be installed prior to and during the operations. Significant changes will occur transforming the site from an extractive one to agricultural. The management of water on the site will ensure that there is minimal impact on downstream water flows or water qualities during extraction.
- ◆ No clearing of any further vegetation will be required. On-site propagation facilities will be established, based on local seed collection to provide the seed and feedstock for the rehabilitation program.



- ◆ The level of deposited dust outside of the site will not increase. Existing levels would appear to comply with EPA Guidelines. No residential amenity will be affected. Deposited dust levels will continue to be monitored at seven gauges within the North Maroota area.
- ◆ Construction noise, although not audible at nearby residences, would be further controlled with the construction of a series of earth berms along the full length of the Eastern boundary of the site (except for the "Northern" section where they already exist). The noise assessment has analysed worst case conditions and under all such conditions, design goals can be met. There is only one predicted exceedance and that is under the worst possible scenario and exceedance is less than 2 dBA.
- ◆ Traffic on Old Northern Road will remain at close to April 1999 levels. Even so, various works will be carried out to upgrade the site's access road and intersection with Old Northern Road. Particular attention has been paid to traffic noise levels and truck movements. These have been scheduled to try and minimise any possible adverse noise and traffic effects and so provide the opportunity to decrease the potential for annoyance to the residents.
- ◆ No rare or threatened plant or fauna species would be impacted by the proposal. Again, it is the intention to rehabilitate large areas of the site, using locally sourced native vegetation seed stock. It is also intended to provide initial enrichment plantings along existing and proposed setbacks, to manage the transition effect between adjacent areas and the site in a more constructive way. This will be followed by intensive site plantings under the revegetation works.
- ◆ Enrichment plantings are proposed to further restrict visual access to the site from three locations that have been identified within the local and regional area. It has been recognised that limited but intrusive views of the site can be obtained from these sites.

### 12.3 SOCIAL EQUITY

Considerations of social equity between the community of North Maroota and the benefits to the wider community from provision of a quality product at a competitive market price is the basis for this assessment of social equity.

An analysis of the social aspects of this proposal indicate that:

- ◆ There will be a small employment creation and therefore little direct and indirect benefits associated with employment creation. However the existing nine employees will continue to be employed with a more significant beneficial impact to the local community
- ◆ The Company will ensure it consults with and take into account all of the reasonable requirements of that local community and will encourage community involvement in understanding more of the operation.
- ◆ The payment, through Section 94 provisions, of further monies to assist Council in the upgrading of community services and infrastructure, namely local road systems, will benefit all road users.
- ◆ There will be small beneficial impact on the local community when more stringent controls are placed on trucks leaving the Dixon site and using Old Northern Road, than those currently using this road.

Commitments made in this EIS and incorporated in the Environmental Management and Rehabilitation Plan that will be prepared, will include various management protocols for those aspects of the proposal that result in off-site effects, namely, transport, noise, air quality, etc. The local community will have an opportunity to assist Council in reviewing the performance of the Company's operation and thereby ensuring that the Company maintains the standards set by this EIS.



## 12.4 ECONOMIC EFFICIENCY

The limited nature of the biophysical and social effects of this proposal are such that should the development receive Development Consent, the net economic benefits that will result to the Company, the local area, the Shire, the Sydney region and consumers generally, will be significant and beneficial.

In summary, the direct and indirect economic benefits will be:

- ◆ Continuation of the benefits of direct employment together with the indirect employment effects from the total of 15 persons. There will be a greatly increased number of indirect employment opportunities created in associated truck driving, service of equipment, provision of parts and materials, etc.
- ◆ A direct contribution annually to the local economy through wages and a continued expenditure on services and the purchase of maintenance items, etc. all of which would benefit not only local, but regional and Sydney-wide, industries.
- ◆ Baulkham Hills Council will continue to receive financial contributions for various purposes.

The economic consequences of the development not proceeding would be a loss of the previous benefits outlined as well as the need for the ongoing management of a site, whose land use would not be environmentally sustainable in the longer term. Accordingly, rehabilitation works would need to be carried out, either by use of the rehabilitation bonds or some other method, less likely to result in an organised, co-ordinated rehabilitation program that the on proposed, as an integral part of this development.

There could also be further supply problems within the industry if other sources of construction sand were not able to readily replace supply from this site. Already the market is suffering from a short fall in white sand. In addition since the closure of the Dixon operation the price of sands has risen significantly. If other sources of sand had to permanently replace the Dixon sands supplies would probably be sourced from areas more remote to the market. This would involve further environmental costs associated with the transport of that product to the market.

Economic efficiency arguments dictate that the project should proceed but subject to the measures committed to and described within this assessment.

## 12.5 ECOLOGICAL SUSTAINABILITY

**Chapter 5 - ECOLOGICALLY SUSTAINABLE DEVELOPMENT**, outlined the requirements for assessment under the various EIS Guidelines and the DCP 500. These detailed the assessment of ecological sustainability and the responsibilities of Council to ensure that when they exercise their approval powers they consider the principles of ESD. *Section 2.14 of DCP 500* sets out the requirement for an ESD Summary Report; the report must give consideration to the following:

- ◆ The precautionary principle.
- ◆ Means of ensuring intergenerational equity.
- ◆ Means of conserving biological diversity.
- ◆ Recognition of the global dimension.
- ◆ Conservation of cultural, educational, etc. attributes of the local region.
- ◆ Economic and social consequences.



- ◆ Overview of the operating and mining procedures.
- ◆ Risks, safeguards and contingency arrangements.
- ◆ Social equity and community satisfaction.
- ◆ Water resource management.
- ◆ Wastes management and minimisation.
- ◆ Effective monitoring and review programs

Most of the aspects in the content of the ESD Summary Report have been addressed in this EIS. However the four key principles of ESD are yet to be addressed, these are:

1. The applicability and the appropriateness of the precautionary principle.
2. Intra and intergenerational equity questions.
3. The conservation of biological diversity and ecological integrity.
4. The improved valuation of pricing of environmental resources.

#### **1. Precautionary Principle**

The principle states that

*"Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation".*

In the assessing of any proposal, in terms of the precautionary principle, the key issues are to determine whether there is the possibility of serious or irreversible damage to the environment and to consider the weighted risk consequences of various options.

In other words, emphasis should be placed on anticipation and prevention of environmental damage rather than reacting to it. The operation on this site has been ongoing for some 17 years. There are, as a result, no activities or features of the proposal for which there is a level of uncertainty in achieving an acceptable level of environmental performance. In those areas where there is some lack of useful operating or monitoring data, such as the effect of tailings pond seepage on the shallow aquifer, there are nevertheless, monitoring and management strategies that have been put in place to identify and respond to any indications of unpredicted and adverse consequences.

It is also considered to be only one irreversible feature of this proposal. This one irreversible feature is that the resource will be depleted and can never be replaced. However, this needs to be reviewed in the context that the Maroota reserve is in excess of 100 million tonnes. The Dixon site represents 1.5% of that total resource and as there is no viable alternative in terms of other sources of sand located closer to the Sydney market, then an alternative view of the proposal could be that it represents an efficient utilisation of the resource.



## 2. Generational Equity

This principle is embodied in:

*"The present generation should ensure that the health, diversity and proactively of the environment is maintained or enhanced for the benefit of future generations".*

As can be seen, this is a question of social equity from a "whole of community" point of view.

To ensure social equity, not only should there be no long term irreversible damage to the environment but the quality of life of the existing residents of the Maroota area should be maintained throughout and beyond the life of this project.

The Company's proposal has been planned to ensure efficient recovery of the resource and the management of all environmental effects in a responsible and appropriate way, conforming with all statutory requirements and non statutory guidelines. In addition the local community's concerns about truck noise and operational dust have been carefully considered and positively responded to in such a manner that the company has made operational commitments in this document. These operational commitments will form part of the Development Consent

## 3. Conservation of Biological Diversity and Ecological Integrity

There is no impact direct or indirect on any habitat or any species.

Progressive rehabilitation of the site, using locally occurring species, will act to enhance the local habitat and hopefully, the strength of the biological diversity and ecological integrity of this part of Maroota.

## 4. Improved Evaluation and Pricing of Environmental Resources

This matter has been addressed in **Chapter 9 - Social and Economic Impact Assessment**.

It is essentially impossible, at this time, to carry out a "whole of project" cost benefit analysis, to put values on environmental resources that will be acceptable to all parties. The reliance here on environmental management rather than pricing of resource impacts is considered to be sufficient to demonstrate the economic efficiency of this proposal. The Section 94 contributions to Council are in some way an indication of the community's aspirations of the value of the resource. In addition the land holders receive a royalty for the use of their land.

## 12.6 CONSEQUENCES OF NOT PROCEEDING

The consequences of not proceeding with the project were addressed in the section on economic efficiency (see **Section 12.4**) and mentioned in **Section 2.3-Development Alternatives**. The circumstance of this proposal, given that it is a final site rehabilitation and an extraction of the residual resource remaining on the site, the option of not proceeding would not appear to be viable. It is not about whether or not the development should proceed but on what terms.



## 12.7 CONCLUSION

The Company's proposal is to complete the extractive resource operations on the subject site and to complete all stages of the rehabilitation program. This EIS has found that the development can be undertaken without adverse impacts on the surrounding biophysical, social and economic environments of the region.

The safeguards and mitigation measures that form part of this proposal have either been exercised in the past (maybe not successfully) or have been developed in the last year, as part of the development of this impact assessment and the proposal.

There will be impacts. They will be minor, however and can be managed within a management framework that includes the Regulatory Authorities, the Company and the local community.



# GLOSSARY OF TERMS

**ANZECC** – Australian & New Zealand Environment and Conservation Council.

**Ambient Air Quality** – the quality of surrounding air, usually expressed as a concentration or deposition rate of air pollutants. Also known as existing air quality.

**Aquifer** - rock strata, which is characteristically porous and permeable, therefore will transmit the flow or passage of water. In relation to Flora - an aggregation of botanically related types which also have similar structure.

**Attenuation** - reduction in sound pressure levels between two locations.

**Background noise level** - the level of the ambient sound indicated on a sound level meter in the absence of the sound or noise produced by the proposed activity.

**Batter** - an artificial, uniform slope.

**Bench** - a step in a batter face or the inclined slope between two different (horizontal) levels.

**Berm** – a safety barrier on the side of an internal access road or a small barrier for diverting/directing rainfall or other liquids.

**Bund Wall** - a wall of earth normally built to such a height and location as to reduce noise effects, screen visual impact, contain a storage of water, etc.

**Catchment** - a drainage area of a reservoir, river, creek, etc.

**Clay** - a size term denoting particles, regardless of mineral composition, with a diameter less than 0.004 mm (4µm).

**Conductivity** - the dissolved salt content of water.

**Depositional gauge** - a dust gauge used for the purposes of measuring particulate matter that settles.

**"Environmental sensitivity" area** - areas of land identified within DCP 500 and located adjacent to natural bushland areas, drainage lines or areas of unsuitable topography.

**Exotic** - introduced or foreign, not native.

**Extraction** - a term synonymous with quarrying.

**Flocculent** - an additive to fine material that is suspended in water. This additive causes the fine particles to agglomerate together, resulting in a larger "flocculated particle" which will naturally settle out of the suspension.

**Friable** - easily crumbled as in poorly cemented rocks.



**Fugitive emissions** - emissions not entering the atmosphere from a stationary vent (stack). Examples of fugitive dust sources include vehicular traffic on unpaved roads, handling of raw materials, wind erosion of dusty surfaces, etc.

**Gabion wall** is a wall constructed of wire baskets filled with rocks.

**Groundwater** - water contained in voids such as fractures and cavities in rocks and inter- particle spaces in sediments.

**Habitat** - a natural environment.

**\* Internal access (haul) road** - a carriageway specifically designed to accommodate the two-way movement of haulage vehicles (for vehicle movement between extraction sites, processing areas and the external road system).

**Inversion** - a weather term for surface defining boundary between two layers of air of different temperatures.

**\* Landscape** - refers to all the flora and fauna diversity and topography, cultural significance (ie. aesthetic, scientific, historic, social, or other special values).

**Lithosol** - one of a group of azonal soils having no clear soil morphology and consisting of a fresh and imperfectly weathered mass of rock fragments.

**Local environmental plan** - a plan developed by a council to control development in part or all of the shire or municipality.

**Nature reserve** - an area set aside for the protection of flora and fauna with limited public access - designed more for scientific interest and research than National Parks.

**Off-road dump truck** - a truck specifically designed for hauling and tipping soil or rock within the quarry or similar situation and not licensed or registered to travel on or across public roads.

**Overburden** - sub-soil and decomposed rock overlaying the main rock body that is not suitable for use in the final product.

**Palaeo channel** - a former river or stream course now infilled by deposits of sand and gravel.

**Particulate matter** - small solid or liquid particles suspended in, or falling through the atmosphere.

**Permeability** - a material property relating to the ability of a material to transmit water.

**\* Piezometer** - a non-pumping well, generally of small diameter, which is used to measure the elevation of the watertable. A piezometer generally has a short well screen through which water can enter.

**Podzolic** - soil descriptive term for soils that are strongly acid and highly differentiated.



\* **Precautionary principle** - refers to when instances of threats or serious environmental damage, lack of scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.

**Protected land** - land with slopes greater than 18° or/and within 40 m of a stream.

**Radial stacker conveyor** - a conveyor that can be rotated and which discharges onto the ground to form a crescent shaped stockpile of product.

**Raw feed** - material from an extraction area which is suitable for processing.

\* **Recharge area** - refers to a geographical area in which water infiltrates then percolates to reach an aquifer.

**Regional environmental plan** - a plan prepared by the State Government Department responsible for planning where controls on development are considered on a regional and statewide basis.

**Rehabilitation** - the preparation of a landform following quarrying and its stabilisation with grasses, trees and shrubs.

**Reserves** - in the mining context refer to an estimated quantity of useable material.

\* **Residence not associated with extractive operation** - a dwelling house whose occupants, whether owner/s or tenants, have no direct involvement in the day-to-day operations of extractive industries.

**Revegetation** - the replacement of vegetation, principally grasses and legumes, on areas disturbed by quarrying activities.

**Riprap** - armour rock protection for water retaining structures.

**Ripping** - breaking up of ground with a bulldozer, using its ripping tine.

**Sand** - sediment comprising particles in the 0.063 mm to 2 mm size range.

**Sandstone** - the general term for a sedimentary rock with sand size particles.

**Scalping** - the removal by screening of the material from the raw feed prior to presenting it to the crushers.

\* **Scenic quality** - refers to the degree of enjoyment derived from what an observer sees either as a sequence of views from a public place such as a road, or from a single point such as a lookout, which is composed of the arrangements of natural and physical features, patterns of land use and its components.

**Sedimentation dam/basin** - an earth embankment or small excavation constructed so as to catch surface run-off and allow sediment carried in the run-off to be deposited by a reduction in run-off velocity.



\* **Significant vegetation** - native bushland, trees or shrubs in excess of 100 mm in diameter at the base and other stands of native vegetation which are identified as vulnerable or threatened plant species.

**Silica** - silicon dioxide (SiO<sub>2</sub>).

**Siliceous** - having a high silica (quartz) content.

**Silt** - a classic sediment, most of the particles of which are between 0.004 mm and 0.063 mm in diameter.

**Silt-stop fencing** - a fine mesh fencing normally installed down slope of a sediment source, designed to trap silt and sediment and allow the water to pass through.

\* **Social impact assessment** - an assessment which focuses on the human dimension of environments specifically identifying the extent and degree of impact of extractive industries on people within the community.

**Specific gravity** - the weight of any body or substance considered with regard to the weight of an equal volume of pure water.

\* **Tallings** refer to waste products from mining and processing operations, commonly in the form of fine grained sediment.

**Tertiary** - a geological time period, 2 to 60 million years ago, comprising Palaeocene and Pliocene epochs.

\* **Threatened species** - species of flora and fauna listed and scheduled under (the Threatened Species Act, 1998) the National Parks & Wildlife Act, 1974 and Section 5a of the Environmental Planning & Assessment Act, 1979.

**Topsoll** - the surface layer of a poorly developed or well developed soil profile containing the main percentage of organic material.

**Transport access point** - refers to those five locations, identified within DCP500 (Figure 12) as acceptable points of access onto Old Northern Road or Wisemans Ferry Road.

**Turbidity** - discolouration of, or suspension of particles in water resulting in a reduction in clarity.

\* **Unsaturated zone** - refers to the zone between the land surface and the watertable. It includes the root zone, intermediate zone and capillary fringe.

\* **Visual sensitivity** - refers to the degree of importance of a particular landscape component within a natural landscape setting and/or scene.

- **Water contamination** - a change in water quality that produces a noticeable or detectable change in its characteristics.

\* **Watertable** - the surface of the saturated zone in an unconfirmed aquifer.

**NOTE:** Those definitions extracted from Definitions in DCP No. 500 are identified with an asterisk.



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